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# Project Management and Sustainability: Playing Trick or Treat with the Planet

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Received: 7 September 2020; Accepted: 12 October 2020; Published: 18 October 2020



**Abstract:** The incorporation of the social, environmental, and economic dimensions of sustainability in different aspects of human life and business provides a guarantee for our future. Organizations have shown a great interest in incorporating sustainability into managerial concepts, both at the strategic and operational levels. Sustainable business strategies are being implemented in many projects, which has led to a recent expansion of interest in exploring the potential of integrating sustainability dimensions in project management. With the intention of contributing to a better understanding of sustainable project management, this paper examines whether project management methodologies, applied in different sectors, support the introduction of sustainability dimensions. It also surveys the level of integration of sustainability dimensions in groups of project management processes. Considering that the incorporation of sustainability in project management poses numerous challenges for project managers, this paper examines the necessary knowledge and skills required for sustainable project management in different sectors. As part of this research, an empirical survey was conducted in project-oriented organizations from both the public and private sectors. The findings reveal that the application of project management methodologies promotes the introduction of sustainability dimensions, particularly the social aspect, irrespective of the sector, since the processes in projects managed by a specific methodology are consistent with the social elements of sustainability. In the public sector, there is a noticeable lack of knowledge of the meaning and dimensions of sustainability and, accordingly, an urgent need for project managers to gain knowledge and skills pertaining to sustainable project management.

**Keywords:** sustainability; project management; sustainable project management; project manager; competences

## 1. Introduction

In the context of growing worldwide competition, technological changes, and an economic drop on a global level, long-term business sustainability has become imperative. Today, this implies the integration of economic, environmental, and social issues into decision-making processes, which means that commitment to sustainability dimensions is perceived as key for the future business success of organizations [1–3]. By introducing sustainability concepts into its business, an organization takes responsibility for the influence that its activities, through different forms of actions, has on clients, employees, management, the community, surroundings, and the environment itself.

Dyllick and Hockerts [4] state that achieving a balance between economic growth and social welfare have been a political and managerial challenge for more than a century and a half. At the end of the 20th century, the concept of sustainable development became one of the essential ideas

concerning society, and in the business world, the need for the integration of this idea with other managerial concepts emerged. By introducing the concept of sustainability, an organization can gain various advantages regarding value creation, performance improvements, efficiency increase, flexibility, and much more [5]. For this reason, organizations often choose sustainable business as their strategic direction. The general goal of sustainable development, perceived as long-term economic and environmental stability, can only be achieved through the integration of and emphasis on the importance of economic, environmental, and social issues in decision-making.

The report of the UN's World Commission on Environment and Development [6], entitled "Our common future", defined sustainable development as "development that meets the needs of the present, without compromising the ability of future generations to meet their own needs", indicating that sustainability has social, environmental, and economic dimensions. Today, many organizations integrate sustainability strategies into their business strategy and mission in order to survive and achieve a competitive advantage, thus showing the concept of sustainability to be a global business trend [7]. By adopting these business strategies and acting accordingly, organizations meet the needs of today's stakeholders, while simultaneously improving and preserving human and natural resources for the future.

Schoper et al. [8] predicted that sustainability would be one of the key areas of project management development until the year 2025. In an effort to harmonize its business goals with global goals regarding sustainable development and to apply them successfully, organizations have made changes and implemented certain projects. Recognizing that a project is a mechanism for the implementation of an organization's strategy, the establishment of the concept of sustainable development on the project management level, as the operational level, is of crucial importance for the successful implementation of a strategy [9,10].

The application of sustainable project management can contribute to value creation, business agility, operational and project excellence, and long-term sustainable business in different sectors. Therefore, in the present research, the authors were motivated to determine the extent to which knowledge of the concept and importance of sustainability and available sustainable solutions exists in the private and public sectors, and whether there is a difference between sectors in this regard. Starting from the assumption that projects are managed by applying a specific methodology, the authors investigated the application of certain methodologies for project management in the private and public sectors and determined which methodologies are more represented in which sector. This is further related to the research on whether projects managed by the application of a certain methodology provide better support for the introduction of specific sustainability project management aspects or not. The intention of the authors was to determine whether there is a difference in terms of the importance of certain knowledge areas of project management in the private and public sectors and, if so, which areas stand out as particularly important, since this is extremely important for project managers. In this segment of the research, the authors explored the knowledge and skills that are particularly important for a project manager to have in order to allow them to manage projects in a sustainable manner. The authors also explored the trend of linking sustainability with other management concepts by pointing to the concrete impact of sustainability concepts on project management, posing the question: Are sustainability concepts really connected with management concepts and applied in project management processes, or is this rather a trick or treat scenario?

## 2. Literature Review

Changes are usually introduced through projects [11], and the integration of sustainability and project management concepts contribute to genuine changes in thinking, operations, cooperation, and partnerships on different levels of business and organization [12]. Due to the fast and unexpected changes that occur in any environment or part of a system, a sustainable project should be able to embrace changes [13]. Many economic, social, and environmental benefits are associated with certain projects [14]. Zamojska and Prochniak [15] stress that some projects provide a positive economic benefit,

but all of them should provide positive social and environmental impacts. Michaelides et al. [16] indicate that important project outcomes are the results of sustainable project management practices: Easier access to capital markets in the future, high customer loyalty, improvements in a supply chain, the development of capabilities, improvements in operational performance and efficiencies in the long term, positive organizational image and credibility, among other things. Morfaw [13] argues that the effective and efficient management of the sustainable project processes requires a complex mix of different economical, societal, and environmental utilities, such as systems, structures, plans, resources, laws, regulations, technologies, etc. Moreover, it is necessary to ensure that sustainable project objectives are aligned with societal objectives [13]. Sustainable project management is an accelerated roadmap to sustainable development. The way our future will look depends significantly on project managers, since the challenges relating to sustainability are quite concrete and rely on the adequate planning and implementation of projects, which can guarantee the protection of world resources and, at the same time, create welfare for people [17].

Chofreh et al. [18] state that introducing sustainability into project management concepts and methods should support organizations in achieving a competitive advantage. However, Banihashemi et al. [19] argue that while many organizations take the initiative to incorporate sustainability, many of them still fail to manage projects, because they employ conventional project management. Sustainable project management can be defined as “the planning, monitoring, and controlling of project delivery and support processes, considering the environmental, economic, and social aspects of the life cycle of a project’s resources, processes, deliverables, and effects, with the aim of creating benefits for stakeholders in a transparent, fair, and ethical way that includes proactive stakeholder participation” [20]. The introduction of sustainability is about project management politics, processes, and procedures, which can be split into the social (people), environment (planet), and financial aspects (profit). The concept of sustainability is based on a balance between three dimensions: Social equality, protection of the environment, and economic prosperity, known as “people, planet, and profit” [17].

The same authors underline that environmental and social dimensions are rarely integrated into the business strategies and practice of organizations. Marcelino-Sádaba et al. [21] confirm this point and further state that the philosophy of the project management concept is limited solely to profit, without consideration of the social and environmental aspects. Therefore, sustainable project management is a concept that encourages organizations to introduce sustainability into their business initiatives and prosper. An organization can contribute to sustainable development by focusing its business activities on the minimization of harmful influences and the maximization of positive influences on the environment and society [17].

The application of sustainable project management requires a certain flexibility and openness to implementing change on a project level. Our analysis of the literature showed that project management theory has been intensively developed since the 1960s. Garel [22] argues that the lack of a unique standing point enabled project management theory and practice to be perceived from different viewpoints or perspectives. The term, “perspective”, can be understood, in accordance with Andersen [23], as a particular approach. By examining and analyzing various aspects of project management, the authors suggested different management approaches. The foundations for the development of several project management approaches have been laid (PMI, PRINCE2, OpenPM2, etc.), and a traditional (waterfall) approach has emerged, which supports a sequence of project stages, process orientation, clarity of requirements and results, and minimal changes during a project’s lifetime. When it comes to a project without these characteristics, traditional approaches have shown their flaws, pointing to the necessity for the development of a management approach that can meet managerial demands, even when the project stages are not sequential, when stakeholders do not precisely communicate all requirements at the beginning of a project, and when project changes through its lifetime are relatively common.

One of the first papers seeking an alternative to traditional project management was written in 1983. The author of this paper, Lichtenberg [24], argues that “in the same way that we do not all

accept the same lifestyle, we cannot all be suited to the same form of project management". The concept of agile project management was developed as an alternative to traditional management. By developing new approaches, the authors tried to overcome the limitations of the traditional ones relating to the limited possibilities of managing projects that do not have a sequential flow, require greater flexibility due to frequent changes, and need more intensive cooperation and communication with stakeholders. Jeff Sutherland and Ken Schwaber developed the Scrum methodology, as an agile methodology, in the early 1990s. It is based on the assumption that user requirements cannot be fully specified at the beginning of product development, so it is necessary to allow for flexibility in changes during its production. Schwaber and Beedle [25] state that the Scrum methodology implements the ideas of adaptability, productivity, and flexibility, and this is its great advantage. Cockburn [26] contributed to the implementation of agility by pointing out the importance of documentation through research and the greater role of communication in project management, and in 1998, he developed a family of methodologies, known as Crystal [27]. The focus is on people, their interaction and communication, collaboration, skills, and talent, rather than documentation, techniques, and tools. In 2001, a group of authors published the Agilemanifesto [28] and laid the foundation for the development of an agile approach to project management. A project, as a temporary endeavor, is not only characterized by various constraints in terms of time and resources, but also by changes, risk, and uncertainty. The existing project management approaches observe projects from the perspective of time, money, and quality, but since project results can influence the environment long after the project has been completed, the potential for involving the concept of sustainability in project management has been studied in recent years. The sustenance that agile approaches provide where there is complexity, uncertainty, and changes can offer significant support for the introduction of the sustainability dimension into project management, even in the later stages of project development [29–32]. The main managerial challenge is to determine the key dimensions as preconditions for sustainable project management, along with possible modes of the application of the concept of sustainability in project management.

Silvius et al. [17] surveyed the possibility for integrating sustainability principles in groups of processes in traditional project management. According to PMBOK [33], the groups of project management processes are initiating, planning, executing, monitoring, and closing. The authors examined the possibility for integrating six principles of sustainability: Sustainability is about balancing or harmonizing social, environmental, and economic interests; sustainability is about both short-term and long-term orientation; sustainability is about local and global orientation; sustainability is about consuming income, not capital; sustainability is about transparency and accountability; and sustainability is about personal values and ethics. They concluded that there are differences between the areas inside the groups of processes. Inside the initiating and planning group, the concept of sustainability is integrated into the scope and objectives of projects, while the executing and monitoring group of processes enables the integration of the concept of sustainability into the process of creating project results. The closing group of project processes includes the handover of project results, which represents a significant aspect of project sustainability. Projects whose results are not accepted cannot be considered sustainable, because in that case, resources, materials, and energy are wasted, without achieving the required performance. The author concluded that all six sustainability principles influence the initiating, planning, and executing of group processes, while all of the principles do not affect the monitoring and closing of group processes.

Tiron-Tudor and Dragu [34] pointed to a direct correlation between sustainability and project management success and pointed out the advantages of sustainable project management. They also stressed their expectation that future organization will become aware of the significance of sustainable project management, while Silvius [1], besides pointing out the correlation between project success and sustainability project management, also promotes sustainable project management as the new way of thinking (the new "school") in the field of project management. Sustainable project management requires a project to be linked to a strategy of the organization. This connection helps projects to be a part of the strategic context and managers to make proper decisions regarding projects, organization,

and society on the whole. Our literature survey has shown that those authors who published papers about integrating sustainability into project management processes have a great interest in the area of project management [1,9,10,35–39]. Sabini et al. [40] confirm that there is a growing number of surveys focusing on the correlation between sustainability and project management. They state that there is no standard analytical frame for understanding sustainable project management. Therefore, it is necessary to analyze why and how to include sustainable business practices into projects and what the nature of the influence that sustainability has on traditional project management practice is. Kivila et al. [41] conclude that there will inevitably be a growing pressure for the sustainable management of projects in the future and therefore a need for further research that can enable the development of an adequate practice to aid organizations in managing projects and taking care of all stakeholders in a sustainable way. Banihashemi et al. [19] consider project managers' experience and competences to be the most influential critical success factor in sustainable project management.

Silvius and Schipper [42], Taylor [43], and Khalfan [44] stress that introducing the sustainability dimension into project management poses challenges among project managers, who should adopt new responsibilities and develop new competences. Besides being responsible for delivering the required results, they now take responsibility for sustainable development in the organization and society. Project managers must think outside the box and the usual boundaries, while developing honest communication about the long-term and short-term social and environmental effects of projects.

Based on the literature review, it can be concluded that there are numerous papers on the subject of project management competences and significantly fewer papers regarding project management competences in sustainable project management.

### 3. Methodology

#### 3.1. Research Questions

Based on the literature review, the authors focused on researching the prospect of introducing the concept of sustainability into project management; whether and to what extent sustainability is incorporated in leading project management methodologies; which sustainability dimensions are integrated into project management processes; what knowledge and skills are significant for sustainable project management; and what projects' distinctive limitations influence their sustainability. The key research questions in this paper are:

1. Does the application of a specific project management methodology provide support for the application of sustainable project management?
2. Are sustainability dimensions integrated within each group of project management processes, and do they equally influence each of these groups?
3. Is there a difference in the knowledge and skills needed for sustainable project management between the public and private sector?

#### 3.2. Questionnaire Design

With the intention of analyzing the defined research questions, the authors created a questionnaire to explore the introduction of the concept of sustainability into project management in different industries. Before the distribution of the questionnaire to the examinees, a pilot version of the survey was created and used during structured interviews with 10 project managers from different industries. According to the conducted interviews, the authors tested the validity of the questionnaire and made a final adjustment of the questions.

The first part of the questionnaire covered questions about the sector and industry to which the examinee's organization belongs, the examinee's previous work experience on projects, and the project management methodology that was used. The examinees could choose between several of the most frequently applied project management methodologies: The PMI methodology, IPMA methodology, Project Cycle Management—PCM (European commission methodology),



agile methodology, and internally developed methodology. In the second part of the questionnaire, the examinees rated the extent to which the social, environmental, and economic dimensions of sustainable development is applied in project management, with key elements for each sustainability dimension stated [17,18,42,45–49].

The third part of the questionnaire examined the extent to which each methodology involves the defined elements of sustainable development. As Daneshpour [50] stresses, traditional and sustainable project management have somewhat opposite project management scopes. While the focus of traditional project management is on time, budget, and quality, the sustainability dimension introduced into sustainable project management changes the project scope, such that the social and environmental aspects are included in addition to the economic aspect. Therefore, it is important to explore the level of support for the sustainability aspect provided by the applied project management methodology. During the previously conducted pilot testing of the questionnaire, the examinees stated that they often use an internally developed project management methodology. As a result, this was offered as one of the proposed methodologies in the final questionnaire.

During earlier interviews within the testing of the questionnaire, it was concluded that the project-oriented management approach is the most widely used. Accordingly, the authors prepared the fourth part of the questionnaire, where examinees rated to what extent they consider it worthwhile introducing sustainability dimensions into each subprocess of the project management process. The PMI methodology was used for the definition of subprocesses of project management processes [17,33]. An understanding of how sustainability influences project management processes and practice is an important precondition for the necessary integration of the concept of sustainability into project management [51], considering that the correlation between sustainability and project management impacts project success [52].

Since the literature review showed that there is only a small number of papers exploring the key competences of project managers in sustainable project management, the fifth part of the questionnaire was prepared to examine them. For the preparation of the questions on project managers' competences, 11 areas of knowledge of the PMI methodology, competences based on the IPMA ICB4 standard, and the results of the research about key competences regarding sustainable project management conducted by the authors were used [19,33,42,47,48,53–57].

In the sixth part of the questionnaire, the examinees were offered a list of project limitations according to the research results presented in [9,58–61], which ought to be related to project sustainability.

The complete list of the measured survey items is given in Appendix A. All the items are measured on a 5-point Likert scale: Relating to tag A, the range of items a1–a3 is from 1- 'not applied' to 5- 'completely applied'; the range of items a1–a3 for tag B is from 1 - 'does not provide support' to 5- 'completely supports'; within tag C, the range of items b1–b5 is from 1- 'not significant' to 5- 'completely significant'; within tag D, the range of items d1–d21 is from 1- 'not needed' to 5- 'completely necessary'; and within tag E, the range of items e1–e14 is from 1- 'not typical' to 5- 'completely typical'.

### 3.3. Data Collection and Sample

During the past years of work and experience in the field, the authors created a list of contacts comprised of project managers and professionals in project management who have a lot of experience in managing projects in different industries. The list is based on the authors' personal, academic, and business contacts. The questionnaire was sent to 130 contacts by e-mail in January 2020. The total number of acquired responses was 103. It was gained from January to March 2020 and provided a response rate of 79.2%.

The main characteristics of the acquired samples are summarized in Table 1. Among the 103 respondents, 82 were employed in private enterprises and 21 in public enterprises. If you look at the industries to which the respondents belong, they are mainly from IT (34.7%), followed by telecommunications (9.2%), education (8.2%), finance/banking (7.1%), etc.

**Table 1.** Sample profile of the questionnaire-based survey of project management.

Items	Classification	Sample Amount	Percentage (%)
Employment sector	Private	82	79.6
	Public	21	20.4
	Total	103	100.0
Industry	IT	34	34.7
	Telecommunications	9	9.2
	Finance/Banking	7	7.1
	Education	8	8.2
	Marketing	3	3.1
	Consulting	5	5.1
	Construction	3	3.1
	Energy	4	4.1
	Food	4	4.1
	Car	3	3.1
	Other	18	18.4
	Total	98	100.0
Number of projects in which the respondent has participated	Less than 3 projects	11	10.7
	Between 3 and 10 projects	29	28.1
	More than 10 projects	63	61.2
	Total	103	100.0
Use of project management methodology	Yes	85	82.5
	No	18	17.5
	Total	103	100.0
Project management methodology	PMI methodology	17	20.0
	IPMA methodology	1	1.2
	PCM (Project Cycle Management)	3	3.5
	Agile approach	28	32.9
	Internally developed methodology	36	42.4
	Total	85	100.0

Most of the respondents have worked on more than ten projects (61.2%), followed by those who worked on 3 to 10 projects (28.1%), and only 10.7% have worked on less than three projects. The majority of the examined projects have been managed by the use of a specific project management methodology (82.5%), and among them, an internally developed methodology was mostly present (42.4%), followed by an agile approach (32.9%) and PMI methodology (20.0%). The IPMA and the PCM (Project Cycle Management) methodologies occur in a very low percentage, as shown in Table 1.

The most important classifiers in this survey are the employment sector, the use of a project management methodology, and the specific project management methodology used. From a total of 103 respondents, 85 have used a specific project management methodology. However, since the IPMA and the PCM methodologies have only been used in 1 and 3 cases, respectively, we decided to exclude these cases from the analyses and to focus exclusively on the PMI methodology, agile approach, and internally developed methodologies.

#### 4. Results

Given that, besides the abovementioned classifiers, the rest of the variables in this study are measured on a 5-point Likert scale (Appendix A), to analyze the results we favored nonparametric tests, such as Mann–Whitney (MW) [62], Kruskal–Wallis (KW) [63], Crosstabs Chi-Square [64,65], Friedman (Frd) [66–68], and Kendall’s tau correlation [69].

#### 4.1. Methodologies for Project Management Supporting the Introduction of Sustainability Dimensions (Research Question 1)

The public and private sector organizations, despite their differences, have similar aspects in terms of the majority of measured features. There is a difference in their opinion regarding the need (Appendix A, tag D) for a specific competence, *Scope management* (MW,  $p = 0.042$ ), where the overall opinion is that there is a greater need for this competence in the public sector (Mean = 3.19, Median = 3, MW mean rank = 63.05), compared to the private sector (Mean = 2.32, Median = 2, MW mean rank = 49.17). Koppenjan and Enserik [70] agree that scope management is important for projects in the public sector. The authors of this paper explore the possibility of incorporating the private sector into projects from the public sector and point out that, in this case, the decision concerning scope has a remarkable influence on the possibility of the execution of profitable and non-profitable parts of infrastructure projects. Agarwal and Kalmar [59] emphasize the importance of managing project scope within sustainable project management, because if there is a misunderstanding about the meaning of sustainable production or processes, and if the project scope is not precisely defined, the inefficient usage of resources and waste creation will appear as a consequence.

When it comes to the constraints (Appendix A, tag E), there is a significant difference in the constraint, *Lack of knowledge about sustainability principles, "green" technologies, and materials* (MW,  $p = 0.003$ ). This is not as typical in the private sector (Mean = 3.94, Median = 4, MW mean rank = 47.67) as it is in the public sector (Mean = 3.94, Median = 4, MW mean rank = 68.90), leading us to the conclusion that the public sector has less knowledge and consciousness of green sustainability principles. The constraint, *Inaccessible "green" solutions* (MW,  $p = 0.012$ ), is also somewhat more typical for the public sector (Mean = 2.86, Median = 3, MW mean rank = 66.12) than for the private sector (Mean = 2.15, Median = 2, MW mean rank = 48.38). Yadav and Pathak [71] and Ho et al. [72] drew somewhat different findings. Yadav and Pathak [71] analyzed sustainability and "green" banking in the public and private sectors in India, and they concluded that banks from the public sector more commonly incorporated sustainability and conducted "green" banking projects than banks from the private sector. This indicates that banks from the public sector are better informed and have more knowledge and availability of green solutions, compared to those from the private sector. Ho et al. [72] argue that the public sector's leadership in the procurement of green technologies came to improve the green supplies in the private sector as well.

An important aspect of this survey was the difference between the projects that have or have not been managed using any kind of specific methodology in project management. We have found that the constraint (Appendix A, tag E), *Inconsistency of internal processes in the organization with elements of sustainable project management* (MW,  $p = 0.029$ ), is more typical for projects that were not managed using specific methodologies (Mean = 3.5, Median = 4, MW mean rank = 65.56) than for the ones that were (Mean = 2.81, Median = 3, MW mean rank = 49.13). If we observe the extent to which the specific aspects of sustainable project management have been applied to projects (Appendix A, tag A), as well as the extent to which those aspects have been supported in the process of project management (Appendix A, tag B), the projects where specific methodologies have been used tend to manifest better results. The results of these analyses are given in Table 2. Daneshpour and Takala [73], Silvius and Schipper [51], Tiron-Tudor and Dragu [34], and Silvius et al. [17] agree that a project management methodology is indispensable for introducing sustainability dimensions into project management and to explore possibilities for linking those methodologies with sustainability dimensions. Those statements support the results of the present research, since the application of a methodology provides support for introducing sustainability dimensions and developing sustainable project results.



**Table 2.** Results of Mann–Whitney tests for the projects that were or were not managed using specific methodologies.

	Survey Items	Use of Methodology	Mean	Median	MW Mean Rank	MW Significance
Application of the following aspects of sustainable project management (Appendix A, tag A)						
a1	Project is approved, planned, and evaluated in accordance with financial and economic performances	Yes	3.89	4	55.91	0.003
		No	2.72	2.5	33.53	
a2	The impact on the environment has been assessed and evaluated	Yes	2.71	2	55.84	0.002
		No	1.72	1	33.89	
a3	Appropriate practices for human resource management in the project were selected and applied	Yes	3.58	4	56.14	0.003
		No	2.44	2	32.44	
Management of the following aspects of the project (Appendix A, tag B)						
b1	Project is approved, planned, and evaluated in accordance with financial and economic performances	Yes	4.14	4	53.64	0.001
		No	3.00	3	27.93	
b2	The impact on the environment has been assessed and evaluated	Yes	3.06	3	52.26	0.048
		No	2.29	3	36.29	
b3	Appropriate practices for human resource management in the project were selected and applied	Yes	3.86	4	53.63	0.001
		No	2.57	2	27.96	

There is no difference between the public and private sectors regarding whether or not a project management methodology was used. However, among the enterprises that have been using any specific methodology, there is a significant difference between the public and private sectors (Crosstabs Likelihood ratio,  $p = 0.005$ ) regarding the type of methodology [74]. The results of this analysis are given in Table 3. It should be noted that, in terms of percentages, in the public sector, the PMI methodology is more common, while in the private sector, internally developed methodologies and the agile approach are more common. This conclusion is in line with the work of Oinarov and Eshmova [75], who stated that the most commonly used project management methodology on the state level is PMI, and various new initiatives are being adapted to this methodology. Obradović [76] points to the development and trends in the field of project management in the public sector. He stresses that many countries in the world are in the process of establishing or already use project management methodologies, and the methodologies used are mainly those based on leading international associations, such as PMI and IPMA.

**Table 3.** Crosstabs sector vs. project management methodology.

		PMI Methodology	Agile Approach	Internally Developed Methodology
Private sector	Count	9	26	31
	Percentage (%)	13.6%	39.4%	47.0%
Public sector	Count	8	2	5
	Percentage (%)	53.3%	13.3%	33.3%

Further analysis led us to examine whether different types of project management methodologies differ regarding the application of various aspects of sustainable project management (Appendix A, tag A). We found that, in terms of *Appropriate practices for human resource management* (KW,  $p = 0.032$ ), this aspect of sustainable project management was more often applied in projects that employ the agile approach (Mean = 3.96, Median = 4, KW mean rank = 47.71) and internally developed methodologies (Mean = 3.64, Median = 4, KW mean rank = 41.24) than those that employ the PMI methodology (Mean = 3, Median = 3, KW mean rank = 29.44). Regarding the project-specific constraints (Appendix A, tag E), *Inconsistency of internal processes in the organization with elements of sustainable project management* (KW,  $p = 0.048$ ) is slightly more typical for projects that use the PMI methodology (Mean = 3.24, Median = 3, MW mean rank = 49.50) and agile approach (Mean = 3, Median = 3, KW mean rank = 44.45) than for projects that employ an internally developed methodology (Mean = 2.47, Median = 2, KW mean rank = 34.31). Additionally, the need (Appendix A, tag D) for *Technical skills* is shown to be more significant (KW,  $p = 0.049$ ) for projects that use the agile approach (Mean = 3.86, Median = 4, KW mean rank = 43.39) or an internally developed methodology (Mean = 3.94, Median = 4, KW mean rank = 44.75) than for those that use the PMI methodology (Mean = 3.35, Median = 3, KW mean rank = 29.12). The social dimension of sustainable project management

regarding human resources is more exemplified in the agile approach than in the PMI methodology. The agile approach is characterized by close and continuous cooperation with stakeholders, clients, strategic suppliers, distributors, and even with competition, which contributes to the achievement of sustainable project results. Albarosa and Valenzuela Musura [77] researched the correlation between agile project management and the social dimension of sustainability, and they found that the application of agile project management impacts the social dimension of an organization through a direct or indirect influence on individuals' health, their capacity to have an influence, their capacity to develop new competences, and their capacity to understand meaning and purpose. The authors agree that agile project management contributes to a high level of personal motivation [78] and individuals' personal empowerment [79], which point to the correlation between agile methodologies and the social dimension of sustainability. The eighth principle declared in the Agilemanifesto [28] indicates that agile processes promote sustainable development, thus adding to the results of this research. Besides the advantages of agile project management regarding the introduction of the social aspects of sustainability, Eskerod and Huemann [80] stressed that PMI can be used for the same reason, i.e., because it provides knowledge about human resources management, although it does so to a lesser extent, compared to an agile approach.

#### 4.2. Integration and the Influence of Sustainability Dimensions within the Project Management Group of Processes (Research Question 2)

Regarding the second research question, in our survey, we found that sustainable project management principles did not contribute to all the sub-processes (Appendix A, tag C) equally (Friedman,  $p = 0.001$ ). As shown in Table 4, sustainability has the most significant influence on the process of *Planning* (Mean = 4.32, Median = 5, Frd. mean rank = 3.3), followed by *Execution* (Mean = 4.29, Median = 4, Frd. mean rank = 3.12), *Control* (Mean = 4.19, Median = 4, Frd. mean rank = 3), *Closure* (Mean = 4.04, Median = 4, Frd. mean rank = 2.85), and finally, *Initiation* (Mean = 4.02, Median = 4, Frd. mean rank = 2.73). This result is consistent with the previous findings of Todorovic and Obradovic [81], although it distinguishes the sub-process of planning as the one most considerably affected by sustainability. The research results are also in harmony with the conclusions of Silvius et al. [17]. They argue that there is difference between the impact of sustainability within group processes of initiating, planning, executing, monitoring, and closing in the sense that not all aspects have the same influence in all groups of processes. In this manner, it is shown that all aspects of sustainability have an impact on the initiating, planning, and executing of group processes, while not all aspects influence the monitoring and closing of group processes.

**Table 4.** Significance of the sustainable project management principles for sub-processes.

Sub-Process	Mean	Median	Friedman Mean Rank	Friedman Significance
Initiation	4.02	4.00	2.73	
Planning	4.32	5.00	3.30	
Execution	4.29	4.00	3.12	0.001
Control	4.19	4.00	3.00	
Closure	4.04	4.00	2.85	

#### 4.3. Competences of Project Managers for Sustainable Project Management in Different Sectors (Research Question 3)

The following focuses on the demand for specific knowledge and skills (Appendix A, tag D) relating to sustainable project management and their impact on sustainability. We first used the Exploratory factor analysis to group the specific knowledge and skills in terms of sustainability. Then, we examined the obtained groups and highlighted the most significant knowledge and skills within those groups.

We used Principal components analysis [82], based on a correlation matrix, and rotated the solution using Varimax rotation [83]. The results of the Exploratory factor analysis are given in Table 5. The Kaiser–Meyer–Olkin, which measures the sampling adequacy [84], shows a very good result (KMO = 0.924), and the Bartlett’s Test of Sphericity (1565.061,  $p < 0.001$ ) also shows that the factor analysis gives a significant result [85]. Table 5 also gives the mean and median values of how significant the knowledge and skills (Appendix A, tag D) are for the sustainability of project management, as well as the results of Friedman tests and Friedman mean ranks for each of the three extracted factors, where the first factor mostly encompasses the skills that are needed for sustainable project management. The second factor encompasses the internal managerial competences, and the third factor encompasses external managerial competences.

**Table 5.** Knowledge and skills significance for the sustainability of project management.

Knowledge and Skills	Mean	Median	Factor Loading	Explained Variance	Friedman Mean Rank	Friedman Significance
Communication	4.41	5.00	0.814		7.72	
Decision-making	4.41	5.00	0.678		7.63	
Problem-solving	4.39	5.00	0.812		7.57	
Leadership	4.36	5.00	0.713		7.34	
Team work	4.27	5.00	0.770		7.06	
Communication management	4.17	4.00	0.700	30.419	6.62	<0.001
Analytical skills	4.13	4.00	0.579		6.33	
Delegation	4.10	4.00	0.616		6.09	
Ethics	4.01	4.00	0.516		5.97	
Creativity	4.00	4.00	0.727		5.55	
Business orientation	3.94	4.00	0.632		5.42	
Technical skills	3.72	4.00	0.617		4.69	
Resource management	4.34	5.00	0.701		4.02	
Quality management	4.25	4.00	0.798		3.83	
Cost management	4.19	4.00	0.808	22.677	3.79	<0.001
Risk management	4.22	4.00	0.719		3.73	
Schedule management	3.92	4.00	0.638		3.14	
Procurement management	3.59	4.00	0.620		2.49	
Scope management	4.02	4.00	0.837		2.08	
Stakeholder management	4.02	4.00	0.488	12.520	2.07	0.023
Integration management	3.82	4.00	0.536		1.84	
Total				65.616		

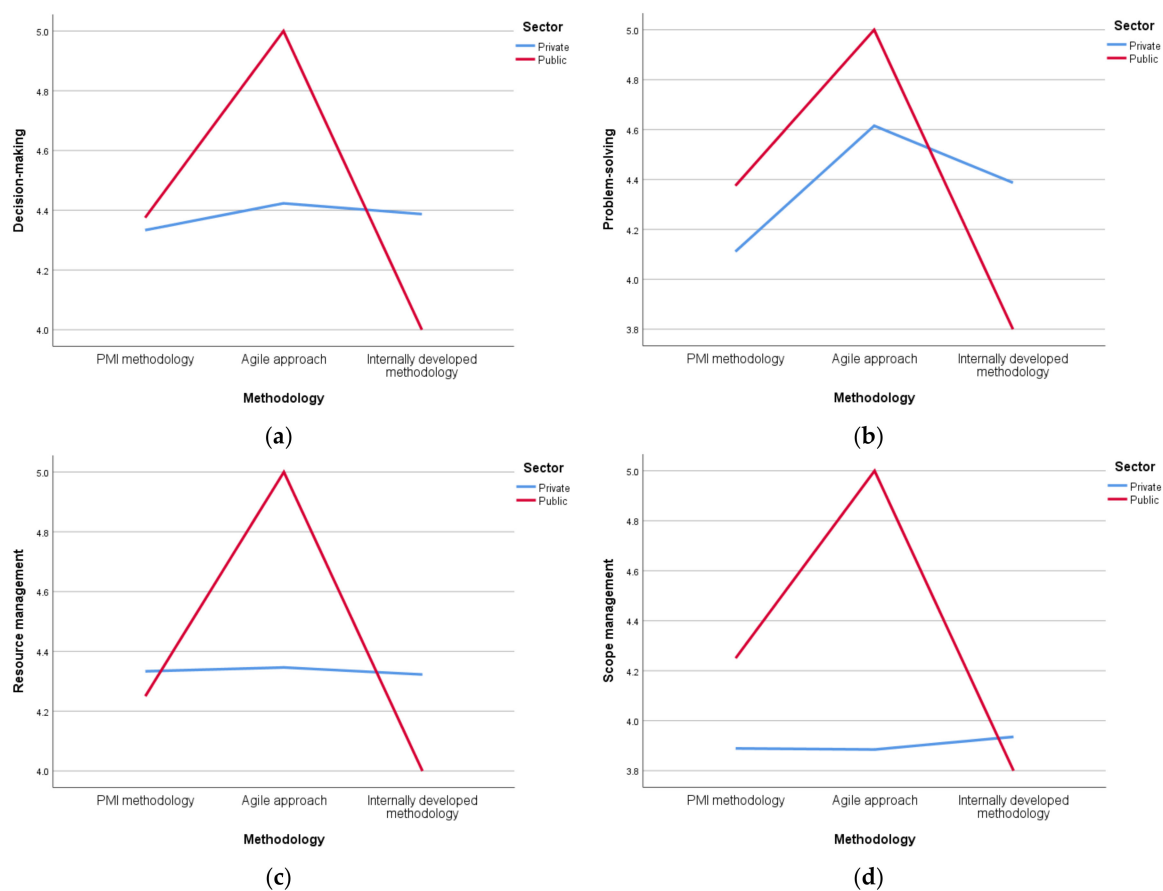
Regarding the skills that are needed for sustainable project management, there is a significant difference to some extent among these skills (Friedman,  $p < 0.001$ ). The most important skills for the sustainability of project management are *Communication* and *Decision-making*, followed by *Problem-solving*, *Leadership*, and *Teamwork*. The research results are consistent with the conclusions of Goedknecht and Silvius [86], who highlighted communication with stakeholders as an extremely important competency for project managers’ in sustainable project management. The same authors emphasized the importance of project managers setting an example and his/her behavior, which could be linked to distinguishing leadership as an important competency. Emmitt and Gorse [87] show that decision-making is an essential component of a project manager’s set of skills, which is in accordance with the research result. The conclusion of Hwang and Tan [88], who identify the five biggest challenges that project managers face when managing sustainably, is also in support of the findings of the present research. Lack of communication is found to be one of the challenges, along with a decreased interest in the team, which can be connected to the results of this research insofar as they help to highlight that communication competences, leadership, and teamwork are important competences for project managers. The first factor mostly encompasses the skills that are needed for sustainable project management and explains 30.419% of the total variability.

Regarding internal managerial competences, as the second factor, the difference between these competences are also statistically significant (Friedman,  $p < 0.001$ ). The most significant are *Resource management* and *Quality management*. This can be associated with the findings from Goedknecht and Silvius [86], who argue that project managers, when sustainably managing a project,

must think of the value of the entire chain. The importance of resource management and quality management must be understood in consideration of this. External managerial competences, as the third factor, explain 22.677% of the variability that is not covered by the first factor. In the external managerial competences, *Scope management* and *Stakeholder management* stand out (Friedman,  $p = 0.023$ ). This factor explains 12.52% of the variability that is not covered by the first and the second factor. Chee Moon et al. [53], Trocki and Buklaha [58], Atencio [89], and Goedknecht and Silvius [86] stress that stakeholder management in sustainable project management represents an important competency for project managers, which is consistent with the present research results.

Furthermore, Agarwal and Kalmar [59] stress the importance of project scope management for sustainable project management. Stakeholder management is particularly important in sustainable project management, considering that by introducing sustainability, a project is observed over a longer period, making the list of stakeholders more and more comprehensive and the responsibility of project managers much more compounded. Besides, the absence of adequate management and a poor definition of the project scope would cause an inefficient use of resources and the creation of waste, which does not follow the concept of sustainability [59].

Figure 1 presents the differences in terms of the need for some of the knowledge and skills analyzed above, depending on the sector and methodology type. It is interesting to note that, in most cases for both the public and private sectors, the needs for knowledge and skills are most distinctive for the agile approach methodology. Additionally, these needs generally seem to be higher in the public than in the private sector. This might be because they are less represented in the public sector.



**Figure 1.** The need for knowledge and skills, depending on the sector and methodology type: (a) Decision-making, (b) problem-solving, (c) resource management, (d) scope management.

The project-specific constraints that affect the sustainability of projects also need to be examined (Appendix A, tag E). The results of the Exploratory factor analysis for these measures, as well as

means, medians, and the results of Friedman tests and Friedman mean ranks, for each of the extracted factors, are given in Table 6. The Kaiser–Meyer–Olkin (KMO = 0.89) and the Bartlett’s Test of Sphericity (961.859,  $p < 0.001$ ) both show significant results.

**Table 6.** Project-specific constraints that affect the sustainability of projects.

Constraints	Mean	Median	Factor Loading	Exploratory variability	Friedman Mean Rank	Friedman Significance
Financial constraints for sustainable solutions	3.01	3	0.743		6.55	
Inconsistency of internal processes with sustainable project management	2.93	3	0.598		6.29	
Lack of analysis of sustainable solutions in the process of project preparation and planning	2.72	3	0.577		5.85	
Lack of incentives (subsidies)	2.74	3	0.722		5.72	
Inconsistency of corporate strategy and/or corporate social responsibility strategy with sustainable project management	2.74	3	0.621	35.736	5.68	<0.001
Lack of benefit analysis for the third parties	2.51	3	0.7		5.17	
Insufficient legal regulations	2.54	2	0.675		5.17	
Lack of knowledge about sustainability principles, “green” technologies, and materials	2.50	2	0.743		5.12	
Outdated sustainability solutions	2.45	2	0.717		4.86	
Inaccessible “green” solutions	2.29	2	0.797		4.58	
Poor human resources plan, which creates the need for additional engagement	3.04	3	0.833		2.67	
Poorly defined project scope/scope changes related to sustainability principles	2.94	3	0.877	22.662	2.62	0.009
Inefficient cooperation with clients/investors related to project goals and scope definition	2.86	3	0.828		2.45	
Inefficient communication with stakeholders	2.66	3	0.782		2.26	
Total				63.398		

Regarding the listed constraints, the first factor mostly encompasses a lack of resources (finance, knowledge, analyses, or solutions). There is a significant difference between these constraints (Friedman,  $p < 0.001$ ). The most critical ones that affect the sustainability of project management are *Financial constraints for the usage of sustainable solutions* and *Inconsistency of internal processes in the organization with elements of sustainable project management*. The research results are consistent with the conclusions of Ghisetti et al. [90], who consider finance to have a key role in determining the track toward a “green” economy and sustainable solutions. At the same time, they noticed financial barriers that contribute to the growing uncertainty of investing, non-competitive markets, technological obstructions, and so on. The first factor explains 35.736% of the total variability. The second factor encompasses poor communication, HR, and cooperation. The difference between these constraints are also statistically significant (Friedman,  $p = 0.009$ ). The most critical constraints are *Poor human resources plan, which creates the need for additional engagement* and *Poorly defined project scope/scope changes related to the inclusion of sustainability principles in the project management process*. This factor explains 22.662% of the variability that is not covered by the first factor. Accordingly, Agarwal and Kalmar [59] argue that, unless the project scope is precisely defined, the project will use resources inefficiently and create waste.



## 5. Conclusions

In addition to evaluating projects' results from the perspective of time, money, and quality, it is necessary to consider their impact on the environment. For that reason, there have been many surveys on the possibility of introducing the concept of sustainability into project management. Introducing sustainability dimensions relates to project management politics, processes, and procedures, which have social, environment, and financial aspects that ought to be in balance. Projects are managed using a certain methodology or approach, both in the public and private sector. Since there is an apparent growing interest in sustainable project management, it is necessary to explore and develop a practice for sustainable project management. Based on the research results, the authors of this paper analyzed the application of project management methodologies in different sectors, their support for introducing sustainability dimensions, the level of integration of sustainability dimensions with project management group processes, as well as the required knowledge and skills for sustainable project management in different sectors.

The results of the research have revealed that projects managed using a certain methodology were not inconsistent with internal processes that have elements of sustainability. Thus, it can be concluded that there is support for the introduction of sustainability when projects are managed using a certain methodology. The application of methodologies differs when it comes to sectors. The PMI methodology is more commonly used in the public sector, while the agile methodology and internally developed methodologies are more popular in the private sector. There is a more distinct need for completeness in scope management in the public sector than in the private sector. Furthermore, the public sector is characterized by a lack of knowledge and awareness of sustainability dimensions and "green" technologies and materials, and more often than not, it is also characterized by an unavailability of "green" solutions, compared to the private sector. The successful management of a project's scope is especially important for sustainable project management, since an inadequate understanding of the meaning of a sustainable project or process will have a negative impact on the scope definition, which will, in turn, lead to inefficiency.

Given that the project management process includes groups of subprocesses, to understand the correlation between project management and sustainability, the authors examined whether introducing sustainability has an equal influence within each group of subprocesses. Since the results showed that it has the highest impact on planning and execution processes, and the lowest impact on the initiation process, it was concluded that introducing sustainability does not have the same influence on all groups of subprocesses. For sustainable project management, it is important to understand these differences and to establish the right balance.

Introducing the social, environmental, and economic dimensions of sustainability into project management changes the level of responsibility and the set of competences required of the project manager. The project management orientation ceases to be short-term, and project managers become responsible for the sustainability of the project results and must consider all long-term impacts and effects. Furthermore, introducing sustainable project management changes the list of stakeholders; it becomes more comprehensive, which complicates the responsibility of project manager. Besides the need to be competent in the sense of having the knowledge, skills, and capabilities required for project management, sustainability in project management requires project managers to be ethical, righteous, and fair in managing projects.

When it comes to the knowledge and skills required of project managers for sustainable project management, the results of this paper have shown that communication and decision-making are of the highest rank. Therefore, it can be concluded that companies should pay attention to developing project managers' communication and decision-making knowledge and skills in order to improve the results of sustainable projects. Furthermore, resource management and quality management represent two of the most important knowledge areas. This finding indicates the conclusion that the project manager who manages a project in a sustainable manner must put the focus on the resources in the project, be informed and use "green" technologies and "green" solutions in order to contribute to

sustainability, and manage the required quality of project results through intensive communication with stakeholders. By analyzing the need for knowledge and skills within sectors, the research has shown that these needs are more pronounced in the public than in the private sector.

Considering the results of the research, the authors concluded that sustainability in project management is not a trick and that project managers today, both in the private and public sector, integrate sustainability into project management. Through the conducted research, we pointed out a wide range of possible areas for connecting sustainability and project management, which provides guidelines for future research and the deepening of existing knowledge. The conclusions of the paper can be useful for both organizations and project managers. Organizations need to understand that using a specific project management methodology provides a strong basis for introducing sustainability and better results in this regard. Moreover, project managers need to understand in which direction they need to develop their competencies in order to manage their projects in a sustainable manner.

The present research nonetheless has its shortcomings. The first is the absence of a hybrid approach in the questionnaire part dealing with the support for the introduction of sustainability dimensions into existing project management approaches. The reason for this is that the authors of this paper argue that the companies included in the research do not have enough understanding of the hybrid approach and sustainability dimensions. Therefore, only the approaches that are most commonly used by the examinees were included in the research. Realizing that there is a growing number of studies that pay attention to linking the hybrid approach and sustainability dimensions, the authors will analyze and explore the potential of a hybrid project management approach to sustainable project management. Additionally, future research will focus on different industries in order to analyze different aspects of the inclusion of sustainability in project management in companies from different industries. This is related to the conclusion of this research, where no significant difference between the private and public sectors was observed. The second limitation is the fact that the authors did not analyze individual agile methodologies, focusing instead on a general agile approach to project management, so the examinees could more clearly differentiate between the offered approaches. The future research will focus on the available and applicable agile methodologies. The third shortcoming consists of the fact that the competences of project managers for sustainable project management were considered, while the competences of other participants were not. The reason is that through this research, the authors aimed to analyze the roles and responsibilities of a project manager, as the participant who must adapt his or her competences, roles, and responsibilities the most in the context of introducing sustainability into project management. In future research, the authors will expand their research on the competences, roles, and responsibilities of other participants in sustainable project management and the associated changes that they must undergo. Future research will include different categories of competencies—contextual, behavioral, and technical—and will analyze their importance for sustainable project management and possible differences in this regard. We hope that this research will be useful for all interested parties in sustainable project management and that it will motivate them to conduct further researches in this new field.

**Author Contributions:** D.T.-N., M.T., V.O., M.D., and T.O. conceived and designed the questionnaire and carried out the survey; M.D. analyzed the data; D.T.-N., M.T., M.D., T.O., and V.O. wrote the paper and discussed and agreed to submit the manuscript. All authors have read and agreed to the published version of the manuscript.

**Funding:** This research received no external funding.

**Conflicts of Interest:** The authors declare no conflict of interest.

## Appendix A

Table A1. Survey items.

Tag	Survey Items
A	Application of following aspects of sustainable project management
a1	Project is approved, planned, and evaluated in accordance with financial and economic performances (ROI, NPV, profitability, added value, potential benefits)
a2	The impact on the environment has been assessed and evaluated (reduced use of natural resources, waste management, reduced pollution of the environment, legal regulations)
a3	Appropriate practices for human resources management in the project were selected and applied (health and security at work, employment, benefits, career development, connection with business partners and customers, local government, etc.)
B	Management of the following aspects of the project
b1	Project is approved, planned, and evaluated in accordance with financial and economic performances (ROI, NPV, profitability, added value, potential benefits)
b2	The impact on the environment has been assessed and evaluated (reduced use of natural resources, waste management, reduced pollution of the environment, legal regulations)
b3	Appropriate practices for human resource management in the project were selected and applied (health and security at work, employment, benefits, career development, connection with business partners and customers, local government, etc.)
C	Significance of the sustainable project management principles for sub-processes
c1	Initiation – development of the project idea, description of the project scope, and outputs of phases or projects
c2	Planning – definition of the project goals, plan of the project activities, resources, and costs
c3	Execution – planned project activities are executed by engaging people and other resources
c4	Control – a process of continuously monitoring and measuring the progress in a project and identification of the gap between the planned and actual situation
c5	Closure - a process that formalizes the acceptance of products, services, or results and terminates the project and/or phase
D	The need for the following knowledge and skills for sustainable project management
d1	Integration management
d2	Scope management
d3	Schedule management
d4	Cost management
d5	Quality management
d6	Resource management
d7	Communication management
d8	Risk management
d9	Procurement management
d10	Stakeholder management
d11	Technical skills
d12	Analytical skills
d13	Business orientation
d14	Decision-making
d15	Teamwork
d16	Leadership
d17	Delegation
d18	Problem-solving
d19	Communication
d20	Ethics
d21	Creativity
E	Project-specific constraints
e1	Inefficient cooperation with a client/investor in the process of determining the project goals and project scope definition
e2	Poorly defined project scope/scope changes related to the inclusion of sustainability principles in the project management process

Table A1. Cont.

Tag	Survey Items
e3	Lack of knowledge about sustainability principles, “green” technologies, and materials
e4	Lack of the analysis of sustainable solutions in the process of project preparation and planning
e5	Inefficient communication with stakeholders
e6	Inaccessible “green” solutions
e7	Financial constraints on the use of sustainable solutions
e8	Poor human resources plan, which creates the need for additional engagement
e9	Sustainable solutions that will become outdated in the long term
e10	Lack of benefit analysis for third parties, on whom the project can have an impact
e11	Inconsistency of the internal processes in the organization with elements of sustainable project management
e12	Inconsistency of the corporate strategy and/or corporate social responsibility strategy with elements of sustainable project management
e13	Insufficient legal regulations
e14	Lack of incentives (subsidies)

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