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The nexus of project management approaches in sustainable development: innovative behaviors as a mechanism in the Polish financial industry

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Abstract

Purpose – Based on the social exchange theory, the aim of the present study is to examine the effects, both direct and indirect (through sustainability-oriented innovative behaviors [SIBs]), of sustainable project leadership (SPL) on sustainable project performance (SPP). Project management approaches (PMAs) (traditional, hybrid and agile) were examined as conditional factors in the "SPL–SIBs" relationship.

Design/methodology/approach – The study employs structural equation modeling based on data collected from 197 software engineering project team members working in the financial industry in Poland.

Findings – The study revealed that SPL significantly, positively affected SPP. It also provided evidence for the significant mediating impact of SIBs in the relationship between SPL and SPP and the conditional effect of agile and hybrid PMAs on the "SPL–SIBs" relationship.

Originality/value – The novelty of this work lies in introducing sustainable leadership into project management research, proposing and testing a unique and complex research framework, designing valid scales for measuring SPL and SPP, and suggesting many theoretical and empirical implications.

Keywords Software development, Sustainable leadership, Innovation, Sustainable financial services

Paper type Research paper

1. Introduction

The classic development theories focused on economic growth, while the concept of sustainable development became prominent after the 1972 United Nations conference in Stockholm. It emphasizes a balance between economic, environmental and social development (the triple bottom line approach). This concept has been extended to various domains, including project management (Armenia *et al.*, 2019). Sustainable project management is associated with "planning, monitoring and controlling project delivery and support processes, considering the environmental, economic and social aspects of the life cycle of the project's resources, processes, deliverables and effects, aimed at realizing benefits for stakeholders, and performed in a transparent, fair, and ethical way that includes proactive stakeholder participation" (Silvius and Schipper, 2014). Since the extent to which the goals are

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met is a measure of a project's performance or success, sustainable project performance (SPP) or sustainable project success should be associated – beyond the traditional project objectives of cost, time and quality – with the harmonization of financial, environmental and social objectives in the delivery of the project (Liu *et al.*, 2021).

Sustainability issues have so far been discussed mainly in the contexts of the environmental bottom line and infrastructure and development projects, because these types of projects may potentially have the most negative impact on the natural environment (Armenia *et al.*, 2019; Labuschagne *et al.*, 2005). Even if sustainability has been discussed in the context of other projects, the environmental issues prevailed (e.g. Oliveira and Rabechini, 2021). The extant literature emphasizes the need to implement sustainable project management in different types of projects (Zakrzewska *et al.*, 2022). There is also a scarcity of research which can contribute to our understanding of the factors which impact the success of sustainable projects (Khalifeh *et al.*, 2020; Shaukat *et al.*, 2021). Furthermore, Päivärinta and Smolander (2015) called for more research on factors that impact the success of software engineering projects, because modern companies cannot exist without software. The effective implementation of sustainability in software engineering projects remains an unexplored area (Khalifeh *et al.*, 2020). Considering the above, this study is intended to fill these research gaps through examining the antecedents of the SPP of software engineering projects.

Since there is a greater need for leadership than for management in the context of projects (Bhatti *et al.*, 2021), and the leader's specific role – and how it leads to project performance – is an area that needs further exploration (Anantatmula, 2010), this study examines the impact of leadership on SPP. At this point, it is worth pointing out that some authors indicated project leadership as being crucial for project success (Alvarenga *et al.*, 2019), whereas others identified the relationship between these variables as insignificant (e.g. Yohannes and Mauritsius (2022) in the case of IT projects). Recently, the interest of researchers has been in examining how empowering, servant and ethical leadership contributes to traditionally approached project performance (Bhatti *et al.*, 2021; Bilal *et al.*, 2021; Harwardt, 2020; Lee *et al.*, 2014; Mubarak *et al.*, 2021; Nauman *et al.*, 2022). Moreover, the behaviors of project managers are similar to those of line managers in terms of practicing a given leadership style (Keegan and Den Hartog, 2004). This creates a space for introducing an emerging leadership style – i.e. sustainable leadership – into the project management domain in a time of growing importance of sustainability issues. Sustainable leaders consider a wider stakeholder group and ensure the delivery of results that meet the triple bottom line: environmental, financial and social (Iqbal and Piwowar-Sulej, 2023a). Previous research provided evidence on the direct impact of sustainable leadership on a company's sustainable performance (e.g. Iqbal *et al.*, 2020; Iqbal and Piwowar-Sulej, 2022a), yet failed to identify the role of this leadership style in terms of project leaders and SPP (Bulmer *et al.*, 2022). Therefore, the aim of this study is to determine how and when sustainable project leadership (SPL) contributes to SPP.

Since sustainable performance depends on applying sustainable innovation (Stanciu *et al.*, 2014), it is important to identify opportunities to ensure SPP through the sustainability-oriented innovative work behaviors (SIBs) of project team members that are above and beyond the formalized responsibilities identified for the role (Park and Jo, 2018). Leadership style is a crucial factor that influences team members' innovative behaviors (Bossink, 2007), but the link between sustainable leadership and SIBs remains unexplored (Javed *et al.*, 2021) in the literature on both general management and project management. Drawing on the social exchange theory (SET) (Blau, 1964), which argues that people who receive something from others feel obliged to them, one may assume that project team members will demonstrate SIBs because they experience caring treatment and support from a sustainable project leader. These behaviors are further expected to stimulate SPP because they include creative problem-solving, proactive idea generation, and a willingness to experiment with sustainable practices. Taking this into account, this study is intended to recognize the mediating impact of project team members' SIBs between SPL and SPP.

Finally, projects can be managed in accordance with different project management approaches (PMAs). There are two general approaches to running projects: traditional and modern (agile). Although previous studies found that the agile PMA stimulated innovative behaviors (Koch *et al.*, 2023; Malik *et al.*, 2021), the interaction between PMA and the variable of particular project leadership styles has never been explored before. Furthermore, PMA has never been used as a moderator of the "leadership–innovative behavior" relationship. Additionally, hybrid PMAs represent a rarely explored topic (Reiff and Schlegel, 2022). Considering the above, this study examines whether PMA moderates the impact of SPL on SIBs, with the assumption that agile project management should amplify this relationship the most.

To sum up, the aim of this study is to theoretically and empirically explore the relationships between sustainable leadership in projects (SPL) and SPP, following the assumptions of the SET and including SIBs as a mediating factor and PMA as a moderating factor. This paper reports on the results, which were obtained based on the computer-assisted telephone interviewing (CATI) method. Considering the increasingly important role of projects in industries where traditionally repetitive activities have been the core business (Piwowar-Sulej, 2021), empirical research was conducted among software engineers working in projects in financial industries (banking, insurance and leasing) in Poland. To gain a competitive advantage, financial companies implement, in the form of projects, many innovative technology-enabled financial services and the business models that accompany those services, i.e. fintech solutions (Mention, 2019). Simultaneously, financial consumers and investors require transparency, safety and ethics embedded in their product and service offerings (Tuyon *et al.*, 2022).

At this point, it is worth emphasizing that the Polish banking sector (as a part of the broader financial sector) is one of the most modern in the entire economy. Deloitte ranked Poland in sixth place out of 41 countries in the ranking of digitization leaders in banking (Pawlik, 2022). Thus, this study also addresses this important contextual gap. Furthermore, since the size of the company matters in terms of the availability of financial and human resources to implement innovation (Das *et al.*, 2018), medium-sized and large companies were selected as the target group in this study. The data of 197 project team members were used to empirically test the hypotheses through partial least squares structural equation modeling (PLS-SEM) in the software program SmartPLS 3.0, v.

This study contributes to the literature in several ways. Firstly, it extends the sustainable project management literature by introducing the concepts of SPL, the SPP of software engineering projects and team members' sustainability-oriented innovative behaviors (SIBs). It addresses the proposal raised by Keegan and Den Hartog (2004) to develop new leadership theories in project management based on the leadership styles practiced by line managers. It also responds to the call by Tamburri *et al.* (2021) to extend research on the success of software engineering projects and to increase the understanding of the role of hybrid PMAs (Reiff and Schlegel, 2022). Secondly, it offers some key antecedents of sustainable software engineering project success in the financial sector. It also expands the limited empirical evidence on the effect of SPL and PMA on SIBs. Thirdly, it provides a better understanding of the mechanism by which SPP is achieved, by highlighting a potential intervening variable in the form of SIBs. It also contributes to studies on the SET by explaining the relevance of this theory in a project setting. Finally, it shows directions for future research.

2. Development of hypotheses

2.1 Sustainable project leadership (SPL) and sustainable project performance (SPP)

Sustainable leaders strive to accomplish a balance between the social, environmental and economic performance of their unit. They make use of those policies and practices that create long-lasting value for a wide group of stakeholders, which requires networking with various

stakeholders (Iqbal and Piwowar-Sulej, 2023a). They also contribute to lower costs and higher potential revenue by monitoring changes in the market (Gerard *et al.*, 2017).

Specific leaders' behaviors are also a driving force that encourages team members to achieve successful outcomes. In the case of sustainable leadership, people are inspired and encouraged through a positive working environment that is based on trust and cooperation, as well as the alignment of their needs with the goals of the unit (Gjerde and Ladegård, 2019). The extant literature shows that sustainable leadership also promotes the development of team members' competencies, employee participation and empowerment, knowledge sharing, and team diversity (Avery and Bergsteiner, 2011; Iqbal and Piwowar-Sulej, 2023b).

Drawing on the SET, one can state that sustainable leaders provide their team members with different resources, such as trust (a socioemotional resource) and knowledge (an impersonal resource) (Scheuer *et al.*, 2021). In the exchange process, employees offer their engagement in fulfilling sustainability-oriented goals. It has been proven that the way line managers – as sustainable leaders – cooperate with the business environment, provide an exchange of knowledge between various stakeholders and treat people increases the employees' and the organization's sustainable performance (Piwowar-Sulej and Iqbal, 2023). Therefore, it may be expected that project managers will contribute to SPP by implementing this leadership style. The resources and support given by sustainable project leaders will enhance project team members' reciprocated behaviors and further lead to SPP. Thus, the authors propose the following hypothesis:

H1. Sustainable project leadership (SPL) significantly positively impacts sustainable project performance (SPP).

2.2 Sustainable project leadership (SPL), sustainability-oriented innovative behaviors (SIBs) and sustainable project performance (SPP)

The innovative behaviors of employees examined in this study (SIBs) refer to the creation of novel sustainability-oriented ideas or methods and their implementation in practice in the process of work (cf. Scott and Bruce, 1994).

A leader may enhance employees' innovative behaviors by giving them freedom and supervisory encouragement (Amabile, 1996). Leaders may also provide resources, including information (through knowledge sharing among the team and themselves), support and the time necessary for innovative behaviors (Hughes *et al.*, 2018). The SET can act as a lens through which to understand the relationship between employees' innovative behaviors and a "positive" leadership style (Piwowar-Sulej *et al.*, 2023). More specifically, the SET posits that the above-presented resources provided by a leader, which are needed for innovation, will be returned by employees in the form of innovative behaviors.

Sustainable leadership uses practices typical of different positive leadership styles, such as empowering (they involve employees in decision-making), ethical (they promote ethical conduct), servant (they prioritize the needs of company stakeholders) and transformational leadership (they intellectually stimulate employees) (Iqbal and Piwowar-Sulej, 2023b). All of these styles positively impact employees' innovative behaviors (Iqbal and Piwowar-Sulej, 2023a; Rao Jada *et al.*, 2019; Saxena and Prasad, 2020). Sustainable leadership has also previously been linked with general employee innovation (Javed *et al.*, 2021). As far as sustainable innovation is concerned, Liu and Zhao (2019) revealed that ethical leadership stimulates employees' green innovative behaviors. Aboramadan *et al.* (2021) provided evidence that environmentally specific servant leadership influences such behaviors, whereas Zhang *et al.* (2020) found that green transformational leadership impacts green creativity. Since sustainable leadership uses the practices of the above-mentioned leadership styles to achieve balance and harmony between organizational success and the well-being of society and the planet (Iqbal and Piwowar-Sulej, 2023b), it is expected that SPL will positively stimulate SIBs, which is reflected in the second hypothesis:

H2a. Sustainable project leadership (SPL) significantly impacts the sustainability-oriented innovative behaviors (SIBs) of project team members.

Innovation, broadly understood, is directly included in the definitions of projects. For example, Turner (1993) describes a project as an "endeavor in which human, material, and financial resources are organized in an innovative way" (Turner, 1993, p. 8). Therefore, project performance relies on innovation. Innovation is also a driving force for sustainable development (Kneipp *et al.*, 2019). For example, innovation was presented among the SPP criteria for construction projects (Sanmi and Ayodeji, 2019; Tabassi *et al.*, 2016). However, innovation should be sustainable itself in order to contribute to SPP. This means that innovation should aim to improve the functioning of existing products, services and processes with respect to not only economic, but also environmental and social factors (Aagaard and Lindgren, 2015).

Project team members play a central role in fostering sustainable innovation within a project. Their ability to think creatively, take risks and adapt to change contributes to the development and implementation of innovative solutions that can enhance sustainable project outcomes. Previous research conducted in non-project settings provided evidence that the green innovative behaviors of employees stimulate the sustainable performance of organizations (Wang *et al.*, 2022). Project team members' SIBs go beyond green innovative behaviors by also considering the economic and social aspects of the project. They include not only generating sustainability-oriented ideas, but also promoting and realizing those ideas. Therefore, they are expected to stimulate SPP, which is shown in the following hypothesis:

H2b. The sustainability-oriented innovative behaviors (SIBs) of team members significantly, positively impact sustainable project performance (SPP).

Sustainable leadership involves guiding a team with a focus on environmental, social and economic sustainability. Leaders who prioritize sustainability inspire and influence their teams to integrate these principles into their work. Sustainable leadership brings opportunities to companies in the form of continuous improvement and general innovation (McCann and Holt, 2010a). Avery and Bergsteiner (2011) also reported that sustainable leaders encourage systematic innovation in the workplace. They care about knowledge sharing, they build a culture of trust and collaboration, and they empower people and create opportunities for them to explore (Gerard *et al.*, 2017; Zhang and Bartol, 2010). The experience of trust particularly increases employees' efficiency, encouraging them to work beyond their job requirements, which also means "to work innovatively" (Sharkie, 2009).

Based on the arguments presented in the SET (Blau, 1964), project team members, under the influence of sustainable leadership, are encouraged to exhibit innovative behaviors because they experience caring treatment and support from a sustainable project leader. The innovative behaviors of project team members act as a bridge between SPL and SPP. By fostering a culture of creativity, problem-solving, and proactive engagement, SPL sets the stage for the team to generate innovative solutions that positively impact the project's economic, environmental and social dimensions. This leads to the next hypothesis:

H2c. Project team members' sustainability-oriented innovative behaviors (SIBs) positively mediate the relationship between sustainable project leadership (SPL) and sustainable project performance (SPP).

2.3 The moderating role of the project management approach (PMA)

The traditional PMA promotes the perspective that rigorous, hierarchical control best handles complexity. The project's scope, time and costs are determined in the early phases of the project life cycle. The project work starts with the collection and analysis of requirements,

and moves through the design of a solution to the implementation of the solution. The traditional PMA seeks to minimize changes during the course of the project (Piwowar-Sulej, 2021).

In turn, the agile PMA (as reflected in, for example, the Scrum project methodology) attempts to bring flexibility to project execution. The project work is divided into equal iterations with parts of the project scope assigned to each. People and their interactions are valued more than processes and tools (Agilemanifesto.org, 2020). The project team – not a formal project manager – is responsible for the execution plan and making the iterations. A project leader is a person who helps the team perform at the highest level by delivering frequent and honest feedback from other project stakeholders. The agile PMA promotes autonomous project teams (Schwaber and Sutherland, 2017). This approach is especially favored in software development projects because of the increasing demands for rapid development and the need to deal with continuous change (Reiff and Schlegel, 2022).

It should be mentioned that both the traditional and agile PMAs have their advantages and disadvantages. Therefore, hybrid PMAs (e.g. the Water-Scrum-Fall methodology) are being implemented in companies. They usually take the flexibility and adaptability of agile project management and combine them with more traditional approaches to the ordering of tasks (Piwowar-Sulej, 2021).

As presented in Section 2.2, SPL has the potential to stimulate SIBs. Additionally, agile project management provides a work environment which is characterized by open communication, creativity and flexibility. Agile practices are a source of empowerment (Malik *et al.*, 2021) which – in line with the SET – can be treated as an employee benefit. Many studies have found that subordinates reciprocate this benefit by performing in accordance with leaders' preferences, in project settings as well (Fareed *et al.*, 2023; Mubarak *et al.*, 2021). An agile work environment stimulates general innovative behaviors in project team members (Koch *et al.*, 2023; Malik *et al.*, 2021), thus spurring SIBs – especially when a project leader practices SPL. Therefore, it is expected that when agile project management interacts with caring employee treatment from a sustainable project leader, the impact of SPL on SIBs will be amplified. Similarly, a hybrid PMA should have a positive moderating role, though lower than in the case of the agile PMA. In turn, when a traditional PMA is being used in a company, it negatively moderates the impact of SPL on SIBs.

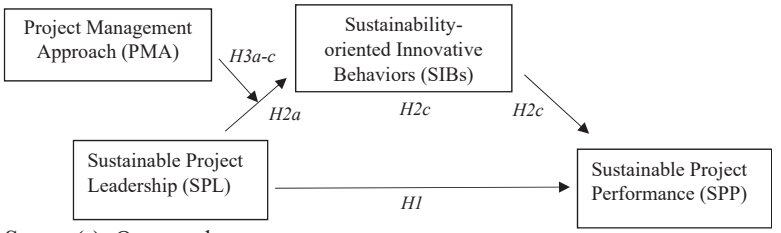
H3. PMA has a moderating impact on the "SPL–SIBs" relationship.

H3a. The agile PMA positively moderates the "SPL–SIBs" relationship.

H3b. The hybrid PMA positively moderates the "SPL–SIBs" relationship, though its impact is lower than the moderating impact of agile PMA on this relationship.

H3c. The traditional PMA negatively moderates the "SPL–SIBs" relationship.

The research model, which includes all the above-presented hypotheses, is presented in Figure 1.



Source(s): Own work

Figure 1.
Research model

3. Research methodology

3.1 Population, sample and data collection

The population in this study consists of software engineers working as project team members in medium-sized and large companies operating in the financial industries in Poland. Addressing the questionnaire to project team members (instead of project managers) allows for more objective opinions about the leaders' attributes and effectiveness in terms of SPP (Piwowar-Sulej, 2022). There are no official statistics referring to the number of medium-sized and large companies operating in the financial industries in Poland, due to the fact that many of these companies are registered under various types of business activities. Thus, the number of companies was determined through both the classification of economic activities and industry reports. As a result, about 100 medium-sized and large companies operating in the financial industries in Poland were counted (Piwowar-Sulej, 2021). Additionally, the absence of a list of software engineers working in these companies further confirmed the absence of a sampling frame. Prior to the data collection process, the software program G*Power v.3.1, based on an *F*-test with *a priori* power analysis, mandated 77 as the minimum sample size to offer robust findings (Faul *et al.*, 2009). Accordingly, a professional research agency in Poland adopted a convenience sampling approach and collected via the CATI method data from 197 project team members working on different projects in medium-sized and large financial companies.

3.2 Survey instrument

In the first phase of this study, in-depth interviews were conducted among 12 practitioners (project managers and project team members working on software projects) to collect items for the measurement of SPP and SPL. As Mansour Salamé *et al.* (2021) admitted, there is no standard definition of performance because of its context-dependent nature. This study used a mixed (deductive/inductive) approach to item generation, as recommended by Morgado *et al.* (2018). First, the respondents were given examples of scales used to measure the sustainable performance of organizations (e.g. (Hourneaux *et al.*, 2018) as well as different types of projects: public–private partnership projects (Liang and Wang, 2019), infrastructure projects (Mansour Salamé *et al.*, 2021), government-financed projects (Nawawi *et al.*, 2015), construction projects (Liu *et al.*, 2021; Sanmi and Ayodeji, 2019), private finance initiative projects (Zhou *et al.*, 2013) and IT projects (Venters *et al.*, 2018). The respondents generated items related to sustainability in software engineering projects (the way that projects are carried out) and sustainability through software engineering projects (the future consequences of projects) (Schneider and Betz, 2022). Drawing on the sustainability pillars, the SPP scale consisted of three dimensions: economic performance (EcP), environmental performance (EnP) and social performance (SoP).

Next, scales used to measure sustainable leadership in organizations (Kalkavan, 2015; McCann and Holt, 2010b) which have been positively verified in many studies (e.g. Iqbal and Piwowar-Sulej, 2022b, 2023b), along with the behavioral patterns of project leaders required for sustainable project management (e.g. Tabassi *et al.*, 2016), were presented to the respondents, who generated items for the SPL scale based on them.

Then, to theoretically refine the items for the SPL and SPP scales, expert opinions were used (four academics in the field of project and organization management). The number of items in the scale was limited by excluding the redundant items. Moreover, the "sum-score decision rule" was applied, which is effective in predicting the usefulness of an item (Morgado *et al.*, 2018). The value was calculated as 3 points for an item perceived as completely representative, 2 points for a somewhat representative item and 1 point for an unrepresentative item (Hardesty and Bearden, 2004). Ultimately, 12 items for SPP and 11 items for SPL were selected based on the experts' judgments, with 8 being the minimum sum of scores.

For the measurement of SIBs, the scale presented by Aboramadan (2022) was adopted. Since this scale focuses only on green innovative behaviors, all sustainability pillars were included in the statements, with the assumption that sustainable innovation in a project should generate long-term social and environmental benefits while creating economic profits for the company (Kneipp *et al.*, 2019). All the above-mentioned scales are presented in the Appendix.

In this study, PMA – which covers three aspects: traditional, hybrid, and agile – was rated as a categorical variable. The respondents answered the question, "Which of the presented PMAs prevails in software engineering projects in your organization?", as in a study by Piwowar-Sulej (2021).

Since a Likert scale is a useful tool for measuring respondents' opinions in survey research (Zhou *et al.*, 2013), such a scale was used in this study. In particular, a five-point Likert scale (from 1 – "strongly disagree" to 5 – "strongly agree") was used because it was found that such a scale increases the response rate (Bouranta *et al.*, 2009). Addressing the questionnaire to project team members (instead of project managers) produced more objective opinions about leaders' attributes and effectiveness in terms of SPP.

3.3 Analytical approach

Structural equation modeling simultaneously analyzes a series of relationships between numerous interrelated variables. Two of the most famous statistical tools, namely, covariance-based SEM and partial least squares SEM, are applied in relation to the study objectives and attributes (Ringle *et al.*, 2020). PLS-SEM, which is prediction-oriented by nature, examines the variance in an endogenous variable. Covariance-based SEM evaluates constructs as common factors and comes up with the covariation values between related indicators (Sarstedt *et al.*, 2019). As the present study is explanatory by nature and highly complex, the application of PLS-SEM was justified. The PLS-SEM analysis required an assessment of both the measurement and structural models; the measurement model analysis was conducted prior to the structural model assessment. Moreover, the authors also conducted a confirmatory factor analysis to see the distinctiveness of the variables in this study.

4. Study findings

4.1 Demographic analysis

This study was dominated by male participants (n = 158, 80.20%); only 39 women participated in the research. Most of the respondents (n = 113, 57.36%) were 30–40 years old, followed by those (n = 58, 29.44%) whose age was higher than 40 years. The majority of employees participating in this research worked for medium-sized firms (n = 126, 63.95%), followed by large firms (n = 71, 36.04%). In the present study, most of the participants (n = 113, 57.36%) had 5–10 years of work experience. Each of the remaining categories, less than 5 years and more than 10 years of work experience, had 42 participants.

4.2 Data screening and common method bias

In the current study, the authors mandated the research agency to check against each measurement indicator in the online survey form to deal with missing values. The z-score analysis in the software suite SPSS revealed that three cases had a z-score value greater than 3.29; these univariate outliers were removed from the dataset. The Mahalanobis distance test did not show any multivariate outliers in this study. The skewness values for SPL (−1.416), SIBs (−1.355) and SPP (−0.247) were in the range of ±3. Similarly, the kurtosis values for SPL

(2.008), SIBs (2.254) and SPP (−0.536) were in the range of ±3. Thus, the dataset demonstrated univariate normality. Moreover, on the basis of Mardia's kurtosis ($\beta = 40.215, \rho < 0.005$) and skewness ($\beta = 7.193, \rho < 0.005$), multivariate normality was also confirmed.

In the statistical analysis, Harman's single-factor test revealed that a single factor counts for 20.942% of the total variation. Moreover, the authors also ran a correlation matrix procedure and found 0.822 as the highest correlation between two items. Therefore, both Harman's single-factor test (Podsakoff, 2003) and the correlation matrix procedure (Bagozzi *et al.*, 1991) confirmed the absence of a common method bias in this study. Confirmatory factor analysis also revealed the fit of the baseline model for the study, which was comprised of SPL, SIBs and SPP, as compared to alternative models ($\chi^2 = 2676.718$, CFI = 0.958 > 0.950, SRMR = 0.0738 < 0.080, RMSEA = 0.077 < 0.080).

4.3 Descriptive analysis

In the present study, SPL, SPP and SIBs are continuous in nature. The authors measured them using a five-point Likert scale. The mean values of SIBs (M = 3.771), EcP (M = 3.907) and EnP (M = 3.838) were in the range of 3.0–4.0. Thus, these variables had a moderate presence in the financial industries in Poland. Moreover, descriptive analysis revealed high-level practices of SPL (M = 4.019), SoP (M = 4.311) and SPP (M = 4.018) among the software engineering projects in the research sample.

4.4 Measurement validation

In this study, the measurement model is comprised of three reflective constructs: SPL, SIBs and SPP. The analysis of a reflective construct requires an assessment of its indicators for reliability, internal reliability and validity. One item of EnP and SoP and two items of SPL were removed because their loadings were lower than 0.40 (Hair *et al.*, 2020). The factor loadings of all other items of SPL, EnP, EcP, SoP and SIBs fell within the range of 0.565–0.873, which indicated acceptable reliability. As shown in Table 1, the SPL, SIBs, EnP, EcP, SoP and SPP had acceptable internal reliability because their Cronbach's alpha values were higher than 0.70. The factor loading and average variance extracted (AVE) values are also presented in Figure 2.

The AVE values of SPL (0.549), SIBs (0.626), SoP (0.553), EnP (0.542), EcP (0.578) and SPP (0.697) were found to be greater than 0.50. Because the values of both indicators and constructs were above the cut-off values, these constructs were determined to have acceptable convergent validity. Moreover, the study employed the Fornell–Larcker criterion to examine the construct's discriminant validity. According to this criterion, a construct has acceptable discriminant validity when the square root of its AVE value is higher than its inter-construct correlation values. As shown in Table 2, the square root of the AVE values of SPL, SIBs, SPP, SoP, EnP and EcP were greater than their inter-construct correlation values. Thus, all these constructs have acceptable discriminant validity.

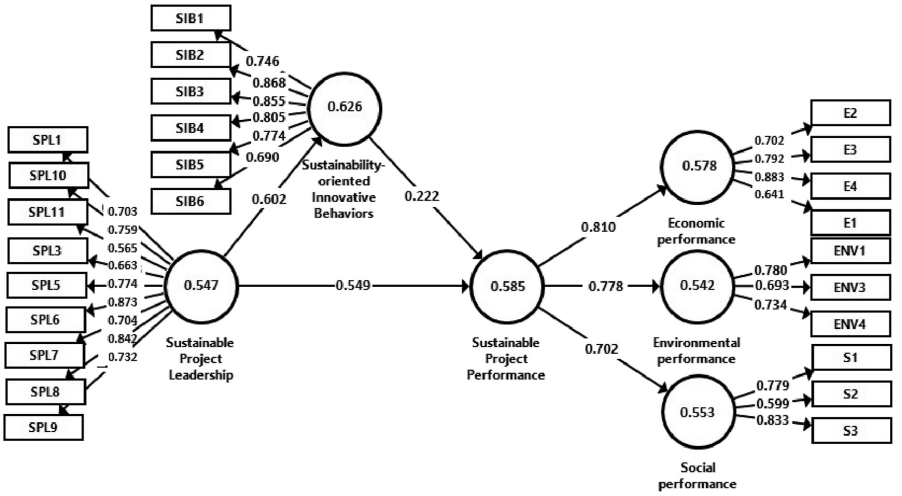
4.5 Hypothesis testing

The path analysis revealed that SPL significantly, positively influenced the SPP ($\beta = 0.549, \rho < 0.050$) of software engineering projects in the Polish financial industries. Therefore, Hypothesis H1 was supported (see Table 3). SPL was significantly, positively related to SIBs ($\beta = 0.602, \rho < 0.050$) and SIBs significantly, positively affected the SPP ($\beta = 0.222, \rho < 0.050$) of software engineering projects. This means that both Hypotheses H2a and H2b were accepted. The products of path coefficient of SPL to SIBs (0.602) and that of SIBs to SPP (0.222) were also positive and significant ($\beta = 0.133, \rho < 0.050$), which indicates

Construct	Item	Loadings	Cronbach's alpha	Composite reliability	Average variance extracted (AVE)
Economic performance (EcP)	E1	0.641	0.790	0.844	0.578
	E2	0.702			
	E3	0.792			
	E4	0.883			
Environmental performance (EnP)	ENV1	0.780	0.758	0.780	0.542
	ENV2	0.693			
	ENV3	0.734			
Social performance (SoP)	S1	0.779	0.761	0.785	0.553
	S2	0.599			
	S3	0.833			
Sustainable innovative behaviors (SIBs)	SIB1	0.746	0.880	0.909	0.626
	SIB2	0.868			
	SIB3	0.855			
	SIB4	0.805			
	SIB5	0.774			
	SIB6	0.690			
Sustainable project leadership (SPL)	SPL1	0.703	0.874	0.914	0.547
	SPL3	0.663			
	SPL5	0.774			
	SPL6	0.873			
	SPL7	0.704			
	SPL8	0.842			
	SPL9	0.732			
	SPL10	0.759			
	SPL11	0.565			
Sustainable project performance (SPP)	EcP	0.810	0.763	0.808	0.585
	EnP	0.778			
	SoP	0.702			

Source(s): Own work

Table 1.
Indicator loadings, reliability, and validity



Source(s): Own work

Figure 2.
Measurement model analysis

a mediating impact of SIBs in the "SPL–SPP" relationship. Therefore, Hypothesis H2c was accepted.

In this study, the coefficient of determination (R^2 value) was 0.382 and 0.155 for SIBs and SPP, respectively. On the basis of cut-off values for R^2 (Henseler *et al.*, 2015), there was a weak predictive accuracy (0.155 < 0.25) for SPP and a moderate predictive accuracy (0.382 < 0.50) for SIBs.

The authors ran the Andrew Hayes Process Model to examine the interaction impact of SPL and PMA on SIBs (Hypothesis H3). The path analysis revealed that the interaction term (SPL*PMA) significantly, positively influenced SIBs ($\beta = 0.206, \rho = 0.023 < 0.050$) (Table 3). The means that PMA significantly, positively moderated the relationship between SPL and SIBs. It was evident that the impact of SPL on SIBs strengthened while moving from the traditional to the agile PMA. Therefore, Hypothesis H3 was supported in this setting. Furthermore, the structural analysis revealed that both the agile ($\beta = 0.613, \rho < 0.050$) and the hybrid PMA ($\beta = 0.407, \rho < 0.050$) significantly, positively affected the "SPL–SIBs"

Construct	1	2	3	4	5	6
1. Economic project performance (EcP)	*0.760*					
2. Environmental project performance (EnP)	0.718	*0.736*				
3. Sustainability-oriented innovative behaviors (SIBs)	0.228	0.152	*0.791*			
4. Sustainable project leadership (SPL)	0.357	0.281	0.598	*0.741*		
5. Sustainable project performance (SPP)	0.810	0.778	0.182	0.366	*0.765*	
6. Social project performance (SoP)	0.424	0.502	0.232	0.249	0.702	*0.744*

Source(s): Own work

Table 2. Fornell–Larcker criterion

Relationship	B	STDEV	*t*-value	*p*-value	LLCI	ULCI
Sustainable project leadership (SPL) > Sustainable project performance (SPP)	0.549	0.062	8.828	0.000	0.405	0.659
Sustainable project leadership (SPL) > Sustainable innovative behaviors (SIBs)	0.602	0.071	8.484	0.000	0.449	0.715
Sustainable innovative behaviors (SIBs) > Sustainable project performance (SPP)	0.222	0.057	3.900	0.000	0.107	0.326
Sustainable project leadership (SPL) > Sustainable innovative behaviors (SIBs) > Sustainable project performance (SPP)	0.133	0.039	3.401	0.001	0.063	0.211
Sustainable project leadership (SPL) * Project management approach (PMA) > Sustainable innovative behaviors (SIBs)	0.206	0.089	2.290	0.023	0.028	0.383
Sustainable project leadership (SPL) * Agile project management > Sustainable innovative behaviors (SIBs)	0.613	0.130	4.710	0.000	0.355	0.870
Sustainable project leadership (SPL) * Hybrid project management > Sustainable innovative behaviors (SIBs)	0.407	0.085	4.758	0.000	0.237	0.576
Sustainable project leadership (SPL) * Traditional project management > Sustainable innovative behaviors (SIBs)	0.201	0.117	1.710	0.089	−0.031	0.434

Source(s): Own work

Table 3. Hypothesis testing

relationship, whereas the former had a larger impact than the latter (Table 3). Therefore, Hypotheses H3a and H3b were also accepted. However, the interaction term (SPL * traditional PMA) did not significantly affect SIBs ($\beta = 0.201, \rho = 0.089 > 0.050$) in the surveyed companies. Thus, Hypothesis H3c was rejected.

5. Discussion

This study provides evidence of a direct relationship between SPL and SPP. This finding contradicts the irrelevant role of leadership in the IT projects' success revealed by Yohannes and Mauritsius (2022), though it supports many other studies that emphasized the crucial role of project leadership in delivering this success (e.g. Lei *et al.*, 2020; Mubarak *et al.*, 2021). As Martens and Carvalho (2017) stated, the environmental and social elements of sustainability are difficult to incorporate into projects. However, this study – the first study on SPL – demonstrates that this leadership style leads to higher SPP, which means not only eco-efficiency of projects but also value delivered to other project stakeholders. Sustainable project leaders cooperate with all project stakeholders, treat them equally, use open communication and are supportive toward project team members. These behaviors from leaders positively contribute to SPP.

The results also enrich the scant evidence on the antecedents of innovative behaviors in projects. The extant project management literature shows that incentive contracts (Zhang and Jin, 2014), slack resource availability (Horsthuis *et al.*, 2012), financial resource constraints, team climate (Weiss *et al.*, 2011) and leader's behaviors – i.e. help in finding resources, encouragement, positive feedback and autonomy (Simon *et al.*, 2019) – encouraged project team members to create and implement innovative ideas in different types of projects. In turn, leaders hiding knowledge has led to poor innovative behaviors in IT projects (Mubarak *et al.*, 2022). As far as specific leadership styles are concerned, previous studies have found that transformational leadership (Zhang *et al.*, 2018) and ambidextrous leadership (Zheng *et al.*, 2023) stimulated innovative behaviors in construction projects. Khan *et al.* (2022) provided evidence that inclusive leadership enhanced innovative behaviors in IT projects. This study clearly shows that SPL stimulates SIBs in software engineering projects. In this case, SIBs are reciprocated for the supportive behaviors of leaders. It should be stated that previous studies have indicated that projects – being temporary phenomena – have a limited capacity to build positive relationships between transformational leadership and employee behaviors, in comparison with traditional functional organizations (Aarseth *et al.*, 2017). However, as the current study shows, sustainable project leaders have an impact on project team members' SIBs. The latter, in turn, are beneficial in order to better conduct projects.

This study also confirms that SIBs significantly, positively mediate the "SPL–SPP" relationship. According to Martens and Carvalho (2017), sustainability challenges are opportunities for innovation in projects. As the study shows and the SET suggests, when project managers use SPL, they encourage project team members to think and act innovatively. SPL can be described as an innovation-oriented leadership style, which has been found to be an important predictor of project success (Ahmed *et al.*, 2023). This study shows that sustainability-oriented innovation enhanced by sustainable project leaders is necessary for SPP.

Finally, this study demonstrates the moderating role of PMA in the relationship between SPL and SIBs. In particular, it provides evidence of a positive moderating impact of the agile PMA on this relationship. In this way, this study contributes to the literature on agile project management by extending previous research into the positive outcomes of agile practices on IT project success (e.g. Moedt van Bolhuis *et al.*, 2023; Radhakrishnan *et al.*, 2022). However, as this study shows, not only an agile PMA can contribute to SIBs; a hybrid PMA was found to be a good moderator of the "SPL–SIBs" relationship as well. Therefore, this study also

enriches the scarce literature on hybrid PMAs and supports the finding by Reiff and Schlegel (2022) that hybrid PMAs have the potential to increase creativity in finding solutions. Surprisingly, the results show that the traditional PMA does not act as a moderating variable between SPL and SIBs. This finding should encourage scholars to search for additional variables that may explain this non-significant effect (e.g. project characteristics (Ciric Lalic *et al.*, 2022)).

5.1 Theoretical contributions

The theoretical contributions of this study are presented in the following points. Firstly, the study adds to the literature on factors that influence project success. In particular, it addresses the proposal raised by Tabassi *et al.* (2016) to further explore leadership styles in the context of project performance and in light of sustainability. This study also adds to the discussion on how to minimize the negative side effects of digitization, taking into account the fact that software engineering is a fundamental practice of digitization (Schneider and Betz, 2022). It also enriches the very limited empirical evidence on the outcomes of hybrid PMAs (Reiff and Schlegel, 2022).

Secondly, this study provides scales for measuring the constructs of SPL, SIBs, and SPP. Therefore, it enriches the project management literature in terms of methodology. It takes into account the economic, environmental, and social aspects in all the examined constructs, while most of the previous research on sustainability in project management focused on individual sustainability pillars (e.g. green project management) (Martens and Carvalho, 2017). In particular, based on the deductive-inductive approach to item generation, experts' opinions and statistical analyses, it offers original scales for measuring SPL and SPP which can be used in future research.

Thirdly, this study contributes to the literature on the SET, showing the applicability of this theory in explaining the relationship between sustainable project leaders and project team members. Finally, it shows that SPL impacts SPP, both directly and indirectly – through SIBs. Therefore, it opens up new directions for research that may further explore different additional factors that influence the examined relationships.

Schoper *et al.* (2016) predicted that sustainability would be one of the key areas of project management development by the year 2025. Therefore, the authors would like to encourage other researchers to build and test models aiming to increase SPP. In this study, SPL moderately predicted SIBs, but SPL and SIBs together weakly predicted SPP. Moreover, SIBs significantly mediated the relationship between SPL and SPP. Thus, it is recommended to explore any potential mediating factors on this relationship in further studies. Future studies may also include control variables such as the size of the project, because it determines the importance of the leadership style (Thite, 1999).

5.2 Practical implications

Establishing the sustainable development concept at the project management level is of the utmost importance for successfully implementing a sustainability-oriented organizational strategy (Aarseth *et al.*, 2017) and creating sustainable financial services (Tuyon *et al.*, 2022). However, as Banihashemi *et al.* (2017) stated, many companies still fail to manage projects in a sustainable way. This study provides practical implications for increasing the SPP of software engineering projects in the financial sector. First of all, the surveyed companies should develop SPL. HR departments are responsible for including sustainability-oriented criteria when recruiting project managers. In turn, HR development specialists should provide project managers with sustainability-oriented training. Moreover, it is worth monitoring the level of SPL in companies.

Secondly, since SIBs strengthen the "SPL–SPP" relationship, project managers should promote SIBs among project team members through caring treatment and support. The support is associated with sending supportive messages as well as providing the various resources needed for innovative behavior. Then, as argued by the SET, project team members will do their best to work innovatively when searching for and implementing sustainability-oriented solutions. Importantly, this study encourages project leaders to implement agile and hybrid PMAs to further spur SIBs.

Thirdly, this study also provides useful material for educational institutions, which may be used in courses devoted to project management. It is worth infusing sustainability into their higher education programs to increase software engineers' awareness of sustainability, and thus contribute to their SIBs. It is also worth including the findings in training for HR specialists. Since one of the roles of modern HR departments is that of a business partner, HR professionals working in project-oriented organizations should be familiar with the latest developments in the relationship between project manager and employee (Piwowar-Sulej, 2017).

Finally, sustainability-oriented projects consider the needs and interests of diverse stakeholders. They address climate change and contribute to global efforts to mitigate the impacts of climate change. They are also more likely to align with the social and cultural context of the communities they impact. They may include marginalized communities, thus contributing to social equity. This can lead to improved living conditions, better access to resources, and reduced social disparities. Therefore, this study also has utilitarian value from the broader social perspective.

6. Conclusions

Sustainable development presents companies with growing challenges. Future expectations of not only customers and business partners, but also employees will surely include elements of sustainability. In this situation, gaining a competitive advantage will depend on the company's ability to implement changes in products, processes, and services that fulfil environmental and social requirements as well as economic ones. This implementation needs appropriate, that is, sustainable project management. Since effective project management is associated with an effective leadership style, this paper – as the first – examined the impact of SPL on SPP. In particular, it provided evidence that SPL increases SPP. Moreover, it proved that SPL stimulates team members' SIBs and that SIBs strengthen SPL's impact on SPP. Furthermore, it was found that agile and hybrid PMAs positively moderated the "SPL–SIBs" relationship. These findings lead to both theoretical and practical implications, which are presented in this study.

This paper has some shortcomings, though it nevertheless provides directions for future research. Firstly, the results are country-specific and the data refer to the financial industries. In order to extend the applicability of the findings, similar research in different industries and countries is needed. For example, important fintech ecosystem players include start-up technology developers. Secondly, this study presents the opinions of respondents who were employees of mid-sized and large financial companies. Identifying the views of, for example, governments and financial customers regarding SPP would make a further contribution to the academic knowledge. Another limitation may be the nature of the quantitative research approach. Since the SET suggests that relationships between parties evolve over a period of time into trusting, loyal, and mutual commitments (Xerri, 2013), longitudinal research would help achieve a better understanding of the dynamics between variables over time.

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Appendix
Scales used in this study

SPP

1) Economic performance

Our projects' economic performance is usually at an acceptable level in terms of:

E1. fulfilling budget constraints

E2. contributing to the company's income (sustainable product and services acquisitions)

E3. reducing the company's costs

E4. complying with the relevant legal requirements and regulations

2) Environmental performance

Our projects' economic performance is usually at an acceptable level in terms of:

ENV1. energy use during a project life cycle

ENV2. virtual meetings instead of travelling during a project

ENV3. the energy efficiency of the final product

ENV4. the reduction of space (reducing the number of hardware devices needed to offer services)

3) Social performance

Our recent projects' social performance is usually at an acceptable level in terms of:

S1. ensuring customer satisfaction (time and quality)

S2. ensuring a good working environment (professional development, working time, etc.) for project team members

S3. ensuring organizational learning through the participation of a wide group of project stakeholders during a project life cycle

S4. meeting ethical standards

SPL
The project leaders who led software projects in my company:

SPL1. acted in a sustainable, socially responsible manner toward external project stakeholders

SPL2. acted in a sustainable, socially responsible manner toward internal project stakeholders

SPL3. acted in a sustainable, environmentally responsible manner

SPL4. acted in a sustainable, ethically responsible manner

SPL5. made decisions while considering the short term (delivering a product) and the long term (effects of consuming the product)

SPL6. recognized when a mistake was made that affected the sustainability of a project

SPL7. were willing to correct mistakes that affect sustainability

SPL8. attempted to use unique, innovative methods to resolve sustainability issues

SPL9. balanced economic, social, and environmental project goals

SPL10. demonstrated sustainability by persevering through all stages of the project's life cycle

SPL11. promoted open communication concerning sustainability in projects

SIBs
During software engineering projects:

SIB1. I search out new sustainability-related technologies, processes, techniques, and/or product ideas

SIB2. I generate sustainability-oriented creative ideas

SIB3. I promote sustainability-oriented ideas with others

SIB4. I investigate and secure the funds needed to implement new sustainability-oriented ideas

SIB5. I develop adequate plans and schedules for the implementation of new sustainability-oriented ideas

SIB6. I am innovative in terms of sustainability

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