Sustainability in Project Management Practice: A Literature Review

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***Abstract*—The intersection between sustainability and project management has received significant attention in literature. Organizations have come to acknowledge the importance of incorporating sustainable practices in their business operations, particularly through their projects. However, integrating sustainability concerns poses challenges, that require the development of methods, tools, and techniques to assess sustainability at the project level. To assist project managers in this endeavor, a comprehensive literature review was conducted. The review aims to answer two main questions: (1) What motivates project managers and their teams to incorporate sustainability in project management practice? (2) Which key project management practices and frameworks/models can be used to ensure sustainability in projects? The findings of this review provide valuable insights for project managers seeking to integrate sustainability practices throughout the entire project management life cycle.**

Keywords—Sustainable project management, Motivations, practices, frameworks/models, life cycle

I. Introduction

Sustainability is one of the most critical challenges of present times. Project management was called to take responsibility for sustainability in the 2008 World Congress of the International Project Management Association (IPMA), as projects involve many resources and interact directly with surrounding communities, creating and 'projecting' the future [2].

A project is defined by the Project Management Institute as a temporary effort to create and deliver a unique product, service, or result [3]. On the other hand, project management is widely accepted as the application of knowledge, skills, tools, and techniques to project activities to meet project requirements [3], allowing us to turn today's objectives into future achievements. Therefore, projects and project management \as drivers for change are vehicles towards sustainability [2], [4]–[6] and, thus, play an important role in the sustainable development of organizations and society [2], [4].

The focus of sustainability in projects has been predominantly centered around the development of sustainable products or services. However, the concept of sustainable project management, which involves effectively managing a project in a sustainable manner, is still not well-understood. In this context, the project manager plays a pivotal role, as they have the authority and responsibility to ensure that sustainability aspects and principles are applied throughout the project. Integrating sustainability into project management needs a mindset shift for project managers. However, there is still a lack of understanding about running a sustainable project while managing it sustainably. In this matter, the project manager has a central position, having a decisive influence on the application of sustainability aspects and principles to the project.

In fact, sustainability is changing the project management profession, therefore, it is necessary to identify and develop tools, methods, and techniques to assess sustainability at the project level, enabling project managers to integrate sustainability into project management and assess the project's environmental, economic, and social impacts [5], [7], [8]. However, current project management frameworks and widespread bodies of knowledge containing the best project management practices, for example, the Project Management Body of Knowledge (PMBOK) [3], poorly address sustainability and fail to effectively address social and environmental issues, and sustainable development objectives in the project's context [4], [8]. Thus, the objective of this literature review was to identify sustainability practices that could support project managers, as well as to identify which factors motivate project professionals to integrate sustainability into management practices.

For this purpose, a literature review was conducted through a structured process that involved the identification of relevant, peer-reviewed literature pertaining to the subject under investigation. To achieve this, databases such as Web of Science and Scopus were used. A comprehensive search string was employed, targeting titles, keywords, and abstracts of scientific articles. By employing this approach, a wide range of sources were explored, ensuring the inclusion of diverse perspectives and a comprehensive overview of sustainable project management.

II. Sustainability and Project Management

A. Sustainability

The sustainability concerns regarding natural resources date from the 18th century [9], being raised to a political issue later in 1971 with the book "The Limits of Growth", where the authors conclude by claiming that the exponential growth of the world's population and economy would lead to the extinction of the planet's natural resources if it maintains at the current speed [9]. Besides the criticism, this book resulted

in a public discussion leading to the creation of the World Commission on Environment and Development, the Brundtland Commission, where sustainable development was defined as "*development that meets the needs of the present without compromising the ability of future generations to meet their own needs"* [10]. The perspective that sustainability stands for social and environmental concerns along with the economic dimension, was also introduced by the Brundtland Commission.

This vision was widely accepted, and the 'triple bottom line' (TBL) or 'Triple-P' (People, Planet, Profit) conceptualization of sustainability, was introduced by Elkington in 1997 in his book "Cannibals with Forks: the Triple Bottom Line of 21st Century Business", promoting the idea that sustainability should be based on the balance and harmony between the three pillars of sustainability: economy (profit), environment (planet), and social (people) [1].

Thus, the three pillars of sustainability combine economic, environmental, and social responsibility in order to guarantee a rational use of present resources without compromising future generations and their needs, thereby creating a community that respects human needs while achieving short- and long-term success in terms of environmental, economic and social security and integrity [11], [12].

B. Sustainable Project Management

Sustainability was linked to change by the Brundtland Commission stating that sustainable development is, in its essence, a process of change [10]. More recently, Marcelino-Sádaba *et al.* [4] concluded that projects are instruments for change management and therefore, project management would enhance the change required for sustainability.

While the literature on sustainability has grown steadily and is relatively established and well-known, the relationship between sustainability and project management is still a relatively premature topic, with the majority of academic articles being published over the last decade [4], [6], [13]. Sustainable Project Management is the designation given for the intersection between sustainability and project management, and it is considered by Silvius [5] as a new school of thought considering projects from a societal and sustainability perspective.

While sustainability is often interpreted using the 'triple bottom line' criteria, when considering sustainability in the context of project management, more dimensions are added to the subject. When questioning how sustainability is defined in the context of project management, Silvius and Schipper [1] enunciated additional sustainability dimensions/principles: values, time, geographical, performance, participation, waste, transparency, accountability, cultural, risk (reduction), and political aspects.

The impact of considering sustainability in project management was also an object of study by Silvius and Schipper [1]. Aiming to answer how considering sustainability impacts project management processes and practices, the authors identified several areas of impact of sustainability on the practices of project management, such as: recognition of project context, identification and involvement of stakeholders, project requirements, business case, dimensions of project success, selection and organization of the project team, project schedule, procurement, risk identification and management, project communication, project reporting, project handover, and organizational learning. In short, the authors concluded that incorporating sustainability impacts basically all project management processes and practices.

Sustainable Project Management was then defined by Silvius and Schipper [1] as "*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 was formulated with the purpose of considering all the different dimensions of sustainability and also the impact of considering them [6], thereby implying that traditional project management practices do not fulfil the basic principles of sustainability.

This definition created an ambiguity between projects that deliver a product or a service in a sustainable way and projects that develop and deliver sustainable products or services. Taking into consideration that it is not sufficient to consider the sustainability of project deliverables without ensuring the sustainability of the project delivery processes, Huemann and Silvius [2] addressed and cleared this ambiguity or dichotomy by establishing a difference between "sustainability by the project" and "sustainability of the project":

- "Sustainability by the project" refers to a project that delivers a sustainable good or service [2], i.e., projects are tools to implement and deliver a sustainable solution through its products and/or services [6].
- "Sustainability of the project" is related to a project that, regardless of the final deliverable, adopts sustainable approaches in its processes [2], i.e., projects that take the value that sustainable project management brings to an organization or society regardless of the product or service delivered [6].

Introducing sustainability into project management processes is considered to be a source of innovation and new opportunities, creating competitive advantages for the organizations that develop projects incorporating sustainable practices into their daily activities and in their strategic objectives. This is due not only to solidarity reasons but also because it brings value to the company, corroborating the evidence that economic well-being is intrinsic to society's well-being and environment preservation [14]–[16].

The implementation of sustainable practices requires project managers to face challenges and new responsibilities and develop new competencies. There is a necessity for a scope shift from traditional project management that manages time, budget, and quality, to sustainable project management focusing on managing social, environmental, and economic impacts [1]. In addition to the scope shift, the authors claim that a paradigm shift, as well as a mind shift, are also required. That is, transitioning from a predictable and controllable approach to a flexible, complex, and opportune approach where project managers seek to implement sustainability concepts in organizations to take responsibility for sustainable development instead of acting subordinate. This requires project managers to think out of the box and usual boundaries while developing honest communication [14].

Despite the growing attention to sustainability in project management, Økland [13] claimed that there is still a gap in the literature between what is documented in the literature and what is carried out in practice. The reason behind this discrepancy, according to Økland [13], is fundamentally the ambiguity of the sustainability concept. While the recognition of the three dimensions of sustainability along with other dimensions previously mentioned is consensual, sorting out which dimensions will contribute to sustainability in practice is a difficult task that requires specific competencies from project managers and practitioners [13]. Furthermore, Marcelino-Sádaba *et al.* [4], [9] expressed the lack of integration of sustainability and project management in a way that practical knowledge, tools, and instruments are needed to express sustainability in operational terms. To conclude, the lack of knowledge and practical guidance on how sustainability criteria and project management processes should be integrated leads to the failure of many organizations in managing projects because they employ conventional project management practices [17].

III. Motivations for Sustainable Project Management

The integration of sustainability in project management refers to both the project's deliverables and the sustainable management of the project. Either way, project managers play a central and influential role and position. Hence, the relevance of studying which factors influence the behavior of project managers and motivate them to address sustainability in their projects. This section aims to identify which factors motivate project managers to address sustainability in project management, in other words, the reasons identified in the literature to implement sustainable project management.

Through a systematic literature review, Sabini *et al.* [6] divided the reasons to implement sustainable project management into three categories: economic, reputational/ethical, and long-term organizational benefits. The economic motivation is underlined in the notion that considering sustainability in the implementation of projects leads to an improvement in the economic performance of the projects. Reputational motivations are driven by public opinion which incentives organizations to develop and deliver products and services progressively more sustainably. Finally, long-term benefits relate to the understanding that sustainable project management is necessary for organizational survival [6].

The perception that the implementation of sustainable project management leads to project success is also seen as a prominent reason. The relationship between sustainable project management and project success is widely addressed in the literature [4], [8], [12], [15], [18]. Carvalho and Rabechini [8], concluded that the implementation of sustainable project management brings closer project success and helps reduce social and environmental impacts. Hence, organizations should introduce sustainability in project management practices as a source of competitive advantage [8]. In addition, in a study developed by Martens and Carvalho [18] using four organizations that actively use project management tools and apply sustainable practices to conduct projects, it was concluded that sustainability in project management contributes to project success and that the organizations include sustainability as a strategic commitment because it results in economic, environmental, and social benefits [18].

Silvius and de Graaf [19] explored the factors that positively or negatively influence project managers to address the sustainability of the project within the project board. They used the Theory of Planned Behavior to explain sustainable behaviour, and to understand, predict, and control behaviour by connecting identified factors to beliefs. The study revealed four factors: 'Moral compass and personal ability', 'Potential benefit', 'Potential risk', and 'Organizational fit'. The moral compass and personal ability factor is related to moral and ethical beliefs about what is considered right and influenced by the opinions of others. The second factor, potential benefits, is associated with the positive relationship between sustainability and project success. Conversely, the potential risk factor is referred to as the risk associated with addressing sustainability which negatively influences project managers. Lastly, the organizational fit factor is related to the opinions of the main stakeholders of the organization about sustainability, including managers and employees [19].

Likewise, having the Theory of Planned Behavior as a conceptual starting point, Silvius and Schipper [20] explored the factors that stimulate project managers to address sustainability issues in the project, calling them stimulus patterns: 'Pragmatic', 'Intrinsically motivated', and 'Task-driven'. Project managers classified in the 'pragmatic' pattern are usually driven by practical knowledge, tools, and results, meaning that they take a pragmatic approach, i.e., even if they are not necessarily self-motivated towards sustainability, they will likely address it when they see a purpose or a good application for sustainability. On the other side, project managers inserted in the 'intrinsically motivated' pattern are strongly self-motivated and address sustainability issues because they care about the environment and the future of new generations, not caring about others' opinions. These project managers do not follow what is considered to be the right thing to do, but what they consider to be the right, despite what others think. Other project managers are considered to have a 'task-driven' pattern, i.e., they will address sustainability issues if these are part of the project's objectives or requirements or even if they will be rewarded for that attitude [20].

In a nutshell, project managers are not motivated to address sustainability in project management practices in the same way, but instead, they are willing to include sustainable practices due to a variety of factors, some rational, some emotional, and some practical. By understanding the nature of project managers' motivation, it becomes more accessible to assign project managers to sustainability-related projects and align their personal motivations with the strategic sustainable objectives of the organization [20].

Table I presents a summary of the key factors that motivate project managers to incorporate sustainability practices.

TABLE I. KEY MOTIVATION FACTORS

Motivations	*References*
1. The perception of enhanced financial performance of the project	[6]
2. Viewing sustainability as a source of competitive advantage	[8]
3. Recognizing a positive impact on project success	[8], [18], [19]
4. Acknowledging long-term benefits for the organization	[6]
5. Responding to societal pressure and expectations	[6]
6. Aligning sustainability with the organization's strategic objectives	[20]
7. Recognizing sustainability as a critical success factor	[20]
8. Valuing environmental awareness and concerns for future generations	[20]
9. Reflecting personal beliefs of the organization's shareholders	[19]

IV. SUSTAINABILITY IN PROJECT MANAGEMENT

Taking sustainability into account within the realm of project management requires its inclusion and implementation in all the aspects of project management [4], demanding processes, methods, tools and techniques that positively impact project success [8].

In the context of project management, sustainability refers both to products and/or projects and can be defined into two types of relationship: sustainability of the project's product or sustainability of the project's management processes [4], [8]. According to Labuschagne and Brent [21], to align project management with sustainable development principles, the first step is to integrate the sustainable product and the project life cycle management, or in other words, to integrate both product and process perspectives, since the deliverable of a project is inevitably shaped by the delivery of the process [21].

Integrating sustainability and project management demands guidance to help project managers with its implementation, as well as a group of instruments and tools that project managers can use to address sustainability in project management practices. However, it is noticeable that the main project management frameworks and standards still fail in considering environmental and social sustainability, not succeeding to address sustainability [4], [17]. That is, the current project management methods need to be reviewed to ensure the incorporation of sustainability aspects [21].

A literature review was conducted to identify methods, tools, and techniques that can be applied when taking into consideration sustainability in project management practice. Regarding which practical instruments and tools are available to project professionals to assess sustainability in the projects, the literature shows little information on existing instruments. Project managers can either choose to use unstructured methods to integrate sustainability, such as brainstorming approaches, or structured methods, for example, the development of project sustainability management plans as part of the project management plans of a project [22]. Some studies focus on the integration of sustainability into project deliverables having as a result more sustainable projects in terms of a more sustainable deliverable. On the other hand, other studies focus on the integration of sustainability dimensions into the processes and delivery of the project [9].

Based on what was found in the literature, this chapter is divided into two parts. The first refers to sustainable project management frameworks/models, and the second relates to sustainable project management practices.

A. Sustainable Project Management Frameworks/Models

Sustainable Project Management Frameworks/Models are defined as structured sustainability impact assessment instruments developed to integrate sustainability into project management.

Sustainability Impact Analysis (SIA) is an approach usually performed in the initiation or planning phases of the project to explore the economic, environmental, and social impacts, and assist in the decision-making process and the strategic planning of policies, programs, strategies, and action plans [17]. In the last years, some SIA instruments were developed for project managers to assess the environmental, economic, and social impacts of a project. For example, the Sustainability Project Management Maturity Model (SPM3) [23], [24], the P5 Standard for sustainability in project management [25], and the Project Sustainability Excellence Model [26]. However, the practical application, as well as the quality of those instruments for real-life purposes, is still very weakly documented [9], [17].

The Sustainable Project Management Maturity Model (SPM3) [23], [24] was first published in 2010 to help organizations translate the concepts of sustainable development into practical actions, allowing them to monitor progress [24]. The SPM3 model provides an overview of how the different variables of sustainability are being considered in the management of specific projects while allowing organizations to check the level of integration of sustainability within the operating project and serving as guidance on how to improve the integration of sustainability, by comparing the actual with the desired levels of consideration of the sustainability indicators in the project [27]. Given the misperception about whether the assessment of sustainability in a project should consider the project itself or the project's deliverables, the SPM3 model assesses, independently, the process of delivering and managing the project (including the resources used in the project and the way the processes are executed), and the deliverables of the project (including the impacts that it has on stakeholders and society) [27]. The SPM3 model distinguishes four different maturity levels – compliant, reactive, proactive, and purpose – in which 22 different sustainability indicators are considered to determine the extent to which sustainability is addressed [27].

The P5 Standard for Sustainability in Project Management aims to identify potential impacts, positive or negative, on sustainability, thereafter analyzed to support decisions and effective resource allocation [25]. Therefore, the main objective of the P5 Standard is to align the projects with the organizational objectives for sustainability through an analysis of the potential impacts of the project's activities, results, and outcomes on the environment, society, corporation, and the local economy [28]. P5 links the triple bottom line approach, project processes, and the resulting products and/or services, and it stands for Product, Process, People, Planet, and Prosperity [25]. It is applied at the beginning of a project to define and prioritize sustainability risks and opportunities to enhance the project's value and impact on the environment, society, and economy [29]. The P5 Standard is commonly used in the P5 Impact Analysis (P5IA) to define and prioritize sustainability impacts aiming to improve the expected benefits of the project, increase the

positive impacts, and decrease the negative impacts on the environment, wealth, and on society.

The Project Sustainability Excellence Model (PSEM) was developed by Szabó [26] in response to his belief that, nowadays, sustainability and innovation play a big role in stakeholders' expectations. For this reason, there was a need for methods and tools for analyzing and assessing projects taking into consideration sustainability and innovation aspects besides the traditional iron triangle – cost, time, and quality [26]. Bearing that in mind, the author developed a new method, based on the GPM Global P5 Standard and the IPMA Project Excellence Model, to assess how projects become successful by contributing to organizational, local, and regional development focusing on innovation, sustainability, and creativity.

The sustainable project management frameworks/models are presented in Table II.

TABLE II. SUSTAINABLE PROJECT MANAGEMENT FRAMEWORKS/MODELS

Frameworks/Models	*References*
1. Sustainability Project Management Maturity Model	[22]–[24], [27]
2. Project Sustainability Excellence Model (PSEM)	[26]
3. P5 Standard for Sustainability in Project Management	[22], [25], [29]
4. P5 Impact Analysis (P5IA)	[28]

B. Sustainable Project Management Practices

Sustainable Project Management practices are described as the tools and techniques (e.g., project charter, the risk register, etc.) that practitioners use to execute project management processes, as well as the behaviors and attitudes adopted to ensure sustainability in projects [30]. Thissection reports the practices identified from literature gathered into the following phases of the project management life cycle: initiation phase, planning phase, execution, monitor andcontrol phase, and closure phase.

1) Initiation phase

Projects are usually initiated based on a business case. One important part contained in the business case is the project justification accompanied by a cost-benefit analysis and assumptions, explaining why the investment of the business need is worth it [3]. The project is commonly justified by a financial business case. However, non-financial factors, such as social or environmental factors, are needed to uphold the project's long-term economic, social, and environmental impacts [30] since the traditional methods of return on investment, such as cash-flow and payback period, are not suitable to consider environmental and social factors [5]. Sustainability in project management implies that the business case of a project needs to address the Triple Bottom Line criteria of economic, environmental, and social benefits [1].

Next, when initiating a project, a clear understanding of the project context is required in order to adapt to the objectives, stakeholders, and environment of the project, and to select the most appropriate methods and tools to obtain the desired results [3] – tailoring. Therefore, the recognition of the context of the project implies the integration of the sustainability dimensions necessary along the 'triple bottom line' criteria.

The decision on the project objectives is also a major activity in the initiation phase. According to Labuschagne and Brent [21], one of the main challenges for businesses is to align operational processes with the three objectives of sustainable development. Thereby, project management documents, for example, the project charter, need to clearly address the sustainable development objectives: social equity, economic efficiency, and environmental performance, so that everyone enrolled in the project is aware of the project objectives.

Finally, identifying stakeholders is the first step of stakeholder engagement and it starts before or when the project is initiated and actively continues throughout the project [32]. The inclusion of sustainability dimensions will certainly increase the number of stakeholders in the project [33]. 'Sustainability stakeholders' should be selected to represent the environmental and/or social aspects of the project [30]. Some examples are environmental protection groups, human rights groups, non-governmental organizations, etc.

2) Planning phase

The planning phase includes those processes required to establish the scope of the project, revise the objectives, and define the course of action necessary to attain the objectives that the project was undertaken to achieve [32]. These processes include, among others, risk identification, schedule management, procurement activities, communications management, and stakeholder engagement.

Starting with the identification and assessment of risks and opportunities, implementing sustainable project management requires this process to evolve to identify also environmental and social risks and opportunities [5], [34].

The consideration of the project impact is also important in this phase. In addition to the financial impacts, it is becoming increasingly important to consider the environmental and social impacts of the project. From a social sustainability perspective, taking into consideration the impacts of the project on the community, namely the health, safety, and education of the people involved in the project, leads to the improvement of the performance of long-term projects and the quality of living of the people directly affected by the project [7]. In the literature, projects' environmental and social impacts are commonly associated with the management of environmental and social policies and standards [7], [35]. Environmental, social, and sustainability impact assessments are mentioned as a strategy for the implementation of sustainability policies to promote the sustainability of the project in the geographical and/or local context where the project is settled [35]. For this reason, environmental and social impact assessments are often required during the preparation and design phases of projects with significant impacts on the environment and society.

Project schedule management includes the processes required to manage project completion on time [3]. The opportunity to consider sustainability in these processes was recognized by Silvius and Schipper [1], who suggested sustainable schedules to minimize waste. Waste is commonly mentioned to occur in materials, however, it can also occur in idle resources or waiting times. Hence, minimizing waste to perform projects as efficiently as possible is intrinsic to sustainable project management.

Furthermore, project procurement management processes are also referred to in the literature as relevant to include sustainability concerns. Procurement covers everything from materials, and suppliers to solutions, labor, and services [3].It makes sense for an organization that pursues sustainabilityon a long-term horizon, to reflect its values on procurement contracts to mitigate risks to the firm [31]. Therefore, the selection of suppliers represents a huge opportunity to secure sustainability by valuing sustainable performance criteria or rejecting non-ethical behavior in procurement processes [1]. Additionally, waste reduction is a consequence of purchase reduction, and it is initiated when the organization starts visualizing the entire supply and value chain [31]. This way, project managers should adapt procurement processes and criteria to meet the sustainability vision of the organization, for example by asking if supplier evaluations include sustainability criteria; if sustainability obligations are encoded in contracts; or by questioning how transparent the entire supply chain is in terms of sustainability priorities [31].

Green procurement is the concept that integrates these aspects. It is still hardly implemented because of the many associated challenges. Its consideration can be illustrated by developing procurement management plans that include all the relevant information regarding the resources that will be acquired, how the procurements will be integrated, etc.

Integrating sustainability into project management requires a more open and proactive engagement of stakeholders [5]. Therefore, communication management processes, as well as stakeholder management processes, play an important role in the development of sustainable project management. Taking the principle of transparency, sustainable project management would imply proactive and open communication. This requires a reevaluation of the traditional way of providing only the information considered needed by the stakeholders [1]. When considering the new 'sustainability stakeholders', project managers need to comprehend how they should communicate with them, how the information will be received, and how engagement can be ensured [31]. That said, communication can be formal and informal and can be delivered verbally through meetings and conversations, or written on project reporting, presentations, and lessons learned to allow stakeholders to be well-informed about the sustainability aspects of the project [3], [31].

Along with communication management processes, stakeholder management is considered a core activity for project success since the main objective of project management is to meet stakeholder needs and expectations [3]. Therefore, sustainable development requires the inclusion and participation of stakeholders, and also the political dimension, recognizing the different interests of stakeholders. Hence, to meet stakeholder needs and expectations, project management must be performed in the context of sustainable development [33].

In the stakeholder management area, there are two different approaches to be considered: 'management of stakeholders' and 'management for stakeholders' [33]. In the first approach, management of stakeholders, stakeholders are seen as resources in a way that the project needs them to achieve the objectives proposed. On the other hand, in the second approach, stakeholders' interests and rights are recognized and considered valuable for the project. In this approach, stakeholder communication becomes stakeholder participation suggesting that the unidirectional information flow between the project and stakeholders turns into a dialogue allowing the involvement of stakeholders in the developing phases of the project. According to Eskerod and Huemann [33], stakeholder issues are treated superficially in project management standards following the management of stakeholders approach, i.e., making stakeholders comply with the project needs. Therefore, a paradigm shift is required in the foundational values of project stakeholder management to involve stakeholders' interests in the creation of project objectives, improving their engagement and participation toward more sustainable project management [8].

In sum, proactive involvement and engagement of stakeholders imply that they are actively involved in project activities such as the definition of requirements, assessment of costs and benefits, project planning and scheduling, identification of risks and opportunities, and project reporting [9], [36]. Given the important role of stakeholder engagement in encouraging sustainable outcomes in projects, Santos and Fernandes [36] performed a stakeholder analysis in R&I projects aiming to provide insight into the evaluation of stakeholder engagement through the lens of sustainable project management framed in the P5 Standard, concluding that the P5 Standard is adequate to frame the benefits to stakeholders of R&I projects [36].

The establishment of a Sustainability Management Plan is also a good practice to define how sustainability is addressed in the project. The Sustainability Management Plan [37] was first introduced as a part of PRiSM (Projects integrating Sustainable Methods), which is a structured project management methodology that incorporates tools and methods to highlight sustainability objectives and integrates them into the traditional project phases. The Sustainability Management Plan is used as a separate project plan from regular project plans to address the sustainability aspects of the project, define the sustainable objectives of the project, identify the activities required to achieve those objectives, assign responsibilities, and integrate the focus on sustainability in the overall plans [37].

In 2015, Silvius developed a Sustainability Management Plan template paying attention to the context of the project in terms of addressing the stakeholders' interests and the sustainability strategy of the organization, differentiating from the previous which focus essentially on the project and not that much on the context of the project [37].

3) Execution, Monitor, and Control phase

The processes included in the execution, monitoring, and control phase are those required to complete the work defined in the planning phase to ensure project requirements, in addition to processes of tracking, reviewing, and regulating the progress and performance of the project [3].

The importance of committing to green procurement was already explained in the planning phase. The selection of suppliers is an opportunity to integrate sustainability into projects, for example, while considering the sustainability performance of potential suppliers in supplier selection [8] Additionally, one of the strategies identified by Aarseth *et al.* [35] focuses on the development of sustainable supplier practices to ensure sustainability in projects, meaning that organizations should support suppliers with guidelines to implement sustainable practices, such as minimization of resource consumption, maximization of resource reuse, protection of the natural environmental, pursue of quality in

built environment, and promotion of social-economic uplifting, etc. However, finding suppliers concerned with the same sustainability issues is still a difficult task. In this matter, Carvalho and Rabechini [8] gave the example of the difficulty for green construction project management to find subcontractors that provide green construction services associated with the high costs of opting for green equipment and materials.

Managing the project team is also a big part of managing projects since these are inherently delivered by project teams. Improving team competencies, team member interaction, and overall team environment are described as key parts of developing teams resulting in improved teamwork, enhanced interpersonal skills and competencies, and overall project performance [32]. For this reason, project managers are concerned with developing effective project teams to reach high team performance and achieve the project's objectives. Therefore, following this perspective, it makes sense that increasing knowledge about sustainability and sustainability issues helps to improve the sustainability performance of the project [35]. Training programs are usually performed to enhance the competencies of the project team members. Thus, developing sustainability competencies can be achieved for example through sustainability training programs [28]. However, while project managers are focused on improving team competencies and creating a motivating environment where teamwork predominates, they should also look at the broader picture and include social aspects of sustainability while managing the team [1], [31]. Social sustainability means that organizations provide equal opportunities, encourage diversity, and ensure quality of life [7]. Hence, managing projects sustainably requires project managers to include social elements such as work-life balance, training, equity, quality, and enhancement of the work environment, education, ethics, social inclusion, sufficient and appropriate income, health and safety, worker rights, respect, etc. [31].

Another aspect to consider in the execution phase is project operations, particularly practices adopted, and technologies used. Martens and Carvalho [18] developed a study aiming to investigate how organizations are introducing sustainability in project management. They found out that organizations have a strong environmental focus opting for greener practices, among other practices, to reduce energy consumption, carbon emissions, and waste production, and adopt eco-alternatives such as natural lighting and natural ventilation. On the other hand, the checklist proposed by Carvalho and Rabechini [8] to help organizations introduce sustainability in projects suggests prioritizing and applying clean technologies in the product development and project execution phase. According to Glavic and Lukman [38], environmental technologies can be understood as the application of knowledge to use natural resources efficiently while reducing and/or recycling wastes, controlling, and minimizing risks, and reducing pollution.

Further on, in the same checklist, it is noticeable the prominence given to the application of Design for Environment principles during the development of the project. Design for Environment is often used as a synonym for Eco-design because both terms consider the complete life-cycle of a product, particularly the environmental aspects during all stages of the process [4], [8]. Eco-design, as well as Design for Environment, can be described as a process of product development that takes into account the entire life cycle of the product as well as environmental aspects during all stages of the process [8], [38]. Design for environment is mentioned as a relevant methodology to improve positively the environmental impacts since the initiating process, for example, by aligning the stakeholders' expectations with the project's goal towards sustainability [8]. However, while considering only the environmental perspective, the economic and social aspects are left behind. To overcome this gap, it was introduced the design for sustainability that goes one step further and integrates the economic and social aspects along with the environmental aspect of the design [4].

To emphasize sustainability in the development of the project design and address sustainability issues in project management, it is necessary to implement a culture of life cycle thinking requiring consideration of the various life cycles involved in a project [39]. According to Labuschagne and Brent [21], it is necessary to recognize and consider the existence of the project life cycle, the process life cycle, and the product life cycle. Value management and life cycle management are two methods used to emphasize sustainability in the development of the project design [35]. Life cycle management includes the process of decision-making. Life cycle assessment is an analytical tool to implement life cycle thinking for evaluating the impact of a product on the environment over its entire lifespan [4]. Thus, there is a need to think about how project deliverables can be innovated to contribute to a more sustainable society [24], and how to design them to be sustainable in the short-, medium-, and long-term.

These methods are often used to derive economic, environmental, and social impact indicators. Sustainability indicators are used to measure the sustainability performance of implemented projects, ensuring that are being managed following sustainable development principles [21]. In the study pursued by Martens and Carvalho [18] to investigate how organizations are including sustainability aspects in their project management function, it is reported that all the interviewed companies use sustainability indicators as structured methodologies and claim the relationship between the use of those indicators and the success of the project. Most of the organizations use indicators derived from models such as GRI (Global Reporting Initiative), which is aframework containing hundreds of indicators; and the remaining organizations use indicators owned by the company, and, therefore, specific to projects.

According to Labuschagne and Brent [21], it is required to understand the various life cycles involved in a project to identify suitable sustainability indicators. Many authors have developed frameworks and methods to derive sustainability indicators [21], [39], [40]. Among the pioneers are Labuschagne and Brent [40], who recognized the lack of development of social factors and indicators to measure the social impact of projects, compared to environmental indicators. To overcome this gap, the authors proposed a Social Impact Indicator (SII) procedure based on a Life Cycle Impact Assessment (LCIA) method previously introduced to assess sustainability impacts, by considering the project life cycle, the process life cycle, and the product life cycle to derive economic and environmental indicators used to measure the sustainability performance of operational activities.

Finally, as the project progress, project reports are formally filled in to communicate relevant information to

stakeholders. Including sustainability aspects in the project processes, will require reporting these aspects as the project goes further [1]. For this purpose, Sustainability Reporting is a project report specifically developed for organizations to visualize the sustainability performance and impacts from everyday activities [28].

4) Closure phase

The final process group englobes all project management processes performed to formally complete or close a project, phase, or contract appropriately [3].

Evaluating success at the end of the project is crucial. Traditionally, project success is mainly evaluated using standard metrics such as quality, scope, time, and cost. However, with the evolution of project studies regarding management and success variables, more dimensions/metrics were added to be tailored to specific projects, including the sustainability dimension, this way integrating also environmental and social aspects besides economic aspects [8].

Projects are an opportunity for continuous learning since they include processes of knowledge management, making it easier to learn from experience [7]. Silvius and Schipper [1] affirm that the last area of impact of sustainability is the organizational learning from a finished project, suggesting that organizations should learn from their project to reach sustainability objectives, e.g., waste reduction, energy usage, resources, and materials reuse, etc. That is, learning is critical for improving sustainability assessment and performance in the future [11].

Lessons learned is the exercise executed by the project team when determining what can be done in the future to improve processes and outcomes [41]. hereby, they are an effective way to conclude if what was done was effective so that improvements of a specific project can be shared and used as input for following projects [3]. To make improvements on the sustainability performance of a project, it makes sense then to include social, environmental, and economic aspects when registering the lessons learned.

C. Match and Contribution

This paper makes a valuable contribution to the conference and aligns with the "Program and Project Management" Field of Interest (FoI) of the IEEE Technology & Engineering Management Society (TEMS). By focusing on sustainability in project management, this research delves into the integration of sustainability practices in project management and explores the motivations behind sustainable project management. This study directly addresses the conference's theme by shedding light on the crucial aspects of sustainability and project management intersection.

V. Conclusion

A literature review was carried out to answer two research questions: (1) What motivates project managers and their teams to incorporate sustainability in project management practice? (2) Which key project management practices and frameworks/models can be used to ensure sustainability in projects?

Regarding the first question, a set of key reasons why project managers feel motivated to integrate sustainability into project management practices was identified (see Table I). A strong economic dimension could be observed, along with the perception of project success, notwithstanding individual motivations such as environmental concerns.

In what concerns the second question, a research gap on practical sustainable methods, tools, and techniques to be incorporated into project management practice was identified.It is observed that incorporating sustainability in project management is fundamentally focused on achieving sustainable products and services rather than focusing on sustainable project management processes. Nevertheless, several sustainable practices per major project management phase were identified, including for example, the identification of 'sustainability stakeholders' [1], [31], [33], the consideration of sustainability impacts of the project [7], [35], [40], the emphasis on sustainability in project design (Design for Sustainability) [4], [8], [35] and the evaluation of project success in terms of economic, environmental and social performance [12]. Also, four sustainable project management frameworks/models were identified, namely the SPM3 sustainable Project Management Maturity Model [23], the P5 Standard for Sustainability in Project Management [28], the P5 Impact Analysis [28], and the Project Sustainability Excellence Model [26]. These were concluded to be effective in assessing sustainability impacts at the project level.

In short, the main contributions of this paper are, on the one hand, the systematization of knowledge to incorporate sustainability into project management processes and to deliver products and services with relevant economic, environmental, and social contributions. On the other hand, the provision of a set of sustainable project management practices that can be applied in each phase of the project management life cycle, as well as the identification of sustainable project management frameworks/models, which can be used to assess sustainability in projects and project management, are excellent guidelines for project managers seeking to integrate sustainability practices throughout the project management life cycle. This review stands out by identifying gaps in knowledge and areas where further research is still needed. Also, it includes studies from different sources and settings, allowing for the integration of diverse perspectives.

Further research on sustainable project management practices presents a significant opportunity to bridge the gap between theory and practice. Building upon the existing literature review, numerous possibilities for future exploration emerge. Particularly, there is a need for empirical research that gathers data from project management professionals, providing valuable insights into the actual implementation of sustainable practices and assessing their perceived usefulness in real-world project scenarios. Additionally, it is crucial to investigate the barriers and drivers to sustainable project management. Understanding these is essential to identify the factors that influence the adoption and effectiveness of sustainability in project management practice. Delving deeper into these areas of research can enhance understanding and provide practical guidance for project managers and organizations seeking to incorporate sustainability into their projects.

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