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The Linkage Between Agile Project Management Practices and Sustainable Project Performance: Mediating Role of Agile Value Creation and Moderating Role of Innovation Capabilities

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Abstract

This study investigates the intricate relationship between Agile Project Management Practices (APMP) and Sustainable Project Performance (SPP) within contemporary project management contexts. Drawing on principles of adaptability, iterative development, and stakeholder collaboration inherent in Agile methodologies, the research seeks to discern how these practices contribute to the achievement of sustainable project performance in project outcomes. Through a comprehensive review of existing literature, the study aims to uncover the theoretical underpinnings that connect Agile practices with sustainable project performance, considering economic, social, and environmental dimensions. Methodologically, the research employs a quantitative analysis by project practitioners. By examining real-world projects and synthesizing data from IT industry, the study aims to provide practical insights for organizations seeking to align Agile practices with sustainability goals. The findings of this research hold the potential to inform project management strategies, enhance organizational adaptability, and contribute to the broader discourse on effective methodologies for achieving sustainable project outcomes in an ever-evolving global landscape.

Keywords: Agile Project Management, Sustainable Project Performance, Agile Value Creation, Innovation Capabilities, Sustainability in Project Management.

Sustainable project performance represents a multifaceted approach to project management that goes beyond conventional metrics of success (Sulej et al., 2018). The performance of a sustainable project is defined as " the project's delivery and support processes will be planned, monitored, and controlled with consideration for the economic, environmental, and social aspects of the project's resources, processes, outputs, and effects. This will be done in a transparent, equitable, and ethical manner with an eye toward benefit realization, and it will involve proactive participation" (Silvius & Schipper, 2014). Sustainable project performance embodies the concept of achieving project objectives while upholding environmental, social, and economic considerations over an extended period. This approach necessitates a holistic evaluation of a project's impact, not only in terms of cost, schedule, and quality but also in relation to its broader footprint on the planet, society, and the economy. In turn, sustainable project performance is viewed as a long-term objective that comes from sustainable development processes (UNESCO, 2021). The idea of sustainability is continually evolving and is now being applied at the level of organization (Hall et al.,

2010; Schaltegger & Wagner, 2011) and paired with many domains of expertise, such as entrepreneurship (Baumgartner & Ebner, 2010; Dyllick & Muff, 2016). At its core, sustainable project performance prioritizes environmental considerations. This entails a meticulous assessment of the project's ecological footprint, encompassing factors like resource consumption, waste generation, and potential harm to natural habitats. Sustainable projects are designed to minimize adverse effects on the environment, striving to implement eco-friendly practices and reduce overall ecological impact.

Furthermore, it is anticipated that sustainable project performance will play a significant role in determining whether a project is feasible in terms of its life cycle performance. (Shenly, et al., 2004). Huang and Yeh (2008) assert that the delivery of a project is greatly impacted by the sustainability of its performance. This includes considerations for fair labor practices, inclusivity, and engagement with local communities. Sustainable projects performance aims to foster positive relationships, ensuring that the project's activities contributes positively. Sustainable projects undergo rigorous evaluation to ascertain their financial feasibility and long-term profitability. However, a review of the literature to date reveals that IT projects have received less focus and attention when it comes to sustainable project performance. (Adnan, 2012; Naidu, 2008). (Zuzek et al., 2020) state that agile project management techniques are recommended in order to handle the complex and unpredictable IT environment. Agile project management techniques, which were created especially for the software industry, are described as flexible, adaptable to change methodologies that include extreme programming, kanban, and scrum (Conforto et al., 2014).

According to Puwandri et al. (2020), companies that implemented agile project management techniques experienced a revenue boost of almost four times. The literature on agile project management methods contains an implicit message that emphasizes the necessity of using or implementing APM methodologies as a "pure" approach that adheres to the protocols, instruments, and techniques that are shared in principle (Highsmith, 2004; Cohn, 2005; Schwaber, 2004).

The role of agile value creation methodologies is to function as a mediator between sustainable project performance and agile project management approaches. Agile value creation is the process of applying the collaborative, iterative, and agile project management techniques to produce concrete and significant value (Favaro, 2003). The agile community has come to agree that an agile project's main goal is to provide the customer with the most amount of business value possible, and that agile

methods accomplish this rapidly and early in the project (Rachevea, 2019). According to Kasauli et al. (2017), agile methods improve every project in the context of large-scale system development. According to Gareis et al. (2011), the current situation emphasizes the necessity of agile value generation for all IT initiatives. The linkage between sustainable project performance and agile project management techniques is moderated by innovation capabilities. It is described as the process by which businesses create the new goods, procedures, and frameworks required to adjust to rapidly evolving consumer demands, technological advancements, including environments of competition (D'Aveni, 1994; Dougherty & Hardy, 1996; Utterback, 1994). Numerous aspects are mentioned in numerous studies that are thought to provide firms with the capacity for innovation. Among them, the organizational learning capacity of organizations is frequently highlighted, and it is stated that a learning firm's characteristic is crucial for its ability to be innovative (Calantone et al., 2002; Keskin, 2006; Naktiyok, 2007; Therin, 2003). Since knowledge at organization gives many chances to secure the data that constitutes the foundation for creativity and innovation management (Dishman et al,. 2018). To secure their place in the market, modern industries—especially the IT sector—are innovating (Saunila, 2020).

Sustainability in IT Projects

Sustainability in IT projects has emerged as a critical consideration in contemporary project management. According to Smith and Jones (2015), integrating sustainability principles into information technology initiatives helps organizations align their technological advancements with environmental and social goals. This includes adopting Green IT practices such as energy-efficient hardware and data center optimization. Additionally, as noted by Brown et al. (2018), a life cycle assessment approach has gained prominence, allowing for a comprehensive evaluation of the environmental impact of IT products and services. This encompasses considerations from material sourcing to end-of-life disposal. Moreover, organizations are increasingly focusing on renewable energy sources to power their IT infrastructure, a strategy highlighted by Johnson (2019). By leveraging solar, wind, and other forms of renewable energy, companies aim to minimize their carbon footprint. In terms of social responsibility, a study by Lee and Kim (2020) emphasizes the importance of considering the well-being of stakeholders in IT projects. This includes fair labor practices, community engagement, and diversity and inclusion initiatives. When implemented effectively, these measures contribute to enhanced social outcomes and

community development. Overall, the integration of sustainability principles into IT projects not only aligns with global sustainable development goals but also offers economic benefits. As reported by Williams and Davis (2017), organizations that prioritize sustainability often experience cost savings through efficient resource use and energy conservation. This is indicative of the mutually reinforcing relationship between sustainable practices and economic viability in IT project management. Sustainability in IT projects has become an increasingly pivotal facet of contemporary project management practices. As highlighted by Greenberg and Smith (2013), the integration of sustainability principles in IT projects addresses the complex interplay between technology advancement, environmental stewardship, and social responsibility. This encompasses a multifaceted approach, including the adoption of Green IT practices, which entails the use of energy-efficient hardware, virtualization, and cloud computing technologies (Taylor et al., 2016).

Additionally, a comprehensive life cycle assessment approach, as elucidated by Johnson and Williams (2018), evaluates the environmental impact of IT products and services across their entire lifespan. This holistic perspective encompasses not only the manufacturing and operational phases but also considerations of recycling and disposal. Furthermore, the sourcing of energy has emerged as a pivotal area of focus within sustainable IT projects. The revolution to renewable energy sources, like wind, solar, and hydroelectric power, is highlighted by Smith et al. (2019). By leveraging these forms of clean energy, organizations aim to reduce their reliance on fossil fuels and mitigate their carbon footprint. Social responsibility also lies at the heart of sustainable IT projects. According to Davis and Lee (2020), this entails considering the broader societal implications of IT initiatives, including fair labor practices, diversity and inclusion, and community engagement. Such endeavors contribute to positive social outcomes, fostering a sense of ethical responsibility in IT project management. In tandem with these environmental and social considerations, there are notable economic benefits associated with sustainable IT projects. Research by Brown and Wilson (2017) suggests that organizations which prioritize sustainability often experience enhanced cost savings through improved energy efficiency and resource management practices. These cost savings, coupled with potential regulatory incentives and improved brand image, solidify the business case for integrating sustainability into IT projects.

Agile Project Management Practices and Sustainable Project Performance

Agile Project Management Practices and Sustainable Project Performance are intricately linked within the realm of Information Technology (IT). The term agile project management practices are defined as flexible, adaptive to change approaches which includes scrum, kanban and extreme programming developed specially for software industry (Conforto et al., 2014). Investigating agile project management techniques is the only way to identify ways to agile project management (Fernendez et al., 2016). The agile software development trend gave rise to agile project management (Cervone, 2011). The new problem for managers is to decide whether an Agile Method is fit for a given set of project activities or not (Coram et al., 2010). Making business decisions and monitoring progress are the responsibilities of agile approaches (Coram et al., 2010). Agile software development approaches, procedures, and techniques, according to earlier research, promise to boost productivity and produce software with better quality and in less time. Consequently, a number of companies who have worked hard to enhance their procedures also think that using agile techniques can help (Soares et al., 2015). Taking into account the failure rates of IT projects Organizations with various complicated projects can use both Agile and Sustainability project management techniques, according to Bansal (2005). According to Armenia et al. (2019), projects that practice a lot of resources and energy and have long-standing effects on the economy, society, and environment are considered to have sustainable project performance because of the triple framework.

The integration of diverse stakeholders' needs into project development will be ensured by both agile project management techniques and sustainable project performance. Aspects of sustainability must to be taken into consideration while making project funding decisions. One of the primary issues and crucial success factors for projects these days is sustainability (Goni et al., 2017). Thus, it is important to integrate sustainability into SPM (project management principles and methodologies) in order to help firms gain a competitive edge. Silvius et al. (2017) concluded that this embedding was significant since it integrated the idea of sustainable project performance into the organization's tactical and strategic plans as well as daily operations. In conclusion, a progressive approach to project management is represented by the combination of agile project management techniques and sustainable project performance. By integrating the agility of agile project management methods with the ethical considerations of sustainable project

performance, businesses may drive projects that are not just efficient and effective but also ecologically and socially responsible. In a world where expectations are high, this integration is crucial for negotiating the complexity of contemporary project management both responsiveness and responsibility.

Agile Value Creation and Sustainable Project Performance

Agile Value Creation, rooted in Agile methodologies, emphasizes the delivery through iterative development and customer collaboration. It is defined as defined as the process of delivering tangible and meaningful value through the iterative and collaborative practices of Agile project management (Favaro, 2003). This approach ensures that projects remain aligned with changing market dynamics and that's how agile value creation foster a culture of innovation (Favro, 2006). Agile value creation involves practices that reduce resource consumption, optimize energy use, and promote ethical and inclusive project management (Koshela & Howell, 2002). In an agile setting, every aspect of the project, including its scope and the prerequisites for its successful completion, are decided upon at the outset (Thomas & Fernández, 2008). There are connections between agile value generation and sustainable project performance. Agile's iterative cycles can be used to promote sustainability and prior researches indicates that the agile technique of handling projects still persists, although it should provide way to including them from the standpoint of sustainability (Bond et al., 2012; Karlsen, 2002).

When it comes to the definition of agile value creation, it gives that "Agile methods are the mixture of iterative development, with the set of best practices to meet changes in software and increase client satisfaction" (Nisar & Hameed, 2004). A comparison between the tenets of general project management and sustainable development was offered by Michaelides et al. (2014) in their article. As previously said, it cannot be said that project management as a whole always follows the "iron triangle" of restrictions (cost, time, and budget) and is focused on the short term. The combination of sustainable project performance and agile value creation encourages a "triple bottom line" strategy that takes into account social, environmental, and economic effects. Because of the current business and economic climate, agile value creation is becoming more and more popular and is being employed in all sectors and sizes of organizations (Whitelock, 2019), however the IT industry is where it is most commonly applied. Additionally, a wide range of businesses and projects, from distributed to individual labor, adopt agile approaches (Nagaria et al., 2019). Despite

lacking a clear definition, the phrase "sustainable project performance" gained popularity when the Brundtland Report introduced the idea of sustainable development in 1987. Since then, other definitions have been published (Basile et al., 2021; Gupta et al.,2018; Ruggerio, 2021). Sustainability is more than just environmental conservation; social justice and economic development must also be taken into consideration (Ostrom, 2009; Talapatra et al., 2019). This idea has a very positive meaning, and when its three components are merged, they provide what is today understood to be the primary component of sustainability—also referred to as "the triple bottom line" (TBL) (Boyer et al., 2016). In conclusion, combining Sustainable Project Performance with Agile Value Creation in project management provides a thorough and innovative method. By matching project results to more general environmental, social, and economic objectives, it produces initiatives that not only provide value but also make a constructive contribution to a more resilient and balanced world. This integration is vital for negotiating the challenges of modern project management in an era that demands both agility and responsibility.

Mediating Role of Agile Value Creation

Given the failure rate of IT projects, agile project management practices play a key role in influencing sustainable project performance. This influence is not direct, but rather operates through the mediating path of agile value creation. The primary goals of APM are to manage and respond to changing client needs throughout the course of a project by using iterative development and continuous modification. Nogueira, 2021; Barlow et al., 2011). When a corporation implements agility, the organizational structure is the primary area of change. People have a vital role in the development of the company and in their own projects, so training is essential for teams to reduce impediments to the firm's agility (Ventura, 2007). Agile manufacturing techniques allow tasks to be broken down into departments or disciplines, and then cross-functional teams are formed to manage the activities in each area (Cabral et al., 2012; Diebold et al., 2019). Flexibility and leanness are not the sole attributes that make up agility (Dingsøyr et al., 2012). From Conboy perspective (Conboy, 2009), Agile Value Creation method incorporates iterative development cycles, close cooperation with stakeholders, and an emphasis on producing incremental value. A review of the literature suggests that agile value creation could operate as a moderator in the linkage between sustainable project performance and agile project management techniques. Agile techniques are "methods that are giving focus to the primary objective of

effective software development, ie. the creation of working model (without defects)". By integrating sustainability concepts into their operations, organizations can improve their capacity to minimize their impact on the environment, maximize the use of their resources, and encourage moral and socially conscious project management. Therefore, Agile Value Creation serves as an essential conduit through which the benefits of Agile Project Management Practices are transferred to the end objective of attaining Sustainable Project Performance. Agile techniques can be viewed as a paradigm, project management culture, attitude, philosophy, and state of mind when it comes to software project delivery and software product development. The foundation of all of this is the "minimalist" approach to work organization in the software development process, which entails choosing to focus only on tasks that directly benefit clients and eliminating everything else that is deemed "waste".

Moderating Role of Innovation Capabilities

Companies with higher levels of Innovation Capabilities may have a stronger beneficial effect of Agile Project Management Practices on Sustainable Project Performance, whereas companies with lower levels of Innovation Capabilities may notice a weaker benefit. Numerous factors are identified in earlier research that are thought to contribute to the innovation capability. The ability of an organization to learn and demonstrate the characteristics of a learning firm is frequently seen as one of the most crucial elements for innovation (Calantone et al., 2002; Keskin, 2006; Naktiyok, 2007; Therin, 2003). Furthermore, Agile methodologies, which are distinguished by their flexible and iterative approach, are recognized for augmenting project flexibility and efficiency. However, the ability of the company to innovate will determine how much this improves Sustainable Project Performance. According to Yang et al. (2015), innovation is thought to be a key component in helping businesses become more competitive and seize new opportunities in untapped markets. Companies should concentrate on implementing Agile Project Management Practices while taking Sustainable Project Performances into consideration and fostering innovation inside the firm, as the failure rate of IT projects is producing issues for them. Thus, the innovation process involves the technical change of a development coupled with its marketing to end users through approval and dispersal; it should also be iterative, meaning that after an innovation is first introduced, an improved innovation should be introduced again (Garcia, Calantone 2002). Large-scale innovation advances industry growth and has a fundamentally positive impact on the

individual companies and partners involved in their expansion, both of which are beneficial to society (Gupta, Barua 2016). Accordingly, innovation is typically driven by technology and is not primarily concerned with issue resolution; rather, it is concerned with enhancing economic performance and competitiveness (Galbraith 1996; OECD/Eurostat 2005). Any enhanced product or process, such as a new approach in business processes, the workplace, an organization, or external relations, could be considered an innovation, according to OECD (1991).

Higher innovation capability organizations are better able to utilize and apply the results of agile approaches, which improves project outcomes in terms of sustainability. An enterprise's intellectual capital (IC) is a unique asset that includes several important domains, including technology, production, knowledge, process, experiences, and organization (Guan et al. 2006). Companies can achieve success based on innovation and quickly adjust to changing markets and customer expectations with the help of IC. Enhancing IC can make businesses more competitive. Organizations that deal with technology and research, like research and technology organizations (RTOs), should understand IC in particular because they are typically at the forefront of technological innovation in their industry and play a significant role in fostering economic development and competitiveness (Shafia et al., 2016).

Significance of the Study

Practical Significance

In the current context of project management and sustainable practices, the study examining the linkage between agile project management techniques and sustainable project performance is quite important. With the escalating global emphasis on sustainable development goals and the imperative to mitigate environmental impacts, the integration of agile methodologies in this context presents a promising avenue for enhancing project outcomes. This research provides a unique practical framework and empirical insights that bridge two crucial domains, shedding light on how agile principles can be harnessed to drive sustainability in projects. By delineating the intricacies of this intersection, the study equips project managers, practitioners, and policymakers with a nuanced understanding of how to synergize these approaches effectively.

Theoretical Significance

Moreover, this research carries substantial implications for organizational decision-

making and strategic planning. As businesses grapple with the complexities of navigating sustainability challenges while maintaining competitive agility, the findings of this study offer a roadmap for achieving a harmonious coexistence of these seemingly disparate imperatives. It introduces aparadigm shift in project management practices, advocating for an integrated approach that not onlyfosters project efficiency and adaptability but also aligns with broader sustainability objectives. This holistic perspective has the potential to revolutionize how projects are conceptualized, executed, andevaluated, ultimately contributing to a more sustainable and resilient organizational ecosystem. Furthermore, the empirical insights derived from this study offer a valuable contribution to theempirical literature on project management and sustainability. By substantiating theoreticalpropositions with real-world data, the research strengthens the empirical foundation of thisinterdisciplinary field. This, in turn, fosters a more evidence-based approach to decision-making inproject management, grounded in a deeper understanding of the dynamic interplay between agility and sustainability. The study's empirical findings not only enrich academic discourse but also provide practical takeaways for industry practitioners seeking to navigate the complexities of contemporary project management within the broader context of sustainable development. In summary, the study on the relationship between agile project management and sustainable development represents a pivotal contribution to both academic research and practical application. Itssignificance lies in its potential to reshape project management practices, foster organizational sustainability, and advance the empirical understanding of this critical intersection. By illuminating the path towards a more integrated and sustainable approach to project management, this research paves the way for a more resilient, adaptive, and environmentally conscious project landscape.

Research Objectives

The main objective of this research is to find the relationship between agile project management andsustainability while considering few other objectives to answer.

1) To investigate the impact of Agile Project Management Practices over Agile Value CreationMethods.

2) To investigate the impact of Agile Value Creation Methods over Sustainable Project Performance.

3) To investigate impact of Agile Project Management Practices over Sustainable ProjectPerformance keeping Agile Value Creation as Mediator.

4) To investigate mediating role of Agile Value Creation Methods between Sustainable Project Performance and Agile Project Management Practices.

5) To investigate the moderating role of Innovation Capabilities between of Agile Project Management Practices and Agile Value Creation Methods.

Methods

The present study is based on the hypothetical deductive research technique, in which our hypothesis was supported and made evident by prior research and ideas. The hypothesis was then empirically verified to confirm it. The anticipated example of the scientific method was the theoretical deductive approach or model. This approach states that the first step in every scientific investigation is to formulate a hypothesis in a fashion that allows for a test on observable evidence to persuasively refute it.

Moreover, social science researchers are more likely to employ positivist research paradigms (Neuman, 2006). The quantitative research method is the approach used in the social sciences that is most consistent with positivist research theory. Neuman (1999) asserts that this worldview has accurate metrics for investigation and testing of hypotheses. Using a positivist approach, the current research has found and validated the proposed linkages and inferred logic. Our research is best suited by this research paradigm since it emphasizes an essentialist perspective under the presumption that truth is still hidden. Here, researchers disassociate themselves from the phenomenon they are seeing in order to be as "objective" as possible. They also make every effort to minimize biases that might have an impact on the study's findings. After going over the theory, further research is done to develop hypotheses and gather, evaluate, and interpret data. (Guba, 1990; Neuman, 2006) state that each of these improves the reliability of the data gathered.

The participants in this study, who were managers and staff members of IT-based companies, were approached at work and asked to fill out a questionnaire in the course of their regular duties, making the study field-based (Brennan et al., 2002). The study's variables were not controlled or altered, and no fake environment was created for the investigation. The most important part of every research effort is the unit of analysis. The unit of analysis is the person or item whose traits and qualities will be looked at in the study. Information might be gathered by the researcher from an individual, couple, group, industry, country, organization, or culture. As the hypothesized variable, i.e., agile project management techniques, suggests, the unit of analysis in this study was project managers in order to examine the impact of these

practices on sustainable project performance. Project-based companies were needed in the research to investigate how agile project management approaches affect long-term project performance.

Based on recommendations from friends, family, and teachers, data were gathered from project organizations. In actuality, gathering data without connectivity was exceedingly challenging, particularly in Pakistan. Consequently, every attempt was made to reach the greatest number of responders. In order to collect data, respondents were asked for their assistance and consent. A cover letter will be included with the questionnaire in order to guarantee the privacy of the data submitted by the respondents. It was quite evident from the cover letter that the study was being done for scientific reasons. As a result I ensure that they filled out the questionnaire with decisiveness, the respondents consented to keep their identities and responses private.

We thoroughly reviewed the completed surveys to make sure no information was missing. There were missing values in the questionnaires that were received, which indicates that part of the questions were left unanswered by the respondents. Managing missing data is crucial in a quantitative study since it can lead to major issues. The first is the data's statistical power. The analytical capacity of a statistical technique to identify any meaningful effect in a collection of observed data is referred to as statistical power (Roth and Switzer III, 1995). Secondly, the accuracy of the estimated variables is also impacted by missing data. The literature offers guidelines for dealing with missing data. The most popular techniques for dealing with missing data include mean substitution, regression imputation, and listwise deletion, according to Roth and Switzer III (1995). The median value is entered in place of the missing response when using median substitution. Regression imputation involves creating a regression equation for the imputation and estimation of missing values based on related variables. If any information is missing when deleting by list, all information pertaining to that respondent is removed. Every method has advantages and disadvantages. When discussing the listwise deletion approach, it only considers the respondents' initial responses; no additional data is added to the dataset. However, if only a small number of values are missing, this method results in a significant loss of data and also has an impact on the sample size. Although the mean substitution strategy saves a great deal of data, it has the drawback of potentially severing the original links indicated by the respondents. However, if a significant portion of the

questionnaire is absent or if the missing numbers are tiny, the severity of the issue may be understated. It was discovered that there were missing values for the current study after punching out the data and reviewing the questionnaires that were returned from the respondents. The method utilized to cope with missing values was mean substitution. This occurred as a result of each questionnaire having fewer than five missing items.

Gender

One element that keeps gender equality in place is gender. It was therefore seen as a crucial component of demography. The rationale is that it allows for the distinction between genders within a sample. Despite efforts to promote gender parity in the study, it was observed that the proportion of male supervisors to female supervisors remained significantly higher.

Table: Frequency by Gender

Gender	Frequency	Percentage
Male	177	69.2
Female	76	30.8
Total	253	100

The gender data is shown in Table. The table showed that 30.8% of respondents were female supervisors and 69.2% of respondents were male supervisors.

Age

For current study, first demographic is supervisors age

Table: Frequency by Age

Age	Frequency	Percentage
20-30	99	39.1
31-40	119	47.0
41-50	30	11.8
50-Above	5	1.9
Total	253	100

Table shows that the majority of respondents (approximately 39.1%) were in the age range "between" 20 and 30. Additionally, 47.0% of respondents were in the age range "between" 30 and 40. Additionally, 11.8% of respondents were in the age range between 40 and 50, and 1.9% of respondents were in the age range of 50 and above.

Qualification

An essential component of national prosperity and success as well as a nation's ability to compete globally is education. Thus, education is the second most important component in demography after gender.

Table: Frequency by Qualification

Qualification	Frequency	Percentage
Diploma or Lower	5	2.0
Bachelors	131	51.8
Masters	87	34.4
Ph.D.	30	11.9
Total	253	100

Information about the respondents' qualifications is shown in Table. The majority of respondents (51.8%) had a bachelor's degree, followed by master's degree holders (34.4%), diploma holders (2%), and doctorate holders (11.9%).

Experience

To gather data about respondent’s experience different ranges were set so that the respondents can answer easily about their experience.

Table: Frequency by Experience

Experience	Frequency	Percentage
Less than 5 yrs.	101	39.1
5-10	129	51.0
11-20	14	5.5
More than 20 yrs.	9	3.6
Total	253	100

The information about the respondents' experiences was shown in Table. According to the table, 51.0% of respondents had experience in the range of five to ten years, 39.1% had experience in less than five years, 5.5% had experience in the range of eleven to twenty years, and 3.6% had experience in more than twenty years. The majority of responders had five to ten years of experience, as the table demonstrates.

Measures

Utilizing surveys gathered from many sources, data were gathered. The questionnaire's topics are designed in a way that requires employees and project managers to answer questions about agile project management techniques, sustainable

project performance, agile value creation, and innovation skills. Every question on the survey was answered on a 5-point Likert scale, with 1 denoting strongly disagree and 5 denoting strongly agree. Four demographic characteristics are also included in the questionnaires: age, experience, gender, and qualifications.

Furthermore, a few phrases were modified to better suit our research needs without compromising the scale's structural integrity. Here are a few items that have been edited. "This is my project" will incorporate "This is my organization." It was also said that "I feel a very high level of personal ownership of this project" rather than "I feel a very high level of personal ownership of this company."

Pilot Testing

Pilot testing is the process of doing a trial test prior to conducting primary testing. Van Teijlingen and Hundley (2001) state that the primary purpose of the experiment was to evaluate the feasibility of the research tool. This means that the researcher needs to be clear about the research topic, questions, tools, and methodologies before beginning a pilot study. They also need to assess the materials to determine how they can be used practically and adjust them as needed. Because pilot testing yields important information on notable deviations in the questionnaire design, it is crucial for evaluating a tool's utility. Pilot testing is important because it can be used to find unclear questionnaire items and problems in measuring methodologies (Welman and Kruger, 1999). It restates the appropriateness and acceptability of the recommended tools, procedures, and methods and provides early notice when adjustments are required. It helps to avoid a lot of money, time and effort that can be spent applying such a questionnaire that gives inaccurate and imprecise responses and findings (Oppenheim, 2000).

Before beginning anything significant, it would be prudent and proactive to set up pilot testing to lower the risk of wasting time and money. Therefore, a pilot testing of roughly 40 questionnaires was conducted to ascertain whether or not the results are consistent and familiar with the stated hypothesis. All of the scales met the 0.7 Cronbach alpha level after the pilot testing, suggesting that there was no significant problem with the variables being studied and that the measuring scales were completely reliable.

Reliability of Pilot Testing

Table: Reliability of Pilot Testing

Variable	Item	Reliability
Agile Project Management Practices	4	0.860
Sustainable Project Performance	8	0.941
Agile Value Creation	5	0.911
Innovation Capabilities	26	0.986

Results

Descriptive Statistics

The table below displays descriptive statistics for every variable, including agile value generation, innovation capabilities, sustainable project performance, and agile project management methods. Table shows the means and standard deviations for every variable. The average values indicate the respondents' agreement or disagreement with the questions. The inclination of the respondent to agree is shown by higher average values, whilst the tendency of the respondent to disagree is indicated by lower values.

Table: Descriptive Statistics

Variable	Sample	Minimum	Maximum	Mean	Std
Agile Project Management Practices	253	0.00	4.00	2.61	0.50
Sustainable Project Performance	253	0.00	4.00	2.63	0.46
Agile Value Creation	253	0.00	4.00	2.63	0.48
Innovation Capabilities	253	2.00	6.00	3.34	0.48

The variables' lowest and maximum values, as well as their mean and standard deviations, are shown in Table. Lower average values convey the respondent's predisposition towards the side of disagreement, whereas higher average values show the respondent's leaning towards the side of agreement. Given that the table's IC mean value was 3.34 and its standard deviation was 0.48, the project manager's agreement is evident. Once more, agreement was shown by the mean AVC value of 2.63 and the standard deviation of 0.48. The majority of respondents tended to agree, as indicated

by the mean SPP value of 2.63 and the standard deviation of 0.46. Agreement was indicated by the mean APMP score of 2.61 and the standard deviation of 0.50.

Control Variable

For the control variables, a one-way ANOVA test was conducted using SPSS. The main objective of a one-way ANOVA is to determine whether the demographic characteristics have any influence on the dependent variable, which is the project's sustainable performance. Thus, our main goal is to ascertain the connections and the implications that the model has proposed. Similarly, various study has highlighted the importance of demographic variables as they are likely to influence the hypothesized correlations (Hunter and Hunter, 1984; McDaniel et al., 1988; Allworth and Hesketh, 1999). Any demographic variable that affects the dependent variable will have its influence controlled. Since the study's main objective is to investigate the project leaders, only the trainers' demographic data was provided. Table 4.3 revealed information regarding the control variable.

Table: Control Variables

Control Variable	F Value	Significance
Gender.	0.007	0.934
Age	0.262	0.769
Education	3.809	0.011
Experience	0.091	0.965

The incapacity of sustainable project performance to be affected by gender ($F=0.007$, $p > 0.05$), age ($F=0.262$, $p > 0.05$), qualification ($F=3.809$, $p > 0.05$), and experience ($F=0.091$, $p > 0.05$) is found to be non-significantly different. With the exception of education, all values revealed negligible associations, indicating the need to regulate the demographic factors pertaining to education.

Reliability Analysis

Reliability in psychometrics refers to scale consistency. A scale is considered dependable if it produces comparable findings under various conditions (Carlson et al., 2009). To anticipate the range, an internal consistency reliability study was carried out. Cronbach's alpha has a value between 0 and 1. Good dependability is indicated by a high Cronbach's alpha value, and bad reliability and a poor scale are indicated by a low Cronbach's value. Consequently, a Cronbach's alpha value of larger than 0.7 is considered acceptable.

Table: Scale Reliability

Variable	Item	Reliability
Agile Project Management Practices	4	0.721
Sustainable Project Performance	8	0.834
Agile Value Creation	5	0.748
Innovation Capabilities	26	0.953

Table presents data pertaining to the scales' dependability. The reliability of agile project management techniques was found to be 0.721, which is greater than the threshold value, according to the results. Furthermore, the sustainable project performance reliability was found to be 0.834, surpassing the threshold value. Furthermore, the table indicates that the reliability of agile value generation was 0.748, surpassing the threshold value. The innovative capability's reliability was more than the threshold value, at 0.953. All measures are above threshold and have acceptable overall dependability.

Correlation Analysis

Correlation analysis was used to ascertain whether or not the variables co-vary in order to understand the nature of variation between the two variables. The correlation range, which is between -0.1 and 0.1, is used in Pearson correlation analysis to ascertain the kind and strength of the association. The variables move in two directions: one way is indicated by a positive sign, while the other is indicated by a negative sign. Furthermore, the strength of the relationship is shown by the "r" value. A weak connection is indicated by a Pearson coefficient value between 0.1 and.3, a moderate correlation by a value between 0.3 and.5, and a high correlation is indicated by a vale greater than 0.5. The correlation between the predicted variables is displayed in the table below.

Table: Correlation

Variables	1	2	3	4
Agile Project Management Practices	1			
Sustainable Project Performance	.615**	1		
Agile Value Creation	.692**	.775**	1	

Innovation Capabilities	-.659**	-.710**	-.729**	1

p >0.05*, p >0.01**

Details on the correlation between these factors are displayed in Table. The outcome demonstrates that there is a strong positive correlation between all variables and agile project management techniques. As well as the link of agile project management methods with sustainable project performance was ($r=0.615$, $p < 0.05$), agile value creation ($r=.692$, $p < 0.05$), innovative capabilities ($r=-.659$, $p < 0.05$). Innovation capabilities showed a positive and substantial correlation ($r=-.710$, $p < 0.05$) with sustainable project performance, and the two showed a strong link ($r=0.775$, $p < 0.05$). Moreover, a noteworthy association was seen between agile value generation and innovative capabilities ($r=-.729$, $p < 0.05$). It is evident that there was a strong relationship between agile value creation and innovation capabilities and sustainable project performance.

Regression Analysis

In order to examine if there are correlations between variables, correlation analysis was used; however, it does not show that there are causal relationships between variables—rather, it simply infers the existence of relationships through inadequate support. Regression analysis was thus done to confirm the reliance of one variable on another in order to demonstrate a causal relationship. There are two forms of regression analysis: multiple regression and simple regression. To determine a causal relationship between two variables, simple regression, also known as linear regression, is used. When more than two variables are present, like in the case of mediation and moderation, multiple regression is carried out. Here are two tables that show the results of a basic regression analysis. Using model 4 to determine the indirect impact of the independent variable on the dependent variable through a mediator, hypotheses 1-3 were initially explored. In the second stage, we centered the independent and moderator variables to examine the moderation of time consciousness in accordance with Cohen, Cohen, West, and Aiken's (2003) recommendations.

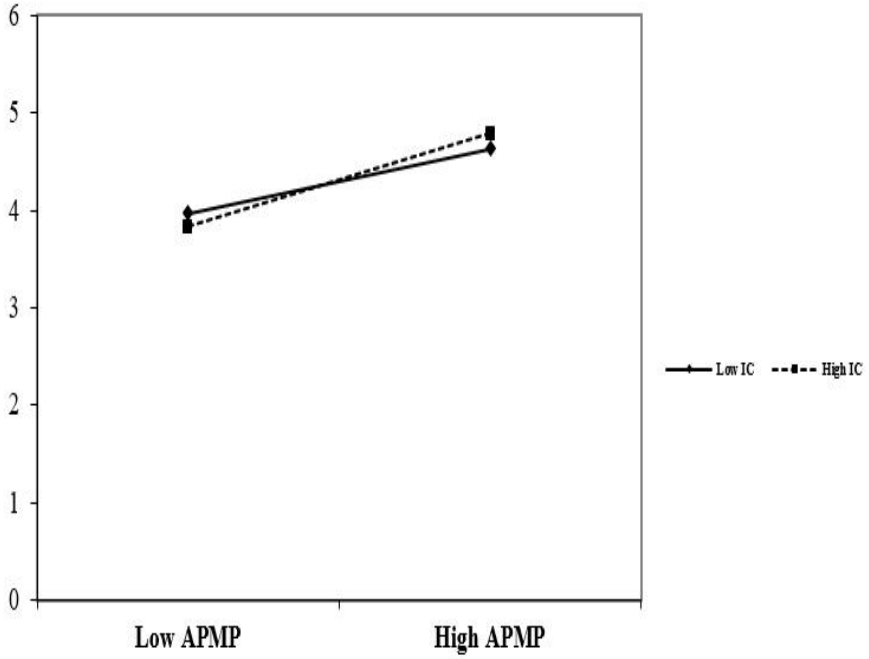
Table: Regression Result for H1-H3

	B	SE	T	R2
Agile Value Creation (Mediator)				0.479
Constant	0.8764***	0.125	6.983	
Agile Project Management Practices (IV)	0.6718***	0.044	15.153	
Education	0.0050***	0.030	0.164	
Sustainable Project Performance (DV)				0.612
Constant	0.5473***	0.1143	4.790	
Agile Project Management Practices	0.1409***	0.0511	2.754	
Agile Value Creation	0.6447***	0.0527	12.241	
Education	0.0142***	0.0256	0.556	
	Effect	**SE**	**LL95%**	**UL95%**
Indirect Effect of IV on DV	0.433	0.086	0.2468	0.5861

Table: Moderation Analysis

Variable	**SPP**		
Step 1	**B**	**R2**	**Del R2**
Agile Project Management Practices	-0.1694	0.5616	
Innovation Capabilities	-0.7586		
Education	0.0067		

Step 2			
APMP * IC	0.1032	0.6422	0.018



Figure

Discussion

This study set out to create and evaluate a managerial model of the antecedents of agile project management practices in project-based organizations. Data was gathered for this purpose from Pakistani project organizations. The study's findings were in line with the theoretical model as predicted. The results, in particular, demonstrated that agile value creation and project management techniques may be precursors to long-term project success. In this case, agile value creation sparked the impact of agile project management techniques on long-term project performance. Furthermore, the results demonstrated that the connection between agile project management techniques and sustainable project performance was reinforced by innovative capabilities.

There is a substantial and favorable correlation between agile project management and the performance of sustainable projects. Because of the strong correlation between agile project management techniques and sustainable project performance, hypothesis 1 was accepted based on the results of this particular study. According to Goni et al. (2017), one of the primary concerns and indicators of project success nowadays is sustainability. Agile approaches, which are based on ideas like

responsiveness, agility, and customer collaboration, can improve project performance over time by making it more resilient and responsive. One of the main focuses of this research is how agile principles and sustainability concepts—best represented by the Agile Manifesto—align. Emphasizing economic, social and environmental consequences, the Triple Bottom Line (TBL) hypothesis gives a framework for hypothesizing the positive implications of Agile on project sustainability. A vast number of studies suggest that focusing on sustainable development can make the organization more flexible, more comparable, with stronger ability to conquer new markets (Obradovic et al., 2018). Stakeholder theory, which emphasizes cooperation and a range of stakeholder interests, and lean thinking, which places a strong emphasis on efficiency and waste reduction, both offer insightful viewpoints. Agile methods' innate commitment to learning and continuous improvement aligns with theories of organizational learning, indicating that agile can promote an innovative and continuous improvement culture.

When contextual factors like organizational dynamics and project type are taken into consideration, empirical research that combines quantitative and qualitative methods, such as surveys and case studies, can shed light on the complex relationship between agile project management practices and sustainable project performance. According to Silvius et al. (2017), this embedment is significant since the organization's daily operational activities, tactical plan, and strategic plan all take into account the sustainable project performance concept. It is ultimately important for researchers and project managers looking for flexible and effective ways to deliver projects to comprehend how agile techniques support sustainable project outcomes.

Agile value creation entails techniques that maximize energy efficiency, minimize resource consumption, and advance inclusive, moral project management (Koshela & Howell, 2002). Agile approaches, which are based on principles like working with customers to offer solutions, adapting to change, and collaborating, may have a significant impact on the long-term success of projects. A few years ago, the IT industry experienced similar issues as the majority of its employees and products did not function as intended (Highsmith 2009). By tying agile values to sustainability objectives, a theoretical framework is established for investigating the ways in which these principles support long-term project performance.

Agile approaches place a strong emphasis on customer participation, which implies that stakeholder involvement is a fundamental principle that may result in more

sustainable outcomes when taking into account different viewpoints. IT industry experts realized that using a responsive approach like this can maximize collaboration, leading to a faster delivery of a better product than with conventional approaches (Frank Cervone 2011). These studies have the potential to shed light on how businesses might apply agile principles to enhance project delivery and advance sustainability in terms of the social, economic, and environmental spheres.

It is thought that agile project management techniques, which are typified by customer collaboration, iterative development, and adaptability, have a good impact on the results of sustainable projects. Agile emphasizes producing company value more quickly through frequent iterations (Measey and Radtac 2015). A mediating mechanism can be implemented through agile value creation, which is founded on principles that prioritize customer value delivery and adaptability to changing needs. It is conceivable that agile techniques' emphasis on flexibility, stakeholder involvement, and the continual delivery of workable solutions encourage the development of values, which in turn affect the project's overall sustainability. The objective of this study is to evaluate the mediating function of agile value creation by conducting an empirical investigation of the sequential relationship utilizing surveys and statistical analyses. The advantages of applying agile project management techniques to improve sustainable performance have been the subject of numerous surveys and research (Highsmith 2009; Vijayasarathy and Turk 2008; Owen and Koskela 2006). In order to integrate project management practices with environmental, social, and economic sustainability goals, businesses must comprehend the role that value creation through agile techniques plays in promoting sustainable project performance. The results of this study may help decision-makers and practitioners understand the different ways that agile methods affect project sustainability outcomes. Under agile manufacturing processes, tasks can be separated into departments or disciplines, and cross-functional teams are then formed to manage the operations in each area. (Cabral et al., 2012; Diebold et al., 2019).

Sustained project performance, there will be a higher positive correlation between agile project management practices and agile value creation. The ability of a business to employ the particular resources at its disposal to produce the desired results is commonly understood to be its capabilities (Borjesson and Elmquist, 2011). A company's capabilities are typically defined as what it can (or cannot) do (Yang, 2012). Agile approach, which is characterized by customer collaboration, iterative

development, and adaptability, is seen to have a favorable impact on sustainable project outcomes. Agile techniques may have a greater or lesser impact on sustainability depending on an organization's capacity for innovation, which includes the creation, assimilation, and application of new ideas. The ability to apply resources to successfully produce and explore new ideas is the basis for innovative capabilities, which have drawn increasing attention from researchers in recent years (Calantone et al., 2002; Guan and Ma, 2003; Mir et al., 2016; Ngo and O'Cass, 2012; Oura et al., 2016). These capabilities are critical to creating competitive advantages (Guan and Ma, 2003; Menguc et al., 2014). It is possible that firms with strong innovation skills can more effectively apply agile approaches to address sustainability concerns and benefit from emerging opportunities. Based on businesses' demands to successfully translate knowledge and ideas into new products, processes, and systems and to successfully execute them, Guan and Ma (2003) established seven characteristics of integrated circuits, including agile methods to guarantee project sustainability. In order to improve sustainability in the project context, findings can help guide strategic decisions about investments in innovation, organizational learning, and project management techniques. The study's findings indicate that innovation capacities moderate the association between agile value creation and agile project management techniques, strengthening the former's beneficial influence on long-term project performance.

Limitation of the Research

There are imperfections in everything in the world; nothing is flawless. We encountered several difficulties when performing this specific study, which also affects our research. First, it could be difficult to generalize the results due to contextual diversity across IT businesses, project kinds, and organizational structures. Taking into account the variety of project contexts is crucial since the impact of agile methods on fostering sustainable performance can differ greatly based on the particular project context. Second, there may be brief difficulties due to the dynamic nature of project life cycles and the possible impact of outside variables. Although longitudinal studies might lessen this, the durability and consistency of identified correlations over time may be impacted by innate uncertainties and modifications to project conditions. Furthermore, relying solely on participants' self-reported information in the questionnaire could lead to response bias since individuals might give socially acceptable answers or impressions that differ from the project's real

results. It is difficult to scientifically evaluate and compare the performance of sustainable projects across studies due to the subjective nature of sustainability measures and the lack of widely recognized measuring standards. Finally, because agile techniques are constantly changing and technology is advancing at a quick pace, studies may encounter obstacles. The definition of "agile" may evolve over time, and new variables brought about by evolving technology may have an impact on how agile approaches and sustainable outcomes interact. Notwithstanding these drawbacks, recognizing and resolving them helps strengthen the validity and relevance of study results in this intricate and ever-evolving subject.

Theoretical Implications

Examining the linkage between Sustainable Project Performance (SPP) and Agile Project Management Practices (APMP) has significant theoretical ramifications that extend existing theories in a number of fields. The study expands on our conceptual knowledge of how Agile methods affect sustainability results by introducing the possibility of merging project management and sustainability theories. Understanding how Agile techniques affect SPP can be very beneficial for the implementation of organizational theories, especially those pertaining to innovation, organizational learning, and change management. The study has the potential to enhance the understanding of innovation and agility theories by demonstrating the relationship between sustainable project outcomes and Agile techniques, which are recognized for promoting creativity and flexibility. Applying stakeholder theory to evaluate how Agile practices affect SPP may provide more nuanced insights into the ways that stakeholder cooperation and involvement support sustainability objectives.

The practical consequences of the research, when studied theoretically, center on internal resources and competencies as drivers of competitive advantage. Additionally, studying how Agile affects change management procedures contributes to the development of change management theories by providing theoretical insights into how businesses may strategically traverse dynamic settings. The study offers theoretical evidence for the interdependence of economic, social, and environmental elements in the pursuit of sustainable project management results by aligning with the Triple Bottom Line (TBL) hypothesis.

Furthermore, the study may shed light on how agile methods are institutionalized in businesses and sectors, influencing normative standards and behaviors pertaining to long-term project performance. The study's theoretical

implications underscore its potential to advance fundamental theories in several fields and promote a comprehensive and well-rounded comprehension of the interplay of project management techniques, sustainability objectives, and organizational behavior. Therefore, the research's theoretical richness advances the theoretical frameworks that direct both academics and practice by laying the foundation for future scholarly initiatives that explore the nuanced links between agile methods and sustainable outcomes.

Practical Implications

The linkage between Sustainable Project Performance (SPP) and Agile Project Management Practices (APMP) has important application implications for project management companies and practitioners. First of all, it provides useful information on how implementing Agile methods can strategically support sustainability goals. Businesses can improve their ability to adapt to shifting market and environmental conditions by utilizing Agile approaches, which will increase the likelihood of long-term project success. The study also provides helpful advice on how to optimize project management procedures for sustainable results. The results can be used by project managers to customize Agile principles to particular project contexts, with a focus on the areas that have the greatest impact on environmental, social, and economic sustainability. Agile methods may need to be integrated with sustainability objectives, requiring changes to stakeholder engagement tactics and project planning. This will give practitioners a path for execution.

Additionally, the investigation of Agile's influence on Sustainable Project Performance in the study provides useful information for allocating resources and facilitating organizational growth. Using Agile principles, project teams can rank the resources that will have the biggest impact on long-term results. This entails developing an improvement-oriented culture, improving flexibility, and successfully involving stakeholders. The study's application to organizational learning initiatives is noteworthy, as it highlights the significance of cultivating a learning culture that is consistent with Agile principles. The integration of Agile principles with sustainability goals can be facilitated by the implementation of training programs and knowledge-sharing mechanisms by project managers and organizational leaders.

The results of the study might also help firms design and improve their project management processes. Leslie (2015) found that only 10% of project managers in the design and construction sectors adopt agile, according to a past survey by the

Software Advice Company. Enterprises aiming to improve their sustainability performance should think about integrating Agile concepts into their project management structures. This can entail modifying project management techniques to better support customer collaboration, iterative development, and flexibility in response to modifications. The development of performance measures in line with sustainability objectives is another practical application that can help organizations evaluate how well Agile processes work to achieve long-term project success.

To summarize, the research's practical implications highlight the measures that project managers and organizations may take to effectively integrate Agile principles with sustainability goals. From strategic alignment and process optimization to resource allocation and organizational learning, the study provides real insights that can inform decision-making and boost the overall sustainability performance of projects.

Conclusion

Investigating the linkage between Sustainable Project Performance (SPP) and Agile Project Management Practices (APMP) is an important field of research with broad implications for project management theory and practice. The research yields theoretical insights that offer a comprehensive understanding of the intersection between sustainable project performance and Agile techniques, which are based on the principles of adaptability, client collaboration, and iterative development. The amalgamation of sustainability and project management theories results in a more all-encompassing structure for assessing project performance. The practical implications highlight doable actions that project managers and organizations can take to strategically connect Agile techniques with sustainability goals. These actions include process optimization, stakeholder involvement enhancement, and the development of a continuous improvement culture. Organizational theories, theories of innovation and agility, resource-based perspectives, theories of change management, theories of stakeholders, and institutional theories are all advanced by the theoretical ramifications. According to the Triple Bottom Line hypothesis, the results highlight how the economic, social, and environmental spheres are interrelated. Furthermore, the study lays the groundwork for next investigations, inspiring academics to go farther into the complex connections between Agile approaches and sustainable project outcomes. This research provides guidance for managing the intricate interactions between Agile methods and the more general objectives of economic,

social, and environmental responsibility within project management contexts, as firms come to understand the need of sustainability. In the end, this study adds to the current conversation on efficient project management techniques and how they affect the production of robust and durable project outputs in a world that is changing quickly.

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