



Considering sustainability in project management decision making; An investigation using Q-methodology

A.J. Gilbert Silvius^{a,*}, Martin Kampinga^b, Silvana Paniagua^c, Herman Mooi^c

^a *LOI University of Applied Sciences, the Netherlands, & University of Johannesburg, South Africa*

^b *Inholland University of Applied Sciences, Delft, The Netherlands*

^c *Technical University Delft, The Netherlands*

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Abstract

Sustainability is one of the most important challenges of our time. Projects play a pivotal role in the realization of more sustainable business practices and the concept of sustainability has also been linked to project management. However, how managers of projects consider sustainability in their operational daily work is still to be explored. This paper uses Q-methodology to investigate the consideration of sustainability aspects in the decision making processes of project managers. The research question was *How are dimensions of sustainability considered in the decision-making processes of project managers in relation to the triple constraint of time, cost and quality?*

Based on the Q-sort of selected respondents, the study found that the consideration of sustainability principles is underrepresented, compared to the triple constraint criteria. However, the analysis of the individual Q-sorts revealed four distinct perspectives that differ significantly in their consideration of sustainability principles and triple constraint criteria.

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Executive summary

The relationship between sustainability and project management is being addressed in a growing number of studies. In two recently published literature reviews on sustainability in project management, a significant growth in publications on the topic in the last 10 years is reported. It is argued that projects play a crucial role in realizing sustainability in organizations and in society and that project and programme managers are significantly placed to make contributions to sustainable management practices. This study presented here aims to enhance the understanding of how project managers consider sustainability in their work, by studying the consideration of sustainability dimensions in the decision-making processes of project managers.

Using Q methodology, in which the respondents ranked 29 considerations in their decision making that represented three categories; sustainability considerations, ‘iron triangle’ of time, cost and quality, and risk considerations, we identified four distinct perspectives of how project managers rank these considerations. These four perspectives are:

People and Quality, with as defining considerations *Quality is the most important factor and The economic, social and environmental consequences are crucial.*

People and Risk, defined by the considerations *We listen to other people's points of view, seeking to understand them, Risk management should align with the organizational objectives, The risk appetite should be compared with the risk capacity and We need to be aware of the community's opinion.*

Time and Cost, defined by the traditional ‘iron triangle’ considerations, and very little consideration of sustainability aspects.

* Corresponding author.

E-mail addresses: mail@gilbertsilvius.nl (A.J. Gilbert Silvius), martinkampinga@gmail.com (M. Kampinga), silvanapaniagua@gmail.com (S. Paniagua), herman.mooi@asml.com (H. Mooi).

Quality, Time and Risk, which can be considered as the most balanced perspective, defined by considerations such as *Quality is the most important factor, Time to market is crucial and Risk management should align with the organizational objectives*.

Overall, the study concluded that only a limited number of sustainability criteria was taken into consideration by the project managers when making their decisions. Project manager's decision making is still largely dominated by the 'iron triangle' considerations of time, cost and quality with the only sustainability principles scoring relatively high in the considerations being stakeholder orientation and transparency and accountability.

1. Introduction

The relationship between sustainability and project management is being addressed in a growing number of studies. In two recently published literature reviews on sustainability in project management, a significant growth in publications on the topic in the last 10 years is reported (Otegi-Olaso et al., 2015; Silvius and Schipper, 2014). It is argued that projects play a crucial role in realizing sustainability in organizations and in society (Marcelino-Sádaba et al., 2015) and that "sustainability aspects would contribute to improve project value such as improved quality of output, increase productivity, profitability, reduction to life cost and business enhancement" (Zainul-Abidin & Pasquire, 2007: 275).

With a relationship between projects and sustainability being established, it is recognized that "Project and Programme Managers are significantly placed to make contributions to Sustainable Management practices" (Association for Project Management, 2006: 7). Hwang and Ng (2013) conclude that "Today's project manager fulfils not only traditional roles of project management but also must manage the project in the most efficient and effective manner with respect to sustainability." (Hwang & Ng, 2013:273). Maltzman and Shirley (2013) even talk about a pivotal role of the project manager and also Goedknecht (2013) concludes that the project manager has a lot of influence on the application of sustainability principles in or to the project. What these studies have in common is that they highlight the opportunity that the role of the project manager offers. The project manager has a central position in the project and that provides the opportunity to influence many aspects of the project (Silvius, 2016b). Silvius and Schipper (2014) reflect that taking up a responsibility for sustainability implies a 'mind shift' for the project manager and that sustainability changes the profession of project management.

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). How the managers of projects and programs consider sustainability in their operational daily work is still to be explored (Silvius and Schipper, 2014).

This paper aims to enhance the understanding of how project managers consider sustainability in their work, by studying the

consideration of sustainability dimensions in the decision-making processes of project managers. Influenced by the most popular standards of project management, project managers may take decisions based on the 'triple constraint' criteria of time, budget and quality (Project Management Institute, 2013), however, several authors suggest that considering sustainability should affect these criteria (for example: Haugan, 2012; Sánchez, 2014). The research question of this study is therefore formulated as *How are dimensions of sustainability considered in the decision-making processes of project managers in relation to the triple constraint of time, cost and quality?*

The remainder of this article is organized as follows. In the next paragraph, the concepts and dimensions of sustainability and their impact on project management and decision making in projects will be explored. The following paragraph describes the research design of the study, which was based on Q-methodology. Q-methodology provides a foundation for the systematic study of the subjectivity that project managers, as all individuals, logically have in their decision-making (Brown, 1980). Paragraph 4 will present the findings of our study. The paper will be concluded with a summary of the conclusions that can be derived from the study and some suggestions for further research.

2. Sustainability in project management

2.1. The concepts of sustainability

Concerns about sustainability of natural resources may date back as far as the early 18th century. Already in 1713, the Saxon Mining Officer Hans Carl von Carlowitz published the first comprehensive treatise about sustainable yield forestry (Sylvicultura oeconomica): He suggested to log only as many trees as grow back and used the term "sustainable" in this context (Carlowitz, 1713, p. 105-106). Von Carlowitz's concerns emerged out of the timber shortfall for the Saxon mines and may therefore be understood as primarily economically driven. Despite these early concerns about the sustainability of our development, the book "Silent Spring" (Carson, 1962) is often considered a launching hallmark of the more contemporary concerns about sustainability and the use of natural resources (Dyllick and Hockerts, 2002). The concerns about sustainability were lifted to the political agenda with the 1972 book "The Limits to Growth" (Meadows et al., 1972), that was commissioned by the 'Club of Rome' think tank. In The Limits to Growth, the authors simulate the consequences of mankind's use of earth's natural resources and conclude that if the world's population and economy would continue to grow at their current exponential speeds, our use of the planet's natural resources would overshoot their capacity. And although The Limits to Growth was received with criticism, disbelief and rejection by economists and businesses (Meyer and Nørgård, 2010), it 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 'Our Common Future', the Brundtland commission defined sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (World Commission on Environment

and Development, 1987). 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 economic perspective, on development and performance.

The visions 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 (Keating, 1993). 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 (Elkington, 1997): Sustainability is about the balance or harmony between economic sustainability, social sustainability and environmental sustainability (Silvius and Schipper, 2014). According to Savitz (2006), the Triple Bottom Line concept captures the essence of sustainability.

The Triple Bottom Line evolved into a set of perspectives for assessing, reporting or communicating the impact of human actions on nature. Several frameworks or sets of sustainable development indicators (SDIs), are specifications of these three ‘pillars’ of sustainability (Adams and Frost, 2008). These frameworks help in operationalizing the concept of the Triple Bottom Line. However, they also introduce the risks that the interrelations between the three perspectives are overseen and that the social, environmental and economic perspectives are each considered in isolation. The holistic understanding of sustainability requires an integration of economic, environmental and social perspectives (Elkington, 1997; Linnenluecke et al., 2009).

The Triple Bottom Line has also been extended to a ‘Quadruple Bottom Line’ with various fourth pillars, for example culture or politics. However, as consensus seems to be lacking on the fourth pillar, this study will not consider this extension.

Elaborating on these concepts, Dyllick and Hockerts (2002) conclude that sustainability is about consuming the income and not the capital. This aspect is a common realm in business from the economic perspective. From a social or environmental perspective, however, the impact may not be visible in the short-term, causing degradation of resources in the long run. In order not to compromise “*the ability of future generations to meet their needs*”, as stated in the Brundtland definition, sustainability therefore requires a balanced orientation on both short and long term. Sustainability implies that “*the natural capital remains intact. This means that the source and sink functions of the environment should not be degraded. Therefore, 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 et al., 1996).

One strategy to realize equilibrium between resource extraction and resource renewal is logically decreasing the levels of production and consumption until the extraction rate reaches the equilibrium level. However, with the projected increase in world population and our ‘linear economy’ value chains, this strategy is not considered a viable option (Sukhdev, 2013). Another strategy to prevent the depletion of natural resources is that of the ‘circular economy’: A concept that aims to realize resource minimization

and the adoption of cleaner technologies by promoting the benefits of recycling residual waste materials and by-products (Andersen, 1999). In the circular economy, raw materials and resources are processed from used products, thereby minimizing waste and the need for extraction of ‘virgin’ resources. Braungart and McDonough (2002) elaborate on the concept of the circular economy in their ‘cradle2cradle’ concept with the principle that ‘waste equals food’, suggesting continuous cycles of production and consumption, without waste.

The above definitions and concepts discuss sustainability, or sustainable development, on the macro-level of societies. However, for the goal of our study, we need to discuss sustainability within the context of organizations. The International Institute for Sustainable Development elaborates on the generic definitions in a definition more focused on sustainable management of organizations: “*Adopting business strategies and activities that meet the needs of the enterprise and its stakeholders today while protecting, sustaining and enhancing the human and natural resources that will be needed in the future.*” (Deloitte and Touche, 1992). With mentioning the “*...needs of the enterprise and its stakeholders today...*”, the authors seem to make the point that without profitability on the short term, care for the environment and humanity cannot be sustained on the longer term.

The Dow Jones Sustainability Indexes define ‘corporate sustainability’ as “*a business approach that creates long-term shareholder value by embracing opportunities and managing risks derived from economic, environmental and social developments*” (Dow Jones, 2009). Next to the Triple Bottom Line and the both short term and long term orientation discussed earlier, these definitions also mention the interests of shareholders (Dow Jones, 2009) and/or stakeholders (Deloitte and Touche, 1992). In the so called ‘stakeholder theory’, Freeman (1984) developed the notion that *all* stakeholders of a company or an organization, and not just the shareholders/financiers, have the right and legitimacy to receive adequate management attention that takes into account their interests (Julian et al., 2008). The interests of all stakeholders should be embraced by the organization and win-win situations should be sought (Eskerod and Huemann, 2013).

The Dow Jones definition of corporate sustainability also mentions opportunities and risks. Risk, or the reduction of risk, has been mentioned as one of the motivations for sustainability (UNEP Finance Initiative, 2006; Godfrey et al., 2009; Yilmaz and Flouris, 2010). Godfrey et al. (2009) conclude that a proactive approach of mitigating risk, for example by investing in sustainability, particularly aimed at secondary stakeholders, creates additional value for shareholders and stakeholder, compared to a reactive ‘paying the damage’ approach. In short, a proactive approach to sustainability pays off.

In the context of organizations, sustainable development relates to the concepts of (Corporate) Social Responsibility (CSR) (Ebner and Baumgartner, 2006). (C)SR is defined by the International Organization for Standardization (ISO) 26,000 as the “*responsibility of an organization for the impacts of its decisions and activities on society and the environment, through transparent and ethical behaviour that: contributes to sustainable development, including health and the welfare of society; takes into account the*

expectations of stakeholders; is in compliance with applicable law and consistent with international norms of behaviour; is integrated throughout the organization and practiced in its relationships.” (International Organization for Standardization, 2010).

Next to the concepts mentioned before, this definition highlights the responsibility or accountability that an organization has for the societal impact of its decisions and actions, and the transparency and ethicality of its behavior. With the mentioning of ethics and norms of behavior, a normative aspect is introduced. Sustainability is a value based concept, reflecting values and ethical considerations of society (Robinson, 2004; Martens, 2006). And its integration into business decisions and actions should go beyond being compliant with legal obligations. Dahlsrud (2008) therefore points out the voluntariness dimension of CSR.

In the ISO 26000 definition, the statement, “... *is integrated throughout the organization and practiced in its relationships.*”, implies that the responsibility of an organization does not ‘stop at the door’. An organization also bears responsibility of the behavior and societal impact of the activities of business partners in the value chain. The increasing globalization of economies thereby affects the geographical area that organizations influence. Intentionally or not, organizations influence, or 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 (Gareis et al., 2011).

The concepts and sources discussed in this paragraph elaborated on the meaning and contents of sustainability. However, Gareis et al. (2013) concludes that content related definitions of sustainability may be adequate to assess the sustainability of the content of projects (outputs and outcomes), but that they may not be adequate to cover the integration of sustainability into the management perspective on projects. They therefore suggest that when considering sustainability in the management of projects, a more process related view, based on a set of guiding principles (Hopwood et al., 2005; Fergus and Rowney, 2005), should be preferred over a content related view, based on a set of criteria.

In our study, we followed this approach and define sustainability in this paper as a set of principles or dimensions. Table 1 summarizes these principles, with reference to their primary source in literature.

2.2. Sustainability in project management

The ‘Brundtland report’ of 1987 linked sustainability to change, by stating “*In essence, sustainable development is a process of change in which the exploitation of resources, the direction of investments, the orientation of technological development and institutional change are all in harmony and enhance both current and future potential to meet human needs and aspirations*” (World Commission on Development and Environment, 1987). And Marcelino-Sádaba et al. (2015) observe that “*projects are the ideal instrument for change management*” and that “*the necessary change that we require towards sustainability will be boosted by applying the project management discipline to sustainability.*” (Marcelino-Sádaba et al., 2015).

In this context, projects are considered as temporary organizations (Lundin and Söderholm, 1995; Turner and Müller, 2003), most often across organizational structures and boundaries, aimed at realizing a defined deliverable or result, logically or preferably linked to the organization’s strategy or goals, with specified resources and budget (Silvius et al., 2012). Project management is “*the means by which the work of the resources assigned to the temporary organization is planned, managed and controlled to deliver the beneficial change*” (Turner, 2014: 29).

With the growing attention for sustainability, its concepts are also being related to project management (For example by Labuschagne and Brent, 2006; Edum-Fotwe and Price, 2009; Maltzman and Shirley, 2011; Silvius et al., 2012; Gareis et al., 2013; Martens and Carvalho, 2016). Pasian and Silvius (2016) even identify sustainability as one of the evolving schools of thought in project management. With insights and knowledge developing, Silvius and Schipper (2014) provide an overview of how sustainability is considered in the context of project management, based on a structured review of 164 books, journal articles, book chapters and conference papers. Based upon their findings, and the underlying publications, we established the impact of the earlier identified principles or dimensions of sustainability on project management as follows.

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

In their literature review, Silvius and Schipper (2014) found that 86% of the publications address sustainability in terms of the Triple Bottom Line. However, they also found that the publications differ

Table 1
Summary of the principles/dimensions of sustainability.

Principles/dimensions of sustainability	Seminal sources
Sustainability is about balancing or harmonizing social, environmental and economic interests	Elkington (1997)
Sustainability is about both short-term and long-term orientation	Meadows et al. (1972), World Commission on Environment and Development (1987)
Sustainability is about both local and global orientation	Hurrell and Kingsbury (1992)
Sustainability is about values and ethics	International Organization for Standardization (2010), Gareis et al. (2013)
Sustainability is about transparency and accountability	International Organization for Standardization (2010)
Sustainability is about stakeholder orientation	Freeman (1984)
Sustainability is about reducing risks	Godfrey et al. (2009)
Sustainability is about eliminating waste	Braungart and McDonough (2002)
Sustainability is about consuming income, not capital	Dyllick and Hockerts (2002)

in their consideration of the different perspectives. 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 (Silvius and Schipper, 2014).

Some studies on the integration of sustainability into project management focus on operationalizing the Triple Bottom Line concept by developing sets of indicators on the different perspectives (For example Bell and Morse, 2003; Fernández-Sánchez and Rodríguez-López, 2010; Keeble et al., 2003; Labuschagne and Brent, 2006; Martens and Carvalho, 2016). As mentioned before, this approach bears the risk of lacking the holistic approach of the integration of the economic, environmental and social perspectives. Martens and Carvalho (2016) reported an empirical study on the consideration of Triple Bottom Line variables by project managers from diverse industries in Brazil. One of their conclusions was that the consideration of different sustainability aspects of the Triple Bottom Line is related to the strategy and context of the project. A universal set of sustainability indicators for projects may therefore be illusive.

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

This dimension is mentioned in a great number of publications on sustainability in project management, for example in Eid (2009), Gareis et al. (2009, 2013), Müller-Pelzer (2009), Silvius et al. (2012), Eskerod and Huemann (2013), Labuschagne and Brent (2005, 2006). Given the nature of projects as temporary organizations, the orientation is logically focused on the life cycle of the project and therefore biased towards the short-term. Labuschagne and Brent (2006), show how the life cycle of the project interacts with the life cycle of the deliverable that is developed in the project the ‘asset’, and that considering the

sustainability aspects of projects would require considering not only the project life cycle, but also the asset’s life cycle and the life cycle of the products this asset produces. Silvius and Schipper (2014) describe these interacting life cycles in more generic terms, when they define the scope of ‘sustainable project management’ as considering a project’s resources, processes, deliverables and effects.

In the same publication, Silvius and Schipper illustrate the expanded scope of project management, that results from considering sustainability in a visual illustration that shows a time axis stretching from the project life cycle to ‘future generations’. Inspired by this visualization, we combined the ‘interacting life cycles’ provided by Labuschagne and Brent (2006) with the visualization of the enlarged scope of sustainable project management (Silvius and Schipper, 2014) in Fig. 1.

2.2.3. Sustainability is about local and global orientation

“Spatial scale is an important concept in relation to sustainability assessment.” (Edum-Fotwe and Price, 2009). The rationale behind this extended spatial orientation of sustainable project management is that it provides a good foundation for recognizing and identifying sustainability impacts in today’s globalized economies. Intentional or not, many organizations influence, or are influenced by, international stakeholders whether these are competitors, suppliers or (potential) customers (Silvius and Schipper, 2014).

In the context of projects, globalization may relate to the supply chain of materials and resources used in the project, geographically dispersed project sites and or teams, and the value chain of deliverables, use, benefits and effects (Cleland and Gareis, 2006). Considering sustainability in project therefore requires the consideration of “several levels, ranging from the global to the regional and the local” (Gareis et al., 2011).

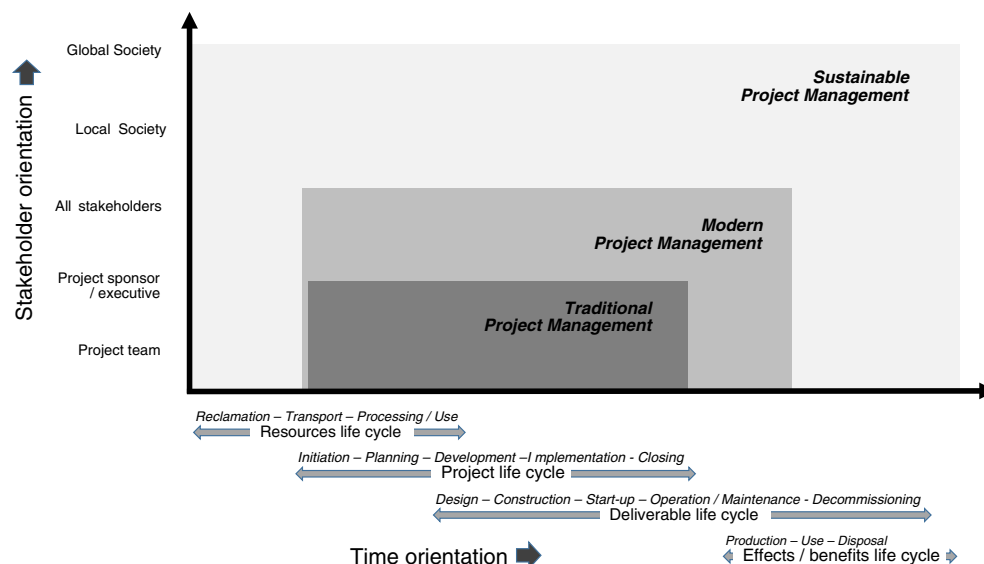


Fig. 1. The enlarged scope of sustainable project management (based on Labuschagne and Brent, 2006 and Silvius and Schipper, 2014).

2.2.4. Sustainability is about values and ethics

The values dimension of considering sustainability in project management is concluded in a number of studies, including Schieg (2009), Gareis et al. (2009, 2013) and Eskerod and Huemann (2013). Sustainable development is inevitably a normative concept (Gareis et al., 2009), reflecting values and ethical considerations of society (Silvius et al., 2012). 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.

Mishra et al. (2011) 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 (2010) and the International Project Management Association (2015) in recent years. The Project Management Institute code (2010) explicitly states that *“The values that the global project management community defined as most important were: responsibility, respect, fairness, and honesty”*.

2.2.5. 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 (International Organization for Standardization, 2010). 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 (International Organization for Standardization, 2010).

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; Taylor, 2010; Silvius et al., 2012). The current standards for project management reflect a more reactive approach to project communications, by focusing on information and communication needs of the stakeholders and emphasizing that the project manager should provide *“only the information that is needed”* (Project Management Institute, 2013: 287).

2.2.6. Sustainability is about stakeholder participation

Several authors (For example Pade et al., 2008; Gareis et al., 2009; Perrini and Tencati, 2006) emphasize the importance of stakeholder participation in projects. This principle logically impacts the stakeholder management and the communication processes in project management (Silvius and Schipper, 2014). However, the intention behind ‘participation’ goes beyond the

process of stakeholder management and communication. Stakeholder participation isn’t so much a specific process, as it is an attitude with which all project management processes are performed (Silvius and Schipper, 2014). According to the ISO 26000 guideline, proactive stakeholder engagement is one of the basic principles of sustainability (International Standards Organization, 2010). Stakeholder participation 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 and Silvius, 2012). Also Eskerod and Huemann (2013) link sustainable development, projects and the role of stakeholders, and conclude that there is a need *“to incorporating stakeholders and their interests in more project management activities”* (Eskerod & Huemann, 2013: 45).

2.2.7. Sustainability is about risk reduction

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 the Government Commerce, 2010). However, when looking at this definition from a sustainability perspective, some question may come up (Silvius, 2016a). For example, *“Are we, next to the economic risks, considering also environmental risks, impacts and effects?, Are we considering also social risks, impacts and effects?, Are we considering long term risks, impacts and effects?, Are we considering risks related with the disposal phase?, Are we considering risks also in our ‘sphere of influence’?, Are we considering risks, impacts and effects also for other/all stakeholders?, Are the/all stakeholders also involved in the risk management process?, Is the risk management process transparent and performed in an ethical way?”* (Silvius, 2016a, 2016b).

With the inclusion of the concepts of sustainability in project management, the assessment of potential risks will need to evolve (Winnall, 2013). Logically in the identification of risks, also environmental and social risks are to 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), and taking a precautionary approach (Silvius, 2016a, 2016b).

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 (Bakker et al., 2010). The recent Deepwater Horizon oil-spill disaster, has fueled the discussion on the suitability of financial risk management techniques for societal and environmental risks.

2.2.8. Sustainability is about eliminating waste

The importance of eliminating waste is mentioned by several authors (For example, Ma, 2011; Maltzman and Shirley, 2011; Khalfan, 2006). Within the context of project management, ‘waste’ may also be non-tangible. Maltzman and Shirley for example 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. Applied to projects, these wastes translates to frequently found practices such as overspecification of requirements, unnecessary requirements, changes in requirements, idle resources, waiting times, miscommunication, incomplete testing, bugs, unfit products, etc. (Maltzman and Shirley, 2013). Taylor (2010) points out the relationship between waste and project planning, scheduling and sequencing. He challenges project managers to think beyond ‘how things are normally done’, and provides several examples. One of the examples being offsite fabrication rather than onsite. This provides possible sustainability advantages of less waste, reduced delivery costs, better use of resources, opportunities to increase labor skills, opportunities for job creation in poorer locations, economies of mass production, etc.

Silvius et al. (2012) also identify failed projects as a waste and concludes that organizations should “*learn from their projects in order to not ‘waste’ energy, resources and materials on their mistakes in projects*” (Eid, 2009; Silvius et al., 2012).

2.2.9. Sustainability is about consuming income, not capital

Sustainability implies that nature’s ability to produce or generate resources or energy remains intact. Silvius et al. (2012) mention that this principle may also be applied to the social perspectives. Organizations should also not ‘deplete’ people’s ability to produce or generate labor or knowledge by physical or mental exhaustion. Projects are environments that can create high pressure on team members (Brink, 2013), resulting in relatively high levels of factors that predict burn-out. Sustainable project management implies that the project manager considers not only the economic capital, but also the social and environmental capital of the organization, thereby safeguarding its capacity for future production.

By discussing the impact of the principles/dimensions of sustainability on project management, as found in the publications on this topic, this paragraph developed a conceptual understanding of the integration of sustainability in projects and project management. This understanding forms the foundation for the empirical part of our study, in which we explored how project managers consider these dimensions of sustainability in their decision making.

2.3. Decision making in project management

Earlier, we quoted Turner’s definition of project management as “*the means by which the work of the resources assigned to the temporary organization is planned, managed and controlled to deliver the beneficial change*” (Turner, 2014: 29). A core-element of project management is stage-gate process (Kerzner, 2009). The stage-gate process was created because the traditional hierarchical command and control structures were not effective for temporary processes that imply a ‘horizontal’ work flow across organizational boundaries, such as projects. The stage-gate process facilitates the decision-making process in projects. The gates are structured decision points at the end of each stage

(Kerzner, 2009). The purpose of the gates is not only to obtain authorization to proceed, but to identify failure early enough so that resources will not be wasted but will be assigned to more promising activities.

Decision making in projects is traditionally dominated by the three aspects of the triple constraint or “*iron triangle*” (Atkinson, 1999; Papke-Shields et al., 2010): cost, time and quality. Also stage gate reviews logically include a review of the project’s performance in terms of time/schedule, costs/budget, quality, risks and issues (Project Management Institute, 2013). And although the success of projects is most often defined in a more holistic perspective (Thomas and Fernández, 2007), this broader set of criteria doesn’t reflect on the way projects are managed.

From the sources above, we may conclude that next to the factors of the triple constraint, the factor ‘risk’ is also considered one of the control variables in project management (Kerzner, 2009). Decisions in projects are made under risk and uncertainty, which means that it is not fully known what the states of nature will be and what the expected payoffs will be for each state of nature (Kerzner, 2009). A risk is “*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). A risk is usually measured by the combination of probability of a perceived threat or opportunity occurring and the magnitude of its impact on objectives. Risk management is an inherent component of project management (Turner, 2014). Effective risk management is likely to improve performance against objectives by contributing to efficient use of resources, reducing waste, reducing fraud, improving service delivery, lowering cost of capital, improving innovation and doing things properly. Risk management should be applied continuously with information made available when critical decisions are being made. Decisions about risk will vary depending on whether the risk relates to long- medium- or short-term organizational objectives (Office of Government Commerce, 2010).

2.4. Considering sustainability in project management decision making

The previous section showed that decision-making in project management is traditionally dominated by considerations relating to cost, time, quality and risk. However, in our literature review on the integration of the principles/dimensions of sustainability into project management, we found several authors agreeing that sustainability aspects should be considered in decision-making. For example, Zainul-Abidin (2008) states that “*Sustainability issues should be considered throughout all stages of decision-making to ensure that decisions made are in the best interest of the clients without detriment to the society and the environment they live in.*”. And also Aaltonen and Kujala (2010) conclude 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*”.

Another interesting insight is provided by a study into the challenges that project managers encounter in green construction and the critical attributes that project managers need to possess in managing green construction projects (Hwang and

Ng, 2013). This study found that the decision-making skill is the most critical managerial skill of the project manager required for overcoming the challenges of green construction. In itself this conclusion may not seem that surprising, however, in ‘traditional’ projects, decision-making ranked only fifth in importance. A significant difference! *“This result could be explained by the need for project managers to make the best possible decision on the selection of specific technologies, systems and subcontractors required for green projects.”* (Hwang & Ng, 2013; 279).

As a suggestion for further research, the authors of this study recommended to carry out further studies on how to improve and strengthen the critical knowledge areas and skills, such as decision-making.

It may therefore be concluded that the current literature on sustainability in project management acknowledges that sustainability should be considered in project management decision making and that decision-making is a critical skill for (more) sustainable projects. The literature also confirmed the need for more empirical studies on this topic in order to explore how the dimensions of sustainability influence decision-making by project managers in practice.

3. Research strategy

This paragraph presents the research strategy and research design of the study. As the literature review showed that sustainability is a multi-dimensional concept and that a clear understanding of how project managers integrate sustainability considerations into their decision making is lacking in literature, the nature of the study is explorative. By exploring the subjective ranking of sustainability considerations and traditional triple constraint considerations, the study aims to identify different perspectives of project managers.

In order to be able to identify different subjective perspectives on sustainability, the study deployed Q-methodology as research strategy. Q-methodology has shown its usability in the context of project management research (For example Suprpto et al., 2015) and provides a foundation for the systematic study of subjectivity, a person’s viewpoint, opinion, beliefs and attitude (Brown, 1980).

Section 3.1 of this paragraph will discuss Q-methodology and its difference from the more commonly used R-methodology. Following this introduction, Section 3.2 will present the

statements that were developed as the ‘Q-set’ of the study. Sections 3.3 and 3.4 will describe the data collection process and the sample of the study.

3.1. Q-methodology

Typically, in a Q-methodological study people are presented with a sample of statements about some topic, called the Q-set. Respondents, called the P set, are asked to rank-order the statements from their individual point of view, according to some preference, judgment or feeling about them, mostly using a quasi-normal distribution Fig. 2). By ‘Q-sorting’ the statements, the respondents give their subjective meaning to the statements, and in this way they reveal their subjective viewpoint (Smith, 2001) or personal perspective (Brouwer, 1999).

These individual rankings (or viewpoints) are then subjected to factor analysis. Stephenson (1935) presented Q-methodology as an inversion of conventional factor analysis in the sense that Q-methodology correlates persons instead of tests; *“whereas previously a large number of people were given a small number of tests, now a small number of people a large number of test-items are given”* (Stephenson, 1935). Correlation between personal perspectives then indicates similar viewpoints, or segments of subjectivity which exist (Brown, 1980). By correlating people, Q-factor analysis gives information about similarities and differences in viewpoint on a particular subject. If each individual would have her/his own specific likes and dislikes, Stephenson (1935) argued, their perspectives will not correlate; if significant clusters of correlations exist, they could be factorized, described as common viewpoints (or tastes, preferences, dominant accounts, typologies, streams, etcetera).

Q-methodology allows reporting on the perspectives from different stakeholders or actors by analyzing the differences and similarities between the perspectives pre-proposed (McKeown and Thomas, 1988). There is no clear rule of thumb for the number of statements in the sort, but typically 20 to 50 (Exel and Graaf, 2005), sometimes 60 statements (Donner, 2001) or even 100 statements, are possible (Cross, 2004). If, for instance, there are 8 categories for the concourse, then the researcher might select four to five of best statements from each category, which yield a set of 32–40 Q set statements (Webler et al., 2009).

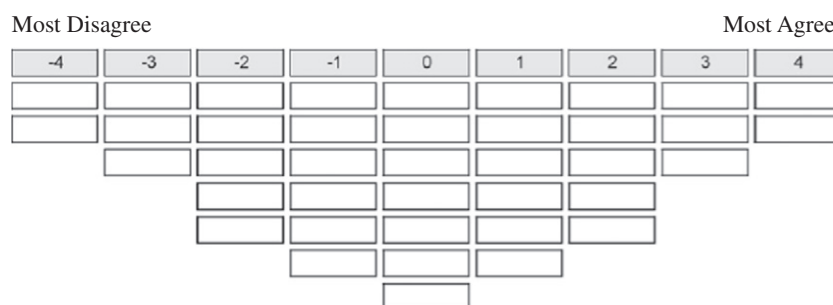


Fig. 2. Sample score sheet.

Q-methodology differs from R-methodology (surveys and questionnaires) in that the latter asks respondents to express views on isolated statements, whereas Q-methodology identifies respondents' views on statements in the context of the valuation of all statements presented (see e.g. Dryzek and Berejikian, 1993). Furthermore, as opposed to R-methodology, Q-Methodology traditionally intends to give a picture of the perspectives that exist (the variety of perspectives) among the population, rather than analyzing the level of support for those perspectives among the population (the balance of perspectives). This implies that the procedure for sampling respondents is usually different from that in R-methodology. Rather than random sampling and large sample sizes, Q methodology relies on purposive sampling and smaller sample sizes. The fact that there is a person who is assumed to have a different point of view is enough reason to include him or her in the sample.

3.2. Statements

In the study, the respondent were asked to rank statement about their decision making in projects on a score sheet, similar to that illustrated in Fig. 2. The statements each were related to aspects to be considered in decision making. The 'umbrella question' for the statements was formulated as '*Within decision-making in projects...*', with each statement completing this sentence. For example: 'Within decision-making in projects... it is essential to take into consideration the amount of energy used in the project'.

The Q-set contained of five categories of statements. The first category, 'sustainability', represented the different principles/dimensions of sustainability that resulted from our literature review. These concepts were operationalized in 14 statements (numbers 1–14), as presented in Table 2. As risk management is an inherent principle of both project management and sustainability, this principle was labeled as a separate category 'risk'. This category accounted for 3 statements.

The last three categories represented the 'triple constraint' of project management: cost, time and quality. Each of the three constraints was operationalized in 4 statements, resulting in 12 statements representing the triple constraint.

The total set of statements consisted of 29 statements. Table 3 presents this total set of statements the respondents needed to rank, with the sources of the statements.

3.3. Data collection

Data collection was done in structured interviews. Before the sorting the statements, five initial questions were asked to start the interview. Two questions asked about the incorporation of sustainability in the strategy of the company and the daily work of the respondent. The respondents rated this question on a scale from one to ten. The other three questions were about the triple constraint during projects: how important are time, cost and quality, on the same scale from one to ten?

Table 2
The sustainability statements in the Q-set.

Sustainability principle/dimension	Statements Within decision-making in projects...	Statement no	Category
Sustainability is about balancing or harmonizing social, environmental and economic interests	The ecological footprint should be taken in to account	1	Sustainability
	The economic, social and environmental consequences are crucial	5	
	The amount of energy used in the project is essential to take into consideration	6	
	The carbon footprint is crucial to take into account	11	
Sustainability is about both short-term and long-term orientation	The sustainability of the project life cycle is important	12	Sustainability
Sustainability is about both local and global orientation	Sustainable procurement is a must	13	Sustainability
Sustainability is about values and ethics	A percentage of project time and budget should be spent on health and safety practices	2	Sustainability
	Health and safety issues are checked	9	
Sustainability is about transparency and accountability	We need to be aware of the community's opinion	8	Sustainability
Sustainability is about stakeholder orientation	We listen to other people's points of view, seeking to understand them	4	
	Stakeholder engagement is vital	7	
			Sustainability
Sustainability is about reducing risks	Risk management should align with the organizational objectives	27	
	The risk appetite should be compared with the risk capacity	28	
	Risk management is fundamental	29	
			Risk
Sustainability is about eliminating waste	The amount of waste produced in the project is key	10	
Sustainability is about consuming income, not capital	Sustainable resources should be used	3	
	Renewable resources are vital	14	Sustainability

Table 3
The statements for the Q-sort.

No	Category	Statements Within decision-making in projects...	Source
1	Sustainability	The ecological footprint should be taken in to account	Wiedmann and Minx (2007), Maltzman and Shirley (2011), Labuschagne and Brent (2005)
2	Sustainability	A percentage of project time and budget should be spent on health and safety practices	Labuschagne and Brent (2005)
3	Sustainability	Sustainable resources should be used	International Organization for Standardization (2010), Silvius et al. (2012)
4	Sustainability	We listen to other people's points of view, seeking to understand them	Eslerod and Huemann (2013), Project Management Institute (2010)
5	Sustainability	The economic, social and environmental consequences are crucial	Hockerts (1999), Labuschagne and Brent (2005), Gareis et al. (2009), Silvius et al. (2012)
6	Sustainability	The amount of energy used in the project is essential to take into consideration	Global Reporting Initiative (2013)
7	Sustainability	Stakeholder engagement is vital	International Organization for Standardization (2010), Eslerod and Huemann (2013)
8	Sustainability	We need to be aware of the community's opinion	International Organization for Standardization (2010), Schieg (2009)
9	Sustainability	Health and safety issues are checked	Global Reporting Initiative (2013), International Project Management Association (2006)
10	Sustainability	The amount of waste produced in the project is key	Braungart and McDonough (2002), Ma (2011), Knoepfel (2010)
11	Sustainability	The carbon footprint is crucial to take into account	Wiedmann and Minx (2007), Maltzman and Shirley (2011), Labuschagne and Brent (2005)
12	Sustainability	The sustainability of the project life cycle is important	Labuschagne and Brent (2005)
13	Sustainability	Sustainable procurement is a must	International Organization for Standardization (2010)
14	Sustainability	Renewable resources are vital	Braungart and McDonough (2002)
15	Time	Time is the most important factor	Kerzner (2009), Project Management Institute (2013), Agarwal and Rathod (2006)
16	Time	Checking the schedule is a priority	Kerzner (2009), Project Management Institute (2013)
17	Time	Time to market is crucial	Mahmoud-Jouini et al. (2004)
18	Time	Being on schedule is a must	Kerzner (2009), Project Management Institute (2013)
19	Quality	Quality is the most important factor	Kerzner (2009), Project Management Institute (2013), Agarwal and Rathod (2006)
20	Quality	Following the quality management plan is a must	Project Management Institute (2013), Office of Government Commerce (2009)
21	Quality	A quality review session is necessary	Office of Government Commerce (2009)
22	Quality	First time right is an important factor	Turner (2014), Maltzman and Shirley (2011)
23	Cost	Available resources is the most important factor	Kerzner (2009)
24	Cost	A tool such as the earned value method should be used	Turner (2014)
25	Cost	A cost/benefit analysis is considered	Project Management Institute (2013), Office of Government Commerce (2009)
26	Cost	Cost is the most important factor to take into account	Kerzner (2009), Project Management Institute (2013), Agarwal and Rathod (2006)
27	Risk	Risk management should align with the organizational objectives	Office of Government Commerce (2010)
28	Risk	The risk appetite should be compared with the risk capacity	Office of Government Commerce (2010)
29	Risk	Risk management is fundamental	Turner (2014), Office of Government Commerce (2010), Kerzner (2009), Project Management Institute (2013)

After the sort there were post-questions, these questions were designed to find more details about the motivation of the respondents to rank certain statements.

3.4. Respondents

The respondents in the study, the 'P-set', were selected from different industries. They were all experienced project managers

(or program managers) within private held companies with sustainability set in their company strategy (in a broad sense) that have the responsibility of decision-making in projects or have influence on the decisions. In total, 12 respondents participated in the study. As discussed earlier, Q-methodology relies on

Table 4
The P-set.

Field of work	Number of respondents	Respondent #
Engineering	8	1, 3, 4, 7, 9, 10, 11, 12
Insurance	3	2, 5, 6
Built environment	1	8

Table 5
Incorporation of sustainability in the work environment of the respondents.

	Min. score	Max. score	Avg. score	St.dev.
How well is sustainability incorporated in the strategy of your company?	1	8	5.9	2.2
How well is sustainability incorporated in your daily work?	1	8	5.3	2.3

Table 6
Importance of the triple constraint factors as experienced by the respondents.

	Min. score	Max. score	Avg. score	St.dev.
How important is time during projects?	5	9.5	7.5	1.4
How important is quality during projects?	6	10	8.3	1.3
How important is cost/resources during projects?	6	10	8	1.1

purposive sampling and smaller sample sizes, making the sample size acceptable.

Table 4 provides an overview of the P-set.

The engineering field is an area where 8 participant performing their jobs. The variety of this group is large, from aerospace to automotive and from engineering consultancy to the oil and gas industry.

3.5. Q-analysis

The individual Q-sorts of the respondents were analyzed in order to reveal a limited number of perspectives in which the statements were sorted by the respondents. The Q sample statements and data from the completed Q-sorts were entered into PQ Method 2.0, version 2.33, which is a computer software program that is specifically designed to analyze Q methodology studies on a personal computer.

4. Findings and discussion

4.1. Initial questions

Table 5 shows the scores on the first two initial questions.

The average score for the incorporation of sustainability in the strategy of the company scored a bit higher than the incorporation of sustainability in the daily work environment. In general the score for the incorporation of sustainability in the strategy of the company is marked higher than the incorporation of sustainability during day-to-day work. This finding may provide support for

the statement of Briassoulis (2001), that it remains difficult to express sustainability in concrete, operational terms.

From the questions on the importance of the triple constraint factors, Table 6 shows that the quality constraint scored the highest score, followed by cost/resources and time.

From these initial questions, a first impression is that the triple constraint factors are more established in the work environment of the respondents than the consideration of sustainability. The ranking of the statements in the next section will provide more insight into this.

4.2. Perspectives

Analysis of the 12 individual Q-sorts revealed four distinct perspectives. The four perspectives in total accounted for 100% of the P-set. Table 7 shows these perspectives, with the gray cells indicating the defining sorts.

The perspectives could be characterized based on the consensus in the array of the Q-sort during the interviews. Perspective 1 was characterized as *People and Quality*, Perspective 2 as *People and Risk*, Perspective 3 as *Time and Cost* and Perspective 4 as *Quality, Time and Risk*.

4.3. Top ranked statements

Table 8 presents the top ten statements of each perspective. In this table, the sustainability statements are marked by a white background (total coverage of 35%), the triple constraint statements are marked in gray (total coverage of 55%) and the risk statements are marked in light gray (total coverage of 10%). For a good understanding of the percentages mentioned here, it should be realized that sustainability statements accounted for 14 of 29 statements in the Q-sort (=48%). Triple constraint statements accounted for 12 statements (=41%) and risk statements for 3 statements (=10%).

A first observation is therefore that in the top ranked statements, the triple constraint statements are overrepresented and the sustainability statements underrepresented.

Table 7
Identification of perspectives with indication of defining sorts.

	Perspective 1	Perspective 2	Perspective 3	Perspective 4	Field of work
Respondent 1	−0.3058	0.3578	0.7533X	0.1823	Engineering
Respondent 2	0.0591	0.8609X	0.0937	0.2281	Insurance
Respondent 3	0.8415X	0.1205	−0.0049	0.2935	Engineering
Respondent 4	0.1957	0.7478X	0.0340	−0.0190	Engineering
Respondent 5	0.0477	0.6289	0.1612	0.6428X	Insurance
Respondent 6	0.5049	0.2271	0.2691	0.6652X	Insurance
Respondent 7	0.2290	−0.0594	0.8501X	0.1473	Engineering
Respondent 8	0.3571	−0.0067	0.6218X	−0.1254	Built environment
Respondent 9	0.0856	0.0458	−0.0214	0.8687X	Engineering
Respondent 10	0.7465X	0.1979	0.3955	−0.0434	Engineering
Respondent 11	0.3453	0.5118	0.6370X	0.0995	Engineering
Respondent 12	0.5597X	0.1612	0.4782	0.4110	Engineering
Explained variance	19%	19%	21%	17%	

Table 8
Top-ranked statements per perspective.

	Perspective 1 People and Quality	Perspective 2 People and Risk	Perspective 3 Time and Cost	Perspective 4 Quality, Time and Risk
1	19 Quality is the most important factor (Q)	7 Stakeholder engagement is vital (S)	18 Being on schedule is a must (T)	19 Quality is the most important factor (Q)
2	5 The economic, social and environmental consequences are crucial (S)	4 We listen to other people's points of view, seeking to understand them (S)	26 Cost is the most important factor to take into account (C)	7 Stakeholder engagement is vital (S)
3	7 Stakeholder engagement is vital (S)	8 We need to be aware of the community's opinion (S)	15 Time is the most important factor (T)	29 Risk management is fundamental (R)
4	4 We listen to other people's points of view, seeking to understand them (S)	27 Risk management should align with the organizational objectives (R)	19 Quality is the most important factor (Q)	15 Time is the most important factor (T)
5	8 We need to be aware of the community's opinion (S)	23 Available resources is the most important factor (C)	16 Checking the schedule is a priority (T)	17 Time to market is crucial (T)
6	23 Available resources is the most important factor (C)	28 The risk appetite should be compared with the risk capacity (R)	21 A quality review session is necessary (Q)	27 Risk management should align with the organizational objectives (R)
7	12 The sustainability of the project life cycle is important (S)	16 Checking the schedule is a priority (T)	25 A cost/benefit analysis is considered (C)	8 We need to be aware of the community's opinion (S)
8	26 Cost is the most important factor to take into account (C)	18 Being on schedule is a must (T)	9 Health and safety issues are checked (S)	14 Renewable resources are vital (S)
9	16 Checking the schedule is a priority (T)	25 A cost/benefit analysis is considered (C)	7 Stakeholder engagement is vital (S)	25 A cost/benefit analysis is considered (C)
10	15 Time is the most important factor (T)	17 Time to market is crucial (T)	20 Following the quality management plan is a must (Q)	4 We listen to other people's points of view, seeking to understand them (S)

As is shown by this table, the four perspectives attached different priorities to the sustainability, triple constraint and risk statements in their top-10 statements. Table 9 summarizes the relative representation of each of the categories of statements in the top-10 ranking of the different perspectives. The column titled Proportional shows the percentage of statements of the different categories in the Q-sort.

4.3.1. Consideration of sustainability

Regarding the consideration of sustainability, the following six statements were found in the top-10 ranked statements.

- Stakeholder engagement is vital (mentioned in all four perspectives)

- We listen to other people's points of view, seeking to understand them (mentioned in three perspectives)
- We need to be aware of the community's opinion (mentioned in three perspectives)
- The economic, social and environmental consequences have to be taken into account (mentioned in one perspective)
- The sustainability of the project life cycle is important (mentioned in one perspective)
- Health and safety issues are checked (mentioned in one perspective)

Reflecting on this result, it may be concluded that the sustainability principle *Sustainability is about stakeholder orientation* is most present in the project managers' considerations

Table 9
Representation of the categories of statements in the top-10 ranked statements per perspective.

	Perspective 1 People and quality	Perspective 2 People and risk	Perspective 3 Time and cost	Perspective 4 Quality, time and risk	Proportional
% of top 10 statements categorized as Sustainability	50%	30%	20%	40%	48%
% of top 10 statements categorized as Time, Cost or Quality (the triple constraint)	50%	50%	80%	40%	41%
% of top 10 statements categorized as Risk	0	20%	0	20%	10%

when making decisions in the project. All four perspectives ranked the statement *Stakeholder engagement is vital* in their top 10.

This was confirmed in the qualitative comments the respondents made. Respondent #2 said: “*You need people to meet the requirements of your strategy*”. Participant #3 added: “*Our projects serve the community, so you always need stakeholder management*”. Respondent #10 added to that: “*This is why you do the project*” and respondent #11 concluded: “*When stakeholders are not involved, things can go awfully wrong*”.

The statement *We listen to other people's points of view, seeking to understand them* made the top 10 in three of the four perspectives. On this statement, respondent #2 said: “*When you know what you are going to do, then check it with your audience, like taking the temperature with a thermometer*”. Participant #4 remarks: “*In the projects you use a lot of experts, you have to listen carefully to them*.” This means that the ‘other’ people are taken into account, other can mean colleagues, stakeholders, senior figures, project surroundings like neighbors or participants involved in the project.

The statement *We need to be aware of the community's opinion*, that was derived from the sustainability principle Sustainability is about transparency and accountability, but also represents a stakeholder perspective was also ranked in the top 10 statements of three of the four perspectives. The project result is often for a community of group of people, when they are not satisfied, the result may be not sufficient. At least not for the community involved in the project.

On the last two statements discussed above, only the *Time and Cost* perspective does not mention these in the top 10 statements.

Of the other sustainability principles, only the principles *Sustainability is about balancing or harmonizing social, environmental and economic interests* and *Sustainability is about both short-term and long-term orientation* and *Sustainability is about values and ethics* had statements in the top 10, but these were all only present in the top 10 of one perspective. In the perspective *People and Quality*, the statements *The economic, social and environmental consequences have to be taken into account* and *The sustainability of the project life cycle is important* made the top 10. Respondent #3 said on this: “*Our vision is enhancing society, the community is always involved in the projects*”.

In the perspective *Time and Cost* the statement *Health and safety issues are checked* (9) is included in the top 10 statements. On this, respondent #7 said: “*Safety is a topic in everything we do, if the safety is not guaranteed for the production then there is a risk. When an accident happens, the project will run out of budget and time*”. Respondent #10 remarks: “*Every meeting safety is on the agenda, safety needs to be in your system*”.

The priority for health and safety may be industry related, however, this aspect is beyond the focus of this study.

It was observed, that almost all the sustainability statements that were ranked in the top-10, can be related to a social or societal perspective on sustainability. Statements that referred to the environmental perspective were included in the sort, but were not ranked in the top-10 by the participants.

Regarding any missing statements during the interview, the respondents noted the absence of the governance topic, a politics related topic because that was important for them in the

decision-making process and they missed the statements related to compliance.

4.4. Bottom ranked statements

Table 10 presents the ‘bottom ten’ statements of each perspective, with the same color coding as in Table 8. Measured over all four perspectives, the sustainability statements cover 67.5%, the triple constraint statements 25% and the risk statements 7.5%. Again, these percentages should be controlled for the number of statements in the Q-sort: 48% of sustainability statements, 41% triple constraint statements and 10% risk statements.

The observation found for the top ranked statements is now inverted. In the bottom ranked statements, the sustainability statements are overrepresented and the triple constraint statements plus the risk statements underrepresented.

The bottom of the table shows that several statements are present that are more related to the environmental perspective of sustainability. Statement 6: *The amount of energy used in the project is essential to take into consideration* is present in all four perspectives. Also statement 11 *The carbon footprint is crucial to take into account* is present in the bottom of the table for all four perspectives. The same is true for statement 10 *The amount of waste produced in the project is key*.

These sustainability statements, and the sustainability principles they were derived from, obviously do not play a large role in the decision-making process of project managers.

4.5. Defining statements

Table 11 shows the 6 statements that proved to be the least defining between the four perspectives. On these statements, the different perspectives scored more or less equal.

Table 12 shows the most defining statements for the four perspectives. On these statements, the scores of the perspectives differed most, indicating the most characterizing statements of the different perspectives (highlighted in gray).

5. Conclusion

The integration of sustainability into project management is picking up momentum (Silvius and Tharp, 2013). The study reported in this paper contributes to the developing literature on this topic, by deriving a set of nine guiding principles from literature that represent the concepts of sustainability and CSR in the context of projects. However, next to this conceptual contribution, the paper also presents an empirical study into the role of sustainability criteria on the decision making processes of project managers. The central research question of the paper was formulated as *How are dimensions of sustainability considered in the decision-making processes of project managers in relation to the triple constraint of time, cost and quality?*

Table 10
Bottom-ranked statements per perspective.

	Perspective 1 People and Quality	Perspective 2 People and Risk	Perspective 3 Time and Cost	Perspective 4 Quality, Time and Risk
20	14 Renewable resources are vital (S)	2 A percentage of project time and budget should be spent on health and safety practices (S)	17 Time to market is crucial (T)	26 Cost is the most important factor to take into account (C)
21	28 The risk appetite should be compared with the risk capacity (R)	26 Cost is the most important factor to take into account (C)	13 Sustainable procurement is a must (S)	1 The ecological footprint should be taken into account (S)
22	10 The amount of waste produced in the project is key (S)	9 Health and safety issues are checked (S)	24 A tool such as the earned value method should be used (C)	28 The risk appetite should be compared with the risk capacity (R)
23	2 A percentage of project time and budget should be spent on health and safety practices (S)	12 The sustainability of the project life cycle is important (S)	5 The economic, social and environmental consequences are crucial (S)	10 The amount of waste produced in the project is key (S)
24	24 A tool such as the earned value method should be used (C)	6 The amount of energy used in the project is essential to take into consideration (S)	10 The amount of waste produced in the project is key (S)	18 Being on schedule is a must (T)
25	13 Sustainable procurement is a must (S)	24 A tool such as the earned value method should be used (C)	6 The amount of energy used in the project is essential to take into consideration (S)	6 The amount of energy used in the project is essential to take into consideration (S)
26	27 Risk management should align with the organizational objectives (R)	19 Quality is the most important factor (Q)	14 Renewable resources are vital (S)	22 First time right is an important factor (Q)
27	11 The carbon footprint is crucial to take into account (S)	14 Renewable resources are vital (S)	1 The ecological footprint should be taken into account (S)	9 Health and safety issues are checked (S)
28	6 The amount of energy used in the project is essential to take into consideration (S)	11 The carbon footprint is crucial to take into account (S)	11 The carbon footprint is crucial to take into account (S)	13 Sustainable procurement is a must (S)
29	17 Time to market is crucial (T)	10 The amount of waste produced in the project is key (S)	8 We need to be aware of the community's opinion (S)	11 The carbon footprint is crucial to take into account (S)

5.1. Overall

Based on the Q-sorts of 12 selected respondents, we found that only a limited number of sustainability criteria were taken into consideration by the project managers when making their decisions. In the ranking of statements, the triple constraint criteria were overrepresented in the top-10, whereas sustainability considerations were overrepresented in the bottom-10 statements.

Table 11
Least defining statements.

Statements	Category	Av. score
Checking the schedule is a priority	Time	1.25
A cost/benefit analysis is considered	Cost	0.75
Following the quality management plan is a must	Quality	0.25
Sustainable resources should be used	Sustainability	−0.5
The amount of energy used in the project is essential to take into consideration	Sustainability	−2.25
The carbon footprint is crucial to take into account	Sustainability	−2.75

This result was not unexpected, as the initial questions asked in the interviews also showed that the triple constraint criteria were scored as more important than the sustainability considerations.

When sustainability was considered, the principle *Sustainability is about stakeholder orientation* was most present in the project managers' considerations, followed by the principle *Sustainability is about transparency and accountability*.

Many respondents argued that the organization's line management needs to make sure that sustainability dimensions are considered in projects, *and* that project managers need to understand what this means for their projects. Both in terms of doing the projects in a sustainable way *and* doing sustainable projects.

5.2. Distinct perspectives

Analysis of the 12 individual Q-sorts revealed four distinct perspectives.

Perspective 1: *People and quality*.

Table 12
Most defining statements.

		Perspective 1 People and Quality	Perspective 2 People and Risk	Perspective 3 Time and Cost	Perspective 4 Quality, Time and Risk
We need to be aware of the community's opinion	Sustainability	2	2	–3	1
Time to market is crucial	Time	–3	1	–1	2
Being on schedule is a must	Time	0	1	3	–2
Quality is the most important factor	Quality	3	–2	2	3
Cost is the most important factor to take into account	Cost	1	–1	3	–1
Risk management should align with the organizational objectives	Risk	–2	2	0	2
Health and safety issues are checked	Sustainability	1	–1	1	–3
The economic, social and environmental consequences are crucial	Sustainability	3	0	–1	0
We listen to other people's points of view, seeking to understand them	Sustainability	2	3	0	1
Sustainable procurement is a must	Sustainability	–2	0	–1	–3
The risk appetite should be compared with the risk capacity	Risk	–1	2	0	–1

This perspective scored highest on the consideration of sustainability, with having 50% of the top 10 statements categorized as sustainability and the other 50% categorized as the triple constraint. Defining statements for this perspective were *Quality is the most important factor* and *The economic, social and environmental consequences are crucial*. The sustainability statements that ranked high in this perspective represented the principles *Sustainability is about balancing or harmonizing social, environmental and economic interests* and *Sustainability is about both short-term and long-term orientation*.

Perspective 2: People and risk.

This perspective scored relatively high on the consideration of risk, with 20% of the top 10 statements. Consideration of the triple constraint factors scored 50% of the top 10 statements and consideration of sustainability 30%. Defining statements for this perspective were *We listen to other people's points of view, seeking to understand them*, followed by *Risk management should align with the organizational objectives*, *The risk appetite should be compared with the risk capacity* and *We need to be aware of the community's opinion*. As we identified *reducing risks* as a principle of both sustainability and project management, this perspective integrated sustainability and project management up to a certain level, although its consideration of sustainability principles is limited.

Perspective 3: Time and cost.

This perspective may be considered the traditional 'iron triangle' project management perspective, with 80% of the top 10 statements being categorized as the triple constraint. The remaining 20% of top 10 statements were categorized as sustainability and mainly reflected the principles *Sustainability is about stakeholder orientation* and *Sustainability is about values and ethics*. Defining statements for this perspective were *Being on schedule is a must*, *Cost is the most important factor to take into account* and *Quality is the most important factor*. The statements that related to the principles *Sustainability is about balancing or harmonizing social, environmental and economic interests*, *Sustainability is about both short-term and long-term orientation* and *Sustainability is about both local and global orientation* were found in the bottom of the statement ranking for this perspective.

Perspective 4: Quality, time and risk.

This perspective can be considered as the most balanced perspective. The top 10 statements of this perspective included all three categories sustainability (40%), triple constraint (40%) and risk (20%) in percentages that were almost proportional to the categories in the total set of statements. Defining statements for this perspective were *Quality is the most important factor*, *Time to market is crucial* and *Risk management should align with the*

organizational objectives. The sustainability statements that ranked high in this perspective represented the principles *Sustainability is about stakeholder orientation.*

5.3. Limitations

One of the limitations of this study may be that it is a time bounded research problem. Data collection has taken place in the first two quarters of 2013. As sustainability is an ongoing social subject, and its role in strategies of organizations developing, so may be its understanding and perception. When this research is repeated in a different time period, the results may also be different.

Another limitation was that of a potential bias in the responses. The data captured relied on the subjective perceptions of the participants. Biased answers therefore cannot be excluded.

5.4. Further research

In order to be able to provide tools for the academic field a stronger framework needs to be developed. As seen from the sections above this framework should be an amalgamation of several frameworks, checklists or guidelines. There is no exact framework for this specific research, all the frameworks used in this research are of a high standard. The issue is that the more specifically designed these frameworks are, the more inflexible the method will be for different research problem.

Further research can be applied to different areas of industries using the same research question in order to determine the differences between the industries concerned. It is likely that the engineering field reacts differently to sustainability than for instance the medical and health care field or insurance companies. And what are the differences between the companies and their projects? The project leader is responsible for the work conducted in the project but not for running the business, most of the time sustainability is imbedded in the strategy of the company, not in the project.

Also, the different phases in the project can be measured in the decision-making process. Maybe sustainability is important at the beginning of the project but less so towards its completion or vice versa.

Conflict of interest

The authors declare that there's no financial/personal interest or belief that could affect their objectivity in this study.

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