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Scientific Research

Sustainability in Project Management Competencies: Analyzing the Competence Gap of Project Managers

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Abstract

Sustainability is one of the most important challenges of our time. How can we develop prosperity, without compromising the life of future generations? Companies are integrating ideas of sustainability in their marketing, corporate communication, annual reports and in their actions. More recently, the concept of sustainability has also been linked to project management. Projects are "instruments of change" within organizations, which play an important role in the realization of sustainable business processes and practices. Project managers are therefore important "change agents" in organizations that have a strong influence on the sustainability of organizations. However, the standards of project management fail to address the role project managers' play in realizing sustainable development and project managers are lacking the competences to consider the sustainability aspects of their projects. For the implementation of sustainability in organizations, it is crucial that this competence gap is closed by the standards of project management competencies. This paper reports a literature-based analysis of the coverage of the competencies required for considering sustainability aspects, in the standards of project management competencies. The study aims to specify the competence gap of project managers with regards to sustainability, and to provide guidance on how to close this gap. The paper therefore makes specific suggestions on how the standards of project management competencies should develop in order to prepare project managers for their pivotal role in realizing sustainability of organizations.

Keywords

Component, Project Management, Project Manager, Sustainability, Competencies

1. Introduction

In the last 10 to 15 years, the concept of sustainability has grown in recognition and importance [1]. How can we

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develop prosperity without compromising the future? The pressure on companies to broaden its reporting and accountability from economic performance for shareholders, to sustainability performance for all stakeholders has increased substantially [2]. Industry leaders realize that "green washing" of current business practices is not a solution. The 2012 BSR/Globe Scan study concludes that "The most important leadership challenge facing business today is the integration of sustainability into core business functions." [3].

This conclusion outlines the need for re-thinking, re-designing and re-developing of business practices in a more sustainable way. Sustainability therefore means change: change of business models, products, services, resources, processes, reporting, and behavior [1]. A frequently used practice of realizing change in organizations is by initiating and performing projects: temporary, task oriented organizations [4] [5]. The concept of sustainability has therefore also been linked to project management [6] [7]. Association for Project Management (past-) chairman Tom Taylor recognizes that "the planet earth is in a perilous position with a range of fundamental sustainability threats" and "Project and Programme Managers are significantly placed to make contributions to Sustainable Management practices" [8]. Also in academic research, the relationship between project management and sustainability is explored (e.g. in [6] [7] and [9]) as one of the (future) developments in project management.

One of the recurring themes in publications on the relationship between sustainability and project management, is the responsibility of project managers for realizing sustainability (for example in [1] [10] and [11]). Silvius and Brink [12], conclude that "the actual responsibility for sustainability may differ by project, but the project manager always will have a decisive or influencing role. When combining this "decisive or influencing role" with the professional duty to "make decisions and take actions based on the best interest of society, public safety, and the environment" as described in the "Code of Ethics and Professional Conduct" of the largest professional association of project managers, the Project Management Institute [13], it is clear that project managers should take responsibility for a more sustainable future. This conclusion confirms the observation that "the further development of the project management profession requires project managers to take responsibility for sustainability" [14]. However, Silvius *et al.* [1] also observe a discrepancy between the standards for project management competencies and the competencies that are required for considering sustainability. They conclude that "it makes sense for the future-proof project manager to develop adequate consulting skills, build expertise in the aspects that determine the sustainability impact of the project and handle complexity in and around projects." Without adequate "sustainability competences", the project manager will not be able to consider the sustainability aspects of his or her project, which will hinder the implementation of sustainability in organizations. It is therefore of eminent importance that this competence "gap" of the project manager is resolved in the standards of project management competencies.

The paper contributes to resolving the competence gap of project managers, by exploring the key competencies of sustainability, analyzing their coverage in the standards of project management competencies and providing guidance on the development of "new" competencies of the project manager. The central questions of the study reported in this paper were: *How are sustainability competences covered by the most important standards of project management competencies*? And, based on this analysis, *which new competencies should be added to the standards of project management competencies*? With this last question, the paper aims to contribute to the development of the project management profession and thereby to the implementation of sustainability in organizations.

The remainder of the paper is organized as follows. After a brief explanation of the methodology of our study, we will first explore how the emerging literature on sustainability in project management considers the role of the project manager in realizing sustainability, as this role determines the required competencies of the project manager. The following paragraph will then explore the standards for project management competencies and Paragraph 5 will explore the competence standards related to sustainability. Paragraph 6 will report our analysis of similarities and differences between the two groups of competence standards, one related to project management and one related to sustainability, in order to identify the impact of considering sustainability on project management competencies and to establish the competence gap of the project manager. The paper will be concluded with a reflection on the findings and suggestions for the development of new competences for the "sustainable project manager".

2. Methodology

As the relationship between sustainability and project management is still an emerging field, the study reported in this paper is based on an analysis of literature and standards. We draw upon the literature on sustainability

competencies in order to find a baseline of competencies required for considering sustainability aspects of organizations. We then compare these "sustainability competences" with the standards of project management competencies in order to establish the competence gap of project managers and to propose new competencies. The nature of our study should be considered conceptual and interpretive.

In our selection of relevant literature, we used Google Scholar as search engine, thereby following the recommendation that "researchers should consult Google Scholar… especially for a relatively recent article, author or subject area" [15]. And although there is a debate in the scientific community on the use of Google Scholar as an academic database [16], it is also considered to provide "unique options" [17] to the academic community.

Our initial starting point was to consider articles published in peer-reviewed journals, regardless of their impact factor [18]. However, as project management as such is still a relatively young discipline, and potential innovations of the profession, as sustainability should be considered [12], tend to get introduced and discussed on (professional) conferences, we decided to also include conference papers. We further also considered books and specific book chapters, as some of these books (for example [19]) received recognition from the professional community as being innovative and influential.

We used the databases Science Direct, Business Source Premier, Ebsco-Host and JSTOR to retrieve the full publications for our analysis. In the analysis we further excluded papers that considered sustainability solely to the project deliverable or project result, without any implication for the management or selection of the project.

3. The Role of Projects in Sustainability

This paragraph provides a discussion of the literature on project management and sustainability, in order to understand how sustainability is changing the role of the project manager.

Already 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" [20]. Change as an intervention to create a more desirable future. Winter and Szczepanek [21] also recognize this change and intervention perspective in projects. Projects are, in this perspective, considered as temporary organizations [22] [23] that deliver (any kind of) change to organizations, products, services, business processes, policies or assets [1]. These project-organized changes, or simply projects, are characterized by:

- A temporary nature or temporary organization;
- Most often across organizational structures and boundaries;
- A defined deliverable or result, logically or preferably linked to the organization's strategy or goals;
- Specified resources and budget.

In this definition, projects are, as temporary organizations, related to a non-temporary "permanent" organization, and realize changes that benefit the strategy or goals of this organization.

The permanent organization utilizes resources and assets in its operational business processes to deliver benefits or value to its customers and ultimately deliver business performance (e.g. profit, market share, return in capital, etc.) to the organization and its stakeholders. Its activities are based on goals that are developed or set in a strategic management process. **Figure 1** [24] provides a high level illustration of this relationship between goal setting, the utilization of assets and re-sources, operations, benefits and performance.

The strategic management of the organization, however, not just includes setting goals. It also includes evaluating the business performance of the organization against these goals. If the performance is satisfactory, the operations may continue. But if the performance is unsatisfactory, because of lack of performance or because of changing goals, there may be reason to change something in the organization. In that case, a temporary organization, in the form of a project, is commonly used to create this change. The change may concern the resources, assets or business processes of the permanent organization, but also the products/services rendered or the internal policies and procedures. The selection of the "right" changes for the organization is usually part of a process called "portfolio management". **Figure 2** illustrates this relationship between projects as temporary organizations and the permanent organization.

Elaborating on the view of projects as instruments of change, as interventions, it is evident that a (more) sustainable society requires projects to realize change. However, Gareis *et al.* observe that "Sustainable develop-

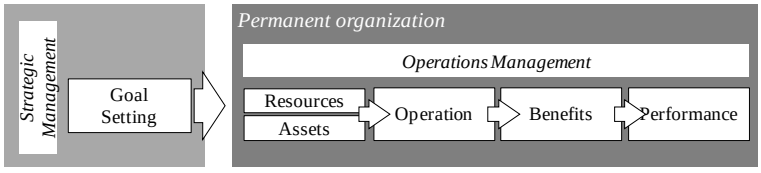

Figure 1. Schematic overview of relationships within the permanent organization [24].

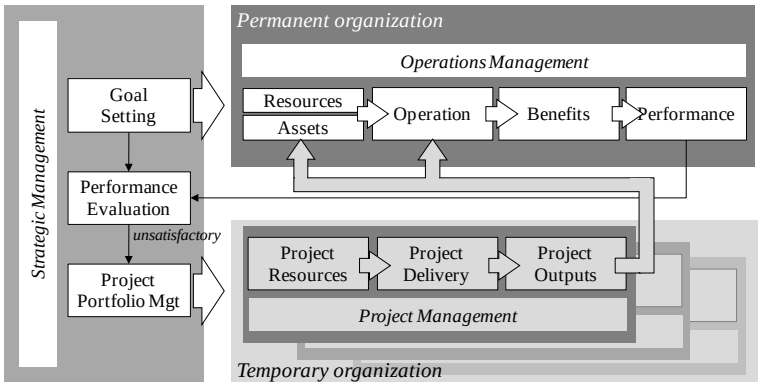

Figure 2. Project as temporary organizations that deliver changes to the permanent organization terrelating life-cycles [1].

ment in temporary organizations such as projects and programs is rarely considered." [6:1]. And Eid concludes that the standards for project management "fail to seriously address the sustainability agenda" [25]. More recently, Silvius and Tharp [26] conclude that "the relationship between sustainability and project management is… picking up momentum" and that the majority of studies was published in the last four years [26].

From the studies and ideas that were published in recent years, a number of conclusions can be derived [1].

3.1. Conclusion 1: Sustainability Is Relevant to Projects and Project Management

As stated in the introduction of this article, APM's (past-)chairman Tom Taylor was one of the first to suggest the project management community to familiarize themselves with the issues of sustainability, recognizing that more should be done to contribute to a more sustainable society [8]. This appeal was the output of a small working party in APM, which recognized that project managers were not well equipped to make a contribution to sustainable development and decided to investigate this issue.

On the 2008 European conference of the Project Management Institute (PMI), Russell elaborated on what Corporate Social Responsibility means for project managers [27]. She pointed out that a project manager, being in the frontline of new or changed activities within an organization, is perfectly positioned to influence the organization's operations towards greater sustainability. Russell also argued that this position is not without responsibility, both for the organization as for the project manager. She concludes that "Corporate social responsibility is too big an issue to leave to someone else to address". Also Schieg [28] and Goedknegt and Silvius [11] make a moral appeal to project managers to take responsibility for sustainability.

3.2. Conclusion 2: Integrating Sustainability Stretches the System Boundaries of Project Management

In some of the first publications on sustainability and project management, Labuschagne and Brent [9] link the principles of sustainable development to project life cycle management in the manufacturing industry [9]. They suggest that the future-orientation of sustainability implies that the full life cycle of a project, from its conception to its disposal, should be considered. Elaborating on this life cycle view, they argue that when considering sustainability in project management, not just the total life cycle of the project (e.g. initiation-development-execution-testing-launch) should be taken into account, but also of the "result" the project produces, being a

change in assets, systems, behavior, etc. This result, in their words: the "asset", should also be considered over its full life cycle, being something like design-develop-manufacture-operate-decommission-disposal. And taking the life cycle view even further, also the life cycle of the product or service that the asset produces should be considered. **Figure 3** visualizes how these three life cycles, "project life cycle", "asset life cycle" and "product life cycle", interact and relate to each other. Including sustainability considerations in projects therefore suggests that all three life cycles are considered.

Because Labuschagne and Brent include the result of the project, the asset, in their framework, it is sensitive to the context of the project. Their studies regarded the manufacturing sector in which projects generally realize assets that produce products. In other contexts, the result of a project may be not an asset, but an organizational change or a new policy. The general insight gained from their work, however, may be that integrating sustainability in projects should not be limited to just the project management processes. It suggests that also the "supply chain" of the project is to be considered, including the life cycle of whatever result the project realizes and also the life cycle of the resources used in realizing the result. Integrating the concept of sustainability in project management may therefore very well stretch the "systems boundaries" of project management.

Another view on the scope of integrating sustainability in to projects can be found in the "SustPM" research project [29]. These projects focused on integrating the concepts of sustainability specifically in project management processes and methods, and not the project management result or deliverable. This specific focus is motivated by the temporary character of projects, which causes the project management processes to be "overlooked" in organizations, when striving for a more sustainable business. In the SustPM study, the concept of sustainability is detailed in six characteristics: Economic-oriented, Ecologic-oriented, Social-oriented, Short, mid, long-term oriented, Local, regional, global-oriented and Value-oriented. Project management is subsequently confronted with these six characteristics in order to develop additions to the project management standards and methodologies.

3.3. Conclusion 3: Project Management Standards Fail to Address Sustainability

This conclusion was most clearly found by Eid in the book "Sustainable Development & Project Management" [25]. Eid studied the integration of sustainable development in construction project management. Some conclusions from his study:

- Project management is an efficient vehicle to introduce a more pro-found change, not only to the construction industry's practice, but more importantly to the industry's culture.
- Project management processes and knowledge fall short of commit-ting to a sustainable approach.
- Mapping sustainable development onto project management processes and knowledge areas, identifies several opportunities for introducing sustainability guidelines in to all project management processes.

Eid identified a number of "leverage points" where sustainable development can connect into project man-

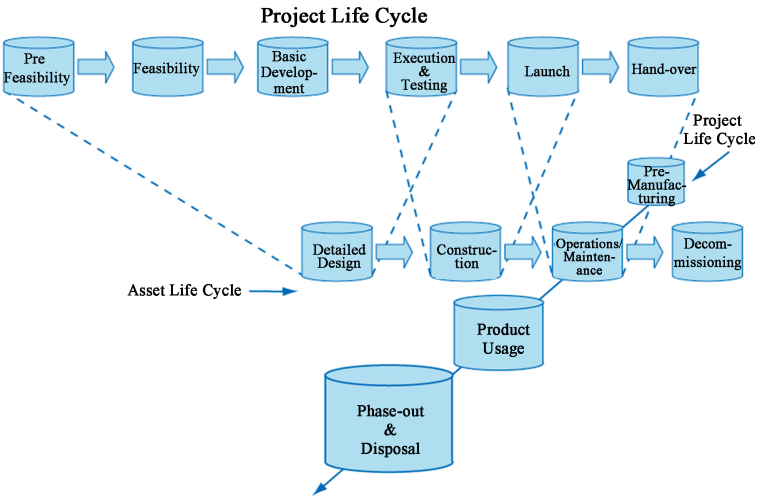

Figure 3. Interrelating life-cycles (Silvius *et al.*, 2009, based on [9]).

agement. These leverage points include the contribution to business strategy, the business justification, the procurement strategy, the readiness for service and the benefits evaluation of a project. The leverage points cover the whole life cycle of the project.

It should be mentioned, that "help may be on its way" with regards to the integration of the concepts of sustainability into project management standards. For example, Schipper and Silvius [30] and Barnard *et al.* [31] provide detailed descriptions on how to integrate the concepts of sustainability in project management processes and formats.

Other initiatives to develop "tools" to integrate sustainability aspects into project management resulted in several checklists. For example, Taylor elaborated on his earlier appeal to the project management profession [8], by publishing "A Sustainability Checklist for Managers of Projects" [32]. This checklist contains a list of suggested consideration for project managers, with which they can incorporate sustainability aspects in their projects. And although the checklist lacks a systematic approach to the concepts of sustainability, it is a meaningful attempt to translate the "abstract" concepts of sustainability to the daily work of the project manager.

The 2010 IPMA Expert Seminar "Survival and Sustainability as challenges for projects", featured several papers and discussions on the integration of sustainability in projects and project management [33]. An international group of experts developed a checklist of sustainability aspects and mapped these aspects on project management processes, roles and responsibilities of project members and project management competencies.

The book "Green Project Management" by Maltzman and Shirley [19] focuses on the integration of environmental sustainability in project management. It introduces the term "greenality" as the merger of "green" aspects and the "quality" of the project. The book provides essential factual knowledge about environmental aspects and includes an extensive description of how project managers and sponsors can integrate these aspects into the different phases of a project.

A more academic approach to the operation alization of sustainability in projects is taken by Oehlman [34]. She developed the "Sustainable Footprint Methodology" to analyze and determine the relevant social, environmental and economical impacts of a project. The framework confronts the life cycle of a project, consisting of three phases: project pre-phase, project execution and operation of the asset, with the three pillars of "the triple bottom line": People, Planet and Profit. Each of the nine "cells" of the resulting matrix is detailed in a set of sustainability indicators relevant to the respective sustainability perspective and the phase in the project lifecycle.

3.4. Conclusion 4: The Integration of Sustainability May Change the Project Management Profession

The conclusion of the 2010 IPMA Expert Seminar mentioned earlier was that the influence of the project manager on the sustainability aspects of his or her project at hand is substantial, regardless whether he/she actually bears responsibility for these aspects [33]. Goedknegt and Silvius [11] reach a similar conclusion in their study. Silvius *et al.* [1] elaborate that this conclusion may actually change the nature of the project management profession. From a managerial role aimed at realizing delegated tasks, it may need to develop into a more advisory role with autonomous professional responsibilities and aimed at the right organizational changes.

Based on the above discussion of the relationship between sustainability and project management, Silvius *et al.* [1] conclude that the integration of sustainability into project management not only impacts the processes and practices of project management, *but also the competencies of the project manager*. Sustainability is a complex and holistic concept and it is necessary to understand what competencies integrating sustainability in projects and project management, would require of a project manager. It is this conclusion that inspired the research question of this paper.

4. Project Management Competencies

Standards for project management competencies, for example, scheduling, risk management, quality management, and so on, first emerged as part of the standards of the International Council on Systems Engineering (INCOSE). However, the first integrated standards for project management competencies did not appear until the mid-1990s. In 1997, IPMA launched the first version of its "IPMA Competence Baseline" (ICB). An improved second version followed in 1999 and a third one, the ICB Version 3, in 2006 [35]. In the development of the ICB, competencies addressing the behavioral and change aspects of projects and the context of projects got increasing attention.

Today, the ICB Version 3.0 is one of the most widely used standards for project management competencies. It is frequently used by organizations as a framework for assessing and developing project managers. The ICB Version 3.0 breaks project management competence down into 46 competencies in the following categories:

- Technical competencies (20 competencies, numbered 1.01 to 1.20) which cover the project management processes, methods and techniques;
- Behavioral competencies (15 competencies, numbered 2.01 to 2.15) which deal with the personal skills of the project manager and their relationships with stakeholders of the project;
- Contextual competencies (11 competencies, numbered 3.01 to 3.11) which cover the interaction of the project with its context (projects, programs, portfolios and the permanent organization).

These competencies are illustrated in the "eye of competence" (**Figure 4**) and are briefly described in **Annex A**.

The ICB Version 3 has little mention of the word "sustainable". Competence 2.04 *Assertiveness* talks about "sustainable relationships to the interested parties" and competence 3.09 *Health, Safety, Security, Environment* talks about "security and sustainability" [35].

The content of sustainability, however, is addressed under the key word of "project context". This starts in competence 1.3 *Project Requirements & Objective*, where the conformity to the context conditions is required in addition to achieving the project objectives. The context is later specified in several of the contextual competencies: 3.05 *Permanent Organization*; 3.06 *Business*; 3.07 *Systems, Products & Technology*; 3.08 *Personnel Management*; 3.09 *Health, Safety, Security, Environment*. In 3.07 *Systems, Products & Technology* and 3.09 *Health, Safety, Security, Environment* the subjects within sustainability (for example, the systems life cycle management) are well addressed. Also, the responsibility (permanent organizations) and some processes (for example, internal and external audits) and tools (Environmental Impact Study) are mentioned. Also the reference to ethics in competence 2.15 implies that at least some social aspects are taken into consideration. Other references to the social aspects of sustainability can be found in element 3.08 *Personnel Management* and 2.14 *Values Appreciation.*

Another frequently used competencies framework is the Project Management Competence Development (PMCD) Framework from PMI. The PMCD Framework identifies three "dimensions" of competence [36]:

- Knowledge: this refers to what the project manager knows about project management.
- Performance: this refers to what the project manager is able to do or accomplish while applying their project management knowledge.
- Personal: this refers to how the project manager behaves when performing the project or related activity.

The PMCD Framework describes the generic competencies needed in most projects, most organizations and most industries. In some industries there may be specific competencies needed, for example specific domain knowledge or knowledge of regulatory and legal requirements. Also, specific organizational knowledge may be required, for example about policies, procedures, internal organization or culture. Overall the PMCD Framework therefore identifies five "units" of competencies (**Figure 5**). The PMCD Framework actually mentions "Knowledge" as a separate unit of competence, but also suggests that knowledge is logically included in all four other units.

The PMCD Framework has no mention of the words sustainability or social responsibility. Nevertheless some competencies relate to sustainability aspects, for example, competence 1.1 *Project aligned with organizational objectives and customer needs* and 1.2 *Preliminary scope statements reflects stakeholder needs and expecta-*

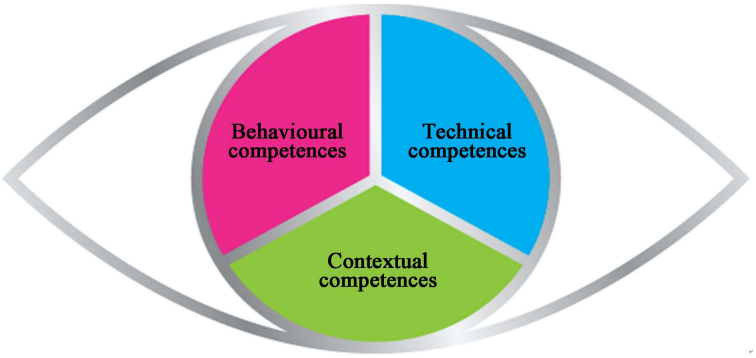

Figure 4. An overview of project management competencies according to the ICB Version 3.0 [35].

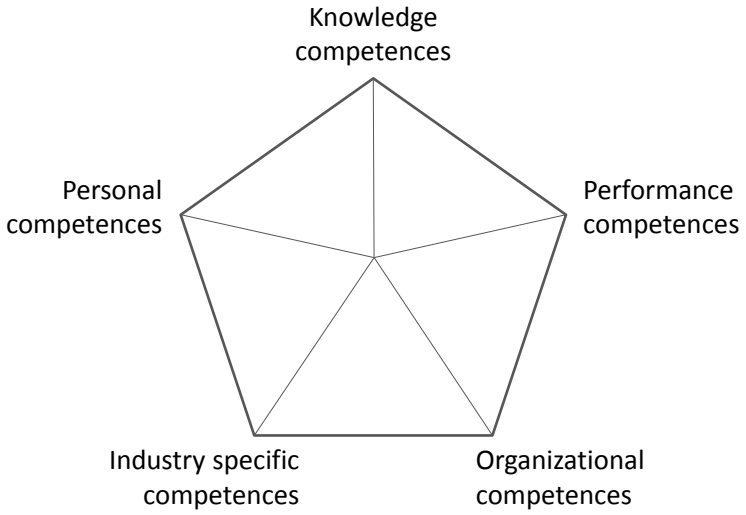

Figure 5. Overview of the PMCD Framework (based on [36]).

tions. include goals on sustainability. With this alignment, sustainability goals may logically be part of the project goals. Another example is competence 6.1 *Actively listens, understands and responds to stakeholders*. Application of this competence assures the active stakeholder engagement that is also suggested by the ISO 26,000 guideline [37]. By engaging with stakeholders, project managers actively discuss potential sustainability needs or wishes from stakeholders.

Another indirect link to sustainability is included in competence 9.1 *Takes a holistic view of project*. Integrating the concepts of sustainability into a project needs a holistic view. Competence 11.2 *Operates with integrity* hints at personal values and perhaps even ethics, which were identified as one of the principles of sustainability.

Perhaps even more links to sustainability can be found in the PMI Code of Ethics and Professional Conduct [13]. This code addresses the increased awareness of business ethics as well as the differentiation of ethical values in different cultures. The code addresses four values and further separates them into as pirational and mandatory components. The four areas are: Responsibility, Respect, Fairness, Honesty. The code is meant to provide a single framework for PMI members and is included in PMI's project management "professional" (PMP) assessment and certification process. The professional and social responsibility content is tested in every domain rather than as a separate domain on the examination. This recognizes that professional and social responsibility is integrated into all of the work of project management. The PMI Code of Ethics and Professional Conduct should therefore be viewed as now integrated into the day-to-day role of a project manager, emphasizing its importance in each phase of the project life cycle. The conclusion is that there is a turned towards sustainability as part of projects and project management but little or no concrete approach is giving.

When both standards are studied, an overlap between the ICB Version 3 and the PMCD Framework can be discovered at a conceptual level. **Figure 6** illustrates this overlap. Please note that the PMCD Framework competence unit "knowledge" is treated as implicit in the other PMCD Framework units of competencies.

From both standards and their comparison the following observations can be made:

- Both frameworks consider a competence as the combination of knowledge, skills and personal attitudes required to be successful in a certain function or to complete a certain task or goal.
- In both standards, these three components (knowledge, skills and attitudes) are interwoven: the knowledge of the project management process, the personal skills required for applying this knowledge and the behaviour while applying.
- Both frameworks recognize internal aspects of managing the project (technical competencies/performance competencies), personal competencies of the project manager (behavioral competencies/personal competencies) and external aspects (contextual competencies/industry specific and organizational competencies).

Since the two frameworks show a strong resemblance in their identification of relevant categories of project management competencies, we adopted the ICB Version 3 structure of technical-behavioral-contextual competencies for the further analysis of the integration of sustainability principles in the competencies.

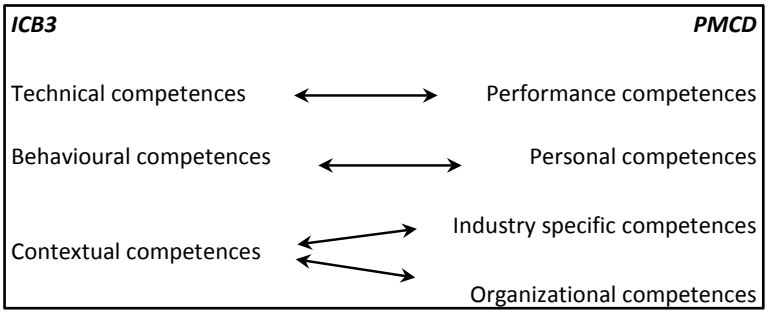

Figure 6. Conceptual comparison of the ICB Version 3.0 and the PMCD Framework [1].

5. Sustainability Competencies

Taking a responsibility for sustainability requires adequate competencies. These "sustainability competencies" have most explicitly been addressed in the extensive literature on "Education for Sustainable Development" (ESD) [38: 105]. A report on ESD in European higher education states: "The competency required for Sustainable Development is manifold, but the basis of it is relevant knowledge and an ability to think, act and take responsibility out of a holistic understanding of the preconditions of life on earth in a global perspective. It includes the ability to continuous learning from others and the ability to cooperate over disciplinary and professional borders, to think and analyse critically and to solve problems seeing possibilities and limitations in ones processional role. An important ability is also that of complex thinking and using specialists for different areas Leaders need to have the ability to create enthusiasm and to think in new creative ways." [39].

A frequently cited concept in ESD literature is that of "Gestaltungskompetenz" (shaping competence; [40]). This Gestaltungskompetenz encompasses a set of key competencies which are expected to enable active, reflective and co-operative participation toward sustainable development. Learning processes which are based on this approach enable students to have the skills, competencies and knowledge to "modify and shape the future of society, and guide its social, economic, technological and ecological changes along the lines of sustainable development" [40].

De Haan [40] identified eight (sub-) competencies of the "Gestaltungskompetenz", that later developed into the following set of key competencies [41]:

- Competence for perspective-taking:
  Being open-minded and creating knowledge from new perspectives.
- Competence for anticipation:
  Being forward-looking in analysis and evaluation of developments.
- Competence for interdisciplinary knowledge acquisition:
  Acquiring interdisciplinary knowledge and acting on it.
- Competence for dealing with incomplete and overly complicated information:
  Recognizing risks, dangers and uncertainties and being able to evaluate them.
- Competence for cooperation:
  Being able to plan together with others and take action.
- Competence to deal with individual decision-making dilemmas:
  Being able to handle conflicting goals when reflecting on action strategies.
- Competence for participation:
  Being able to take part in collective decision-making processes.
- Competence for motivation:
  Being able to motivate one's self and others to take action.
- Competence for reflecting on goals:
  Being able to reflect on one's own goals and those of others.
- Competence for moral action:
  Being able to use ideas of justice as a basis for making decisions and taking action.
- Competence for independent action:
  Being able to independently plan and act.

- Competence for supporting others:
  Being able to show empathy towards others.

The development of knowledge and understanding has both personal and shared elements to it. Social interaction allows one to relate or mirror his or her ideas, insights, experiences and feelings to those of others [42].

Another component of sustainability competence, is the ability to cope with uncertainty [42]. The professional working on sustainable development applies his/hers competencies in a context of uncertainty. And instead of denying this inherent nature of the context, by striving towards minimizing uncertainty and maximizing predictability, it might be more fruitful to accept uncertainty as an inescapable condition, and cope with it [42].

A framework of key competencies of sustainability that integrates the elements mentioned above, is provided by Wick *et al.* [43]. This framework identifies five groups of competences: Systems thinking competences. Anticipatory competences, normative competences, Strategic competences and Interpersonal competences. This framework is illustrated in **Figure 7**.

The framework positions sustainability as an intervention and a change from the current situation. This perspective bears strong resemblance with the perspective of projects as temporary organizations that deliver (any kind of) change to organizations, products, services, business processes, policies or assets, as described in paragraph 3. This paper therefore adopts the framework of key competences of sustainability by Wick *et al.* [43], as a suitable framework for consideration of sustainability competences in project management competencies.

The five key competences of the framework are described as follows:

Systems thinking competences refer to the ability to understand the intermediate and root causes of complex (sustainability) problems. For example [43]:

- How causes and effects relate to each other directly and indirectly.
- The actions, needs, motives, intentions, and mandates of key players in the problem constellation.
- The role technology plays in the constellation.
- What dynamics, cascading effects, feedback loops, and inertia occur in the constellation.

Anticipatory competences refer to the capacity to think systematically about the future and future generations. These require [43]:

- The ability to discern which time scales are relevant to a problem and its possible solutions.
- Familiarity with different theories of how the future emerges, be it determined, accidental, or intentional.
- Understanding of the different types of futures, *i.e.*, possible futures (based on notions of plausibility), probable futures (those determined “likely” to occur), and desirable futures (value-laden; based on sustainability principles).
- Understanding of the corresponding ways to build these different futures using methods like scenario construction, forecasting from statistical or simulation models, and sustainability visioning.

Normative competence refers to the understanding of concepts of justice, equity, social-ecological integrity, and ethics. And to the understanding how these concepts may vary across and within cultures. This requires [43]:

- Being able to collaborate with stakeholders to specify, negotiate, and apply sustainability values, principles, objectives, and goals.
- Being able to assess the (un-) sustainability of current and future states of social-ecological systems, and to create and craft sustainability visions for these systems.

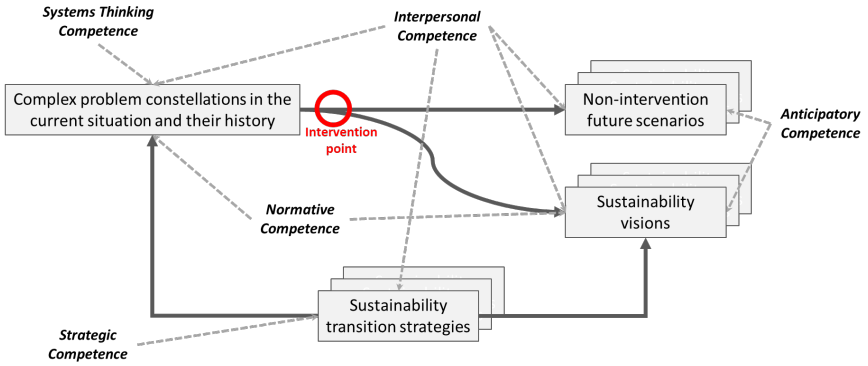

Figure 7. A framework for key competences of sustainability (based on [43]).

Strategic competences refer to the ability to collaboratively design and implement interventions and governance strategies with the sophistication necessary to address sustainability challenges. These competences include [43]:

- Familiarity with concepts and methods for strategy building in real-world situations.
- Being able to understand intentionality, systemic inertia, path dependencies, barriers, carriers, and alliances.
- Being able to understand the viability, feasibility, efficiency, and efficacy of systemic interventions, and the potential of those interventions to produce unintended consequences.
- Being able to use methods for designing, testing, implementing, evaluating, and adapting policies, programs, and action plans in collaboration with different societal actors.
- Being able to accommodate varying perspectives and act despite inconclusive or incomplete evidence.

Interpersonal competences refer to the capacity to motivate and facilitate sustainability research and problem-solving. These require [43]:

- Strong communication and negotiation skills.
- Expertise in participatory methods for collaborating with stakeholders.
- Being able to work in teams, and understand, embrace, and facilitate diversity among cultures and social groups.

In the next paragraph, these five groups of key competences will be our reference framework for the analysis of the coverage of sustainability competences in the ICB3 standard of project management competencies.

6. Coverage of Sustainability Competences in Project Management Competencies

In this section we will confront the project management competencies from the ICB Version 3 with the key competences for sustainability found in paragraph 5 and analyze how these sustainability competences are covered by the ICB3. A schematic representation of our analysis of the coverage is included as **Annex B**.

6.1. Systems Thinking Competences

The ICB3 competence 3.07 *Systems, products & technology* resembles the "systems thinking" competence of analyzing and understanding root causes of complex problems and the role technology plays in the constellation. Related competences are 3.05 *Permanent organization* and 3.06 *Business*, because also these competences relate to current situation (products, processes, systems, resources) of the permanent organization and therefore the sustainability issues that are part of this current situation. And although it is not to be said that the systems thinking competences meant here are fully covered in the ICB3, it should be concluded that the contextual competences of the ICB3 do mention the core elements of the systems thinking competences.

6.2. Anticipatory Competences

The key element of the anticipatory competences is the ability to develop visions and scenarios of possible futures, based on an extrapolation of the current situation and expected developments. This element is not represented in the ICB3 project management competencies. It could be argued that, given the temporary nature of projects, this observation is logical. However, many authors (For example [1] [9] and [29]) include a time dimension in their understanding of the impact of sustainability on project management. In this view, also a short lived organization should consider its long term impact. It is, however, clear that this medium to longer term orientation is not reflected in the project management competencies of the ICB3.

6.3. Normative Competences

The normative competences of understanding concepts of justice, equity, social-ecological integrity, and ethics, are most explicitly visible in the ICB3competencies 2.15 *Ethics* and 2.14 *Values appreciation*. However, for a deeper understanding of these competences, an elaboration of the underlying personal and professional values is required. For example, as described in the PMI Code of Ethics and Professional Conduct, mentioned in paragraph 3. And although the behavioral competencies of the ICB3mentioned above, do make a clear reference to the key elements of this competence, our analysis only shows a partial coverage of the normative competences as described in [43]. For example, the required knowledge of sustainability principles and concepts are not covered by the ICB3 competences.

6.4. Strategic Competences

The strategic competences refer to the ability to design and implement interventions. This ability relates to the core function of projects in organizations. It is therefore not surprising that many competencies from the ICB Version 3, especially the technical competencies, are related to the strategic competence of sustainability. For example, ICB3competences 1.10 *Scope & deliverables*, 1.02 *Interested parties*, 1.03 *Project requirements & objectives*, 1.01 *Project management success*, 1.09 *Project structures* and 1.12 *Resources* all link to the viability, feasibility, efficiency, and efficacy of interventions. Several authors, for example [11] [19], argue that considering sustainability adds new perspectives to the design and management of interventions, thereby impacting the competencies required for the design and management of these interventions. Considering sustainability will therefore also influence the content of the strategic competences and, translated to the ICB3 project management competencies, the content of the project management competencies. For example, also adding social and environmental requirements to the requirements and success factors of the project. The knowledge required for this relates to the ICB3 competence 3.09 *Health, security, safety & environment*.

6.5. Interpersonal Competences

The interpersonal competences of sustainability, for example strong communication skills, negotiation skills, collaboration skills, teamwork and diversity facilitation, can, without exception, be recognized in the behavioral competencies of the ICB3. And although this result is perhaps not surprising, the resemblance between the two groups of competences is remarkably complete.

Annex B shows a more detailed analysis of the coverage of the sustainability competences in the ICB3. **Table 1** provides a summary of our analysis.

Our analysis makes clear that the main hiatus in project management competencies, with regards to sustainability, are the anticipatory conferences, the normative competences and parts of the systems thinking competences. The strategic and interpersonal competences are well covered in the ICB3 project management competencies.

However, we need to point out that competences consist of three elements: knowledge, skills and "core personal characteristics" [44], such as motives, traits and self-concept [45]. *So what does integrating sustainability means for these personal characteristics of the project manager*?

The competence descriptions of ICB Version 3.0 address personal characteristics and motives in terms of the behavior a project manager demonstrates, but lack a vision on where this behavior originates from. This source is the value-system of the individual project manager. A value system is the image a person has on the world with convictions connected to them. Convictions about what is good or bad, important and not important. When life conditions change and there are reasons to think different, then people also change.

Viewing the world from a sustainable perspective requires adopting or developing a new value system. The

Table 1. Summary of coverage of sustainability competences in the ICB3.

Sustainability competences	ICB3 Project management competencies		
	Technical competencies	Behavioral competencies	Contextual competencies
Systems thinking competences	-	-	Partial coverage (specifically 3.05 Permanent organization, 3.06 Business, 3.07 Systems, products & technology)
Anticipatory competences	-	-	-
Normative competences	-	Limited coverage (specifically 2.15 Ethics, 2.14 Values appreciation)	-
Strategic competences	"Full" coverage	-	Partial coverage (specifically 3.09 Health, security, safety & environment)
Interpersonal competences	-	"Full" coverage	-

individual project manager can develop a new value system when he or she accepts a certain responsibility for sustainability, both as an individual and as a professional. Accepting responsibility changes behavior. As an individual this change could include preferring more sustainable products and services, or using voting power within the democratic process. As a project management professional, this change may include taking initiative in "putting sustainability on the agenda" in discussions with the project team, the project's sponsor and other stakeholders. Adopting or developing new value systems, thereby drives change within companies and society. This corresponds with the trend that the project manager's role shifts from a technical and result orientation, towards a more goal and context orientation [46] [47].

7. Conclusions

This paper analyzed the coverage of sustainability competences in the standards of project management competencies, thereby answering the research questions: *How are sustainability competences covered by the most important standards of project management competencies*? And *which new competencies should be added to the standards of project management competencies*? The relevance of these questions comes from the understanding that sustainability needs change and that change is organized in projects. The project manager therefore is an important change agent in organization for the realization of more sustainable business processes and practices.

The role of the project manager in the realization of sustainability requires adequate competencies. The concept of competencies is not new to the project management profession, as well-developed standards for project management competencies are available from two of the world's leading professional organizations: PMI and IPMA. However, as earlier studies concluded, the standards for project management fail to address the enabling role of projects in sustainability. Therefore we cannot rely on these standards for project management competencies for the development of project managers in their role in implementing sustainability in organizations. The study reported in this paper analyzed this competence gap and provided guidance for the addition of new competences to the standards of project management competencies.

Drawing on the literature from the "Education for Sustainable Development" field, we derived five key-competences for sustainability: systems thinking competences, anticipatory competences, normative competences, strategic competences and interpersonal competences. We consequently analyzed the ICB Version 3 standard of project management competencies for its coverage of the sustainability competences and concluded the following results:

- The systems thinking competences are partly covered by the ICB3 project management contextual competencies.
- The anticipatory competences are not covered by the ICB3 project management competencies.
- The normative competences are only limitedly covered in the ICB3 behavioral competencies.
- The strategic competences are well covered in the ICB3 technical competencies.
- The interpersonal competences are well covered in the ICB3 behavioral competencies.

The contribution that this analysis makes is that the competence gap of the project manager, in the context of his/her role in implementing sustainability initiatives, is specified as bases for the resolution of this gap.

Our analyses, provide input for the further development of the project management competence standards. And as the next version of the ICB, Version 4 is announced for release in 2015. The adaptation of the results of this study may be relatively quick. However, organizations that have a strong sustainability strategy or ambition should not wait on the publications of standards, but show leadership by including sustainability competences in the development of project managers. The result of our analysis will provide guidance for this.

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Annex A. Description of the ICB Version 3 Competencies

Technical Competencies

1.01 Project management success
The project manager recognizes and appreciates the criteria and conditions of project success in the eyes of the interested parties.
1.02 Interested parties
The project manager recognizes and identifies the different interested parties in the project.
(Note: "interested parties" is used as synonym of "stakeholders".)
1.03 Project requirements & objectives
The project manager recognizes and understands the goals, requirements and conditions of the project.
1.04 Risk & opportunity
The project manager recognizes and understands the risks of the project and manages these adequately.
1.05 Quality
The project manager understands the quality aspects of both project result as project execution and manages the realization of these aspects.
1.06 Project organization
The project manager designs, establishes and maintains an efficient and effective division of tasks in appropriate roles, responsibilities and capabilities for the project.
1.07 Teamwork
The project manager recognizes the distinct qualities of the different team members and molds them into an effective team.
1.08 Problem resolution
The project manager identifies (potential) problems in an early stage and is capable of solving the issues at hand.
1.09 Project structures
The project manager organizes the project team and its relations with stakeholders in effective organizational and communication structures.
1.10 Scope & deliverables
The project manager specifies the project objective and assignment in specific project results, activities and work packages and understands how these are interrelated.
1.11 Time & project phases
Understanding the interrelations, the project manager plans and schedules the project activities and groups them into a clear project phasing.
1.12 Resources
The project manager identifies, recognizes and organizes the (personal as well as material) resources required for the project.
1.13 Cost & finance
The project manager plans and manages the cash flows related to the project and acquires sufficient funding.
1.14 Procurement & contract
The project manager qualifies, selects and contracts suppliers to the project, plans the purchases and coordinates the deliveries.
1.15 Changes
The project manager handles requests for change efficiently and effectively taking into account the scope of the project and the impact of the changing requirements.
1.16 Control & reports
The project manager directs the realization of the project plan, monitors the progress of activities, reports project progress and anticipates contingencies.
1.17 Information & documentation
The project manager plans, collects, archives and analyzes the project documentation and information.
1.18 Communication
The project manager is skilled in communication and deploys his skills efficiently and effectively. He is also perceptive of verbal and non-verbal communication of others.
1.19 Start-up

The project manager realizes an adequate project start-up that creates commitment of team members and interested parties for the project goal and plan.
1.20 Close-out
The project manager realizes an adequate project closure that transfers the results of the project to the project owner and dismisses the project organization from their duties.

Behavioral Competencies

2.01 Leadership
The project manager stimulates and motivates team members and interested parties to act in the interest of the project and show efficient and effective behavior.
2.02 Engagement & motivation
The project manager is personally committed to and motivated for the project.
2.03 Self-control
The project manager organizes his job effectively and efficiently and dismisses unnecessary tension or pressure.
2.04 Assertiveness
The project manager is adequately assertive and convincing to ensure successful project realization
2.05 Relaxation
The project manager de-escalates conflicts and tension and facilitates effective teamwork.
2.06 Openness
The project manager creates an open atmosphere within his project team that allows new team members to immediately feel at ease. He is also open to feedback and comments.
2.07 Creativity
The project manager explores problems and issues from different and unexplored angles and is able to develop new and innovative solutions.
2.08 Results orientation
The project manager does not lose his focus on the project goals and the interests of the interested parties and achieves project results.
2.09 Efficiency
The project manager utilizes project resources and team members efficiently and effectively.
2.10 Consultation
The project manager analyses issues and situations, seeks advice and new insights, weights pros and cons of different alternatives and makes informed decisions.
2.11 Negotiation
The project manager creates consensus and cooperation for his decisions.
2.12 Conflict & crisis
The project manager anticipates on or recognizes potential conflicts of interest or crises in an early stage and develops solutions that prevent or solve the issue.
2.13 Reliability
The project manager is reliable in his behaviour and does not harm the confidence put in him.
2.14 Values appreciation
The project manager recognizes the beliefs and values of team members and interested parties and respects these.
2.15 Ethics
The project manager understands ethic and moral values and acts accordingly.

Contextual Competencies

3.01 Project orientation
The project manager understands the rationale for the project and is aware of the organizational context of the project.
3.02 Program orientation
The project manager is capable of aligning program goals to business strategy and develops new proposals for new projects supporting this strategy.

3.03 Portfolio orientation
The project manager advises the organization about effective project and program priorities and about the portfolio management process.
3.04 Project, program & portfolio orientation
The project manager creates awareness in the organization of the role of portfolios, programs and projects in the realization of the organization's strategy.
3.05 Permanent organization
The project manager is aware of the complex relations between the project its surrounding organizations and is capable of managing these relations in an effective manner.
3.06 Business
The project manager has knowledge and understanding of the specific business and business processes of the project owner’s organization.
3.07 Systems, products & technology
The project manager understands the causes of developments and the effects of actions in the project and is able to manage these relations effectively.
3.08 Personnel management
The project manager recruits, selects, develops, appraises and rewards his team members in a way that stimulates effective behaviour and successful teamwork.
3.09 Health, security, safety & environment
The project manager is aware of health, security, safety and environmental aspects of the project and manages these adequately.
3.10 Finance
The project manager has adequate knowledge of and insight in the financial and administrative processes of the project and integrates these aspects in his actions.
3.11 Legal
The project manager is aware of legal, compliancy and liability aspects of the project and manages these adequately.

Annex B. Coverage of Sustainability Competences in the ICB Version 3