



Project sustainability strategies: A systematic literature review

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Abstract

Because research focusing on sustainability in a project context is still nascent and fragmented, we carried out a systematic literature review covering all research published in five leading journals in the fields of project management and sustainable production prior to 2016. Our analysis revealed two distinct perspectives in the project sustainability research; one assumes the perspective of the project organisation delivering the asset while the second assumes the perspective of the host organisation. We identify and describe eight distinct strategies used by either the project organisation, its host, or both in collaboration to support sustainability goals. We complement the findings of our literature review with an illustrative empirical case focusing on the delivery of an innovative seawater-based heating solution in Norway.

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1. Introduction

Projects have become increasingly globalized, contributing significantly to growth in the countries in which they are executed, particularly for the local industry in developing countries (Aarseth et al., 2011; Javernick-Will and Scott, 2010). On the other hand, projects also pose challenges to the local community and government, sustainable development being one of these challenges. The question of how actors like state bodies, corporations, and others can develop and execute projects without compromising the life and prosperity of future generations is fundamentally important. Our focus in this paper lies in delivery projects where investment assets (such as buildings and information systems) are delivered to external actors with significant emphasis placed on either that the asset

is delivered in a sustainable manner and/or that the asset itself can be operated by its owner in a sustainable manner.

Most definitions of the concept of sustainability direct attention to the relationship between humans and the resources they use (Voinov, 2007). Wimberley (1993, p. 1) states that “to be sustainable is to provide for food, fibre, and other natural and social resources needed for the survival of a group and to provide in a manner that maintains the essential resources for present and future generations”. This is very much along the lines of the widely used definition of the Brundtland Commission that defined sustainable development as the one that meets the needs of the present without compromising the ability of future generations to their own needs (WCED, 1987). While more than 100 definitions for sustainability have been presented, most scholars working in the area agree that sustainability highlights the need to simultaneously balance social, environmental and economic goals. These goals are also referred to as the three pillars or objectives of sustainable development (Azapagic and Perdan, 2000; Labuschagne and Brent, 2005; Sillanpää, 1999). Despite considerable research interest, sustainability and sustainable

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development remain ambiguous as concepts. The ambiguity has had an upside on the global political stage; by allowing for variations in interpretations, governments could sign up for treaties on sustainable development and yet continue to follow their own agenda (Lele, 1991; Victor, 2006). The pressure on businesses to incorporate sustainability principles and objectives into policies and activities is mounting (Labuschagne and Brent, 2005). The motivation for incorporating sustainability principles may be both value and business based. Hart (1997) has developed a sustainable value framework identifying four core dimensions of sustainability strategy emphasizing the potential for creating win-win situations contributing to both shareholder value and sustainability.

The governments in many countries are more and more aware of their responsibility to ensure sustainability, at least locally. Empirical studies have demonstrated how governments require that companies executing projects develop strategies, action plans and performance indicators which will contribute to sustainable development in the host country (Yanarella and Bartilow, 2000). For example, Bossink (2002) showed how the Dutch authorities' sustainable construction policy requirements generated innovative sustainability-based development and design approaches within the construction companies in the Netherlands. In turn, Ross et al. (2010) demonstrated how the engagement of local stakeholders can be facilitated by the host organization through guidelines and incentives in the context of sustainable low-income housing projects in the South Africa.

Ongoing sustainability discourses include the interaction between humans and other resources co-existing on planet earth, taking place in leading popular science journals such as *Science and Nature* (e.g. Ostrom, 2009; Pauly et al., 2002), research focusing on the diversity and development of agricultural soils (Doran et al., 1996; Kennedy and Smith, 1995; Tilman et al., 2002), sustainability in the production and use of energy (Dell and Rand, 2001; Goldemberg et al., 2008; Rosen et al., 2008), sustainability of various industries such as construction (Ortiz et al., 2009) and tourism (Gössling et al., 2002), and sustainability of different emerging technologies such as photovoltaics (Fthenakis, 2009) or fuel cells (Dincer, 2007). Closer to the area of our research interest, researchers working in the field of organization and management have addressed the role of corporations in achieving sustainability (Shrivastava, 1995), the role of stakeholders in shaping sustainability practices (Sharma and Henriques, 2005), and the concept of corporate social responsibility and corporate sustainability (Van Marrewijk, 2003).

Project management methodologies are not excluded from the sustainability-incorporation pressures. It has been argued that current project management frameworks do not effectively take social and environmental issues into account, and thus require revision (Labuschagne and Brent, 2005). Warhurst (2002) has also argued that there is a need to develop indicators that can be used in decision-making to ensure that projects are managed according to practices that will contribute to sustainable development.

While the literature on sustainability has grown quite steadily and the core discourses within it are relatively well known, the situation is very different regarding literature discussing

sustainability in a project context. Sustainability is a fairly new topic in the project management literature, with the majority of publications dating from the last ten years (Silviu and Schipper, 2014). Thus, the objective of this research is to provide a description of what the relevant sustainability-related discourses in the field of project research are. Furthermore, our aim is to identify whether project organizations or project hosts purposefully utilize distinct *sustainability strategies*, i.e. plans focusing on the fulfilment of their sustainability-related goals under conditions of uncertainty. By strategy we refer to choosing different activities to deliver value (Porter, 1996). Strategies are often described as plans and directions to succeed (Artto et al., 2008) and sustainability strategies then deal specifically with the challenges and opportunities of sustainability. We address these challenges by means of a systematic literature review of articles published in five leading journals focused on research on project organizing and sustainable production. Based on our analysis of 68 articles published in these five journals before the year 2016, we identified two distinct perspectives on project sustainability research. The first assumes the perspective of the project organization delivering the investment asset, while the second assumes the perspective of the host organization, which is the regulating body that approves the project and governs the area where the project is located. Furthermore, we identified eight distinct sustainability strategies used by either the project or its host or by both of them to support sustainability goals. We contrast our findings to an illustrative empirical case focusing on the delivery of an innovative fjord-based heating solution in Norway and discuss the implications of our research for both project research and practice.

2. Method

To meet our research objectives, we chose to carry out a systematic literature review (SLR) focusing on the leading journals that publish project sustainability research. According to Cook et al. (1997) the origin of SLR is in medical and health care fields where the approach has been used as basis for policy decisions. As compared to many traditional and less systematic approaches for carrying out literature reviews, SLR is generally considered to be superior in terms of transparency as other researchers can more easily verify the findings of the study by replicating the research setup. During the last two decades organization and management scholars have begun to adopt SLR in their research designs as well (Pilbeam, 2013). In the context of project research, Ahola et al. (2014) and Müller et al. (2014) represent recent examples of studies that have adopted SLR to map the concept of governance.

To ensure a sufficiently thorough coverage of our research field we chose to target our literature search to the following journals: *International Journal of Project Management (IJPM)*, *Project Management Journal (PMJ)*, *International Journal of Managing Projects in Business (IJMPiB)*, *Construction Management & Economics (CME)*, and *Journal of Cleaner Production (JoCP)*. Combined, these journals publish the majority of academic research focusing on project organizing and sustainable production.

We searched for full-text articles published prior to 2016 with terms “sustainability” AND/OR “sustainable” in the title, abstract or keywords in our target journals with the exception of Journal of Cleaner Production. As JoCP publishes a very high amount of sustainability research that is not related to project organizing in any way, we included the search term “project” in the search carried out in this journal. Our searches resulted in a total of 95 hits. To filter out clearly irrelevant articles from our sample, abstracts of these 95 articles were read independently by two of the authors and categorized as either relevant or irrelevant for the purposes of this study. 27 articles categorized as irrelevant by both authors were removed from the sample. The removed articles addressed diverse topics all relating to the concept of sustainability in one way or the other. Examples of topics discussed in these articles include sustaining organizational commitment, achieving sustainable subcontractor performance, building value through sustainable project offices, and mentorship in academia. What was common to all removed articles was that they did not include any discussion of sustainability strategies, i.e. plans focusing on the fulfilment of their sustainability-related goals or that they were limited to projects carried out within the boundaries of a single organization (e.g. internal product development projects). The initial results of 95 sources also included six book reviews that were removed resulting in a final sample of 68 *project sustainability articles* as summarized in Table 1.

Our analysis of the project sustainability articles proceeded as follows. Following Jarvis et al. (2003), each article was read by the authors, and contents discussing the management of sustainability-related areas were identified and coded. More specifically, our analysis revealed that our sample articles discussed project sustainability from two distinct perspectives. The first group of articles described three distinct *sustainability strategies adopted by project organizations* to either mitigate their negative impacts on their business environment or increase their favourable contribution to the society. Opposed to the first group of articles that adopted the perspective of the project organization, the second group of articles adopted the perspective of the host organization influenced by the project. These articles outlined two distinct *sustainability strategies adopted by project hosts* to increase the favourable contribution of the project or to decrease the unfavourable impacts of the project. We also identified three *distinct strategies adopted by both project organizations and host organizations*. In the following chapter, we first briefly outline the development of the project sustainability discourse and then proceed to discuss the two

identified perspectives on project sustainability strategies in detail.

3. Results

3.1. Project sustainability — a gradually emerging discourse

With the exception of two early project sustainability articles published in Construction Management & Economics in 1997 (Hill & Bowen) and 1999 (Chen & Chambers), the academic discussion on sustainability issues in projects has mostly taken place during the last 10–12 years. During that period, the topic has attracted increasing scholarly interest among project researchers, as can be observed from Fig. 1 presenting the distribution of our 68 project sustainability articles in the five focal journals and across time. Furthermore, we observe that most of the identified sustainability articles have been published in Journal of Cleaner Production (JoCP), Construction Management & Economics (CME) and the International Journal of Project Management (IJPM), while significantly fewer articles have appeared in Project Management Journal (PMJ) and the International Journal of Managing Projects in Business (IJMPiB). Thus, JoCP, CME and IJPM currently seem to function as the main outlets for publishing research focusing on project sustainability in a project context. During the last decade, the number of publications has increased from approximately 1–5 articles published annually in 2004–2008 to 5–10 articles published annually in 2009–2015. Thus, project sustainability is a currently active scientific discourse, see Fig. 1.

The articles published in JoCP, IJPM, PMJ and IJMPB do not represent a single, coherent discourse. Instead, the adopted perspectives and definitions of sustainability range from the three pillars of the Brundtland definition, via the sustainability of a project’s effects (Shiferaw et al., 2012), to the sustained existence of an enterprise or supply chain (Cheung and Rowlinson, 2011). Most of the sample articles do not focus solely on sustainability, but combine sustainability with another discourse in project research including governance (e.g. Herazo et al., 2012; Patanakul and Shenhar, 2012; Shiferaw and Klakegg, 2012; Zeng et al., 2015), stakeholder management (Mathur et al., 2008) and value management (Al-Saleh and Taleb, 2010). Several industries are represented in our sample, including manufacturing (Labuschagne and Brent, 2005) and construction (e.g. Hill and Bowen, 1997; Ross et al., 2010).

Compared to the articles published in JoCP, IJPM, PMJ and IJMPiB, the articles published in CME represent a slightly

Table 1
Details of 68 project sustainability articles identified in our study.

Journal	Keyword hits in search	Articles removed based on abstracts	Final sample of articles
International Journal of Project Management (IJPM)	23	7	16
Project Management Journal (PMJ)	10	4	6
International Journal of Managing Projects in Business (IJMPiB)	8	2	6
Construction Management & Economics (CME)	20	4	16
Journal of Cleaner Production (JoCP)	34	10	24
<i>Total</i>	95	27	68

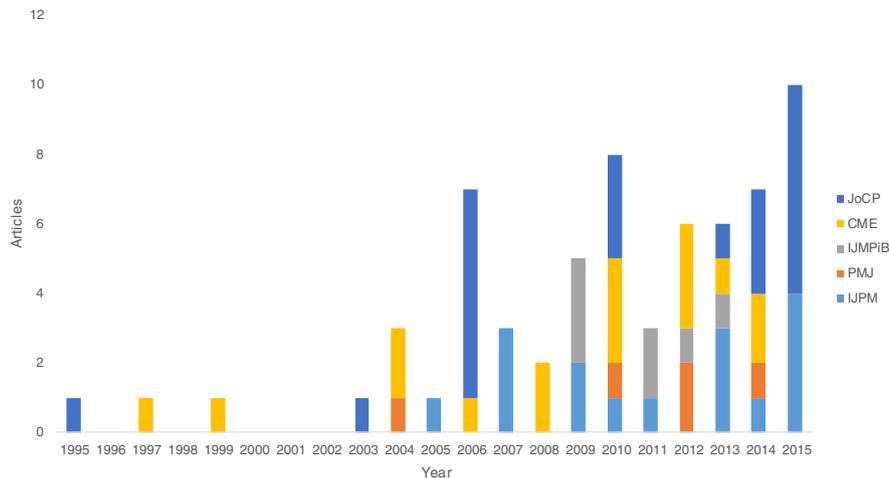


Fig. 1. Project sustainability articles published annually in sample journals.

more coherent group as they predominantly rely on a shared framework or understanding termed “sustainable construction” (or alternatively “green construction”). 11 out of the 16 CME articles in the sample represent or refer to “sustainable construction” (e.g. Bossink, 2002; Hill and Bowen, 1997; Mokhlesian and Holmén, 2012). The term sustainable construction encompasses the design and planning phases of projects as well as the phases following the construction (Hill and Bowen, 1997). The majority of the articles in the sample that deals with the subject, however, take the limited view with a primary focus on the use of materials even though the concept of sustainable construction is originally more holistic.

Table 2 below presents an overview of the strategies identified from the sample articles grouped in three groups: sustainability strategies adopted by project organizations and sustainability strategies adopted by project hosts as well as mutual strategies. In the following, we proceed to discuss each of the eight strategies in detail.

3.2. Sustainability strategies used by project organizations

Focusing on the management of specific projects, several of the sample articles studied have outlined strategies aimed at improving or ensuring sustainability as part of project management:

Setting strategic and tactical sustainability goals is key to aligning project and overall strategies. Herazo et al. (2012) conducted a study of construction projects where the focus was on utilizing sustainable development issues to link clients’ overall strategic management to project management of specific projects. They found that sustainable development was a facilitator in the alignment process between project management and business strategy. Based on a supposition that sustainability criteria in product design, sustainable project processes, organizations committed to sustainability and project managers trained in sustainability are necessary, albeit not always enough, Marcelino-Sadaba et al. (2015) presents a research agenda of which transferring strategies tied to sustainability to specific projects is at the top. Cases where

sustainability goals align with overall project or business goals should be considered low-hanging fruit with regards to implementation. Such is the case presented in Verrier et al. (2016) and Ochoa (2014). Both articles present lean construction’s aim of waste reduction as aligning with sustainability goals. Verrier et al. (2016) integrates sustainability considerations one step further by proposing an approach which adds environmental and social dimensions to the consideration of economic earnings received through Lean actions. Shen et al. (2010) focus on the project feasibility study and its role for integrating sustainable and socially responsible construction practices in China. The authors look to the government as the responsible stakeholder who effectively can promote sustainability in this phase as economic performance currently is given the most concern project feasibility studies, whilst less attention is given to the social and environmental performance. Focusing explicitly on sustainability issues when developing project strategies and paying special attention to instances where sustainability issues align with other concerns are keys to this strategy.

Developing sustainable supplier practices provide the next strategy to ensuring sustainability in projects. It normally falls to the project owner to develop such guidelines, and proactive owners could even support other actors in the project in implementing these. Based on a case study, the Shanghai World Expo 2010, Shi et al. (2012) reported how this was done in practice. Some studies have looked into specific practices that could be included in sustainability guidelines. Ross et al. (2010) studied housing projects in South-Africa and found seven sustainable principles applied in these projects; minimize resource consumption, maximize resource reuse, use renewable, recyclable or recycled resources, protect the natural environment, create a healthy, non-toxic environment, pursue quality in the built environment, and promote socio-economic uplifting. Two of our sample articles emphasize prefabrication as a means to improving sustainability. Jaillon and Poon (2008) conducted a study consisting of a survey and case studies of residential and non-residential buildings in Hong Kong. They found

Table 2
Eight sustainability strategies identified from literature.

<i>Sustainability strategies adopted by project organizations</i>			<i>Sustainability strategies adopted by project hosts</i>		
Strategy	Description	Sources	Strategy	Description	Sources
<i>Setting strategic and tactical sustainability goals</i>	Focusing explicitly on sustainability issues when developing project strategies, paying special attention to instances where sustainability issues align with other concerns.	(Herazo et al., 2012; Marcelino-Sadaba et al., 2015; Martens and Carvalho, 2016; Ochoa, 2014; Verrier et al., 2014)	<i>Setting sustainability policies</i>	Defining sustainable project policies, that include the development of laws and regulations, norms, plans and guidelines to support sustainability on the project level, and executing governmental and regulatory tasks in a manner that emphasizes and promotes sustainability in projects carried out in the host region.	Chen and Chambers, 1999; (Bossink, 2002; Chen and Chambers, 1999; Ross et al., 2010); (Block and Paredis, 2013; Meech et al., 2006)
<i>Developing sustainable supplier practices</i>	Supporting suppliers in implementing sustainable practices such as e.g. use of ecological materials and prefabrication.	Jaillon and Poon, 2008; Liu et al., 2010; (Ross et al., 2010); (Shi et al., 2012); (Eriksson et al., 2013; Jaillon and Poon, 2008; Liu et al., 2010)	<i>Influencing sustainability of project practices</i>	Supporting the incorporation of sustainability into project practices and technical systems through, e.g., construction tools, prefabrication and waste management systems.	(Bossink, 2002; Jaillon and Chi-Sun, 2010; Jaillon and Poon, 2008)
<i>Emphasizing sustainability in project design</i>	Incorporating sustainability issues in early phases of projects and explicit project design documents. The methods are based on development of performance indicators (that may be used throughout the project life cycle) and appraisal techniques such as life-cycle assessments and value management.	Sandoval et al., 2006; Wood et al., 2010; Wang et al., 2014; (Heravi et al., 2015; Marcelino-Sadaba et al., 2015; Sanchez, 2015; Sandoval et al., 2006; Wang et al., 2014; Wood et al., 2010; Zhong and Wu, 2015)			
<i>Mutual sustainability strategies</i>					
Strategy	Description (project perspective)	Description (host perspective)	Sources		
<i>Inclusion of sustainability-promoting actors in project organization</i>	Selection and inclusion of actors that bring sustainability-promoting skills, capabilities and roles to the project.	Inclusion of different authorities and NGO representatives to act as legitimacy actors in project organization, supporting multi-disciplinarity in project organization.	Mathur et al., 2008; (Lenferink et al., 2013; Mathur et al., 2008)		
		Facilitation of local decision making and engagement of local stakeholders in the project's decision making through, e.g., guidelines, norms or financial incentives	(Genus and Theobald, 2015; Mathur et al., 2008; Ross et al., 2010; Yunus and Yang, 2014); Genus and Theobald, 2015		
<i>Developing sustainability competencies</i>	<i>Expanding competencies and skill sets of project managers e.g. by investing in formal training programmes.</i>	<i>Developing sustainability-related competencies of governmental/regulatory actors as well as the general public</i>	(Johnson et al., 2006; Mathur et al., 2008; Ross et al., 2010; Yunus and Yang, 2014)		
			(Gao et al., 2006; Hwang and Ng, 2013; Marcelino-Sadaba et al., 2015; Martens and Carvalho, 2016; Tabassi et al., 2016)		
			Chen and Chambers, 1999; Vezzoli, 2003; Cantalapiedra et al., 2006; Gao et al., 2006; Genus and Theobald, 2015		
<i>Sustainability-emphasis in project portfolio management</i>	This relies on either using a framework for project selection or actively including sustainability as a dimension in early-phase appraisals.	Emphasizing sustainability issues when deciding which projects to fund and approve.	Labuschagne and Brent, 2005; (Khalili-Damghani and Tavana, 2014; Labuschagne and Brent, 2005; Sanchez, 2015)		
			(Meech et al., 2006; Sandoval et al., 2006; Zhang et al., 2015)		

that environmental, economic and social benefits of using prefabrication were significant when compared to conventional construction methods. Similar findings were reported by Eriksson et al. (2013). Based on four infrastructure case projects, they found that industrialized construction can improve both short-term efficiency and long-term innovation and sustainability.

Emphasizing sustainability in project design can be characterized as a strategic choice to actively focus on sustainability during the development of the project design (Abidin and Pasquire, 2007). Value management and life cycle management are two methods available for use in projects' design phase, and the authors claim that expanding these by adding sustainability issues can help projects improve their sustainable performance. However, they found that this potential has not been fully realized by the practitioners, and they hope to promote this by proposing a structural model that incorporates sustainability into value management and life cycle management. The provision of sustainability indicators can be a method for emphasizing sustainability from the front-end design and planning through construction, operations and maintenance and demolition as presented by Heravi et al. (2015). Sanchez (2015) provide a method to derive sustainability indicators from a sustainability analysis, both of which are part of a larger framework for sustainability in project management. An alternative take on sustainability indicators are provided by Zhong and Wu (2015). The authors claim that assessment tools such as Singapore Green Mark are too comprehensive for practical purposes, and propose an alternative indicator set.

3.3. Sustainability strategies adopted by hosts

In addition to the three project-specific sustainability strategies discussed above, we identified two strategies through which hosts can promote sustainability in the projects implemented in their context. When using the concept of host, we refer to the actors that are linked to the geographical and/or local context of where the project is implemented. This is the context that is primarily affected by the project's execution and outcome and typically actively attempts to influence and shape the project in order to promote sustainability, to minimize the negative environmental effects and maximize the social and financial effects of the project. The identified two sustainability strategies adopted by hosts are discussed in detail below:

Setting sustainability policies strategy focuses on the establishment of laws, regulations, norms and guidelines that promote sustainability of the projects in the host country. A study by Bossink (2002) focusing on the sustainability of the Dutch construction sector highlighted the salience of governmental policy making and the development of environmental policy plans, laws, implementation measures, and financial incentives to realize the attainment of ambitious sustainability goals. The centrality of governmental level sustainability policies is also frequently discussed in the context of the developing countries where the challenges are oftentimes seen

to lie in the actual implementation and control of the realization of the sustainability guidelines and visions in practices (Chen and Chambers, 1999; Ross et al., 2010). Environmental impact assessments, social impact assessments and sustainability assessments (Hill and Bowen, 1997) that are typically required during the preparation and design phases of large and complex projects that have significant impacts on their environment and society can also be considered as one important dimension of sustainable policies. Another contribution to this strategy was found in (Block and Paredis, 2013), who argue for the need for “entrepreneurial political leadership” in developing an agenda for sustainable urban transformations. The findings, from case projects, are rather specific, e.g., that mayors in cities must act entrepreneurially to drive sustainable urban development and the important role of “entrepreneurial political leadership” in various forms. These do offer insights into how host institutions can perform its governing role in a manner that promotes sustainability. The case study of (Block and Paredis, 2013; Meech et al., 2006) of the clean-up of the Britannia mine site also illustrates how host institutions can actively promote and help facilitate sustainable projects.

Influencing sustainability of project practices is about incorporating sustainability in projects through different types of technical solutions, systems and standardized practices that are promoted by the host at the industry level. Examples of such practices are specified waste management systems, required environmental management systems and different design tools that in themselves support sustainability (Bossink, 2002). The prefabrication trend within the construction industry and industry-level standardization is also an important element that improves the possibilities for more sustainable construction by alleviating some of the environmental burdens associated with conventional construction (Jaillon and Chi-Sun, 2010; Jaillon and Poon, 2008). In their study, Jaillon and Poon (2008) emphasized particularly the role of the different committees and standardization bodies in implementing changes toward prefabrication-related practices.

3.4. Project and host organizations mutual strategies

Inclusion of sustainability-promoting actors in project organization has been highlighted by multiple sources. Particularly the engagement of local stakeholders, such as authorities, local public and NGOs in the planning, development and execution of projects and project-related decision-making has been brought up as a relevant factor in promoting sustainability (Mathur et al., 2008; Ross et al., 2010; Yunus and Yang, 2014). Indeed, consensus among the key stakeholders is highly important for project stakeholders to fully embrace sustainability (Yunus and Yang, 2014). In practice, the project organizations and hosts can enact a number of means to promoting the active inclusion of local stakeholders. Examples of these are guidelines for setting mutually agreeable targets for sustainability and local stakeholder engagement (Yunus and Yang, 2014), creating targets and guidelines for community participation (Ross et al., 2010) and promoting the social value,

improved legitimacy and opportunities for learning that the inclusion of local stakeholders brings to the project (Mathur et al., 2008). Furthermore, different approaches to the inclusion of a diverse set of stakeholders in the formal organizations of various types of projects have been discussed by several authors; Johnson et al. (2006) looking into two post-disaster housing projects in Turkey and Colombia, Beauséjour (2009) in a case study of waste water management in Vietnam, and Zuo et al. (2009) provided a case study from the NGO sector in Banda Aceh during the post-tsunami reconstruction.

Developing sustainability competencies is another strategy that can be applied by both the project organizations and hosts. In the same way one can expect the sustainability performance of project owner organizations and their projects to benefit from increased knowledge about sustainability issues, so is it logical to assume that better knowledge about sustainability issues in governmental/regulatory body staff will achieve the same. Furthermore, a better educated general public in terms of environmental issues could facilitate more attention and pressure from NGOs and the general population in areas targeted for project development. Several authors discuss various aspects of such competence development; Gao et al. (2006) reports from an experiment to implement training and education in various sustainability issues, covering company managers as well as government staff and the public. Genus and Theobald (2015) build on the general debate regarding the role of higher education institutions in realizing environmentally sustainable urban spaces and identify roles that may be played by academic researchers in building sustainable urban locations. Cantalapedra et al. (2006) start their paper by stating “Education is the foundation for achieving sustainable development”. The paper reports from a project where students were involved in a project of analysis of energy performance of buildings in order to identify and implement cost-effective ways of promoting a greater environmental responsibility. Tabassi et al. (2016) focus on sustainable construction, and the importance of project manager competence and training in sustainability issues for the success of sustainable building projects. Liu et al. (2010) point out the importance of teaching project participants sustainability for them to realize the importance of the project (re-use of limited water). While not directly focused on projects, Vezzoli (2003) argues the need for a redefinition of university level education in the field of sustainable design. Design in this context typically means industrial design of products (and services), but nonetheless represents support for a strategy of strengthening sustainability competencies. We have also included the utilization of benchmarking of project implementation practices into the strategy for building sustainability competencies. One specific approach to this discussed by Chen and Chambers (1999) is benchmarking best sustainability practices. Their study focused on sustainability practices and policies in China, and emphasized the need for the undeveloped countries to benchmark and learn from the experiences in developing countries.

Sustainability-emphasis in project portfolio management entails applying criteria that emphasize sustainability effects

when considering which projects to approve for implementation. Portfolio selection is one of four steps in Sanchez (2015) approach to integrating sustainability issues into project management. Examples of the application of this strategy discussed in papers include a decision model to evaluate how specific proposed projects effect the so-called “urban–rural balance” (Zhang et al., 2015). Sustainability per se is not a key factor included in the model, but expressed in the terms of the key dimensions of efficiency and equity. Another paper deals with the method of early forecasting of potential socioeconomic and environmental impacts as a tool to build a sustainable business case that facilitates the integration of the case project into a sensitive environment, in this case a mining project (Maria Claudia Sandoval et al., 2006). While this is a quite specific context, the approach of conducting such impact analyses can aid host institutions in ensuring that projects are developed in a sustainable manner. Finally, (Meech et al., 2006) describes a joint effort by many stakeholders to clean up a former mine site. It is a good example of how local, provincial and federal governments have worked together to promote a project that aims to remedy past environmental damage.

4. Illustrative case: project Hot Fjord

Before proceeding to discuss our findings in light of earlier literature, we draw on an empirical case to bring in additional details regarding how projects and hosts deal with sustainability challenges. In the following, we focus our attention on a project with the goal to deliver an environmentally sustainable heating solution to a municipality in Norway. The illustrative case builds on research project focusing on sustainable practices in Norwegian context. Eleven qualitative semi-structured interviews were carried out with the project representatives selected based on that they had extensive knowledge about the illustrative case project. They represented different actors involved, as well as the value chain from idea, to execution throughout to delivery of the asset. As described by Siggelkow (2007), the purpose of our illustrative case is not an attempt to empirically verify the sustainability strategies identified from literature but to illustrate their use — by providing a description of how six of the strategies identified in our literature analysis were used in the focal project. Illustrative case studies are primarily descriptive studies and typically utilize one instance of an event to provide a rich description of its salient features.

The purpose of Hot Fjord was to build a combined cooling and heating system for a hospital and the surrounding local community. The idea of the project was to utilize heat transfer technology that leveraged the natural warmth of seawater. Hot Fjord was initiated at the end of the 1990s, when a smaller hospital faced a need for increased cooling capacity and reduced energy costs. A concept in which seawater from the nearby bay would be used to provide both cooling and heating capacity for the hospital was put forward. As the planning progressed, ambitions grew as a larger project made financial sense for the hospital administration and representatives from the county, which at the time owned the hospital and the nearby school. By involving the local municipality in the project, seawater from the

bay could have offered heating and cooling capacity to the rest of the community as well as to the hospital. Two joint venture companies were formed to take responsibility for the development of the necessary infrastructure and acted as the systems operator. The technical solution, using circulation of low-temperature fluid in a pipe system of such a geographically spread-out community, was the first of its kind in the country and offered an environmentally good approach to heat transfer.

The project has contributed to the local identity and generated pride in the local population, which see themselves as part of a pioneering project. The increased sustainability of the local community is integral to the pride created although increased sustainability remained the by-product rather than the rationale behind the project. Several of the strategies we identified for addressing sustainability challenges were used in the Hot Fjord project.

4.1. Project and host organization mutual strategies applied in the Hot Fjord project

4.1.1. Sustainability-emphasis in project portfolio management

Hot Fjord was conceived out of necessity; the hospital needed cooling and the county needed to reduce energy costs. The project was not primarily motivated by sustainability issues. However, as the business case for Hot Fjord was put forward, the county and municipality knew their existing project portfolio well and were able to coordinate other elements from it to expand the project and create a cost-effective broader infrastructure project. The project team was aware of the alignment with the strategic interests of the municipality and the county regarding sustainability (as expressed in the form of environmental indicators) as a positive trait of the project.

4.1.2. Inclusion of sustainability-promoting actors in project organization

In Hot Fjord, a local project manager was in charge of the process from the initiation and onwards. The project manager had detailed knowledge of the technical aspects of fjord heating and was the main force driving the inclusion of the “one big dig” approach, always pondering about “what more” could be put in the ground once the trenches were made and put the project into a larger context. The project group included members from across the local administration, facilitating the extension of the project. Extending the project made both financial and “common” sense, as most of the city centre would have to be dug up in order for the new pipelines to be installed. New high-voltage cables and gas pipe lines were put underground, new water mains and sewers were constructed to reduce leakages, and the drainage for storm water runoff was upgraded. The sustainability effects of the project received more attention after the project was finalized and the system was in operation.

The inclusion of stakeholders in the planning process was and remains a much debated issue for the municipality. Key stakeholders were invited through dialogue meetings. These included representatives from the national administration, the public policy system, and regional actors. Hot Fjord was not driven by any of these actors, however, but rather by local

stakeholders who became integrated in the project team, blurring the lines between the project and the community.

Hot Fjord was actively trying to persuade private homeowners to pledge to connect to the network from the start. As most of the city centre would be dug up, every local resident and business was a stakeholder. Flyers were distributed and town hall meetings held to inform the population and businesses. Local suppliers and contractors were actively involved in the implementation of the project, even though few of them had previous experience with similar projects. As the project progressed it became clear that it benefitted from certain goodwill in the local population. The visibility of the on-going project contributed to the sense of common local ownership of the project. In the end, one might say that the project became managed by stakeholders, making up for a lack of formal strategy or guidelines for the inclusion of stakeholders.

4.1.3. Developing sustainability competencies

Over the course of the project competence and understanding grew and the suppliers were significantly more “professional” at the final phases of the project compared to their starting point. The project manager’s understanding of sustainability grew throughout the project, spurring one of the two spin-offs from the projects, both of which market their services as the sustainable solution for heating and cooling of municipalities.

4.2. Sustainability strategies adopted by the project organization

The project has received attention as an example of “sustainability making sense” for all involved parties, as opposed to providing benefits to some at the expense of others. The strategies identified in the literature for the project organization were only adopted to a limited degree, however.

4.2.1. Setting strategic and tactical sustainability goals

It was clear from the offset that the Hot Fjord solution was an environmentally sustainable solution for heating and cooling. The business case was also present and continually improved upon as the project expanded. Social aspects were handled on a “common sense” basis. All of these aspects are dealing with strategic and tactical goals, yet these were never formalized in a “project sustainability strategy”.

4.2.2. Developing sustainable supplier practices and emphasizing sustainability in project design

Since the strategies to a certain extent developed as the project went along, it is not surprising to find that these two strategies were applied to little extent. With regards to suppliers, the main focus of the project was to have them delivering in accordance with project requirements. This included emphasis on the long-term view and avoiding unnecessary future maintenance. Sustainability also received little attention in the project design, which were driven by focus on the technical solution and the business case.

To a large extent though, these concerns and strategies that were adopted in order to carry the project through to execution aligned nicely with sustainability thinking. There are forthcoming

plans of similar projects in other municipalities and towns, both inside and outside the county, where sustainability effects are the main motivation.

4.3. Host strategies applied in the Hot Fjord project

4.3.1. Setting sustainability policies

The county strove to balance its role in the development of the local communities and the region. Plans and strategy documents were developed mostly through the contribution from different sectors and professions in their areas of the plans, and in most cases sector-specific plans (rather than cross-disciplined, overarching plans) were developed.

The climate plan was a clear strategy document closely connected to sustainability. The plan, however, was not balanced in its attention to the economic, ecologic and social dimensions. Furthermore, it did not include operational goals on a sector level. On the other hand, it included environmental indicators that would measure the effects of Hot Fjord when it came to energy use in the buildings owned by the county.

The host community, in the form of the municipality administration and the county council, did not explicitly link the project with their sustainability strategies. Ex-post evaluations point to a lack of holistic visions on the part of both the municipality and county. But these have both been self-reinforced after the project was executed.

4.3.2. Influencing sustainability of project practices

The county climate plan did not incorporate guidelines for project execution. The lack of guidelines and clear goals left it to the project group to search for sustainable solutions. The local knowledge and close cooperation between involved parties nonetheless resulted in sustainable practices and solutions being put into place.

5. Discussion and conclusions

Our review of project sustainability research revealed two distinct perspectives on how sustainability challenges are managed in projects: one perspective that adopts the lens of the project organization when discussing sustainability, and another research perspective that discusses sustainability from the lens of the host organization that can both influence the project and is affected by it. Furthermore, by focusing on the ways in which both project organizations and their hosts may promote sustainability, we were able to identify altogether eight different sustainability strategies of which three are mutual for project suppliers and hosts, and produce a comprehensive portrayal of concrete activities and practices through which sustainability can be ensured in projects.

Within our sustainability strategy categorization, we synthesized and affirmed several strategies and concepts that are apparent and have been featured in previous portrayals of project sustainability, but have not been systematically treated. Consequently, in addition to advancing our understanding of the perspectives through which sustainability in project management discourse has been approached, the study makes

a contribution to project sustainability research by synthesizing and integrating the different fragmented strategies for managing sustainability. Indeed, prior work on sustainability in a project context has paid only limited attention to explicit strategies through which the sustainability of projects can be enhanced. In particular, our findings related to strategies enacted by host organizations have received limited attention in prior literature.

The role of the Hot Fjord case was to show that the identified strategies are used in real life, though not systematically from the beginning of a project. The principal goal for the project team was energy efficiency and not sustainability, and remained so throughout the project period and it seemed that the sustainability strategies appeared over the course of the project as competence and understanding grew. The sustainability effects of the project received a lot of attention after the project was finalized and the positive attention combined with competence and local enthusiasm between involved parties resulted in sustainable practices and solutions being put into place. The sustainability strategies appeared as self-reinforcing effects.

Our findings on different sustainability strategies suggest that sustainability is a salient issue that needs to be thoroughly considered in project organizations already during the front-end of projects, when the project organization is formed and the roles and responsibilities of the actors and decision-making structures are defined (Morris, 2013). Particularly those strategies that highlight the early engagement and inclusion of diverse stakeholders to the evolving project organization (Johnson et al., 2006; Lenferink et al., 2013; Mathur et al., 2008; Ross et al., 2010; Yunus and Yang, 2014; Zuo et al., 2009) suggest that a project-organizing process with sustainability emphasis is a joint, open and flexible negotiation and shaping process among multiple stakeholders. This is in contrast to the traditional closed and controlled approach to project formation, where only few and selected key actors are taking the project forward.

The identified sustainability strategies are well aligned and resonate strongly with earlier project stakeholder management research (e.g. Olander and Landin, 2005) where the starting point is that to be successful, a project needs to deal with and strategically respond to a multitude of demands, expectations and claims coming from its stakeholder environment (Aaltonen and Kujala, 2010). Predominantly, the role of the local embeddedness and the necessity to take into account the local host organizations' institutional demands in order to manage uncertainty has been vividly discussed (Aaltonen and Kujala, 2010; Ahola et al., 2013; Orr and Scott, 2008). However, this discussion has primarily adopted the project organization's and management's perspective. In our view the findings of this study that adopt the other side of the coin and address particularly the host's strategies toward sustainability complement the discussion on local influences and their management. An important contribution is highlighting influence strategies that host organizations can use to advance their sustainability agendas.

The identified sustainability strategies also serve as a starting point for scholars, project management associations and practitioners to start developing a more holistic and thorough understanding of the versatility of sustainability skills and competences that can be required from project managers. As

such, today's project management guidelines, standards and competence requirements (IPMA, 2006; PMI, 2013) for project managers tend to neglect the area of sustainability as a distinctive project management skill almost completely (Eskerod and Huemann, 2013). Even though one can argue that selected sustainability perspectives (e.g. the stakeholder management perspective in the latest PMBoK version, 2014) have been embedded and added into the standards, the underlying tendency and value base still seem to be to highlight the management of stakeholders instead of the more sustainable perspective of engaging and managing for stakeholders (Eskerod and Huemann, 2013).

Our study opens up several avenues for further research. Evidently, investigating the identified strategies in more real-life projects would provide us with better insights into the applicability of the strategies in different industrial and cultural project contexts, of the practical needs and requirements for developing the conceptualization of the strategies, and of the potential new strategies that are missing. In our view, qualitative case-based research that would address how sustainability is managed particularly in complex projects would be of value, since these projects have typically significant socio-political and institutional influences. Further empirical work would also equip us with better capabilities to start evaluating the dynamics and interaction of the identified strategies and start forming different types of typologies determined by the combinatory use of the identified sustainability strategies in different projects. Such research could also address to which extent the sustainability goals of projects and hosts may be related and overlapping, and what kinds of potential goal conflicts related to the sustainability objectives of different stakeholders may emerge and through what kinds of processes these could be overcome. It would also be valuable to understand better the role of the different actors in promoting sustainability; e.g., are sustainability management activities typically conducted by the main contractor or by the project owner or to what extent do the other actors within the entire network of firms that participate in the project facilitate sustainability management and thinking? Such questions relate to the degree of shared sustainability strategies within project networks and to the discussion on whether sustainability can be considered a shared propensity of the network and through what kinds of measures and constructs it could be operationalized in a project network context. Further research could also increase our understanding of the interrelations of sustainability strategies and processes with the core and support activities within project-based firms, such as project marketing processes, human resource management, project finance and project production and procurement processes.

In terms of practical implications, the identified repertoire of sustainability strategies can serve as a tools palette of paths to improved sustainability, both for project developers/managers and host institutions regulating projects. In practice, the identified strategies can be utilized by project managers, project-based organizations and host organizations to identify, formulate, select and enact the strategies that they find most suitable for the promotion of sustainability in their projects. The list of host activities also facilitates project-based firms' understanding of the

potential influence activities and tactics that hosts may use to promote their own sustainability agendas. If put actively to use, this should help improve the sustainability performance of future projects. Finally, we hope that this compilation of sustainability strategies can inspire other project management scholars to build on and expand these strategies.

Conflict of interest statement

The authors declare that there are no conflict of interest.

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