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Sustainability in Project Management Practices

Inês Soares [1], Gabriela Fernandes [1,*] and José M. R. C. A. Santos [2,3]

[1] Centre for Mechanical Engineering, Materials and Processes CEMMPRE, Department of Mechanical Engineering, University of Coimbra, 3030-788 Coimbra, Portugal; ines.soares@uc.pt
[2] Centro de Investigação de Montanha (CIMO), Instituto Politécnico de Bragança, Campus de Santa Apolónia, 5300-253 Bragança, Portugal; josesantos@ipb.pt
[3] Laboratório Associado para a Sustentabilidade e Tecnologia em Regiões de Montanha (SusTEC), Instituto Politécnico de Bragança, Campus de Santa Apolónia, 5300-253 Bragança, Portugal
* Correspondence: gabriela.fernandes@dem.uc.pt

Abstract: The intersection between sustainability and project management has received significant attention as organizations recognize the criticality of incorporating sustainability practices into their projects. However, incorporating sustainability considerations presents some challenges, requiring the development and adoption of methods, tools and techniques tailored to address sustainability at the project level. Against this backdrop, this study endeavors to develop an understanding of the effective incorporation of sustainability within projects through the micro-level perspective of practices. An online survey was developed based on a comprehensive literature review of which a total of 107 valid responses were collected and analyzed. The results show the most useful sustainable project management practices perceived by experienced project professionals, including 'Sustainability team management', 'Lessons learned towards sustainability' and 'Sustainability risk register', among others. However, a data analysis reveals a prevailing trend marked by the limited perceived usefulness of sustainability practices in the context of project management. Furthermore, through exploratory factor analysis, a clear classification of sustainable project management practices was identified, according to the specific phases of the common project management lifecycle: 'Initiation and planning', 'Execution, monitoring, controlling and replanning' and 'Closure'. By providing a set of sustainable project management practices and identifying the underlying factors that elucidate the incorporation of sustainable project management practices across the project management lifecycle, this study extends a guiding hand to practitioners in pursuing successful sustainability integration in their projects. It vividly illustrates that sustainability can be readily incorporated into project-management processes, delivering sustainable products and/or services in a sustainable way, combining both the 'sustainability of the project' and 'sustainability by the project' perspectives.

Keywords: sustainable project management; sustainable project-management practices; project-management lifecycle

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1. Introduction

Nowadays, sustainability is considered one of the most critical project-management (PM) trends [1]. Projects and PM play a crucial role in driving change towards sustainability, as they directly interact with society and shape the future by transforming today's objectives into future achievements [2–5]. They not only contribute to the sustainable development of organizations but also have a significant impact on the surrounding environment and communities [2,6].

Traditionally, the sustainability discourse in projects focused on the development of sustainable deliverables. However, a compelling need has arisen for Sustainable Project Management (SPM), a paradigm that transcends the deliverables and entails the effective management of projects in a sustainable manner [2]. Nevertheless, despite the growing significance of sustainability in PM, the concept of SPM remains relatively uncharted [4,7].

Notably, the majority of the studies in this domain are qualitative, revealing a distinct lack of representation of quantitative research [4]. The scarcity of quantitative empirical analyses underscores a critical gap in the literature, emphasizing the pressing need for quantitative empirical studies to advance the understanding of sustainability in PM [8].

As sustainability reshapes the PM profession, an urgent demand has emerged for practical methods, tools and techniques tailored to assess sustainability at the project level [5,9,10]. Current frameworks and widely adopted bodies of knowledge, such as the PMBoK from the Project Management Institute, the IPMA Individual Competence Baseline and PRINCE2, often prove inadequate in addressing social and environmental considerations, falling short in the seamless integration of sustainable development objectives within the project context [3,9,11].

Furthermore, Silvius [12] aptly emphasized the imperative for researchers, authors and standards to distill sustainability aspects into practical tools to empower project managers to effectively address sustainability in PM processes. In addition to developing instruments, there exists a compelling need to educate project managers and foster sustainability competencies among practitioners.

Therefore, this paper endeavors to address the pressing need for practical guidance in SPM by fulfilling two research objectives: (1) identify key SPM practices and (2) categorize the SPM practices. Specifically, this paper aims to address the following: what are the key SPM practices that enable the integration of sustainability into PM throughout the PM lifecycle? By having a micro-level perspective on SPM practice perception of practical usefulness for which there is limited understanding, this study aims to support organizations in effectively incorporating sustainability concerns and implementing SPM practices, ultimately contributing to the successful delivery of projects that include sustainability concerns. These endeavors are underpinned by empirical data gathered from PM professionals, offering actionable insights to bridge the critical gap in SPM practice.

To set the stage for the attainment of these two objectives, this paper begins with a comprehensive literature review casting a spotlight on the domain of SPM practices. Herein, SPM practices encompass the methods and approaches used by project practitioners to execute PM processes, along with the behaviors embraced to promote sustainability within projects. The theoretical background underpins the subsequent development of a questionnaire, designed to glean empirical insights from PM professionals. Subsequently, the paper presents the questionnaire data analysis and thoroughly discusses the key findings. Finally, the paper ends with concluding remarks, identification of limitations and recommendations for future research endeavors.

2. Literature Review

2.1. Sustainable Project Management

The intersection of sustainability and PM, known as SPM, is considered a new perspective that examines projects from a societal, economic and environmental standpoint [5]. Thus, sustainability is frequently associated with the triple bottom line criteria. However, the context of PM adds additional dimensions to the understanding of sustainability's impact, including values, time, geographical factors, performance, stakeholder participation, waste management, transparency, accountability, culture, risk reduction and political aspects [13].

Silvius and Schipper [13] proposed a comprehensive definition for SPM: "the planning, monitoring, and controlling of project delivery and support processes, with consideration of the environment, economic, and social aspects of the life cycle of the project's resource, processes, deliverables, and effects, aimed at realizing benefits for stakeholders, and performed in a transparent, fair and ethical way that includes proactive stakeholder participation". This definition highlights the need for a departure from traditional PM practices, as they often fall short of meeting the fundamental principles of sustainability [4].

The concept of SPM has been subject to some ambiguity, leading to some difficulties in distinguishing projects that deliver products and/or services sustainably from projects that

develop and deliver sustainable deliverables. To address this, Huemann and Silvius [2] proposed differentiating 'sustainability by the project' from 'sustainability of the project'. The former denotes projects delivering sustainable goods and/or services, acting as tools for implementing and delivering sustainability solutions through their deliverables. On the other hand, the latter refers to projects that adopt sustainable approaches in their processes, recognizing the value that SPM brings to organizations or society, regardless of the deliverables [2,4].

Therefore, the prior definition emphasizes that SPM involves incorporating sustainability into the processes and practices of PM. The 'impact areas', i.e., the PM areas where sustainability has significant influence over the processes or practices of PM [13] are identified in several studies, including project context recognition [14], stakeholder identification and engagement [11,15], business case [16], project team selection and organization [13], project schedule [13], procurement [9,17], risk identification and management [18], project communication [19], project reporting [20] and organizational learning [13,21]. In essence, sustainability affects virtually all aspects of PM from project initiation to its closure. Sustainability integration into PM processes offers opportunities for innovation and competitive advantages. By incorporating SPM practices into daily operations and strategic objectives, organizations contribute to societal and environmental well-being while also generating economic value [22–24]. However, this integration presents challenges and new responsibilities for project managers, requiring the development of new competencies for them to be able to assess the sustainability of their projects [12,25]. The paradigm shift associated with prioritizing economic, environmental and social impacts in/of PM requires project managers to think beyond conventional boundaries, communicate openly and embrace a flexible and complex approach to address the sustainability aspects of projects effectively [22].

Despite the increasing focus on sustainability in PM, Økland [7] noted a disparity between the content documented in existing literature and the actual practices implemented. More recently, in a study conducted by Magano et al. [26], it was identified that the incorporation of sustainability considerations in projects is still at a premature stage. The authors concluded that this level of consideration is somewhat surprising given the growing emphasis on sustainability in academic research. This discrepancy is attributed to the ambiguity of the sustainability concept, requiring particular skills and competencies from project managers and practitioners to determine the dimensions contributing to sustainability in practical project scenarios [17]. Integrating sustainability and PM calls for practical knowledge, tools and instruments capable of articulating sustainability in operational contexts [3,27]. Without sufficient guidance on the integration of sustainability criteria and PM processes, many organizations are struggling to effectively manage projects [28], often defaulting to conventional PM practices [29].

2.2. Sustainable Project Management Practices

The following sections aim to explore and summarize the existing knowledge on SPM practices aligned with the description above, focusing on the initiation, planning, execution, monitor and control, and closure phases of projects.

2.2.1. Initiation Phase

Typically, project initiation begins with the establishment of a business case, which includes project justification, cost–benefit analysis and underlying assumptions, to determine the viability of investing in a specific business need [30]. While financial business cases are commonly used to justify projects, it is crucial to consider non-financial factors, including social and environmental aspects, to ensure the long-term economic, environmental and social impacts of the project [31]. Traditional financial metrics, such as cash-flow and payback period, are inadequate in capturing environmental and social factors [5]. Therefore, it is imperative for the project's business case to encompass the Triple Bottom Line criteria, considering economic, environmental and social benefits [13].

Additionally, during the initiation phase, it is essential to gain a comprehensive understanding of the project's context to align with the project objectives, stakeholders and the project environment [30]. This understanding entails integrating sustainability dimensions that align with the Triple Bottom Line criteria [13].

The determination of project objectives is also a significant activity during project initiation. Labuschagne and Brent [14] emphasize the challenge of aligning operational processes with sustainable development objectives. The authors highlight the need for PM documents, such as the project charter, explicitly addressing sustainable development objectives, including social equity, economic efficiency and environmental performance, to ensure project participants are aware of and committed to these objectives.

Identifying stakeholders is a crucial step in stakeholder engagement, starting before or during the project initiation and continuing throughout the project [32]. To address sustainability, it is important to select stakeholders who represent the environmental and social aspects of the project, such as environmental protection groups and human rights organizations [13,33].

2.2.2. Planning Phase

The planning phase of a project involves various processes aimed at establishing the project's scope, revising objectives and determining the necessary actions for the intended outcomes [32]. Among these processes, risk management needs to evolve to include the identification of environmental and social risks and opportunities [5,18].

Considering the project's impact is also vital during the planning phase, particularly in accounting for environmental and social impacts alongside financial impacts. Understanding how the project affects the community, including aspects such as health, safety and education, contributes to long-term project performance and enhances the quality of life for those directly affected [10]. Environmental and social impact assessments, as part of sustainability policies, play a role in promoting project sustainability within the project's geographic and local context [17]. Therefore, projects with significant environmental and social impacts often require environmental and social impact assessments during the preparation and design phases.

The planning phase also encompasses project schedule management and procurement management processes. SPM encourages the development of sustainable schedules to minimize waste, not only in terms of materials but also in idle resources and waiting times [13]. Procurement management presents an opportunity to integrate sustainability considerations by selecting suppliers based on their sustainability performance and adopting waste reduction strategies [13]. Therefore, organizations should reflect their values in procurement contracts, adapting their procurement processes and criteria to align with their sustainability goals and vision by assessing supplier evaluations for sustainability criteria, encoding sustainability obligations in contracts and ensuring transparency throughout the supply chain [33]. Green procurement is the concept that incorporates these sustainability aspects and can be achieved through the development of procurement management plans that include relevant information about resource acquisition and integration [30].

Effective communication management and stakeholder management processes are critical in the development of SPM, with transparency and proactive communication and engagement being key. Project managers are encouraged to engage with various stakeholders, consider their needs and interests, properly communicate with them and foster their active participation [13,33]. Concerning communication management processes, planning communication requires project managers to understand how to communicate with the stakeholders, what to communicate and who to communicate with [13]. Following the principle of transparency, in the realm of SPM, communication should be open and proactive.

In the context of stakeholder management, two approaches can be distinguished: "management of stakeholders" and "management for stakeholders" [11]. The first approach views stakeholders as resources to achieve project objectives, while the second approach recognizes stakeholders' interests and rights, promoting both their participation

and dialogue throughout the project [11]. According to the same authors who identify the previous difference, traditional PM treats stakeholders' issues following the "management of stakeholders" approach. Enhancing stakeholder engagement and participation is essential for effective SPM, hence, in order to transition from a traditional PM that treats stakeholders as resources to SPM, towards involving stakeholders and entail their active participation in various project activities, including requirement definition, cost–benefit assessment, project planning, risk identification and project reporting in project objectives, a paradigm shift is required [9,27,34]. Tools, such as the P5 Standard have been developed for stakeholder engagement within the framework of SPM standards, demonstrating its effectiveness in enhancing stakeholder benefits [34]. In addition, Silvius and Schipper [15] have made efforts to integrate sustainability and project stakeholder management by developing practical tools and frameworks that enable project managers to identify and assess stakeholders as well as to plan stakeholder engagement activities.

To effectively address sustainability in a project, it is recommended to develop a dedicated Sustainability Management Plan, separate from standard project plans, specifically focused on sustainability considerations [35]. The Sustainability Management Plan outlines sustainable objectives, identifies necessary activities, assigns responsibilities and integrates sustainability considerations into overall project planning [35]. The plan takes into account the project's context, including stakeholder interests and the organization's sustainability strategy, setting it apart from previous approaches that primarily focused on the project itself [36].

2.2.3. Execution, Monitor and Control Phase

The execution, monitoring and control phase of PM encompasses processes necessary for completing the work outlined in the previous phase and ensuring adherence with project specifications [30].

The significance of green procurement, previously discussed in the planning phase, extends to supplier selection, providing an opportunity to integrate sustainability by considering potential suppliers' sustainability performance [9]. Aarseth et al. [17] highlight the importance of developing sustainable supplier practices, whereby organizations support suppliers with guidance to implement sustainability measures such as minimization of resources, reuse, environmental protection and socio-economic uplift. However, finding suppliers aligned with sustainability objectives remains challenging, particularly due to the considerable expenses associated with choosing environmentally friendly equipment and materials [9].

Effective project team management is vital in PM, given that projects are fundamentally executed by project teams. Enhancing team competencies, fostering interaction among team members and cultivating a conducive team environment all contribute to enhance teamwork, interpersonal skills and project performance [32]. Therefore, project managers strive to develop high-performing and goal-oriented project teams. In this context, developing sustainability competencies to increase knowledge related to sustainability and sustainability issues, for example through training programs, can enhance a project team's sustainability performance [17,20]. Moreover, project managers should include social sustainability aspects into team management practices, in addition to enhancing team competencies and fostering a motivating environment [13,33]. This entails addressing work-life balance, equity, quality of the work environment, education, ethics and worker rights, while managing the team [10].

In terms of project operations and technologies, Martens and Carvalho [37] found that organizations prioritize greener practices to reduce energy consumption, carbon emissions and waste generation. This often involves embracing eco-friendly alternatives such as natural lighting and ventilation. Furthermore, Carvalho and Rabechini [9] highlight in their checklist the importance of incorporating clean technologies in product development and project implementation. In this context, environmental technologies are defined as

leveraging knowledge to optimize natural resource usage, minimize waste, mitigate risks and decrease pollution [38].

The same checklist emphasizes the implementation of the Design for Environment approach during project development. Design for Environment, also referred to as Eco-design, plays a significant role in positively improving environmental impacts by considering the entire lifecycle of a product and its environmental aspects throughout each stage of the process [3,9]. To bridge the gap and address economic and social aspects alongside environmental ones, the concept of 'design for sustainability' emerged, integrating all dimensions in project design [3].

Embracing a culture of lifecycle thinking becomes essential to emphasize sustainability in project design and tackle sustainability challenges in PM. This involves acknowledging the various lifecycles involved in a project, including the project lifecycle, process lifecycle and product lifecycle, to ensure sustainability considerations are incorporated [14,39]. Value management and Life Cycle management are two methods employed to underscore sustainability in project design, with Life Cycle Assessment (LCA) serving as an analytical tool for evaluating a product's environmental impact throughout its entire lifespan [3]. Therefore, it is imperative to consider innovative approaches for project deliverables to contribute to a more sustainable society and be designed with sustainability considerations spanning short-, medium- and long-term horizons [40].

To assess the sustainability performance of implemented projects, organizations frequently establish indicators for economic, environmental and social impacts. Sustainability indicators are used to ensure adherence to sustainable development principles and measure the success of projects [14]. Martens and Carvalho [37] reported that all interviewed enterprises used sustainability indicators as methodologies, crediting project success to their application. Most organizations in the study adopted indicators sourced from frameworks such as the Global Reporting Initiative, which offers an extensive set of indicators. Meanwhile, the remaining organizations used indicators specific to their projects [37].

Understanding the various lifecycles within a project is essential for identifying appropriate sustainability indicators [14]. Several authors have devised frameworks and methodologies for deriving sustainability indicators. For instance, Labuschagne and Brent [39], identified a deficiency in social factors and indicators for assessing the social impact of projects in comparison to environmental indicators. To bridge this gap, they introduced a Social Impact Indicator (SII) procedure grounded in a Life Cycle Impact Assessment (LCIA) method. This approach considers the lifecycles of the project, process and product to generate economic and environmental indicators for measuring the sustainability performance of operational activities.

As projects progress, project reports serve as a formal means of communicating relevant information to stakeholders. Integrating sustainability aspects into project processes necessitates reporting on these aspects throughout the project's duration [13]. In this regard, Sustainability Reporting provides organizations with a specialized project report, facilitating the visualization of sustainability performance and the impacts arising from their daily operations [20]. This comprehensive approach to reporting contributes to greater accountability and transparency in sustainability practices.

2.2.4. Closure Phase

The ultimate process group encompasses all PM processes conducted to appropriately complete or close a project, phase or contract [30].

Evaluating project success is crucial. Traditionally, success has been evaluated based on conventional metrics such as quality, scope, time and cost. However, it should incorporate additional dimensions alongside traditional metrics to tailor success evaluation to specific projects, such as environmental and social criteria to integrate sustainability aspects of the project [9].

Projects provide valuable opportunities for continuous learning, and lessons learnt play a critical role in improving future project processes and outcomes [10]. Silvius and

Schipper [13] emphasize the importance of organizational learning from finished projects to achieve sustainability objectives, such as waste reduction, energy usage and resource and material reuse. Learning from projects is essential to improve sustainability assessment and performance in future endeavors [21].

In summary, this literature review provides an overview of SPM practices across the PM lifecycle, highlighting the integration of sustainability considerations in each phase of the project. The findings underscore the need to align project objectives with the Triple Bottom Line criteria, engage sustainability stakeholders, incorporate environmental and social factors into risk assessments and procurement practices, adopt sustainable scheduling and waste reduction strategies, integrate sustainability into project team management, develop sustainability competencies within project teams, adopt green project operations, apply Design for Environment principles and lifecycle thinking, use sustainability indicators and promote organizational learning through lessons learned.

Furthermore, it is noteworthy that these SPM practices can be further differentiated by approach: 'sustainability by the project' or 'sustainability of the project'. This distinction provides a nuanced perspective on how these practices contribute to either the sustainability of the project's deliverable or to the sustainable management of the project. For a clearer and more organized overview, the SPM practices are summarized and signalized (X) by their respective approaches in Table 1.

Table 1. SPM practices.

'Sustainability by the Project'	*'Sustainability of the Project'*	**SPM Practice**	**References**
		Initiation	
	X	1. Inclusion of environmental, social and financial benefits in the business case.	[5,13,16]
	X	2. Recognition of sustainability dimensions of the project when formalizing the project initiation document.	[13]
	X	3. Incorporation of sustainable development objectives into project objectives.	[3,10,14,17]
	X	4. Identification of 'sustainability stakeholders'.	[11,13,15]
		Planning	
	X	1. Identification of environmental and/or social risks and opportunities.	[5,18]
	X	2. Consideration of environmental and/or social impacts of the project.	[10,17,39]
	X	3. Integration of environmental and/or social aspects in the project's objective, outputs and outcomes into requirements documentation.	[5,10,13,17]
	X	4. Development of sustainable scheduling.	[13]
	X	5. Commitment to green procurement.	[3,9,13,40]
	X	6. Proactive and open communication.	[10,13,19]
X		7. Selection of sustainable approaches for the way products and services are delivered.	[40]
	X	8. Management of project stakeholders considering sustainable development principles.	[5,9,11]
	X	9. Establishment of a SMP to define how sustainability is addressed in the project.	[35,41]
		Execution, Monitor and Control	
	X	1. Selection of suppliers considering their sustainability performance.	[9,13,17]
	X	2. Inclusion of social sustainability aspects in the organization and management of the project team.	[10,13]
	X	3. Development of team members' sustainability competencies to increase knowledge and awareness on sustainability issues.	[17,20]
X		4. Adoption of greener practices on project operations.	[37]
X		5. Application of environmental technologies to the project and product development.	[9,40]

Table 1. *Cont.*

'Sustainability by the Project'	*'Sustainability of the Project'*	SPM Practice	References
X		6. Emphasize sustainability in project design by applying value management and lifecycle assessment/management methods during project development to improve the project's sustainable performance (design for sustainability).	[3,9,17]
X		7. Design project deliverables to be sustainable in the short-, medium- and long-term.	[9,40]
	X	8. Measurement of the sustainability performance of operational activities applying sustainability indicators.	[14,37,39,42,43]
	X	9. Creation of a Sustainability Report to visualize sustainability performance and impacts resulting from everyday activities.	[20]
		Closure	
	X	1. Evaluation of project success in terms of economic, environmental and social performance.	[13,44]
	X	2. Registration of lessons learned including the economic, environmental and social aspects.	[13,21,45]

3. Research Methodology

The methodological choice for this study was a mono-method quantitative research using an online questionnaire survey. The survey-based research was selected to investigate the perceived usefulness of the SPM practices identified from the literature review.

The research process began with a literature review using the Web of Science and Scopus databases. The questionnaire was developed and distributed to professionals involved in projects. The collected data underwent statistical analysis, and finally, the findings were compared with existing literature to draw conclusions.

3.1. Data Collection

The questionnaire was designed on LimeSurvey. The questionnaire underwent a pilot test, where experienced PM professionals provided feedback to improve its length, clarity and potential ambiguities. The questionnaire was revised based on feedback, resulting in a refined final version.

This meticulous approach ensured the questionnaire was well-constructed, user-friendly and capable of capturing the required data effectively. The iterative process of evaluation and refinement enhanced its quality and validity. The questionnaire was made available on a web link, for respondents to complete from November 2022 to April 2023, allowing for a sufficient data collection period.

In the questionnaire, respondents were asked to identify the level of usefulness of the practices for the improvement of sustainability in projects according to a 5-point Likert scale. The level of usefulness was measured from "1—Very low" to "5—Very high". Additionally, respondents were able to select the option "0—no opinion". Furthermore, respondents were asked to provide information about themselves, including various demographic and professional data. Table 2 presents an overview of the questionnaire, including the 25 survey items related to the SPM practices.

A snowball sampling technique was employed to cover PM practitioners worldwide. This approach involved initiating contact with a core group of individuals within the target population, who were then asked to refer other potential participants. Due to the nature of this method, which relies on referrals and network connections, the traditional response rate cannot be calculated. Initially, a database of approximately 3000 email contacts representing PM professionals all over the world was used to invite respondents via personalized emails. To expand reach, social media such as LinkedIn was used in the second phase of contacting professionals. Over 600 personalized messages were sent to individuals with LinkedIn

profiles aligning with the target population, aiming to increase the response rate and ensure diversity among participants.

Table 2. Questionnaire Statements.

SPM Practice	Statements	Variable
Initiation		
Sustainability Business Case	Inclusion of environmental and/or social benefits beyond financial benefits in the business case.	A11
Sustainability project dimensions	Recognition and integration of sustainability dimensions when formalizing the project initiation document, for example, in the project charter (e.g., information on short-term and long-term orientation, and on local and global orientation).	A12
Sustainable development objectives	Integration of sustainable development objectives, encompassing social equity, economic efficiency and environmental performance, into project objectives, such as within the project charter.	A13
Sustainability stakeholders register	Identification of 'sustainability stakeholders' in the stakeholder register (e.g., environmental protection groups, end-user groups).	A14
Planning		
Sustainability risks register	Identification of environmental and/or social threats and opportunities, for example in the risk register.	A21
Sustainability impacts assessment planning	Consideration of environmental and/or social impacts through tasks dedicated to aspects such as environmental impact assessments, social impact assessments and lifecycle impact assessments.	A22
Sustainability requirements	Integration of environmental and/or social aspects of the project's objectives, outputs and outcomes into requirements documentation (e.g., reduce carbon emissions, reduce resource usage and waste production, etc.).	A23
Scheduling towards sustainability	Development of sustainable scheduling (e.g., reduce waste by minimizing idle resources and waiting times).	A24
Green procurement	Commitment to green procurement in the procurement management plan (e.g., take into consideration sustainability aspects when selecting products, materials and suppliers).	A25
Communication towards sustainability	Proactive and open communication to ensure that stakeholders are well informed on the sustainability aspects and performance of the project, for example through project reports, presentations, lessons learned, etc.	A26
Sustainable delivering approaches	Selection of sustainable approaches for the way products and services are delivered (e.g., e-commerce), considering both their use and servicing during the expected lifespan.	A27
Sustainability stakeholders management plan	Management of project stakeholders considering sustainable development principles (e.g., considering and balancing the stakeholder's economic, environmental and social interests).	A28
Sustainability Management Plan	Establishment of a SMP to define how sustainability is addressed in the project (i.e., a document used to define sustainability objectives, identify the activities to achieve those objectives, identify key stakeholders, assign responsibilities and integrate the focus on sustainability within the overall plan).	A29
Execution, Monitor and Control		
Sustainable suppliers	Selection of suppliers considering their sustainability performance.	A31
Sustainability team management	Inclusion of social sustainability aspects in the organization and management of the project team (e.g., health and safety, equal opportunity, work conditions, diversity and job opportunities, life-work balance, etc.).	A32
Sustainability competencies	Development of team members' sustainability competencies to increase knowledge and awareness on sustainability issues, for example through sustainability training programs.	A33
Green project operations	Adoption of greener practices (e.g., natural lighting, natural ventilation, recycling, etc.) on project operations.	A34
Green technologies	Application of environmental/green technologies to the project and product development.	A35
Design for sustainability	Emphasize sustainability in project design by applying value management and lifecycle assessment/management methods during project development to improve project's sustainable performance (design for sustainability).	A36

Table 2. *Cont.*

SPM Practice	Statements	Variable
Sustainable deliverables development	Development project deliverables to be sustainable in the short-, medium- and long-term.	A37
Sustainability performance indicators	Measurement of the sustainability performance of operational activities applying sustainability indicators.	A38
Sustainability reporting	Creation of a Sustainability Report to visualize sustainability performance and impacts resulting from everyday activities.	A39
Closure		
Sustainability project success report	Evaluation of project success in terms of economic, environmental and/or social performance.	A41
Sustainability transition plan	Development of an action/transition plan for assessing and communicating the economic, environmental and social benefits of the project once it is closed (in the medium- and long-term).	A42
Lessons learned towards sustainability	Registration of lessons learned including the economic, environmental and/or social aspects.	A43

During the five-month time window, 107 valid responses were collected. It is noteworthy that the number of responses falls below the minimum sample size required for generalization for 'infinite' population sizes, which is 377 responses at a confidence level of 95 percent with a margin of error of ±5 percent [46]. While a higher number of completed responses would have been preferred, it is important to acknowledge the common time constraints faced by PM professionals.

3.2. Data Analysis

The data collected from the questionnaire was analyzed using SPSS v28.0.1.0 software to undertake descriptive statistics of the variables surveyed and EFA to categorize the variables in factors.

In this research study, EFA was employed to understand the underlying factors influencing SPM practices. EFA helps uncover latent structures and dimensions contributing to variation in observed variables. The step-by-step process of conducting EFA includes: determining factorability by checking correlation coefficients, performing the Kaiser-Meyer-Olkin (KMO) test and Barlett's test of sphericity; factor extraction using Principal Component Analysis (PCA); selecting factors using methods such as scree plot and Kaiser's eigenvalue criteria; factor rotation using varimax rotation; examining factor loadings; performing reliability analysis using Cronbach's alpha; and interpreting the results based on loadings, structure and conceptual understanding. This comprehensive process allows for the identification of meaningful factors and their implications for the research objectives.

4. Results

4.1. Descriptive Results

4.1.1. Data Characterization

The PM professionals consisted of project managers (77.57%), portfolio and program managers (37.38%) and project team members (27.10%). Demographically, the majority of respondents were male, and the largest percentage (30.84%) fell within the 36 to 45 years age group. Over 50% of the respondents had more than 7 years of experience as project managers, almost 50% had similar experience as project team members and nearly 30% had over 7 years of experience as portfolio and program managers. These findings indicate that the respondents have a high level of expertise and are reliable respondents. Table 3 provides more details on respondents' demographics.

Table 3. Key respondents' characteristics.

Gender	Age	Academic Qualifications
80% Male 20% Female	>55 years: 15.89% 46–55 years: 24.30% 36–45 years: 30.84% 26–35 years: 25.23% <25 years: 3.74%	PhD: 12.15% MSc: 60.75% Postgraduate: 16.82% Undergraduate: 8.41% Technical degree: 1.87%

The respondents were distributed across various sectors of activity with the information and technology (IT) sector emerging as the most represented. Nearly half of the respondents reported typical project budgets exceeding EUR 1,000,001. Interestingly, respondents involved in projects with budgets greater than EUR 5,000,001 were primarily from large enterprises, while those with budgets below EUR 50,000 were more common in small and medium-sized enterprises.

Furthermore, the existence of Project Management Offices (PMOs) was reported by 75.70% of the respondents' organizations with only 1% being unaware of their presence, indicating a widespread recognition of the value of centralized entities in overseeing and supporting PM practices.

4.1.2. SPM Practices Usefulness

All the SPM practices were initially gathered in process groups based on the PM lifecycle: 'Initiation', 'Planning', 'Execution, Monitor and Control' and 'Closure', to identify the most useful SMP practices. The mean, median, mode and standard deviation are presented in Table 4 (in decreasing order of respondent scoring), for the usefulness of the practices surveyed.

Table 4. Descriptive statistics of the SPM practices usefulness.

Phase	SPM Practice	Mean	Standard Deviation	Median	Mode
E	Sustainability team management	3.59	1.366	4.00	4
C	Lessons learned towards sustainability	3.56	1.183	4.00	4
C	Sustainability project success report	3.54	1.101	4.00	4
P	Sustainability risks register	3.53	1.067	4.00	3
I	Sustainability Business Case	3.47	1.216	4.00	4
I	Sustainability project dimensions	3.47	1.144	4.00	4
P	Scheduling towards sustainability	3.45	1.292	3.00	4
E	Green project operations	3.40	1.466	4.00	4
P	Communication towards sustainability	3.39	1.250	3.00	3
I	Sustainable development objectives	3.37	1.263	4.00	4
P	Sustainability requirements	3.37	1.350	4.00	4
E	Sustainable deliverables development	3.36	1.416	4.00	4
E	Green technologies	3.31	1.376	4.00	4
P	Green procurement	3.30	1.368	4.00	4
P	Sustainability impacts assessment planning	3.24	1.227	3.00	4
E	Sustainable suppliers	3.23	1.271	3.00	4
E	Sustainability competencies	3.23	1.278	4.00	4
I	Sustainability stakeholders register	3.20	1.404	4.00	4
E	Sustainability transition plan	3.15	1.366	4.00	4
E	Design for sustainability	3.12	1.509	4.00	4
P	Sustainable stakeholder management plan	3.09	1.350	3.00	4
P	Sustainable delivering approaches	2.97	1.463	3.00	4
E	Sustainability performance indicators	2.95	1.349	3.00	4
P	Sustainability Management Plan	2.83	1.470	3.00	3
E	Sustainability reporting	2.65	1.505	3.00	4

Note: I—Initiation; P—Planning; E—Execution, monitor and control; C—Closure.

The mean values range from 2.65 to 3.59. The standard deviations range from 1.067 to 1.509, indicating limited variation in the responses. 64% of the median values are 4, with the remaining values being 3. The most frequent response (mode) is 4 (92%).

The interpretation of the results is straightforward. 'Sustainability team management' is considered the most useful practice. Conversely, 'Sustainability reporting' receives the lowest rating, suggesting that this practice is the least useful according to the respondents' perspective.

Figure 1 shows the top 10 most useful SPM practices. It is worth noting that the top 10 covers all phases of the typical PM lifecycle. The 'Initiation' phase and the 'Planning' phase are the most significant ones with three practices each.

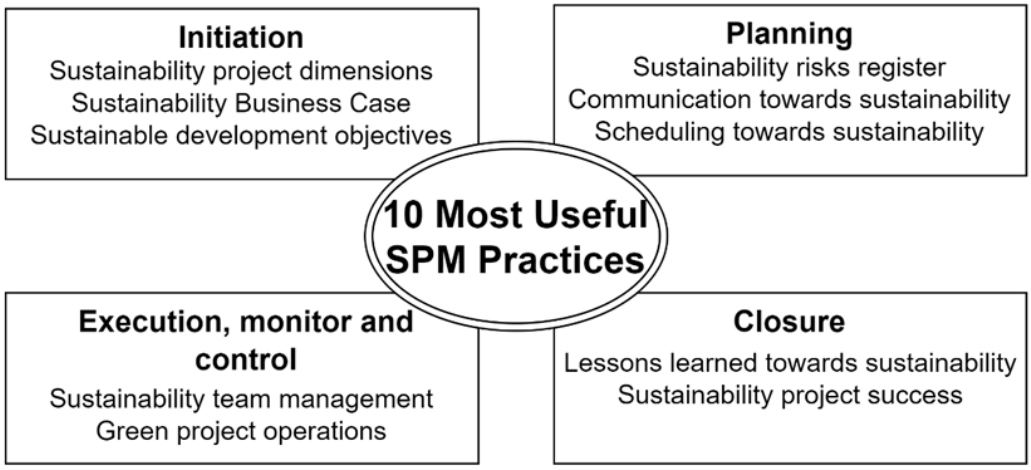

Figure 1. Top 10 most useful SPM practices.

4.2. Exploratory Factor Analysis

The application of factor analysis underwent a series of iterative developments. The initial correlation matrix revealed that most correlation coefficients were above 0.3, except for 'Scheduling towards sustainability' (A24). Communality analysis also identified variables A24 and A26 ('Communication towards sustainability') with communalities lower than 0.5. Subsequently, these variables were excluded from further analysis based on the following rationale:

- Upon their removal, the Kayser–Meyer–Olkin (KMO) score slightly decreased from 0.905 to 0.902, indicating a small impact on the intercorrelation among the variables, but still reflecting strong interrelationships and excellent suitability for conducting EFA. Additionally, the Bartlett's test of sphericity was found to be significant, further confirming the adequacy of the dataset after excluding A24 and A26.
- Although four components emerged with eigenvalues exceeding one, only three factors meaningfully contributed to more than 5% of the variance. While the eigenvalue criteria suggest the retention of all factors with an eigenvalue of more than one, some scholars recommend considering factors that contribute to at least more than 5% of the variance (Singh, 2020).
- A closer examination of the rotated component matrix revealed the emergence of four factors, but the fourth factor contained only two meaningful factor loadings, falling short of the recommended threshold of three loadings. Consequently, variables A24 and A26 were excluded from the analysis due to doubts regarding their alignment with the intended constructs.

With the revised set of variables, the factor analysis was re-executed using the Principal Component Analysis extraction. All variables exhibited communalities above the 0.5 threshold, except for variable A32 ('Sustainability team management'). This variable was also excluded from the analysis due to its low explanatory power. After its removal, the KMO score achieved significance with a value of 0.899 and Bartlett's test was likewise satisfied.

The Principal Component Analysis and Varimax rotation were applied to extract the factors explaining the remaining variables. Three factors with eigenvalues greater than one explained 62.847% of the variance. The rotated component matrix showed substantial contributions from all variables to the identified factors, as detailed in Table 5, which displays the factor loadings post-rotation alongside the communalities of each variable.

Table 5. EFA results.

				Exploratory Factor Analysis Factors		
Phase	**ID**	**SMP Practice**	**Communalities**	**'Execution, Monitoring, Controlling & Replanning' (FA1)**	**'Initiation and Planning' (FA2)**	**'Closure' (FA3)**
I	A11	Sustainability Business Case	0.741	0.188	0.837	0.065
	A12	Sustainability project dimensions	0.573	0.260	0.704	0.100
	A13	Sustainable development objectives	0.582	0.146	0.605	0.442
	A14	Sustainability stakeholders register	0.545	0.395	0.540	0.312
P	A21	Sustainability risks register	0.656	0.260	0.700	0.312
	A22	Sustainability impacts assessment planning	0.574	0.245	0.601	0.392
	A23	Sustainability requirements	0.543	0.347	0.569	0.315
	A25	Green procurement	0.566	0.536	0.522	0.075
	A27	Sustainable delivering approaches	0.561	0.666	0.320	0.126
	A28	Sustainability stakeholders management plan	0.560	0.487	0.361	0.439
	A29	Sustainability Management Plan	0.601	0.630	0.395	0.219
E	A31	Sustainable suppliers	0.535	0.456	0.445	0.360
	A33	Sustainability competencies	0.661	0.678	0.276	0.354
	A34	Green project operations	0.741	0.843	0.148	0.091
	A35	Green technologies	0.749	0.796	0.272	0.204
	A36	Design for sustainability	0.606	0.691	0.216	0.286
	A37	Sustainable deliverables development	0.569	0.493	0.364	0.440
	A38	Sustainability performance indicators	0.726	0.725	0.209	0.397
	A39	Sustainability reporting	0.605	0.599	0.209	0.450
C	A41	Sustainability project success report	0.752	0.139	0.235	0.823
	A42	Sustainability transition plan	0.679	0.315	0.224	0.728
	A43	Lessons learned towards sustainability	0.699	0.219	0.113	0.799
Eigenvalues				10.898	1.500	1.428
Variance explained %				49.538	6.820	6.489
Cumulative %				49.538	56.358	62.847

The loading pattern after rotation confirmed associations between specific variables and factors. Variables A11, A12, A13, A14, A21, A22 and A23 loaded significantly on FA2, representing the 'Initiation' and 'Planning' phases. Variables A25, A27, A28, A29, A31, A33, A34, A35, A36, A37, A38 and A39 displayed higher loadings on FA1, signifying the 'Planning' and 'Execution, Monitor and Control' phases. Variables A41, A42 and A43 demonstrated stronger loadings on FA3, indicative of the 'Closure' phase.

The results of the factor analysis prompted adjustments in the categorization of the SPM practices. Initially, the 'Planning' phase practices were expected to form a distinct factor, but the EFA revealed their alignment with both the 'Initiation' and 'Execution, monitor and control' phase practices. Consequently, these practices merged into two distinct factors, which were named 'Initiation and planning' (FA2) and 'Execution, monitoring, controlling and replanning' (FA1). The third factor retained its name as 'Closure' (FA3), given its association with practices from that phase.

Variables A21, A22 and A23, initially categorized under the 'Planning' phase, showed stronger factor loadings with the 'Initiation' phase, suggesting that respondents perceive these practices as part of project initiation.

Conversely, variables A25, A27, A28 and A29 exhibited higher factor loadings with the 'Execution, monitor and control' phase practices, indicating common characteristics shared between them. This suggests that respondents continue to prioritize and implement these practices in later project phases.

However, doubts arose regarding the inclusion of variable A25 in the 'Execution, monitoring, controlling and replanning' factor as it exhibited similar loadings in both FA1 and FA2. Since 'Green procurement' was initially linked to the planning phase, reflecting its importance in earlier phases of the project, it was grouped into the 'Initiation and planning' factor. To support this arrangement, Cronbach's alpha values were calculated to assess the reliability of this new construct. All values for each factor exceeded the desired threshold of 0.7 [47], as depicted in Table 6. Notably, the inclusion of 'Green Procurement' (A25) slightly increased the Cronbach's alpha value for the 'Initiation and planning' factor, reinforcing its integration with the other practices within that factor.

Table 6. Reliability analysis—new construct.

Factors	Variables	New Cronbach's Alpha	Previous Cronbach's Alpha
'Initiation and planning'	A11, A12, A13, A14, A21, A22, A23 and A25	0.881	0.877
'Execution, monitoring, controlling and replanning'	A27, A28, A29, A31, A33, A34, A35, A36, A37, A38 and A39	0.932	0.933
'Closure'	A41, A42 and A43	0.829	0.829

Moreover, variables A24, A26 and A32 ('Scheduling towards sustainability', 'Communication towards sustainability' and 'Sustainability team management') were not included in any factor, which does not necessarily mean that these practices are not important or should not be included in any phase of the PM lifecycle. Instead, it is possible to assume that these practices are simply not strongly linked to any specific phase of the PM lifecycle but are important for SPM implementation and the overall success of projects, as suggested by the fact that all these practices are included in the top 10 most useful SPM practices (Figure 2).

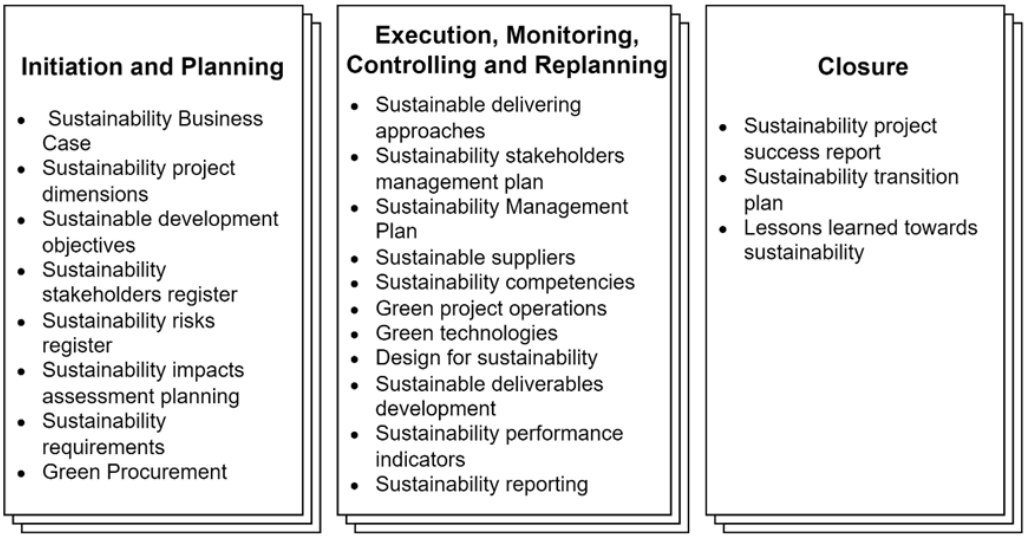

Figure 2. SPM practices categorization.

'Sustainability team management' leads the top 10, indicating that organizations recognize the importance of incorporating social aspects while managing the project team,

such as promoting equal opportunities, diversity, work-life balance, a safe and healthy work environment, etc. [33]. This recognition highlights that organizations find it important to manage responsible teams and foster an inclusive and supportive work culture that enhances the overall well-being and satisfaction of project team members [10]. Thus, the comprehensive implementation of this practice can be seen as a proactive approach to engage social behavior and ensure a positive work environment, to potentially enhance positive financial gains.

'Communication towards sustainability' and 'Scheduling towards sustainability' are also in the top 10. Communication is essential for the success of any project. By communicating with stakeholders about the project's sustainability goals and objectives throughout the PM lifecycle, project managers can help to ensure that everyone is on the same page and that the project is aligned with the organization's overall sustainability goals [29]. Communication can also help to build support for the project and its sustainability goals and to identify and address potential sustainability risks and challenges early on. On the other hand, integrating sustainability considerations into the project schedule can help to ensure that the project is completed on time and within budget [13].

5. Discussion

This section explores the alignment or misalignment between the results of the descriptive analysis, the EFA and the literature reviewed, attempting to narrow the disparity between theory and practice regarding SPM.

The descriptive analysis revealed the top 10 most useful SPM practices, indicating their comprehensive coverage across the various phases of the PM lifecycle. This finding underscores the recognition among organizations of the imperative to integrate SPM practices throughout the entire PM lifecycle [13]. It supports the conclusions of earlier studies on sustainability in PM emphasizing the importance of considering sustainability from project conception to its closure while considering both the lifecycle of the project deliverable and the lifecycle of the project processes [14]. By incorporating sustainability considerations at each stage, organizations can systematically embed sustainability dimensions into their PM processes, thus fostering long-term sustainability and maximizing project effectiveness.

Furthermore, the results of the EFA revealed the emergence of three different factors, each related to specific phases of the common PM lifecycle (Table 5): 'Initiation and planning', 'Execution, monitoring, controlling and replanning' and 'Closure'. The decision to divide the 'Planning' phase practices and distribute them into the 'Initiation and planning' and 'Execution, monitor, control and replanning' factors was made based on the statistical analysis and the observed patterns within the data. This reclassification allowed for a more accurate representation of the relationships and interdependencies among the SPM practices, providing deeper insights into their underlying dimensions and their alignment with the different phases of the PM lifecycle. Figure 2 illustrates the three factors identified by the EFA, each representing a distinct group of SPM practices.

5.1. Initiation and Planning

In the 'Initiation and planning' factor revealed by the EFA, practices essential in the early stages of a project were grouped. These practices were initially grouped in the initiation phase and the planning phase, highlighting their importance in addressing sustainability issues from the beginning of a project.

All SPM practices initially considered in the 'Initiation' phase are included in the top 10 most useful SPM practices, except the 'Sustainability stakeholders register'. The lower usefulness ranking of the 'Sustainability stakeholders register' suggests that organizations may not fully understand or appreciate the importance of identifying and including 'sustainability stakeholders', due to, possibly, a limited understanding of who these stakeholders are. Conversely, the high ranking of 'Sustainability Business Case', 'Sustainability project dimensions' and 'Sustainable development objectives', indicate that the respondents recognize the importance of including sustainability aspects in project initiation to ensure

that the project is aligned with the organization's overall sustainability goals from the very beginning, for example by incorporating sustainability dimensions into the project scope and considering both short-term and long-term orientation, local and global orientation, along other dimensions of sustainability [13].

Moreover, the inclusion of practices from the planning phase, such as 'Sustainability risks register', 'Sustainability impacts assessment planning', 'Strategic sustainability goals' and 'Green Procurement', in the 'Initiation and planning' factor highlights the importance of considering sustainability risks, goals and impacts of the project from the very beginning. 'Sustainability risks register' is considered one of the most useful practices among the respondents, indicating that organizations are mindful of identifying and recognizing environmental and social risks instead of just economic threats and opportunities [13].

Notably, 'Green procurement' was included in the 'Initiation and planning factor' because the majority of the environmental impact of a project is determined earlier in the project. This way, project managers can make better decisions about the project's design and procurement, helping to make sure it is implemented sustainably, leading to significant environmental, economic and social benefits.

5.2. Execution, Monitoring, Controlling and Replanning

The 'Execution, monitoring, controlling and replanning' factor encompasses practices from both the 'Planning' phase and the 'Execution, monitoring and control' phase.

The practices from the planning phase in this factor, such as 'Sustainable delivering approaches', 'Sustainable stakeholders management plan' and 'Sustainability management plan' highlight the importance of integrating sustainability throughout the PM lifecycle while envisioning the entire supply and value chain and engaging stakeholders concerning sustainability. It is interesting to note that these practices are all positioned at the bottom of the descriptive results regarding their usefulness (Table 4). This can uphold some reasons why practices from the 'Planning' phase are included in this factor. It might be due to the lack of acknowledgment of such practices. As the respondents are not aware of these practices or simply do not recognize their relevancy and importance, they tend to leave for later stages of the project.

For example, the 'Sustainability stakeholder management plan' deviates from the expected placement within the 'Initiation and planning' factor. This placement may be attributed to the tendency of project professionals to actively consider sustainability aspects and engage with stakeholders more prominently later in the project. This finding aligns with the emerging need for a paradigm shift from a traditional stakeholder management approach to a 'management for stakeholders' approach wherein stakeholders are actively involved in shaping project objectives, and their interests are valued [11], aiming to enhance stakeholder engagement and participation, and ultimately contribute to SPM practice [9].

Equally, the inclusion of a 'Sustainability Management Plan' in this factor raised some concerns as it is typically associated with earlier project phases, encompassing the definition of sustainable objectives, identification of related activities and assignment of responsibilities. This practice was introduced as a part of the PRiSM methodology to integrate sustainability into PM processes by incorporating impact analysis in the project initiation phase [41]. The fact that the respondents consider the establishment of a Sustainability Management Plan as not as useful as other SPM practices, might justify why this practice is associated with later phases of the PM lifecycle, probably because respondents do not recognize the benefits of implementing this practice in the beginning of a project.

Furthermore, practices such as 'Sustainable suppliers', 'Sustainability competencies', 'Green project operations', 'Green technologies', 'Design for Sustainability', 'Sustainable deliverables design', 'Sustainability performance indicators' and 'Sustainability reporting' are also part of this factor. These practices highlight the importance of incorporating sustainability considerations into supplier selection, enhancing the project team's sustainability competencies, implementing sustainable project operations and technologies, integrating

sustainability into the design process and monitoring sustainability performance using adequate indicators and reporting.

From the respondents' perspective, 'Sustainability reporting' is considered the least useful SPM practice. Such suggests that organizations and project teams may prioritize other aspects of sustainability management over formal reporting. Interestingly, the low ranking contradicts the findings of Fernandes et al. [31], who identified progress report as the most useful PM practice. This discrepancy suggests a possible lack of awareness or understanding regarding the benefits of sustainability reporting, such as promoting transparency, accountability and engagement to provide tangible information about the environmental, social and economic impacts of their projects as the project runs.

On the same note, 'Sustainability performance indicators' also emerged at the bottom of the ranking. This position is in contrast to the observations made by Martens and Carvalho [37] during their interviews with companies, where they noted that all of the organizations included sustainability indicators to measure the sustainability performance of their daily operations. This discrepancy suggests that while the surveyed PM professionals in the current study may not prioritize the use of sustainability performance indicators, other organizations have recognized their importance in evaluating and monitoring sustainability outcomes in their PM practices. It highlights the need for further investigation to understand the reasons behind the differences in the adoption and perception of the importance of SPM practices among different organizations and industries.

5.3. Closure

The 'Closure' factor comprises the SPM practices related to the closure phase of a project. These practices allow for the evaluation of project success, the identification of areas for improvement and the dissemination of knowledge to enhance future sustainability practices.

The high ranking of 'Sustainability project success report' in the top 10, indicates that organizations recognize the importance of assessing the project's success based on sustainability criteria [9]. 'Lessons learned towards sustainability' is also highly ranked, highlighting the importance of capturing and documenting lessons learned from projects, particularly those related to economic, environmental and social aspects. The ranking confirms that organizations recognize projects as an opportunity for continuous learning [10], and value the opportunity to learn from past experiences to improve sustainability performance in future generations processes and outcomes [45].

5.4. Final Considerations

The factors that have emerged from the EFA underscore the importance of seamlessly integrating sustainability considerations throughout the PM lifecycle, from initiation to closure. This not only provides valuable insights to project professionals but also paves the way for the effective incorporation of SPM practices.

Our study's findings resonate with a prevalent trend observed in the literature, characterized by a noticeable gap between the potential of SPM and its practical application [7,26]. For instance, in 2017, Carvalho and Rabechini [9] reported that the sustainability practices they surveyed were scarcely implemented within the organizations they studied. Furthermore, the authors identified a multitude of challenges faced by the companies when attempting to introduce those practices into their operations [9].

The research echoes these earlier findings and underscores a persistent issue within the realm of SPM—a widespread lack of adoption and perceived usefulness and value of SPM practices. Project professionals consistently reported relatively low perceived usefulness of SPM practices, indicating that organizations are yet to fully embrace these practices within their PM processes. The low maturity of SPM can uphold a significant reason for the moderate perception of importance given to sustainability in PM practice, as it is still in the early stages of development within many organizations.

Moreover, the field of SPM is in a continuous state of evolution. Due to the scarcity of practical guidance, knowledge and tools [41], organizations may find themselves at different stages of understanding and implementing SPM practices in concrete operational terms. Consequently, the challenge of integrating sustainability in projects and PM may lie in the lack of competencies among professionals and organizations, rather than the lack of development of methods and techniques, as observed by Marcelino-Sádaba et al. [3]. The research findings may, therefore, confirm the affirmation that project practitioners and decision makers need to develop competencies [17] and undergo a mind shift [13] to be able to identify and implement actions that can significantly contribute to proactively considering sustainability in practice.

Furthermore, it is essential to recognize that the incorporation of sustainability into projects and PM is dependent on the subjective perceptions of project managers [48]. Thus, the relatively low perceived usefulness of SPM practices could be attributed to a lack of awareness and understanding of these practices and the untapped potential they hold for enhancing sustainability performance. Implementing SPM practices requires changes in established processes and mindsets [13], which can face resistance within organizations, as they might perceive these changes as additional burdens or unnecessary complexities, leading to a preference for traditional PM approaches over SPM approaches.

While the alignment of SPM practices with various phases of the PM lifecycle highlights the paramount importance of integrating sustainability considerations from project initiation to closure, the persisting challenges posed by the relatively low perceived usefulness of SPM practices and the disparities in their adoption across organizations clearly indicate a pressing need for further research and concerted efforts to promote and facilitate the seamless integration of sustainability into PM practices. These enduring challenges emphasize the pressing need for organizations and project professionals to foster sustainability competencies, turning sustainability into an integral part of PM.

6. Conclusions

The study presented in this paper embarked on an investigation into the perceived usefulness of Sustainable Project Management (SPM) practices and the underlying factors driving the integration and effectiveness of these practices within the realm of project management (PM). The research aimed (1) to identify key SPM practices and (2) to categorize the SPM practices, to ultimately achieve the successful incorporation of sustainability principles throughout the PM lifecycle.

This paper reviewed relevant literature and identified key SPM practices applicable across various sectors and applications. Within this exploration, a clear distinction between 'sustainability by the project' and 'sustainability of the project' was observed by identifying both practices focused on delivering sustainable products and/or services, and practices focused on carrying out sustainable processes.

The results obtained from the descriptive analysis illuminated a prevailing trend characterized by a limited grasp of the usefulness of these practices. This reaffirmed the existence of a disparity between the suggestions found in the literature and the actual practices carried out in the field. Moreover, the top 10 most useful SPM practices highlighted a recognition among organizations and project professionals regarding the imperative need to embed sustainability across the entire PM lifecycle.

Based on the Exploratory Factor Analysis (EFA), three factors were identified and labeled as 'Initiation and planning', 'Execution, monitoring, controlling and replanning' and 'Closure'. These factors provide valuable insights and a structured framework that can guide organizations and project professionals to adopt and implement SPM practices more effectively throughout the phases of the PM lifecycle. By uncovering these factors, this study serves as a compass for practitioners seeking to seamlessly integrate sustainability issues and considerations into their projects, thus ensuring consistent sustainability outcomes.

In terms of theoretical contributions, this study serves as a compendium of the key SPM practices documented in the existing literature. It lays the foundation for further

empirical development, providing initial insights into the integration of sustainability and PM, and allowing future researchers to leverage and build upon these practices in their studies. Through a comprehensive literature review and organization of key variables, this research offers a comprehensive overview of how to incorporate sustainability into PM processes, fostering the delivery of products and services with significant economic, environmental and social contributions.

Furthermore, this study delves into the perspectives of project professionals via a survey-based approach, providing valuable insights into their comprehension of SPM practices. By collecting data from these professionals, this research enriches our understanding of how these practices are perceived in real-world project scenarios. This micro-level perspective on SPM practices perception across the PM lifecycle provides valuable guidelines for managing sustainability projects in a sustainable way.

However, it is essential to acknowledge the limitations of this research, notably the relatively low response rate of the survey, which may restrict the complete representation of the perceptions and experiences of all PM professionals. Finally, future research focusing on the drivers and barriers to SPM would be important, unraveling the motivations and obstacles that shape the adoption and effectiveness of sustainability in PM practice. Additionally, investigating the reasons behind the limited understanding and perceived usefulness of SPM practices is crucial. Moreover, this study provides insights into incorporating sustainability into PM practice using the PM lifecycle as a conceptual foundation, however, it would be valuable to explore SPM from the lens of the twelve project performance principles outlined in the seventh edition of the PMBoK Guide.

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