



Exploring the relationship between sustainability and project success - conceptual model and expected relationships

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Abstract:

Sustainability is one of the most important challenges of our time. Companies are integrating sustainability in their marketing, communication and their actions. Sustainability has more recently also been linked to project management. The logic behind this link is that sustainability needs change and projects are realizing change. Several studies explored how the concept of sustainability impact project management. The research project reported in this paper elaborates on these works by studying how sustainability affects project success. Project managers, logically, strive for project success and considering sustainability may influence this success. Based upon a review of relevant literature, the paper develops a conceptual model that provides a more detailed understanding of how considering different dimensions of sustainability may affect the individual criteria of project success. The study also provides a conceptual mapping of the different relationships between dimensions of sustainability and criteria of project success. This mapping shows that the most positive relationships are expected for the relationship between sustainability and the success criteria stakeholder satisfaction, future readiness and controlled project execution. The expected relationship between considering sustainability and completing the project on schedule and within budget is uncertain.

Keywords:

sustainability; triple bottom line; sustainable project management, project management; project management success.

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1. Introduction

In the last 10 to 15 years, the concept of sustainability has grown in recognition and importance [41]. How can we develop prosperity without compromising the future? Industry leaders realize that ‘greenwashing’ of current business practices is not a solution. The 2012 BSR/Globe Scan study [7] concludes that “The most important leadership challenge facing business today is the integration of sustainability into core business functions”. One of these business functions is project management, and ‘green’ or ‘sustainable’ project management’ is identified as one of the most important global project management trends today [2].

Also in academic research, the relationship between project management and sustainability is explored [16, 6, 40] as one of the (future) developments in project management. The growing number of publications on the integration of sustainability into project management [40] indicate that the topic is “... picking up momentum” [42]. Based on a structured review of 164 books, articles, papers and book chapters, Silvius and Schipper [40] identify several ‘impact areas’ that provide leverage points for the consideration of sustainability in projects. One of these impact areas is project success. And although project success is a frequently studied topic, the relationship between considering sustainability in a project and its success is still unexplored. In line with this, Martens and Monteiro de Carvalho [29] conclude that there is a “need for studies on the convergence of sustainability issues and project management... as well as its relationship with success in projects”. It is this relationship between sustainability in projects and project success, that the study reported in this paper explores. Integrating sustainability considerations in a project may be expected to, for example, relate to stakeholder satisfaction of the project [26]. However, 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.

The study reported in this paper aims to systemize the relationship between considering sustainability in projects and project success by developing a conceptual model for this relationship, that creates explicit constructs between the different dimensions of sustainability and the different variables of project success. The rationale behind this study is that project managers, logically, strive for project success and that considering sustainability may have an influence on project success or the perception of this success. The contribution it aims to make is to develop a multi-dimensional relationship between sustainability in projects and project success, as opposed to a one-dimensional relationship. By ‘opening up’ this relationship, we aim to develop a better understanding of how considering sustainability in projects may contribute to, or hinder, the success of these projects.

Following this introduction, the paper is structured in four sections. The next section will provide some notes on the methodology followed in finding and analyzing the literature on which our study is based. Following this, section 3 will explore the main constructs of the study: sustainability in projects and project success. Based upon the conceptualizations found in the literature, the following paragraph, section 4, will develop the conceptual model of the relationship between sustainability in projects and project success. Elaborating upon this conceptual model, this section will also provide a discussion of the detailed relationships between the dimensions of sustainability and the criteria of project success. This section represents the main contribution of this paper. The final section, section 5, will provide the conclusions of our study and directions for further research.

2. Methodological approach

As this study aims to develop our understanding of a given phenomenon, it is considered to be of an exploratory nature. We used the systematic literature review methodology [45] of selection, extraction, analysis and synthesis of published academic books and articles. And although all the data we collected was already published, it is generally accepted that worthy insights and contributions can be derived also from existing theoretical works [29].

Following the recommendation by Bauer and Bakkelbasi [8] that “researchers should consult Google Scholar ..., especially for a relatively recent article, author or subject area”, we used Google Scholar as search engine. For data

extraction, we used the databases Science Direct, Business Source Premier, Ebsco-Host and JSTOR to retrieve the full publications for our analysis. We used qualitative content analysis methods to analyze the articles. In this analysis, we combined the conventional, directed and summative content analysis approaches [20].

3. Results

This section reports the review of earlier publications on the main constructs of our study: project success and sustainability in projects.

3.1. Project success

The concept, or criteria of, project success has been a variable in numerous studies. Few people would disagree with the statement that project success is interpretable in many ways. It is, simply put, a rather “elusive concept” [37]. Most early research on project success seems to emphasize the three traditional dimensions: (within) time, (within) budget and (within) specification [35], also known as the known ‘triple constraint’ of time, budget and quality, “despite the fact that this method is currently subject to widespread criticism” [5]. However, starting around the early 80s of last century, other factors are emerging in literature, such as “measuring success after delivery” that “involves looking at the benefits or effectiveness of the project from the perspective of the stakeholder” [23]. In one of the most cited publications from that period that took an extended look on project success, Pinto and Slevin emphasized the importance to consider project success “over time” [36]. The development of the perception of project success over time has also been pointed out by Shenhar et al. [39].

In our analysis of studies on project success, we found 27 different ‘measures’ of project success. Table 1 presents these measures and their sources. From this overview, it shows that project success is a multidimensional concept and that many factors are identified that go beyond the traditional ‘known ‘triple constraint’ criteria. Table 1 also demonstrates that there is no consensus about a universal (set of) measures for project success.

Table 1. Measures of project success found in literature.

Measures of project success	Sources								
	Pinto & Slevin [36]	Wateridge [46]	Baccarini [4]	Atkinson [3]	Shenhar et al. [39]	Collins & Baccarini [11]	Nelson [34]	Müller & Turner [33]	Thomas & Fernandez [43]
1 The project is completed within schedule	x	X	x	x	x	X	x	x	x
2 The project is completed within budget	x	X	x	x	x	X	x	x	x
3 The deliverable is meeting technical specifications		X	x	x	x	X	x	x	x
4 The deliverable is meeting functional performance requirements		X	x	x	x	x	x	x	x
5 The project management process is adequate			x			x			
6 Project risks are managed adequately						x			

Table 1. Measures of project success found in literature (cont.).

Measures of project success	Sources								
	Pinto & Slevin [36]	Wateridge [46]	Baccarini [4]	Atkinson [3]	Shenhar et al. [39]	Collins & Baccarini [11]	Nelson [34]	Müller & Turner [33]	Thomas & Fernandez [43]
7 The cooperation of parties and individuals in the project is good.						x			
8 The project is performed with a high standard of work quality.						x			
9 The customer of the project is using the deliverable (after completion)	x				x		x		x
10 The deliverable is fulfilling the customer's needs		x	x		x	x		x	
11 The deliverable is solving a customer's problem	x	x			x				
12 The project sponsor is satisfied with the project		x	x			x		x	x
13 The end-user is satisfied with the project	x	x	x		x	x		x	x
14 The supplier is satisfied with the project								x	x
15 The project team is satisfied with the project		x		x		x		x	x
16 The (other) stakeholders are satisfied with the project			x			x		x	x
17 The business objectives of the project are met	x	x	x	x	x	x	x	x	x
18 The business objectives of the suppliers / contractors are met				x		x		x	
19 The deliverable creates a larger market share of the customer organization		x		x	x	x			
20 The project prepares the organization for its future					x		x		x

Table 1. Measures of project success found in literature (cont.).

Measures of project success	Sources								
	Pinto & Slevin [36]	Wateridge [46]	Baccarini [4]	Atkinson [3]	Shenhar et al. [39]	Collins & Baccarini [11]	Nelson [34]	Müller & Turner [33]	Thomas & Fernandez [43]
21 The project contributes to the development of the participating organizations				x					
22 The project contributes to the development of the participating individuals				x		x			
23 The project earns public recognition						x			
24 The project reduces waste				x					
25 The project creates a positive economic impact on society				x		x			
26 The project creates a positive social impact on society				x		x			
27 The project creates a positive environmental impact on society				x		x			

In order to develop a more comprehensive set of criteria of project success, we grouped, what we considered related, measures and concluded six condensed criteria of project success.

Criterion 1: *The project is executed in a controlled manner*. This criterion refers to the project management process. This process should be ‘adequate’ [4; 11], with adequately managed risks [11] and with high quality of work standards [11]. When this (adequate) project management process leads to the completion of the project’s deliverable according to specifications [3; 4; 11; 33; 34; 39; 43; 46] and within the agreed time and budget constraints [3; 4; 11; 33; 34; 36; 39; 43; 46], criterion 2, *The agreed project deliverable is completed on schedule and within budget*, is realized.

Criteria 3 and 4 do not refer to the project management process, but to the result of the project. Criterion 3: *The project’s deliverable is ‘fit for purpose’*, refers to whether the deliverable is meeting functional performance requirements [3; 4; 11; 33; 34; 39; 43; 46], whether the customer of the project is using the deliverable [34; 36; 39; 43], whether the deliverable is fulfilling the customer's needs [4; 11; 33; 39; 46] and whether the deliverable is solving a customer’s problem [36; 39; 46]. Criterion 4: *The business objectives or goals of the project are realized*, is building upon this, by referring to the realization of the business case or business goals that were defined for the project [3; 4; 11; 33; 34; 36; 39; 43; 46]. This criterion also includes the business objectives of the suppliers/contractors [3; 11; 33].

Criterion 5: *The stakeholders of the project are satisfied* refers to the qualitative criteria of the satisfaction of the project sponsor [4; 11; 33; 43; 46], the end-user [4; 11; 33; 36; 39; 43; 46], the supplier [33; 43], the project team [3; 11; 33; 43; 46] and (other) stakeholders [4; 11; 33; 43].

The last criterion, criterion 6: *The project prepares the organization for the future*, refers to success measures such as the project prepares the organization for its future [34; 39; 43] and the project contributes to the development of the

participating organizations [3] or the participating individuals [3; 11]. Also included in this criterion are the measures of a positive economic, social and/or environmental impact on society [3; 11] and the public recognition that the project earns [11].

Table 2 summarizes this comprehensive set of criteria of project success and the related measures.

Table 2. Criteria of project success.

Criteria	Measures included in this criterion
The project is executed in a controlled manner	The project management process is adequate Project risks are managed adequately The project is performed with a high standard of work quality
The agreed project deliverable is completed on schedule and within budget	The project is completed within schedule The project is completed within budget The deliverable is meeting technical specifications
The project's deliverable is 'fit for purpose'	The deliverable is meeting functional performance requirements The customer of the project is using the deliverable (after completion) The deliverable is fulfilling the customer's needs The deliverable is solving a customer's problem
The business objectives or goals of the project are realized	The business objectives of the project are met The business objectives of the suppliers/contractors are met The deliverable creates a larger market share of the customer organization
The stakeholders of the project are satisfied	The project sponsor is satisfied with the project The (other) stakeholders are satisfied with the project The end-user is satisfied with the project The supplier is satisfied with the project The project team is satisfied with the project The cooperation of parties and individuals in the project is good
The project prepares the organization for the future	The project prepares the organization for its future The project contributes to the development of the participating organizations The project contributes to the personal/professional development of the participating individuals The project creates a positive economic impact on society The project creates a positive social impact on society The project creates a positive environmental impact on society The project earns public recognition

3.2. Sustainability in projects and project management

The balance between economic growth and social wellbeing has been around as a political and managerial challenge for over 150 years [13]. Also the concern for the wise use of natural resources and our planet emerged already many decades ago, with Carson's book "Silent Spring" [9] as a launching hallmark. In 1972 the 'Club of Rome', an independent think tank, published its book "The Limits to Growth" [31]. In this 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 fueled 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 defines sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" [47]. By stating that "In its broadest sense, sustainable development strategy aims at promoting harmony among human beings and between humanity and nature", the report implies that sustainability requires also a social and an environmental perspective, next to the economical perspective, on development and performance.

The vision that none of the development goals, of economic growth, social wellbeing and a wise use of natural resources, can be reached without considering and effecting the other two, got widely accepted [25]. In his book “Cannibals with Forks: the Triple Bottom Line of 21st Century Business”, John Elkington identifies, this as the ‘triple bottom line’ or ‘Triple-P (People, Planet, Profit)’ concept: Sustainability is about the balance or harmony between economic sustainability, social sustainability and environmental sustainability [14]. In addition to the triple bottom line dimensions, several publications also consider other dimension of sustainability that are relevant to project management. Based upon an extensive analysis of publications that relate the concepts of sustainability to projects and project management, Silvius and Schipper [40] identify the following dimensions of sustainability:

- An economic dimension: considering economic effects and benefits;
- A social dimension: considering human and societal interests;
- An ecological dimension: considering effects on nature and earth;
- A time dimension: considering also long term effects;
- A values dimension: understanding sustainability as a normative concept;
- A geographical dimension: considering both local and global effects;
- A performance dimension: considering failure and non-performance as a waste of resources and energy;
- A participation dimension: sustainable development requires inclusion and participation stakeholders;
- A waste (reduction) dimension: reducing and, if possible, preventing waste;
- A transparency dimension: openly and proactively providing information to stakeholders;
- An accountability dimension: being willing and available to be held accountable for decisions and actions;
- A cultural dimension: respecting differences in values and culture;
- A risk (reduction) dimension: reducing and, if possible, avoiding certain risks;
- A political dimension: recognizing different interests of stakeholders.

After the analysis of the dimensions of sustainability found in the publications on sustainability in project management, they then synthesized these dimensions and concluded that the following dimensions of sustainability are relevant to the integration of sustainability into project management.

Sustainability is about balancing or harmonizing social, environmental and economic interests

In order to contribute to sustainable development, a company should satisfy all ‘three pillars’ of sustainability: social, environment and economic [14]. 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 [17]. The dimension of both short-term and long-term orientation, focuses the attention to the full lifespan of the matter at hand [6].

Sustainability is about local and global orientation

The increasing globalization of economies effects the geographical area that organizations influence. Intentionally or not, many organizations are influenced by international stakeholders whether these are competitors, suppliers or (potential) customers. The behavior and actions of organizations therefore have an effect on economic, 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” [17].

Sustainability is about values and ethics

Sustainable development is inevitably a normative concept, reflecting values and ethical considerations of society [16; 41]. The changes needed for more a sustainable development, will therefore also reflect the implicit or explicit set of values that we as professionals, business leaders or consumers have and that influence or lead our behavior.

Sustainability is about transparency and accountability

The principle of transparency implies that an organization is open about its policies, decisions and actions, including the environmental and social effects of those actions and policies [31]. This implies that organizations provide timely, clear and relevant information to their stakeholders so that the stakeholders can evaluate the organization’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 organization is responsible for its policies, decisions and actions and the effect of them on environment and society. The principle also implies that an organization 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 emphasizes the behavioral side of this principle, by mentioning “proactive stakeholder engagement” as one of its principles [21]. 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” [19].

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 in which it is more efficient to prevent damage, rather than ameliorate it [5]. The recent Deepwater Horizon oil-spill disaster, has fueled 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 [28]. 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 [30] 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 [18]. The principle may also be applied to the social perspectives [41]. Organizations should also not ‘deplete’ people’s ability to produce or generate labor 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.

The dimensions of sustainability listed above provide a well-developed conceptualization of sustainability in projects and project management. We will therefore use this conceptualization in the development of the conceptual model of the relationship between sustainability in projects and project success.

4. The relationship between sustainability in projects and project success

4.1. Conceptual model

Based on the conceptualization of the constructs sustainability in projects and project success, developed in the previous paragraph, we can now develop a conceptual model of the relationship between these two constructs. Fig. 1 shows this conceptual model.

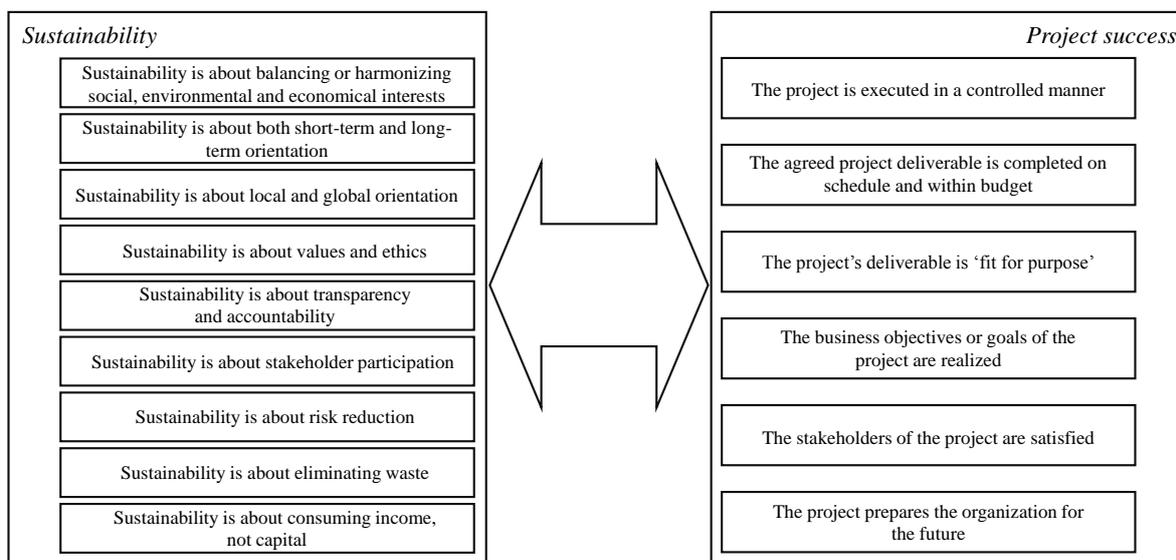


Fig. 1. Conceptual model of the relationship between sustainability in projects and project success.

4.2. Expected relationships

The relationship between considering sustainability in projects and project success is addressed only marginally in the emerging literature on sustainability in project and project management. In fact, only Craddock [12], Mishra et al. [32], Tiron-Tudor & Ioana-Maria [44], Kaysi [24] and Martens & Monteiro de Carvalho [29] explicitly mention this relationship. And although these studies are mostly of conceptual nature, only Tiron-Tudor & Ioana-Maria report an empirical study, these publications conclude the following relationships.

Craddock [12] discusses the evolution in thinking about project success and concludes that “views on project success have changed over the years from definitions that were limited to the implementation phase of the project life cycle to definitions that reflect an appreciation of success over the project and product life cycle” [23]. From the reference to the life cycle in this conclusion, he links project success to excellence in organizations and ‘business excellence models, such as the European Foundation for Quality Management (EFQM) model. And as one of the EFQM model’s eight fundamental concepts of excellence is “Taking responsibility for a sustainable future” [12], the relationship between sustainability in projects and success is established.

Mishra et al. [32] links project success 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”. This appeal on ethical behavior of the project manager can also be found in the ‘Codes of Ethics and Professional Conduct’ that were issued by the Project Management Institute [38] and the International Project Management Association [22] in recent years. In fact, the IPMA code explicitly mentions sustainability as one of the professional responsibilities of the project manager, without explicitly linking this to project success.

Tiron-Tudor & Ioana-Maria [44] studied the level of integration of sustainability into projects and the success of projects in a sample of 35 companies. Based upon an analysis of the correlation between integrating sustainability considerations and project success, they found that this correlation has certain controversies. They found cases where successful projects were not necessarily induced by sustainability, and also cases where a sustainable practice did not lead to success. They concluded that there should be other factors influencing projects outcomes. However, they also concluded that “On the whole, the two compared variables, sustainability integration within project management and projects success, seem to fluctuate in the same trend and there are no significant discrepancies between them” [44].

In a study of the success of several projects related to the London 2012 Olympic Games, Kaysi [24] describes how the London Velodrome Park project is considered a success, despite of being completed in 2011 at a total cost of £105 million, far overrunning the estimated budget of £20 million in 2004. The strength of the project was its motto and its sustainability legacy; “it was a great opportunity to show that London was ready to deliver its greenest venue” [24]. The author concludes that “In order to create successful and valuable projects “sustainability” becomes paramount for project management” [24].

Martens and Monteiro de Carvalho [29] recognize the need for studies on the convergence of sustainability, project management and project success. They provide a theoretical contribution to the discussion on this relationship, by conceptualizing the main constructs based on a study of academic publications.

Next to the publications discussed above, that explicitly address the relationship between sustainability and project success, the relationship between the underlying variables of the two constructs, as identified in the conceptual model of the relationship (Fig. 1), is addressed in more publications. For example Maltzman and Shirley [28] discuss the sustainability dimension of eliminating waste and relate this to the quality, and eventually success, of a project. And Eskerod and Huemann [15] conclude in their study of the relationship between sustainable development and project stakeholder management, that “Stakeholder management has been seen as a core activity for creating project success” and that “seeing project stakeholder management in the context of sustainable development is a necessity in the future and that this will place new demands on project stakeholder management”.

By exploring the literature for indications on the underlying relationships between the constructs of our conceptual model, we developed the following analysis of expected relationships between dimensions of sustainability in projects and project management and criteria of project success.

Sustainability is about balancing or harmonizing social, environmental and economic interests

This dimension of sustainability is expected to have a positive effect on the success criterion ‘executed in a controlled manner’. Reasons for this being that considering social and environmental interest of stakeholders, next to the economic

interests, reduces the risk of the project in the form of disturbances of the project by stakeholders that feel that the project is neglecting (their) social and environmental interests [40]. Considering sustainability may therefore logically contribute to a controlled execution of the project.

The effect of considering social, environmental and economic interests on the well-known 'triple constraint' of time, budget and quality, is less clear. It can be imagined that considering social and environmental interest in the project may lead to extra resources or costs. However, the point made above, that considering sustainability may prevent certain risks, may provide a compensation for this effect. The criteria that relate to the result or deliverable of the project, such as the deliverable being 'fit for purpose' and 'realizing the business objectives or goals' may be positively or neutrally affected by the consideration of social, environmental and economic interests. A positive effect should especially be expected when the main stakeholders of the project have a sustainability ambition.

Logically, considering social, environmental and economic interests may have a positive effect on stakeholder satisfaction, as also the stakeholders that represent the social and environmental interests are more proactively engaged in the project. A similar reasoning can be developed for the criterion 'the project prepares the organization for the future'. As more organizations integrate sustainability into their strategies, an explicit consideration of social, environmental and economic aspects will increase the strategic contribution of a project.

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

Considering both short and long term aspects of the project may influence the project management process in a similar way as described in the criterion balancing or harmonizing social, environmental and economic interests. Meaning that also in this criterion, considering both short-term and long-term is expected to reduce the risk of the project in the form of disturbances of the project by stakeholders that feel that their (long term) interests are not considered. Considering sustainability may therefore logically contribute to a controlled execution, and thereby success, of the project.

As considering both short and long term aspects of the project logically includes the future use of the deliverable of the project and the effects of that use, this criterion is expected to contribute to the criteria that relate to that future use, such as the deliverable being 'fit for purpose' and 'realizing the business objectives or goals'. A similar reasoning can be developed for the criteria stakeholder satisfaction and preparing the organization for the future.

Again, the effect of considering both short and long term aspects of the project on the triple constraint of time, budget and quality, may be less clear. However, there is no obvious reason to assume that considering long term aspects of the projects may go at the expense of short term aspects. More logical would be the expectation that the triple constraint criterion will be considered less important for the success of the project, as the longer term perception of project success concentrates on other criteria [39].

Sustainability is about local and global orientation

Much in line with the reasoning in the previous sections, considering both local and global aspects of the project may reduce the risk of the project, thereby contributing to a more controlled execution of the project. The effect of this criterion on the triple constraint of time, budget and quality, may again be less clear. Introducing a global orientation may lead to extra resources or costs.

The effect of considering both local and global aspects of the project on the deliverable being 'fit for purpose' and 'realizing the business objectives or goals' is also less clear. However, if any effect should be expected, it would logically be positive, as introducing a global orientation may also reduce the risks of using the deliverable after the project's completion. A similar reasoning can be developed for the criteria stakeholder satisfaction and preparing the organization for the future.

Sustainability is about values and ethics

The relationship between project management, ethics and values is most explicitly addressed in the work of Mishra et al. [32] discussed earlier and the Codes of Ethics and Professional Conduct of both the Project Management Institute [38] and the International Project Management Association [22]. And although the relationship between ethics and professional conduct implies a normative perspective on the professional behavior of project managers, the mere fact that the project management community highlights this relationship makes it relevant to the success of the project management process. This means that there should be a positive effect expected of the dimension values and ethics on the success criteria ‘controlled execution of the project’ and ‘completing the deliverable on the agreed schedule and budget’. Another motivation for this expected positive effect is, again, the risk reduction of the project that considering values and ethics may bring.

The effect of considering both local and global aspects of the project on the deliverable being ‘fit for purpose’ and ‘realizing the business objectives or goals’ is less clear. On the criterion ‘stakeholder satisfaction’, a positive effect should be expected, which may, however, depend on the values and ethical morale of the stakeholder him-/herself.

The effect on the criterion ‘preparing the organization for the future’, may also be unclear. However, if we reverse the reasoning, it should be concluded that executing a project in a non-ethical way, will certainly not prepare the organization for the future. Any effect of considering values and ethics in the project should therefore logically be positive.

Sustainability is about transparency and accountability

Providing timely, clear and relevant information to stakeholders may logically be expected to the ‘stakeholder satisfaction’ criterion of project success. On first sight its effect on the success criterion ‘completing the deliverable on the agreed schedule and budget’ may be less positive if providing timely and transparent information to stakeholders leads to extra costs during the process execution. However, in line with the reasoning provided earlier, providing timely, clear and relevant information to stakeholders may also reduce the risk of the project in the form of disturbances by concerned stakeholders. Transparency and accountability may therefore contribute to a ‘controlled execution of the project’ and possibly also to ‘completing the deliverable on the agreed schedule and budget’.

The effect of transparency and accountability on the success criteria that refer to the future use of the deliverable of the project and the business goals of that use, may be less clear. If an effect needs to be hypothesized, however, it would be logical that this effect is positive, as a transparent and accountable project may create a higher acceptance of the project’s deliverable by the relevant stakeholders.

Regarding the criterion ‘preparing the organization for the future’, we also expect a positive effect of transparency and accountability of the project, as the risk of issues leading to future claims is logically reduced.

Sustainability is about stakeholder participation

The ‘stakeholder participation’ dimension of sustainability in projects and its relationship with project success is addressed in several publications. For example Labelle and Leyrie [26] refer to the effective management of stakeholder-project relationships as an important success factor in projects. They conclude that consultation and participation of stakeholders during project development and execution led to a “win-win relationship based on trust”. And that “this contributed to the fact that the project was completed within the time limits and planned budget, and that it exceeded the many targets set by regional partners” [26]. Also Aaltonen and Kujalab [1] observe that “the concerns of social and environmental activists need to be carefully considered as part of the project decision making in order to ensure project success”. Engaging stakeholders in the project’s development and execution also reduces the risks of

stakeholders opposing the project [10] and may develop trust and relationships that enable future cooperation in projects and business operations.

Basically all studies on stakeholder participation and engagement point out its positive effect on project success. Therefore the effect of stakeholder participation on all criteria of project success is expected to be positive.

Sustainability is about risk reduction

The reduction of risk logically relates positively to both the success criteria relating to the project's execution and to the quality of the deliverable of the project. The precautionary principle that is the background of this dimension of sustainability could result in changes in the project development or definition. For example, by refraining from starting a potentially risky project, although the business case for the project is positive. It can also be imagined that extra costs are incurred during the project's executing, resulting from risk reduction actions. The effect of risk reduction on the 'triple constraint' of time, budget and quality, is therefore assessed as both positive and negative. The effect on all other criteria is expected to be positive.

Sustainability is about eliminating waste

The 'no waste' dimension of sustainability is highlighted in several publications on sustainability in project management, including Ma [27] and Maltzman and Shirley [28]. As waste represents a cost, for example in the form of obsolete materials, transportation or removal costs, the reduction of waste logically may lead to greater project success in terms of 'completing the deliverable on the agreed schedule and budget'. Whether the reduction of waste also leads to greater project control, or a deliverable that is more 'fit for purpose', can be debated. However, preventing waste is expected to have a positive effect on the criteria 'stakeholder satisfaction' and 'preparing the organization for the future', as it may logically lead to innovations and the development of new processes that create efficiencies also in future projects. An example of this effect is the improvement of the 'fresh water to cola' ratio that Coca-Cola realized when they were criticized for extracting fresh water from a vulnerable society, when establishing a new factory in India.

Sustainability is about consuming income, not capital

On this dimension, Silvius and Schipper [40] point out that the task orientation and peer-pressure within projects may create a high pressure environment, with higher risks of stress and burnout, compared to other work environments. This effect is confirmed by other studies on projects and burnout. The unplanned absence of resources, being either the project manager or members of the project team, creates a risk for the timely execution of the project. Taking this dimension into account will therefore positively contribute to a 'controlled execution of the project' and most likely also to 'completing the deliverable on the agreed schedule and budget'.

Whether there is also an effect on the deliverable being more 'fit for purpose' or the realization of business objectives, is less clear. On the criteria 'stakeholder satisfaction' and 'preparing the organization for the future', a positive effect should be expected. The reasoning being that team members that experience burnout or stress will most likely be less productive for a longer period of time.

Table 3 summarizes these expected relationships between the dimensions of sustainability and the criteria of project success. From this table it shows that the majority (76%) of the relationships between dimensions of sustainability and criteria of project success are expected to be Positive or Potentially positive. 6% of the relationships were classified as Negative/Positive, as indications could be found for both positive and negative effects. Only one relationship, the effect

of ‘local and global orientation’ on completing the project on schedule and within budget, was classified as Potentially negative. For some 17% of the relationships, we could not hypothesize a relationship.

Most positive relationships are expected for the relationship between sustainability and the success criteria ‘The stakeholders of the project are satisfied’, ‘The project prepares the organization for the future’ and ‘The project is executed in a controlled manner’. Given the nature of sustainability, a positive effect on stakeholder satisfaction and future readiness may not come unexpected. The positive relationship with the controlled execution of the project, however, may be more surprising. This effect is caused by the risk reduction that is associated with a more explicit consideration of sustainability dimensions in a project.

Positive relationships are also expected between sustainability and the success criteria ‘The project’s deliverable is ‘fit for purpose’ and ‘The business objectives or goals of the project are realized’. The most uncertain relationship is expected between considering sustainability and completing the project on schedule and within budget.

Table 3. Expected relationships between dimensions of sustainability and criteria of project success.

	The project is executed in a controlled manner	The agreed project deliverable is completed on schedule and within budget	The project’s deliverable is ‘fit for purpose’	The business objectives or goals of the project are realized	The stakeholders of the project are satisfied	The project prepares the organization for the future
Sustainability is about balancing or harmonizing social, environmental and economic	Positive	Negative / Positive	Positive	Positive	Positive	Positive
Sustainability is about both short-term and long-term orientation	Positive	Unclear	Positive	Positive	Positive	Positive
Sustainability is about local and global orientation	Positive	Potentially negative	Potentially positive	Potentially positive	Potentially positive	Potentially positive
Sustainability is about values and ethics	Positive	Positive	Unclear	Unclear	Positive	Potentially positive
Sustainability is about transparency and accountability	Positive	Negative / Positive	Positive	Positive	Positive	Positive
Sustainability is about stakeholder participation	Positive	Unclear	Positive	Positive	Positive	Positive
Sustainability is about risk reduction	Positive	Negative / Positive	Positive	Positive	Positive	Positive
Sustainability is about eliminating waste	Unclear	Positive	Unclear	Unclear	Positive	Positive
Sustainability is about consuming income, not capital	Positive	Positive	Unclear	Unclear	Positive	Positive

5. Conclusion

The understanding of how the consideration of sustainability influences project management processes and practices is an important condition for the much needed integration of sustainability concepts into project management. The study reported in this paper developed a conceptual model for the relationship between sustainability in projects and project

success. Based on a review of relevant literature on the two main constructs, sustainability in projects and project success, a conceptual model was developed that showed that the relationship between sustainability and project success is not a simple one. The literature on sustainability in project management identified nine dimensions of sustainability, whereas the measures for project success that were reported in earlier studies were clustered into six criteria. With this model, a more detailed understanding of how the different dimensions of sustainability may affect the individual criteria of project success could be developed.

The study also provided a conceptual mapping of the different relationships between dimensions of sustainability and criteria of project success. This mapping showed that the most positive relationships are expected for the relationship between sustainability and the success criteria ‘The stakeholders of the project are satisfied’, ‘The project prepares the organization for the future’ and ‘The project is executed in a controlled manner’. Positive relationships are also expected between sustainability and the success criteria ‘The project’s deliverable is ‘fit for purpose’’ and ‘The business objectives or goals of the project are realized’. The expected relationship between considering sustainability and completing the project on schedule and within budget is uncertain.

The limitation of the study reported in this paper is that it is based upon an analysis of literature and a conceptual mapping. However, the conceptual model developed in the study provides a good foundation for empirical testing of the expected relationships and is therefore a valuable contribution.

The empirical testing of the expected relationships is logically a clear recommendation for further research. The authors plan to do this in a survey based study that explores how project managers and other stakeholders in projects, perceive the different relationships between considering sustainability and project success, as identified in the conceptual model. This approach, exploring the perceptions of the relationships instead of measuring the correlations between the dimensions of sustainability and the criteria of project success for a sample of projects, is selected because the perception of the different criteria of project success change over time [39], which makes it impossible to acquire reliable data of a sufficient sample that allows for establishing significant correlations. Of course, the measurement of perceptions of relationships introduces a more subjective element, however, as some authors indicate that project success is a subjective perception anyway [35; 37], this is not considered an issue.

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