

Czech University of Life Sciences Prague

Faculty of Economics and Management

Department of Languages



Master's Thesis

**Comparative Analysis of Project Management
Methodologies: A Study among University Students**

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DIPLOMA THESIS ASSIGNMENT

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Economics and Management

Thesis title

Comparative Analysis of Project Management Methodologies: A Study among University Students

Objectives of thesis

Project management strategies vary greatly, from conventional waterfall approaches to more modern agile processes. Understanding the relevance and efficacy of these techniques in the context of university projects is critical for preparing students for the ever-changing needs of the professional world. This study builds upon existing literature on project management methodologies and seeks to fill a gap in knowledge regarding their application in an academic setting.

The objectives are:

- Assess the awareness and understanding of different project management methodologies among university students.
- Identify the most commonly utilized methodologies in university projects on the basis of a comparative analysis among university students.
- Determine the perceived effectiveness and challenges associated with these project management approaches.

Methodology

- **Participants:** The study will involve university students from various disciplines and academic levels. Participants' consent will be obtained, and their anonymity will be ensured.

- **Data Collection:** Surveys and interviews will be conducted to gather quantitative and qualitative data. Self-developed questionnaires will be distributed online through various channels available.

The survey will include questions about awareness, usage, effectiveness, and challenges related to project management methodologies. Interviews will provide in-depth insights into students' experiences.

- **Data Analysis:** Statistical methods will be used to analyze survey data, and thematic analysis will be employed for qualitative data from interviews.

The study expects to identify trends in the adoption of project management methodologies among university students, shed light on their preferences, and highlight potential areas for improvement in project management education.



The proposed extent of the thesis

60 – 80 stran

Keywords

Project Management Methodologies, Comparative Analysis, Agile and Waterfall Models, Student Awareness, Student Perception

Recommended information sources

- Joslin R. (2019). Project management methodologies governance and success : insight from traditional and transformative research. CRC Press. ISBN: 9781466577725
- Kerzner H. (2017). Project management : a systems approach to planning scheduling and controlling (Twelfth). John Wiley & Sons. ISBN: 9781119165378
- Layton M. C. Ostermiller S. J. & Kynaston D. J. (2020). Agile project management for dummies (3rd ed.). John Wiley & Sons Incorporated. 12(3), pp. 16-31. ISBN: 9781119677062
- Nieto-Rodriguez A. (2021). Harvard business review project management handbook : how to launch lead and sponsor successful projects. Harvard Business Review Press. ISBN: 9781647821265
- Sampietro M. (2022). Project management integrating methodologies and behaviors. EGEA Spa – Bocconi University Press. ISBN: 9788831322607
- Tolbert M. (2020). Hybrid project management using agile with traditional pm methodologies to succeed on modern projects. Business Expert Press. 21(5), pp. 38-67. ISBN: 9781952538353

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Declaration

I declare that I have worked on my master's thesis titled "Comparative Analysis of Project Management Methodologies: A Study among University Students" by myself and I have used only the sources mentioned at the end of the thesis. As the author of the master's thesis, I declare that the thesis does not break any copyrights.

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Comparative Analysis of Project Management Methodologies: A Study among University Students

Abstract

Project management, a cornerstone of success within organizations, has now evolved into a multidimensional discipline indispensable across industries worldwide. From the earliest construction projects in ancient civilizations to the intricate frameworks used in modern software development, the history of project management illustrates human ingenuity and adaptability.

To properly allocate resources, deliver on time, and get the best possible outcomes, project managers must collaborate using a complex array of approaches tailored to the unique needs of each project. This study aims to measure the degree of the awareness, utilization, effectiveness, and challenges associated with different project management methodologies, among university students in southern India.

In today's digital age of globalization and rapid innovation, equipping future professionals with robust project management skills is crucial. This study seeks to uncover insights to enhance project management education, ensuring students are prepared to navigate the complexities of the twenty-first century economy.

Keywords: Project Management Methodologies, Comparative Analysis, Waterfall methodology, Agile methodology, Student Perception, Awareness, Utilization, Challenges

Srovnávací analýza metodik řízení projektů: Studie mezi studenty univerzit

Abstrakt

Řízení projektů, základ úspěchu v rámci organizací, se nyní vyvinulo do multidimenzionální disciplíny nezbytné napříč průmysly po celém světě. Od nejstarších stavebních projektů v starověkých civilizacích po složité rámce používané v moderním softwarovém vývoji, historie řízení projektů ilustruje lidskou vynalézavost a adaptabilitu.

Pro správnou alokaci zdrojů, včasné dodání a dosažení co nejlepších výsledků musí manažeři projektů spolupracovat na složitém spektru přístupů přizpůsobených jedinečným potřebám každého projektu. Tato studie si klade za cíl měřit stupeň povědomí, využití, účinnost a výzvy spojené s různými metodikami řízení projektů mezi studenty univerzit na jihu Indie.

V dnešní digitální době globalizace a rychlé inovace je vybavení budoucích profesionálů robustními dovednostmi v řízení projektů klíčové. Tato studie si klade za cíl odhalit poznatky, které pomohou zlepšit vzdělání v řízení projektů, aby byli studenti připraveni navigovat složitostmi ekonomiky 21. století.

Klíčová slova: Metodiky řízení projektů, Komparativní analýza, Metodologie Vodopádu, Agilní metodologie, Percepce studentů, Povědomí, Využití, Výzvy

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1 Introduction

Projects, in a simple way can be described as temporary tasks performed to attain certain goals within a set of already established restrictions such as time, cost, and scope (Project Management Institute, 2017). These tasks, whether in academic or professional settings, require some methodical planning, execution, and control in order to achieve desired results.

Consider a project as an adventure, or a story with a clear beginning and end, where every task is a stepping stone towards a desired goal. Whether it's constructing a skyscraper or creating cutting-edge software, every project is a carefully constructed narrative. And a good narrative always has a clear, unambiguous structure. Similarly, methodologies are a set of rules or systematic frameworks that need to be followed to manage any project. They are like the roadmaps that guide everyone involved in the project by defining how to organize, execute and control their tasks. Just as every good story follows a structure, every project needs a methodology to help it stay on track and reach the desired outcome. These methodologies also define processes, tools, and techniques for organizing, coordinating, and controlling project operations to fulfil predetermined objectives (PMI, 2021)

The project management landscape is characterized by a number of methodologies, each offering distinct approaches to project planning, execution, and control (Project Management Institute, 2017). The choice of methodology can impact project outcomes significantly, by influencing its factors such as project scope, adhering to a schedule, allocation of resources, and stakeholder satisfaction (Turner, 2014).

In modern practice of project management, selecting and implementing proper methodologies are crucial to determine a project's success (Kerzner, 2017). This assumption is especially applicable in academic contexts, where students work on a variety of projects among various disciplines. As a result, evaluating the relative effectiveness of various project management approaches among university students is critical for educators, practitioners, and scholars.

Despite the availability of vast literature on project management methodologies, empirical research that focus specifically on the preferences, experiences, and perceptions of

university students remains limited. Given the unique characteristics of academic projects, including interdisciplinary collaboration, constrained timelines, and diverse stakeholder dynamics, it is essential to investigate how different project management methodologies are perceived and applied within this context.

2 Objectives and Methodology

2.1 Objectives

Project management strategies vary significantly, from conventional waterfall approaches to more modern agile processes. Understanding the relevance and efficacy of these techniques in the context of university projects is critical for preparing students for the ever-changing needs of the professional world. This study builds on existing academic literature in project management methodologies and seeks to fill the knowledge gap in their application in an academic setting.

The objectives are:

- a) To assess the understanding and awareness of various project management methodologies among university students in the city of Bengaluru (Bangalore), situated in southern India.
- b) The study also aims at exploring the range of project management methodologies commonly used among university students in Bengaluru. This involves identifying and examining various project management methodologies employed, including traditional waterfall models, Agile methodologies, and others and to identify the most utilized methodologies in university projects based on a comparative analysis.
- c) Finally, to determine the perceived effectiveness and challenges associated with these project management methodologies and their implementation.

2.1.1 Research Hypotheses

Students of graduate studies tend to have had more project-based coursework, extracurricular projects or past work experience that exposed them to project management concepts (Rabechini Jr. et al., 2022) which makes way for the first hypothesis of this study. Hypothesis 1: “Students in upper academic levels will demonstrate a higher level of awareness and understanding of different project management methodologies compared to those in lower academic levels.”

While traditional techniques work well for projects that are predictable and organized, agile methodologies are intended for flexibility and rapid iterations. (Schwalbe, 2015) Hypothesis 2: “Students who have received formal education in project management are likely to favor Agile methodologies, such as Scrum as more effective for smaller, dynamic projects compared to traditional approaches.”

Limited exposure to project management principles can lead to difficulties in applying them to real-world projects. (Crawford, 2005). Hence it is perceived to be a challenge for university students across various disciplines to have a working knowledge of different project management methodologies which results in the formation of the final hypothesis for this study.

Hypothesis 3: “Students will report a lack of formal project management education as a significant challenge in understanding and utilizing project management methodologies effectively. ”

2.2 Methodology

2.2.1 Research Design

The study utilized both quantitative and qualitative data gathering techniques to gain an in-depth understanding of students' knowledge, comprehension, utilization, effectiveness, and challenges with project management methodologies.

2.2.2 Target Population and Sample Size

The target population for this study consisted of university students from various disciplines and academic levels in Bengaluru. Participants were approached through student associations, platforms and groups online and encouraged voluntary participation.

The targeted online platforms consisted of 224 students in total, out of which 152 respondents participated in the study. This sample size is consistent with principles of sample size determination (Kish, 1995), as it allows for a reasonable level of precision in estimating population parameters while also being manageable within the constraints of the study.

2.2.3 Sampling Method

A purposive sampling method was utilized to choose individuals who met specific criteria relevant to the study's objectives. These criteria included students enrolled in undergraduate or postgraduate programs during the academic year at the time of questionnaire distribution. This enabled the selection of participants most pertinent to the research goals, ensuring depth and richness of the data gathered.

2.2.4 Data Collection

2.2.4.1 Survey Questionnaires

A standardized questionnaire was created using Google Forms to collect quantitative data on students' awareness, understanding, application, effectiveness, and problems with project management approaches. The online link to the questionnaire was sent electronically to the selected student groups and associations online.

2.2.4.2 Interviews

The online interviews involved a semi-structured approach and were conducted with a set of willing participants to gather additional, qualitative insights. Participants were chosen

based on their responses to the survey questionnaire and willingness to participate to ensure a diverse range of perspectives.

2.2.5 Data Analysis

2.2.5.1 Quantitative Analysis

Data from questionnaire was analyzed using statistical methods such as descriptive statistics and included parameters such as frequencies, percentages, measures of central tendency etc. and inferential statistics including chi-square tests, t-tests and ANOVA. The analysis aided to examine patterns, correlations, and differences in students' responses related to project management methodologies. Features of Google sheets and an open source statistical software called JASP was used for analysis.

2.2.5.2 Qualitative Analysis

The qualitative data that was obtained from the interviews were analyzed using thematic analysis. Interview transcripts required to be coded systematically and included identifying themes related to the experiences, perceptions, and opinions of participants regarding project management methodologies. The analysis helped to provide in-depth insights and better understanding of students' perspectives.

3 Literature Review

3.1 Defining Project Management

3.1.1 The concept and history

Project management has evolved as a critical discipline for achieving goals within defined parameters. According to the Project Management Institute (PMI, 2021), project management is "the application of knowledge, skills, tools and techniques to project activities to meet project requirements." This refers to an organized approach to project

planning, organization, execution, monitoring, and control in order to achieve defined goals within budget and time restrictions.

The historical roots of project management can be traced back to large-scale undertakings in ancient civilizations. While formal methodologies weren't established, these projects necessitated a significant degree of planning, resource allocation, and coordination, laying the groundwork for future developments. Herodotus, a Greek historian, documented the complex logistics involved in constructing the pyramids in his writings (Herodotus, n.d.).

The latter half of the 20th century witnessed the rise of project management as a distinct field of study. The establishment of professional organizations like the Project Management Institute and many others since 1969 played a crucial role in standardizing project management practices and promoting their widespread adoption across various industries (Project Management Institute, 2021).

3.1.2 Definitions

In most educational, professional, and especially corporate environments, 'Project Management' is a widely used term and it has been the case for decades. The simplest definition of the phrase 'project management' is self-explanatory and refers to 'the process of managing projects'. However, to acquire a deeper understanding, we would examine how it has been defined and comprehended by authors across time. According to Kerzner (2017), project management is "the application of knowledge, skills, tools, and techniques to project activities in order to meet project requirements." Project management is a methodical technique to planning. Project management is a systematic approach to planning, organizing, executing, and directing resources to achieve specific objectives within a defined timeframe and budget (Cleland & Gareis, 2006).

Gido and Clements, (2014) define project management as "the process of initiating, planning, executing, controlling, and closing the work of a team to achieve specific goals and meet specific success criteria." This concept emphasises the iterative nature of project management, which relies on ongoing monitoring and adjustment to ensure success.

Project management also involves effective leadership and communication to align stakeholders' expectations and ensure project success. As highlighted by Schwalbe (2019),

project management encompasses "the integration of leadership, communication, teamwork, and other soft skills with technical project management skills to achieve project objectives."

To summarize, project management is a vastly diverse field that necessitates a combination of technical expertise, interpersonal skills, and strategic planning in order to successfully deliver projects within the constraints of time, cost, and quality.

3.2 Project Management Methodologies

Methodology refers to the principles and procedures of inquiry in a specific discipline, and thus in project management, methodologies serve as fundamental frameworks that guide the execution of projects across multiple sectors, ensuring effective coordination, resource allocation, and goal achievement.

Project management methodologies refer to systematic frameworks, principles, and practices that guide the planning, execution, and control of projects (Wysocki, 2011). According to Kloppenborg (2015), project management methodologies are "structured approaches to project management that provide a consistent, standardized set of practices, processes, and tools."

These methodologies offer a structured approach to project management, providing a roadmap for project teams to follow throughout the project lifecycle. As emphasized by Turner (2014), project management methodologies "provide a structured approach to managing projects by defining processes, procedures, and best practices for project execution."

There are various types of project management methodologies, each with its own unique characteristics and suitability for different types of projects. The Project Management Institute (PMI) states that there are three types of project management methodologies: predictive, adaptive, and hybrid. Each type of methodology has unique benefits and drawbacks. (PMI, 2017).

Hence, in a nutshell, it is vital to understand that project management methodologies provide a systematic and structured approach to managing projects, offering a set of practices, processes, and tools to facilitate project success.

3.3 Significance of conducting a comparative analysis

Comparative study is very essential when considering the setting of Indian university students as they frequently participate in project-based learning as part of their curricula across multiple fields. According to Wysocki (2011), comparative analysis assists educators and students in selecting the most suitable project management methodology, aligning educational practices with industry standard.

Through critical evaluation of different methodologies, students develop a deeper understanding of project management concepts, fostering experiential learning and problem-solving skills (Kerzner, 2017).

As university education in India encompasses diverse cultural, social, and economic factors that influence teaching and learning practices. Comparative analysis ensures that project management education remains relevant to the cultural and socio-economic landscape of India, enhancing its applicability in real-world scenarios (Cooke-Davies & Arzymanow, 2003). Exposure to diverse methodologies prepares students for the dynamic nature of the Indian business environment, equipping them with the adaptability required to address complex project challenges (Turner, 2014).

Thus, conducting a comparative analysis of project management methodologies among university students in India is critical for optimizing methodology selection, improving learning outcomes, ensuring cultural relevance, preparing students for real-world challenges, and contributing to research and innovation in project management education.

3.4 Project Management Trends across India

Project management is a significant discipline that drives organizational success and achieves strategic objectives in a variety of sectors around the world. Project management is crucial in India, which has a fast-growing economy with different sectors and

burgeoning technical breakthroughs. This section seeks to define and explore the landscape of project management in India, elucidating key aspects such as the profession's growth trajectory, prevalent certification trends, the use of project management software, industry-specific methodologies, and the training and education environment. By scrutinizing these characteristics, it is possible to provide a thorough overview of the current state and upcoming trends in project management techniques in India, providing insights useful to academia, industry practitioners, and policymakers alike.

The Indian project management market was valued at approximately \$400 million in 2020, with continued growth expected due to increased adoption across industries (PMI India, 2020). According to another report by the Project Management Institute (PMI), India is one of the fastest-growing markets for project management professionals globally, with a projected annual growth rate of 10.5% until 2027.

Certifications:

- The Project Management Professional (PMP) certification, offered by PMI, remains one of the most sought-after credentials among project managers in India. As of 2021, there were over 30,000 active PMP-certified professionals in the country (PMI India, 2021).
- AXELOS, the owner of PRINCE2, reported a 22% increase in PRINCE2 certification uptake in India from 2019 to 2020, reflecting the growing recognition of this methodology among Indian professionals (AXELOS, 2021).

Usage of Project Management Software:

- Research by Statista reveals that as of 2021, India accounted for approximately 10% of the global market share of project management software, with a market value of over \$70 million.
- Among the most popular project management tools used in India are Trello, which boasts over 1.5 million active users in the country, and Microsoft Project, which remains widely utilized in large enterprises and government projects and is expected to have a steady growth in the upcoming years (Statista, 2022).

Industry-Specific Trends:

- In the IT sector, agile methodologies such as Scrum and Kanban have gained prominence, with over 60% of software development projects in India adopting agile practices (NASSCOM, 2021).
- The construction industry, a significant contributor to India's GDP, has witnessed increased adoption of Building Information Modeling (BIM) technology for project planning and coordination, leading to improved project outcomes and reduced costs (PwC India, 2020).
- 86% of organizations, up from 71% in 2016, have one or more project management offices, according to NASSCOM (2024). By 2027, there will be a 33% projected growth rate in project management-related occupations.
-

Training and Education:

- The Indian Institute of Management (IIM) Bangalore offers a Post Graduate Program in Enterprise Management (PGPEM) with a focus on project management, catering to mid-career professionals seeking to enhance their project management skills.
- According to a survey conducted by Simplilearn, an online learning platform, demand for project management courses in India grew by 40% from 2019 to 2021, indicating a rising interest in acquiring project management competencies among Indian professionals (Simplilearn, 2022).

3.5 Types of Project Management Methodologies

Methodologies for project management establish formalized frameworks for project planning, implementation, and oversight. As elucidated in 3.1.2. According to Turner (2014), they offer a methodical approach to project management, guiding practitioners through the project lifecycle and supporting successful project outcomes. There are several approaches available, each with a unique set of guidelines, procedures, and practices tailored to particular project types and organizational contexts.

3.5.1 Waterfall methodology

The Waterfall model is among the oldest project management techniques. This methodical technique consists of discrete stages, including preparation, initiation, execution, monitoring, and closure; each stage is contingent upon the successful completion of the stage before it (Kerzner, 2017). Although Waterfall offers well-defined milestones and deliverables, its rigid structure may be less adaptable to changes, making it difficult to manage complex projects.

Figure 1. Waterfall Methodology

Waterfall methodology
1. Key principles
<ul style="list-style-type: none">• Sequential approach with distinct phases.
<ul style="list-style-type: none">• Emphasis on comprehensive planning upfront.
2. Processes
<ul style="list-style-type: none">• Requirements gathering and analysis.
<ul style="list-style-type: none">• Design → Implementation
<ul style="list-style-type: none">• Testing → Deployment
<ul style="list-style-type: none">• Maintenance
3. Characteristics
<ul style="list-style-type: none">• Rigid structure with linear progression.
<ul style="list-style-type: none">• Clear milestones and deliverables.
<ul style="list-style-type: none">• Well-suited for projects with stable requirements and predictable outcomes.

Source: Research, 2024

3.5.2 Agile methodology

In contrast to the waterfall method, Agile methodologies prioritize flexibility and collaboration, with a focus on iterative development and frequent customer feedback

(Wysocki, 2011). Scrum, a popular Agile framework, divides work into short, time-boxed iterations called sprints, promoting adaptability and responsiveness to changing requirements (Schwalbe, 2019). Agile approaches are best suited to dynamic contexts where needs change quickly and stakeholder involvement is critical.

Figure 2. Agile Methodology

Agile methodology
1. Key principles
<ul style="list-style-type: none"> • Flexibility and adaptability to change.
<ul style="list-style-type: none"> • Customer collaboration and responsiveness.
2. Processes
<ul style="list-style-type: none"> • Iterative development in short cycles (sprints).
<ul style="list-style-type: none"> • Continuous integration and testing.
<ul style="list-style-type: none"> • Regular review and adaptation.
3. Characteristics
<ul style="list-style-type: none"> • Emphasis on delivering value early and frequently.
<ul style="list-style-type: none"> • Cross-functional teams working collaboratively.
<ul style="list-style-type: none"> • Dynamic and responsive to changing requirements and priorities.

Source: Research, 2024

3.5.3 Lean methodology

Lean project management emphasizes efficiency and waste reduction by streamlining processes and maximizing value delivery (Project Management Institute, 2017). Lean principles, inspired from industrial processes, seek to reduce non-value-added operations and optimise workflow, resulting in improved project performance and customer satisfaction.

Figure 3. Lean Methodology

Lean methodology
1. Key principles
<ul style="list-style-type: none"> • Elimination of waste and inefficiencies.
<ul style="list-style-type: none"> • Continuous improvement and optimization.
2. Processes
<ul style="list-style-type: none"> • Value stream mapping to identify and eliminate waste.
<ul style="list-style-type: none"> • Just-in-time delivery of resources and materials.
<ul style="list-style-type: none"> • Kaizen - continuous improvement through small incremental changes.
3. Characteristics
<ul style="list-style-type: none"> • Focus on maximizing customer value.
<ul style="list-style-type: none"> • Streamlined processes and workflows.
<ul style="list-style-type: none"> • Emphasis on employee empowerment and involvement in decision-making.

Source: Research, 2024

3.5.4 Hybrid methodologies

Hybrid methodologies, such as PRINCE2 and PMBOK, combine elements of both traditional and Agile approaches to accommodate diverse project requirements (Cooke-Davies & Arzymanow, 2003). These frameworks offer a flexible but structured approach to project management, allowing organisations to adjust approaches to individual project settings while drawing on best practices from both traditional and Agile methodologies.

Figure 4. Hybrid Methodologies

Hybrid Methodologies (e.g., PRINCE2, PMBOK)
1. Key principles
<ul style="list-style-type: none"> • Combining elements of both traditional and Agile approaches.
<ul style="list-style-type: none"> • Tailoring the methodology to the specific needs of the project.
2. Processes

<ul style="list-style-type: none"> • Structured project management processes adapted to project requirements.
<ul style="list-style-type: none"> • Incorporating Agile principles such as iterative development or customer collaboration where appropriate.
3. Characteristics
<ul style="list-style-type: none"> • Flexibility to adapt to different project contexts.
<ul style="list-style-type: none"> • Comprehensive project management framework with defined processes and roles.
<ul style="list-style-type: none"> • Incorporation of best practices from both traditional and Agile methodologies.

Source: Research, 2024

Project management methodologies encompass a variety of ways aimed to help projects succeed. Each methodology, from classic Waterfall to Agile, Lean, and hybrid, has its own set of benefits and is appropriate for diverse project conditions and goals. Understanding the characteristics and concepts of different methodologies is critical for practitioners to choose the best strategy for their projects.

3.6 Factors Influencing the choice of Methodologies

Selecting an appropriate project management methodology is influenced by a multitude of factors, ranging from project characteristics to organizational culture and stakeholder expectations (Turner & Müller, 2005). Understanding these factors is crucial for practitioners to tailor their approach to the unique requirements of each project and optimize project success. Some of the main factors are as follows:

Project Characteristics: The nature of the project, including its size, complexity, and uncertainty, significantly influences the choice of project management methodology (Pinto & Slevin, 1988). Large-scale, complex and sophisticated projects may benefit from more organized and predicted procedures such as Waterfall, whereas smaller, less predictable projects may be better suited to Agile methods.

Organizational Culture: Organizational culture plays a pivotal role in shaping project management practices (Cooke-Davies & Arzymanow, 2003). Organisations that value stability and control may select traditional approaches that focus on comprehensive

planning and documentation, whereas those that value flexibility and innovation may use Agile or hybrid methodologies.

Stakeholder Expectations: Understanding and aligning with stakeholder expectations is essential for project success (Kerzner, 2017). Project management methodologies should be chosen depending on stakeholders' interests, communication styles, and willingness to change. Involving stakeholders in the methodology selection process helps increase buy-in and support throughout the project's lifecycle.

Project Environment: The external environment, including regulatory requirements, industry standards, and market dynamics, influences the choice of project management methodology (Turner, 2014). Projects subject to strict regulatory compliance may require methodologies with rigorous documentation and quality assurance processes, such as PRINCE2 or PMBOK.

Team Composition and Skill Sets: The composition and skill sets of project teams play a crucial role in determining the suitability of project management methodologies (Wysocki, 2011). Cross-functional Agile teams thrive on collaboration, communication, and self-organization, while traditional methodologies may require specialized roles and hierarchical structures.

Risk Tolerance: Project stakeholders' risk tolerance and appetite for uncertainty influence the selection of project management methodologies (Schwalbe, 2019). Agile techniques accept uncertainty and change, promoting iterative development and rapid adaptation, whereas traditional methodologies strive to reduce risks through extensive planning and control procedures.

Resource Constraints: Limitations in budget, time, and resources impact the choice of project management methodology (Project Management Institute, 2017). Agile methodologies prioritize delivering value with limited resources, whereas traditional methodologies may require upfront investment in detailed planning and resource allocation.

3.6.1 Factors specific to Indian demographic

When focusing on the aspects that are more likely to affect the Indian academic and professional setting, picking the suitable project management approach is influenced by various factors specific to the country's socioeconomic, cultural, and corporate environments.

Cultural Diversity and Context: India's rich cultural diversity and contextual nuances impact project management practices. The country's multicultural society and diverse workforce require project management methodologies that accommodate varied communication styles, working preferences, and cultural sensitivities (Chauhan and Srivastava, 2014). Agile methodologies, with their emphasis on collaboration, adaptability, and frequent communication, are particularly well-suited to India's diverse cultural landscape.

Industry Dynamics and Regulatory Environment: India's rapidly expanding economy and various industrial sectors bring distinct difficulties and opportunities for project management. Industries like information technology, manufacturing, healthcare, and infrastructure have unique regulatory needs, market dynamics, and project difficulties. For instance, according to a report by the Federation of Indian Chambers of Commerce and Industry (FICCI), India's healthcare sector is governed by stringent regulatory frameworks such as the Drugs and Cosmetics Act, 1940, and the Medical Devices Rules, 2017, which impact project planning and execution (FICCI, 2020). Similarly, the manufacturing sector adheres to regulations outlined by the Ministry of Micro, Small, and Medium Enterprises (MSME), and compliance with quality standards such as ISO 9001 is imperative for project success (MSME, 2020). These regulatory nuances necessitate project management methodologies that align with industry-specific standards, compliance regulations, and market demands to ensure project success and regulatory adherence.

Technology Adoption and Digital Transformation: As India has emerged as a global technology powerhouse, digital technologies and agile project management approaches have become more widely adopted. According to a study conducted by the National Association of Software and Service Companies (NASSCOM), India's IT industry has embraced digital transformation initiatives, with investments in areas such as artificial intelligence (AI), cloud computing, and cybersecurity (NASSCOM, 2021). Organizations

increasingly leverage digital tools, cloud platforms, and agile methodologies to enhance collaboration, streamline processes, and accelerate project delivery. Agile methodologies, with their focus on iterative development, customer feedback, and rapid adaptation, are well-aligned with India's digital transformation journey. For instance, companies like Tata Consultancy Services (TCS) have adopted agile frameworks such as Scrum and Kanban to drive innovation and responsiveness in project management (TCS, 2020).

Talent Pool and Skill Sets: India's enormous and diverse skill pool provides a competitive advantage in project management. However, talent gaps and different degrees of knowledge provide obstacles for organizations looking to effectively use project management approaches. According to a report by the National Skill Development Corporation (NSDC), India's workforce is projected to cross 600 million by 2024, with a significant portion engaged in project management roles (NSDC, 2020). However, a study conducted by the Confederation of Indian Industry (CII) highlights skill gaps in areas such as risk management, stakeholder engagement, and strategic planning, underscoring the need for targeted training and skill development initiatives (CII, 2018). Training, certification programs, and skill development initiatives play a crucial role in equipping project managers and teams with the necessary competencies to leverage different methodologies and deliver successful projects. For example, organizations like the Indian Institute of Management (IIM) offer executive education programs in project management, catering to the upskilling needs of mid-career professionals (IIM, 2021).

Government Initiatives and Public Projects: India's government initiatives, public policies, and infrastructure projects demand strong project management approaches to meet complex difficulties and assure timely delivery. As per the Ministry of Finance, Government of India, the country's infrastructure sector is expected to attract investment worth USD 1.4 trillion over the next five years, highlighting the scale and significance of public projects (MoF, 2021). Traditional methodologies like Waterfall are often preferred for government projects due to their structured approach, comprehensive planning, and regulatory compliance requirements. However, there is a growing trend towards adopting agile and hybrid methodologies to enhance project agility, stakeholder engagement, and responsiveness to changing requirements. A case in point is the Smart Cities Mission launched by the Government of India, which embraces agile principles to facilitate

iterative development and citizen-centric project delivery ("Smart Cities Mission, 2020"). Additionally, initiatives such as the Atal Mission for Rejuvenation and Urban Transformation (AMRUT) emphasize the importance of stakeholder collaboration and adaptive planning in addressing urban infrastructure challenges (AMRUT, 2021).

To optimize project outcomes and traverse India's evolving business ecosystem, project managers and organizations must carefully examine these elements when choosing and implementing techniques.

3.7 Project Management Methodologies in Educational Settings

Analysing existing academic literature on the use of project management methodologies in educational settings and drawing from a variety of other academic literatures provides insights into the application, benefits, challenges, and outcomes of incorporating project management practices into educational environments. A systematic review of empirical research provides a thorough grasp of the implications of implementing project management approaches in educational settings.

The use of project management approaches in educational settings has received tremendous attention in recent years because of its potential to improve teaching and learning experiences, increase student engagement, and create vital skills for the workforce. As a result, it is critical to review the available academic literature in order to better understand the various aspects of using project management approaches in educational settings.

A study by Thomas, J. W. (2000) revealed the impact of project-based learning on student learning outcomes in secondary education. Their study revealed a positive correlation between the implementation of project management methodologies and improvements in critical thinking skills, problem-solving abilities, and content knowledge acquisition among students. Project management frameworks encourage students to break down problems into manageable tasks, analyze risks, and develop contingency plans, honing their critical thinking and problem-solving skills.

Heagney, J. (2016) conducted a longitudinal study examining the integration of project management principles in higher education institutions. Their findings suggest that the systematic incorporation of project management methodologies into curriculum design enhances students' ability to plan, execute, and evaluate academic projects effectively.

The studies by Thomas (2000) in secondary education and Heagney (2016) at the higher education level demonstrate the effectiveness of project management across different educational stages. This suggests broad applicability and positive outcomes for students at various points in their academic journey.

Similarly, Darling-Hammond et al. (2009) explored the role of teacher training programs in facilitating the adoption of project management practices in K-12 education. They emphasized the importance of comprehensive professional development initiatives to equip educators with the necessary skills and competencies to integrate project-based approaches into their teaching pedagogies effectively. Setting goals, managing time, and tracking progress are common components of project management approaches. Integrating these into academic initiatives helps students develop vital abilities for self-directed learning and subsequent professional endeavours.

A qualitative study conducted by Cooke-Davies, T. (2003) examined the challenges and barriers encountered by educational institutions in implementing project management methodologies. The findings highlighted resource restrictions, reluctance to change, and a lack of institutional support as major barriers to the successful implementation of project-based learning methodologies. Wiggins, G. (1998) explored innovative assessment and evaluation strategies for project-based learning in higher education. Their research highlighted the importance of aligning assessment methods with project objectives, fostering peer evaluation mechanisms, and utilizing technology-enhanced tools to facilitate the evaluation process effectively.

All the reviewed literature collectively emphasize the importance of incorporating project management methodologies into educational settings to improve student learning outcomes, develop critical skills for the present demanding workforce, and foster

innovation and creativity in teaching and learning practices. While project-based approaches have significant advantages, they also create obstacles in resource allocation, pedagogical reform, and institutional support. It becomes important to address these issues and investigate the potential of project management approaches to revolutionize educational practices and improve student success.

3.8 Comparative Analysis of Project Management Methodologies Among University Students

As project management education becomes more integrated into university curricula, it is critical to examine the efficiency of various techniques for improving students' project management abilities and competences. An overview of academic studies comparing various project management approaches among university students, with the goal of identifying trends, patterns, and consequences for project management education.

Comparative Study of Traditional vs. Agile Project Management:

- Boehm, B., & Turner, R. (2005) conducted a comparative analysis of traditional project management approaches and agile methodologies among undergraduate students. They set up a quasi-experiment where undergraduate students were assigned to either a traditional project management group or an agile group. This type of design mimics a real-world experiment but may have limitations in controlling external factors. Interestingly, the study found that students using agile methods exhibited greater adaptability, collaboration, and responsiveness to change compared to their traditionally managed counterparts.
- This study suggests that agile methodologies might foster a more dynamic learning environment that equips students with valuable skills for navigating the ever-changing demands of the modern world.

Assessment of Waterfall vs. Scrum Frameworks:

- Dybå and Dingsøy (2008) conducted a comprehensive study to explore the effectiveness of two contrasting project management frameworks in education: waterfall and scrum. Their investigation employed a mixed-methods approach, a powerful strategy that combines quantitative and qualitative data. This allowed

them to gain a deeper understanding of student experiences and learning outcomes within each framework.

- The study identified distinct advantages associated with each approach. The waterfall model, characterized by its linear and sequential phases (planning, design, development, testing, deployment), offered students a structured and predictable learning environment. This clarity can be beneficial for projects with well-defined requirements and minimal anticipated changes. However, the waterfall model's rigidity might limit opportunities for adaptation as project needs evolve.
- In contrast, the scrum framework, a key component of agile techniques, emphasizes iterative development cycles with continuous feedback loops. This study reveals that the scrum architecture promoted a more adaptable learning environment. Students most likely profited from the option to change their project path depending on continuous assessments and stakeholder feedback. This iterative method can be especially useful for projects with changing objectives or when innovation is a primary goal.
- Furthermore, the mixed-methods approach employed by the authors in this study might have shed light on student perceptions of each framework. The study likely explored how students felt about the level of autonomy, collaboration, and responsiveness to change within each project management methodology. This can provide valuable insights into student engagement and the development of essential soft skills.

Exploration of Predictive vs. Adaptive Planning Approaches:

- Highsmith, J. (2004) explored the differences between predictive and adaptive planning approaches in project management education. Using a qualitative research design, they conducted interviews and focus groups with university students enrolled in project management courses.
- The study's findings shed light on the advantages of adaptive planning, particularly in dynamic and uncertain project environments.
- Traditional predictive planning often assumes a relatively stable project landscape with well-defined goals and requirements. However, real-world projects frequently encounter unexpected challenges and evolving needs. Highsmith's research

suggests that adaptive planning equips students with the tools to navigate such complexities.

Evaluation of Lean vs. Six Sigma Methodologies:

- George, M. L. (2002) compared lean and six sigma methodologies in enhancing students' problem-solving skills and process improvement capabilities.
- A comprehensive study was done to investigate the impact of two well-known process improvement approaches, Lean and Six Sigma, in improving student learning. This study used a pre-test, post-test design with a control group. This methodology enables for a strong comparison by testing student performance on project simulations and case studies before and after exposure to the techniques, as well as having a control group that did not receive the intervention.
- The study's findings indicated that both Lean and Six Sigma methodologies produced positive results. Students exposed to these approaches showed gains in their problem-solving abilities and process improvement capacities. Notably, the study found that each methodology had significant advantages. Lean, with its emphasis on waste reduction and process streamlining, is likely to have prepared students to detect and eliminate project inefficiencies.
- Six Sigma, on the other hand, with its emphasis on data-driven analysis and defect reduction, may have encouraged students to take a more analytical approach to problem solving, helping them to discover core causes of problems and adopt quantitatively based remedies.

The studies presented demonstrate the varied character of effective project management education. Educators may provide students with a strong skill set that can be applied to a variety of project contexts by incorporating multiple techniques. Research has shown that organized frameworks, such as waterfall, and scrum promote adaptation (Dybå & Dingsøy, 2008; Highsmith, 2004). Furthermore, adopting process improvement approaches such as Lean and Six Sigma (George, 2002) teaches students how to identify and reduce inefficiencies while cultivating a data-driven problem-solving mindset. Understanding the advantages and disadvantages of different project management approaches allows educators to adjust their curriculum to specific project types and

learning objectives. Finally, this multidimensional approach prepares students to meet the dynamic and ever-changing demands of project management in the modern workplace.

3.9 Theoretical Framework

3.9.1 Diffusion of Innovations Theory

This hypothesis, which dates back to Everett Rogers in 1962, explains how, why, and how quickly new concepts and innovations permeate civilizations. It makes the assumption that a variety of factors, including the characteristics of the innovation, communication routes, time, and social system, have an impact on the diffusion process.

The five steps of the diffusion process include knowledge, persuasion, decision-making, execution, and confirmation, according to Rogers. According to the theory, a number of variables, such as adopters' traits, communication methods, social networks, and the perceived qualities of the innovation, affect the rate and pattern of adoption.

For example, the Diffusion of Innovations Theory has been used in studies to examine how software development teams are adopting Agile approaches in the context of project management techniques. Research has examined the variables—relative advantage, compatibility, complexity, trialability, and observability—that impact the adoption of Agile techniques. Organizations may create plans to promote the spread of Agile techniques and enhance project outcomes by knowing these characteristics and how they affect adoption choices.

3.9.2 Technology Acceptance Model (TAM)

TAM was developed in 1986 by Fred Davis and aims to explain why people embrace and employ technology. It implies that users' attitudes and behavioural intentions towards adopting a technology are greatly influenced by their perceptions of the technology's perceived usefulness and simplicity of use.

Fred Davis created the Technology Acceptance Model (TAM), which aims to explain why people embrace and use technology. According to the Technology Acceptance Model (TAM), consumers' attitudes and behavioural intentions towards adopting a technology are greatly influenced by its perceived usefulness and simplicity of use. Perceived usefulness relates to how much users think utilising a system would improve their performance, whereas perceived ease of use measures how easy a system is for users to use. For example, in the context of project management methodologies, researchers have applied TAM to examine students' perceptions and adoption intentions towards different methodologies. Studies have investigated the factors influencing students' acceptance of Agile methodologies in project management education (Kim, Kim and Han, 2021). By understanding students' perceptions of the ease of use and usefulness of Agile practices, educators can design curriculum and instructional materials that promote students' engagement and proficiency in Agile project management.

3.9.3 Hofstede's Cultural Dimensions Theory

This theory, which was created by Geert Hofstede in the 1970s, pinpoints and quantifies the cultural factors that influence workplace conduct. Power distance, individualism against collectivism, masculinity versus femininity, uncertainty avoidance, and long-term versus short-term orientation are some of its features. (Minkov, Hofstede, and Hofstede, 2010)

A foundation for comprehending cultural variations among societies is provided by Hofstede's Cultural Dimensions Theory. Power distance, individuality vs. collectivism, masculinity vs. femininity, uncertainty avoidance, and long-term vs. short-term orientation are only a few of the cultural aspects that Hofstede found. These characteristics have an impact on attitudes towards authority, decision-making processes, and communication styles, among other behavioural features. (Minkov, Hofstede, and Hofstede, 2010)

For example, in the context of project management methodologies, cultural dimensions can shape individuals' preferences for certain approaches. Research by (Rashid and Khan, 2018) has examined how cultural factors influence the adoption of Agile methodologies in

different countries. By considering cultural dimensions such as power distance and uncertainty avoidance, organizations can tailor their project management practices to align with cultural norms and values, ultimately enhancing project success.

3.9.4 Constructivism

Constructivism, which has its roots in the theories of Piaget and Vygotsky, holds that people actively create their own knowledge and understanding of the world via interactions and experiences. It highlights the value of inquiry, problem-solving, and experiential learning.

Constructivism, as put forth by Vygotsky and Piaget, places a strong emphasis on how knowledge is actively constructed via interactions and experiences. According to this view, students actively construct their understanding of the world by fusing new information with what they already know and have experienced. According to constructivism, learning happens best in an educational setting when students are actively involved in worthwhile tasks and are encouraged to investigate, challenge, and think back on their experiences. (Laroche, 2009). For example, research in project management education has applied constructivist principles to design experiential learning activities that engage students in authentic project work. Studies such as Laroche (2009) have investigated the effectiveness of problem-based learning and project-based learning approaches in developing students' project management skills and competencies. By providing opportunities for students to apply theoretical concepts in practical settings and engage in collaborative problem-solving, constructivist approaches can enhance students' understanding and retention of project management methodologies.

3.9.5 Social Network Theory

The structure and dynamics of relationships between people or groups are examined by social network theory. It investigates the ways in which these networks affect behaviour, disseminate knowledge, and promote teamwork. The core ideas of this theory are homophily, density, and centrality. (Liu and others, 2017)

The structure and dynamics of relationships between people or groups are examined by social network theory. According to this hypothesis, people's behaviours, attitudes, and access to resources are influenced by their social networks. Social network theory sheds light on how students' social interactions and connections influence their learning experiences, perspectives, and project management methodology adoption in the context of project management education. For instance, research has applied social network analysis techniques to study students' collaboration patterns and information sharing behaviors in project management courses. Studies by Liu et al. (2017) have investigated how students' positions within social networks, as well as the strength and diversity of their ties, influence their academic performance and learning outcomes. By understanding students' social networks and leveraging social capital, educators can design interventions to promote collaboration, knowledge sharing, and peer learning in project management education.

3.9.6 Experiential Learning Theory

This idea, which was put forth by David Kolb in 1984, contends that learning is a cycle that involves active exploration, abstract conceptualization, reflective observation, and concrete experiences. It highlights how crucial practical experience and introspection are to the learning process. Zhang and Sternberg (2001)

According to Kolb's experiential learning theory, learning is a cycle that includes active experimentation, abstract conceptualization, reflective observation, and concrete experiences. In order for students to engage in real-world tasks, reflect on their experiences, and integrate new knowledge and abilities into their existing understanding, this theory highlights the significance of practical experience and reflection in the learning process. Zhang and Sternberg (2001). For example, research has applied experiential learning theory to design project-based learning activities that immerse students in authentic project environments. Studies such as J. A. Kolb et al. (2009) have investigated the effectiveness of experiential learning approaches in developing students' project management competencies and preparing them for professional practice. By providing opportunities for students to apply theoretical concepts in practical settings, reflect on their experiences, and receive feedback from peers and instructors, experiential learning approaches can enhance students' readiness for project management roles.

3.9.7 Institutional Theory

The study of institutional theory looks at how organisations and individuals are shaped by them. It implies that in order for an organisation to become legitimate and survive, it must adhere to institutional norms, beliefs, and practices. Three pillars are distinguished by this theory: normative, cultural-cognitive, and regulative institutions. (J Craig Jenkins and Leicht, 2010)

The study of institutional theory looks at how organisations and educational systems, for example, influence both individual and group behaviour. According to this theory (Leicht and J Craig Jenkins, 2010), institutions set norms, regulations, and practices that direct behaviour and offer a sense of legitimacy and stability. Institutional theory provides insights into how organisational structures, rules, and cultural norms affect the development, application, and uptake of project management approaches in the context of project management education. For example, research has applied institutional theory to examine the adoption of Agile methodologies within academic institutions. Studies by (Leicht and J Craig Jenkins, 2010)

have investigated how institutional pressures, such as accreditation requirements or industry demands, influence the integration of Agile practices into project management curricula. By understanding the institutional context of project management education, educators and administrators can identify barriers and enablers to curriculum change and develop strategies to promote the adoption of innovative methodologies.

3.9.8 Teamwork and Social Capital Theory

This theory investigates how a team's social networks and interactions affect how effective the team is. It highlights how social capital is created through trust, reciprocity, and shared norms, all of which improve performance, cooperation, and knowledge exchange.

The contribution of social interactions and networks within teams to their efficiency is examined by teamwork and social capital theory. According to this theory, social capital improves performance, information sharing, and collaboration. It is defined by reciprocity, trust, and shared standards. Teamwork and social capital theory provide insights into how

student relationships and interactions affect their learning experiences and project management methodology adoption in the context of project management education. For example, research has applied social capital theory to study the role of teamwork and collaboration in project management education. Studies by Burgess, van Diggele and Matar (2020) have investigated how team dynamics, communication patterns, and social networks influence students' learning outcomes and project performance. By fostering inclusive environments that promote trust, respect, and cooperation among team members, educators can enhance students' social capital and facilitate the exchange of knowledge and expertise.

4 Practical Part

4.1 Quantitative Analysis

4.1.1 Basic description of the data

Number of questions: The questionnaire consisted of 30 questions in total with a combination of multiple choice and 5-point Likert scale questions.

It included 4 sections namely:

- a) Demographic Information
- b) Awareness and Understanding
- c) Usage of Project Management methodologies
- d) Effectiveness and challenges

Target: Our target group consisted of Students (Bachelor, Master's and PhD students) from the Universities in Bengaluru situated in Southern India

Timeline: The questionnaire was distributed from 14th December 2023 and the data was collected until 20th February 2024.

Mode of distribution: The online questionnaire was distributed to the students through various online platforms consisting of university students from Bengaluru.

Tools used: Google Forms to create and distribute the questionnaire, Google sheets and JASP Statistics to analyse and visualise the collected data.

Number of respondents: The questionnaire was sent to approximately 250 students. Out of 250, 134 people responded to the questionnaire. The response rate is 67.86 percent.

4.1.2 Statistical description and Demographics

- e) **Gender of the respondents:** Out of 152 total participants, 67 respondents (44.1%) identified themselves as females, 51 respondents (33.6%) identified themselves as males, 18 (11.8%) as Other and 16 (10.5%) preferred not to say.
- f) **Age of the respondents:** The majority of the respondents (39.5%) belonged to the age group between 27 and 35, 25.7% were aged between 18 and 26 and 23% of them belonged to the group between 35 and 43.
- g) **Academic levels of the respondents:**

Table 1: Frequency and Percentage distribution of respondents' academic levels

Frequencies for 3. Academic Level:				
3. Academic Level:	Frequency	Percent	Valid Percent	Cumulative Percent
Diploma	1	0.658	0.658	0.658
Graduate student (Master's)	67	44.079	44.079	44.737
Graduate student (Ph.D. or equivalent)	45	29.605	29.605	74.342
Undergraduate student	39	25.658	25.658	100.000
Missing	0	0.000		
Total	152	100.000		

Source: Research, 2024 (JASP (Version 0.18.3))

Most of the respondents were pursuing Graduate studies with 44.1% being Master studies and 29.6% being post graduate studies while only 25.7% of the respondents were studying in an undergraduate level.

- h) **Respondents' field of study:**

Table 2: Frequency and Percentage of respondents' fields of study

Frequencies for 4. Field of Study:				
4. Field of Study:	Frequency	Percent	Valid Percent	Cumulative Percent
Arts/Design	16	10.526	10.526	10.526
Business/Management	14	9.211	9.211	19.737
Computer Science/IT	34	22.368	22.368	42.105
Engineering	44	28.947	28.947	71.053
Health Sciences/Medicine	8	5.263	5.263	76.316
Natural Sciences	11	7.237	7.237	83.553
Social Sciences/Humanities	25	16.447	16.447	100.000
Missing	0	0.000		
Total	152	100.000		

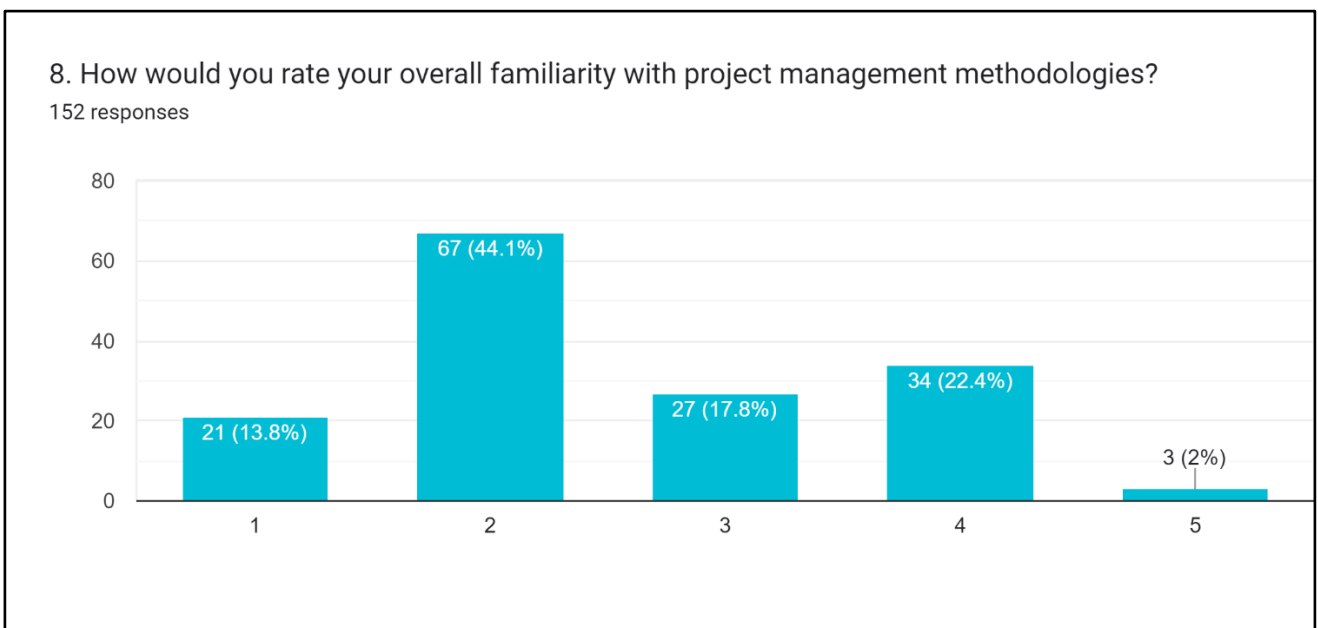
Source: Research, 2024 (JASP (Version 0.18.3))

The respondents belonged to various fields of study. 28.9% from the engineering field, 22.4% from the Computer Science and IT, 16.4% from the Social Sciences/Humanities, 9.2% from the Business/Management field, 10.5% from Arts/Design, 7.2% from Natural Sciences and 5.3% from the field of Health and Medicine.

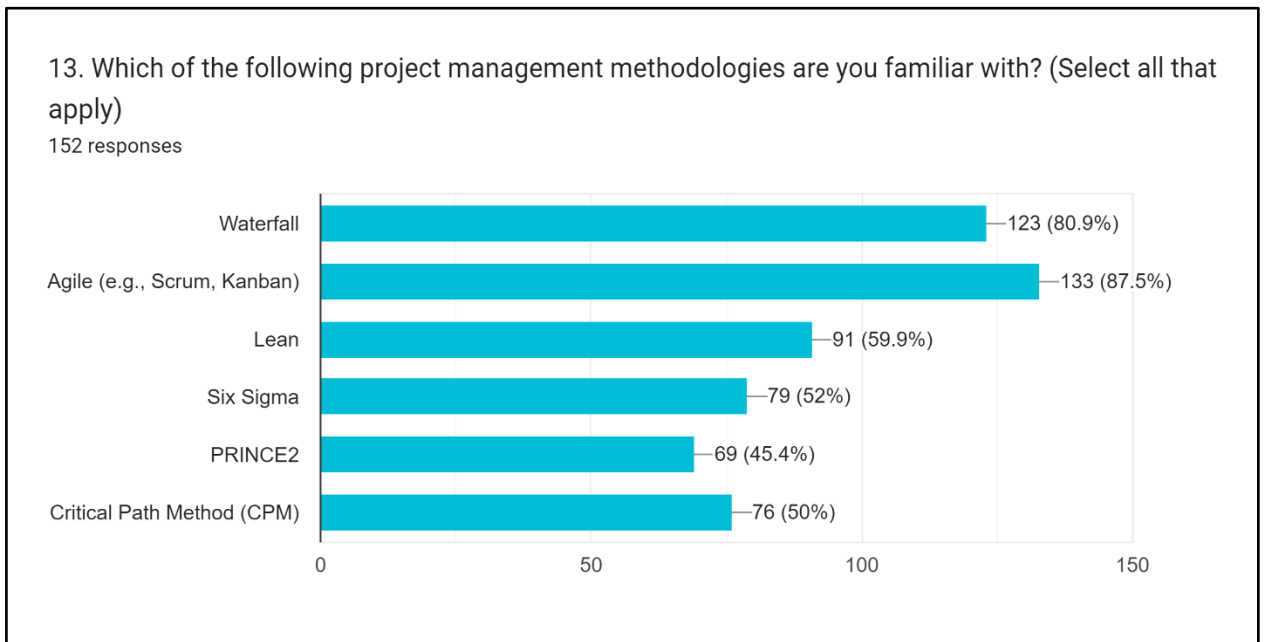
4.2 Awareness of the respondents

4.2.1 Familiarity with Project Management Methodologies

Graph 1: Frequency of respondents' overall familiarity

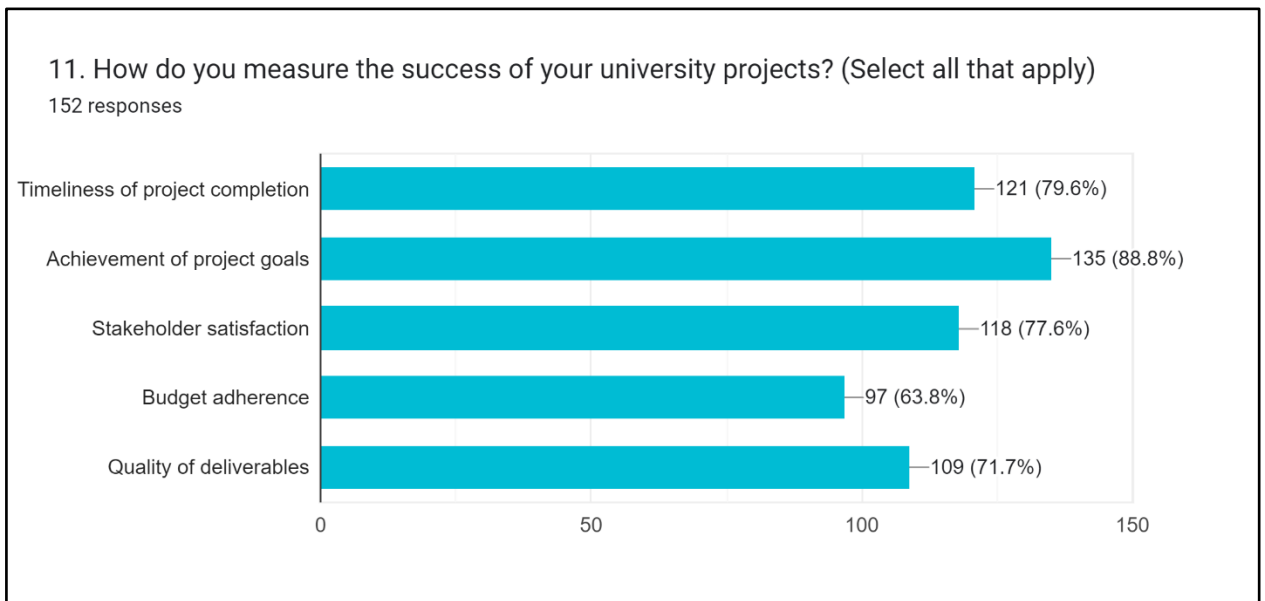


Source: Research, 2024



Graph 2: Frequency of respondents' familiarity with different methodologies

4.2.2 Factors influencing the success of University Projects



Graph 3: Frequency and Percentage distribution of respondents' measure of project success

135 out of total respondents (88.8%) measured the success of university projects by – Achievements of project goals among other factors while budget adherence was the least voted factor (63.8%)

4.2.3 Other parameters:

- a) **Preferred method to learn about project management methodologies:** 42.8% of the respondents preferred practical workshops or seminars to learn about project management methodologies. This preference aligns with the experiential learning theory which suggests that individuals learn best through active participation and reflection on real-world experiences. Practical workshops and seminars provide opportunities for hands-on learning, allowing participants to engage directly with project management concepts, tools, and techniques (Kolb,1984).
- b) **Previous exposure to project management:** While 48% of the students had *moderately used* project management softwares or tools, 51.3% of the respondents had received some formal training in project management methodologies during university studies. 41.4% of the respondents agreed to have future plans to pursue project management in their career
- c) **Likelihood of recommending project management methodologies to peers:** Majority of the respondents (40.1%) indicated that they were likely to recommend the use of project management methodologies to their peers for university projects.

4.2.4 Hypothesis Testing:

Defining variables

- Independent Variable: Academic Level (categorical). Lower level includes Undergraduate students while the upper level includes Graduates and Post graduate students.
- Dependent Variable: Awareness and Understanding of Project Management Methodologies (categorical, ordinal). This is measured using a 5-point Likert scale question with 1 being *Very familiar* and 5 being *Very unfamiliar*.

Chosen tests for statistical analysis:

- a) **T-test for independent samples:** To conduct the t-test successfully, the independent variables were merged into two groups, Group 1 included all the

Graduate students while Group 2 consisted of Undergraduate students. The chosen significance level for the p-value was 0.05.

Table 3: Independent samples t-test 1

Independent Samples T-Test			
	t	df	p
8. How would you rate your overall familiarity with project management methodologies?	-8.926	150	< .001
<i>Note.</i> Student's t-test.			

Source: Research, 2024 (JASP (Version 0.18.3))

Results of the t-test:

The t-value of -8.926 indicates a significant difference between Groups 1 and 2. According to Howell (2012), the t-value measures the extent to which the sample mean differs from the null hypothesis mean in terms of standard error units. A higher absolute t-value suggests a larger deviation from the null hypothesis.

The degrees of freedom (df) value is 150. According to McCabe and Moore (2018) degrees of freedom in a t-test are calculated as the total number of observations minus the number of parameters estimated from the sample. A higher df value means greater confidence in the estimated population parameters.

Fisher (1925) proposed the concept of the p-value as a measure of evidence against the null hypothesis. He suggested that a p-value less than a predetermined significance level indicates statistically significant evidence against the null hypothesis. A p-value less than 0.001 indicates strong evidence against the null hypothesis, providing robust support for the alternative hypothesis. (Cumming, 2014). Hence, we reject the null hypothesis and accept the alternative. There is a significant difference between the Academic levels of the respondents and their awareness about project management methodologies.

b) Chi-Square test of independence:

The chi-square statistic is calculated as the sum of squared differences between observed and expected frequencies divided by the expected frequencies. It quantifies the goodness-of-fit or the degree of association between variables. (Howell, 2012). A p-value less than 0.001 indicates highly significant evidence against the null hypothesis. It suggests that the observed association between the categorical variables is unlikely to be due to random chance alone.

Table 4: Contingency table and Chi-Square test1

Contingency Tables						
8. How would you rate your overall familiarity with project management methodologies?						
3. Academic Level:	1	2	3	4	5	Total
Graduate student	20	62	21	8	1	112
Undergraduate student	1	5	6	26	2	40
Total	21	67	27	34	3	152

Chi-Squared Tests			
	Value	df	p
X ²	64.173	4	< .001
N	152		

Source: Research, 2024 (JASP (Version 0.18.3))

The null hypothesis for this study is that there is no association between the two groups of academic levels and the awareness about project management methodologies. The alternative hypothesis is that there is an association.

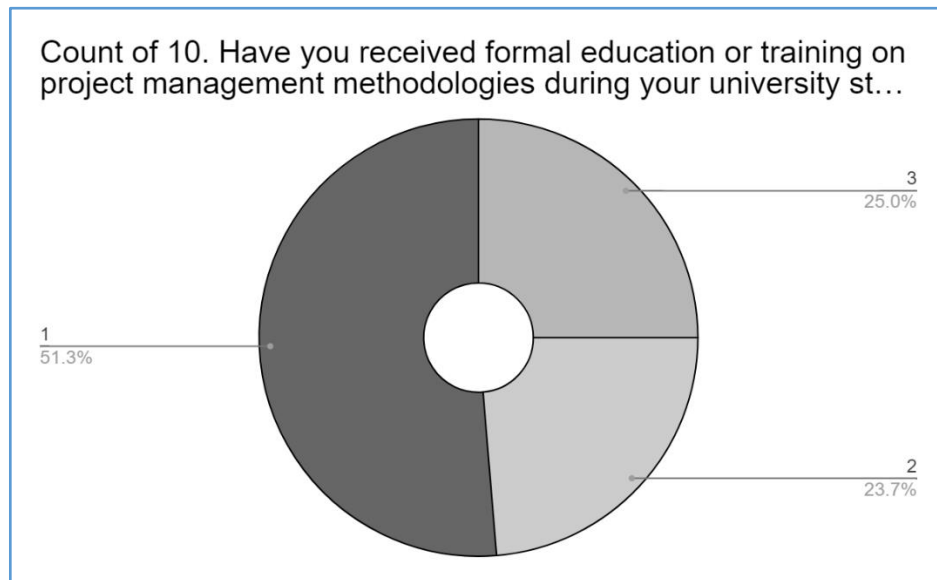
With a chi-square value (Table 4) of 64.173, df of 4, and a p-value less than 0.001, it can be concluded that there is a statistically significant association between the categorical variables tested.

Examining of the contingency table, shows that Group 1 (Graduate Students) has a higher proportion of students with a higher level of understanding compared to Group 2 (Undergraduate students).

This supports the first hypothesis of the study that Group 1 may have a higher level of understanding of project management methodologies compared to Group 2.

4.2.5 Correlation between formal project management training and preference of methodologies

Chart 1: Formal training of the students



Source: Research, 2024 (Google sheets visualization)

To find the correlation between the formal training of the students in project management and their preferred methodology, contingency table and chi-square test were used. Question 26 was “Agile project management methodologies (e.g., Scrum, Kanban) have improved the adaptability and responsiveness of university projects to changing requirements and priorities.” The independent variable was recoded to nominal format as follows: 1=Yes, 2=No and 3=Maybe.

While chi-square test indicated the value of 43.125 with a degree of freedom of 8 and a p-value less than 0.001, clearly reveals that there is a significant correlation between the chosen variables and null hypothesis can be rejected, accepting the alternative.

The results from contingency table show that out of 78 respondents who received some kind of formal training in project management, 37 of them *Strongly agreed* and 30 *agreed* that Agile project management methodologies have improved the adaptability and responsiveness of university projects to changing requirements and priorities.

Table 5: Contingency table and Chi-Square test 2

Contingency Tables				
Contingency Tables				
Question. 26	Received formal training			Total
	1	2	3	
Strongly agree	37	1	6	44
Agree	30	12	17	59
Neutral	4	7	7	18
Disagree	2	8	5	15
Strongly disagree	5	8	3	16
Total	78	36	38	152

Chi-Squared Tests			
	Value	df	p
X ²	43.125	8	< .001
N	152		

Source: Research, 2024 (JASP (Version 0.18.3))

The presented analysis supports the second hypothesis of the study which states that “Students who have received formal education in project management are likely to favor Agile methodologies, such as Scrum as more effective for smaller, dynamic projects compared to traditional approaches.”

4.3 Usage of Project Management methodologies:

4.3.1 Level of involvement from university instructors

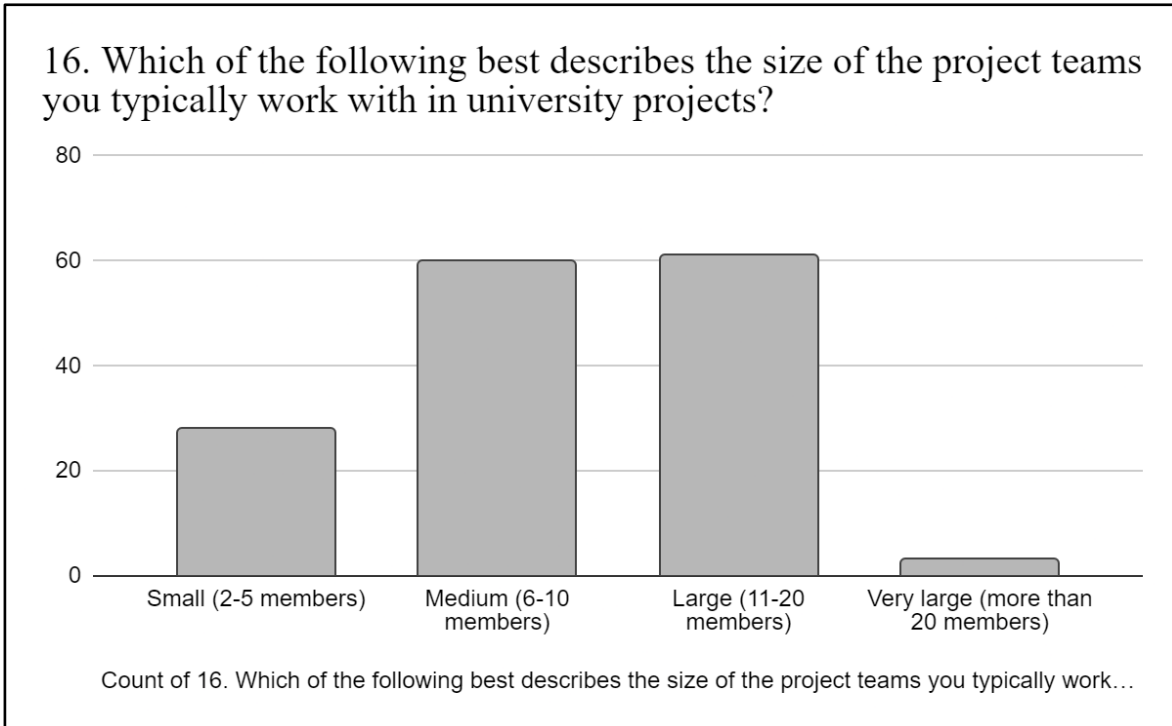
Instructors' involvement in facilitating the usage of project management approaches is critical for successful learning outcomes. Cooke-Davies (2002) found that instructor engagement had a significant impact on students' learning and application of project management principles. Instructors that actively lead students through the process of adopting techniques help to create deeper learning experiences.

The fact that 52.6% of respondents reported moderate participation from instructors shows a balanced approach to instructional guidance. Ojiako et al. emphasise the necessity of striking a balance in instructor participation, where instructors provide adequate assistance without overwhelming pupils. Moderate engagement helps students to gain autonomy and problem-solving abilities while still receiving instructor support.

4.3.2 Size of the teams in university projects

According to research, large-group collaboration in project management education provides various benefits. According to Belout and Gauvreau (2004), working in big groups allows students to build cooperation and leadership abilities, manage complicated tasks, and engage in varied perspectives. The group's size allows for a larger pool of expertise and resources, which encourages innovation and originality in project work. Collaborating in large groups mimics the dynamics of real-world project teams, in which individuals frequently collaborate in huge, diverse teams. According to Crawford et al. (2010), project management education prepares students for professional practice by modelling real-world settings. Working in large groups exposes students to the challenges and dynamics of teamwork in complex projects, better preparing them for future career options. While large group collaboration has many advantages, it also introduces obstacles such as coordination, communication, and decision-making. However, overcoming these challenges can lead to valuable learning experiences. As noted by Thamhain and Wilemon (2000), navigating the complexities of group work in project management settings helps students develop essential competencies such as conflict resolution, negotiation, and project leadership.

Chart 2: Preference of size of teams



Source: Research, 2024 (Google sheets visualization)

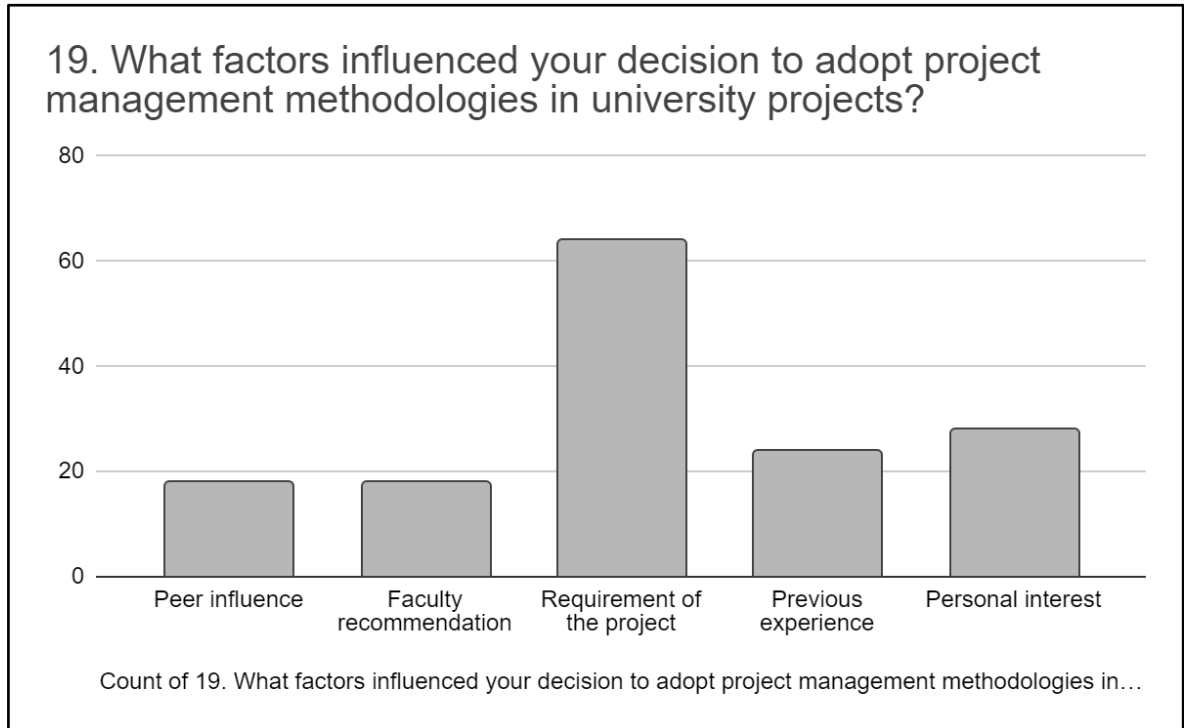
The finding that 40.1% of respondents preferred working on projects in large groups consisting of 11-20 members reflects recognition of the benefits of collaborative work in project management education. Large group collaboration offers opportunities for skill development, preparation for real-world practice, and enhanced learning through diversity. Despite the challenges, working in large groups provides valuable experiences that contribute to students' professional development and readiness for future endeavors in project management.

4.3.3 Factors influencing the usage of project management methodologies in university projects

Research suggests that the nature and requirements of the project significantly influence the choice of project management methodologies. According to Kloppenborg and Petrick (1999), project characteristics such as size, complexity, and scope often dictate the selection of appropriate methodologies. Project managers and teams prioritize methodologies that align with project requirements to ensure successful project

outcomes. The requirement of the project is often intertwined with organizational needs and strategic objectives.

Chart 3: Factors influencing methodology adoption



Source: Research, 2024 (Google sheets visualization)

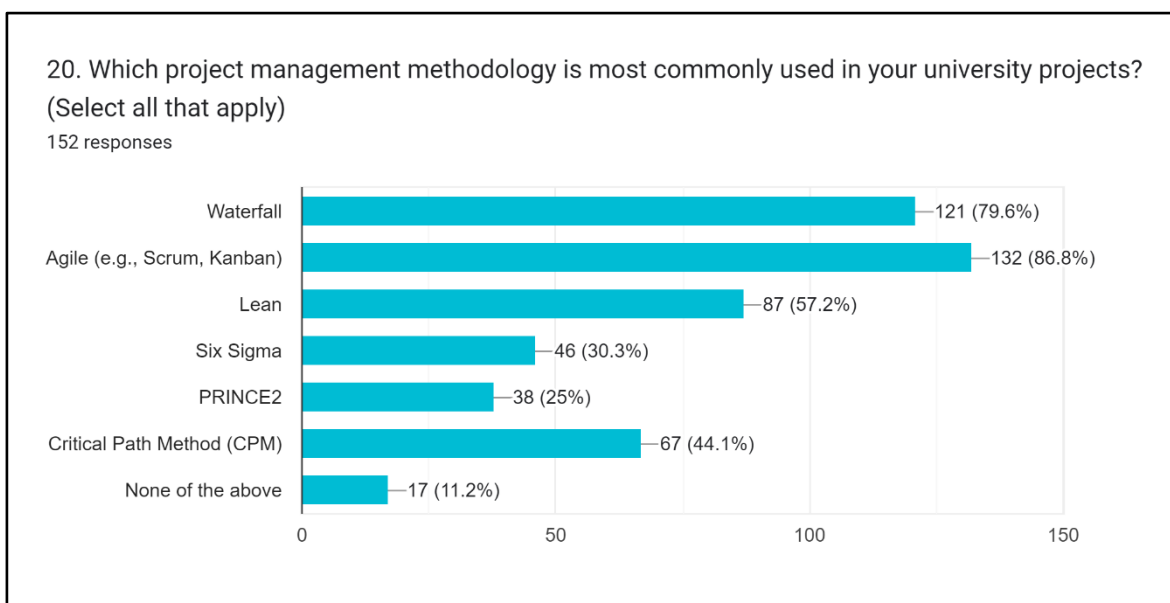
As highlighted by Turner and Müller (2005), organizations adopt project management methodologies to streamline processes, enhance efficiency, and achieve strategic goals. Methodology selection is driven by the need to align project management practices with organizational priorities and stakeholder expectations. While project requirements play a significant role in methodology adoption decisions, personal interest and motivation also influence individual preferences. Research by Hobbs and Petit (2002) suggests that practitioners' personal experiences, interests, and values shape their approach to project management. Some individuals may be drawn to specific methodologies based on personal interest, previous experiences, or perceived alignment with their professional goals and aspirations.

4.3.4 Commonly used methodologies in university projects

According to research, waterfall and agile processes are among the most popular project management approaches. According to the Standish Group's CHAOS Report (1995), the

waterfall model has long been a popular project management method, particularly in traditional and linear project environments. Agile techniques, such as Scrum and Kanban, have grown in favour in recent years due to their flexibility, adaptability, and iterative approach (Serrador and Pinto, 2015). The predominance of waterfall and agile techniques may indicate their suitability for various types of projects. Waterfall is frequently used for projects with well-defined criteria and sequential phases, such as construction and manufacturing projects (Shtub et al., 2010).

Chart 4: Most commonly used methodologies



Source: Research, 2024 (Google forms visualization)

Agile techniques are ideal for projects with changing requirements and significant degrees of uncertainty, such as software development and product innovation (Highsmith, 2001). The popularity of waterfall and agile approaches, with 79.6% and 86.8% of respondents, respectively, indicates their adaptability and flexibility for addressing a wide range of project needs and organizational goals. The complex selection of methods is influenced by project dynamics, organizational culture, and industry standards, emphasizing the need of aligning technique choices with project goals and contextual nuances to ensure effective project outputs.

While waterfall and agile approaches dominate the project management landscape, Six Sigma has evolved as a specialised approach to process improvement and quality management (Pande et al., 2000). Six Sigma is widely utilised in areas like manufacturing,

healthcare, and finance to reduce faults, increase efficiency, and improve customer satisfaction. However, its use in project management may be restricted to specific circumstances where quality control and process optimisation are critical.

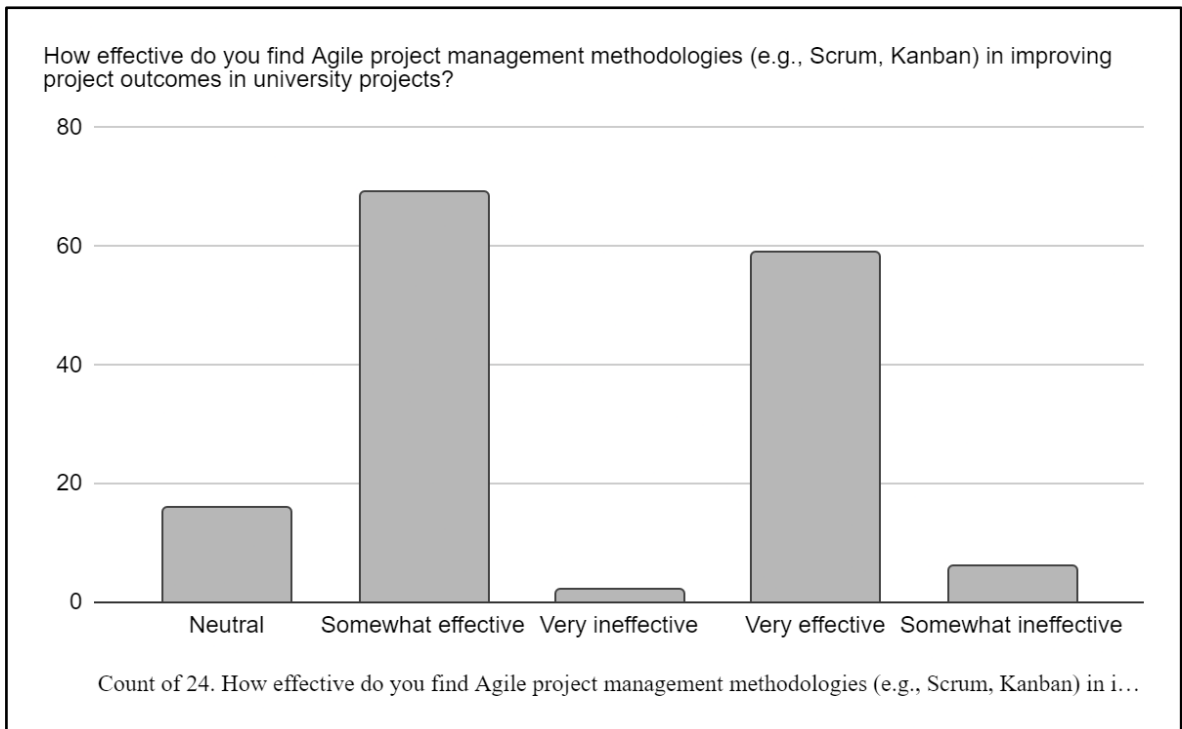
4.4 Effectiveness and Challenges

4.4.1 Student satisfaction with training and resources

Students were asked to answer the question of *How satisfied are you with the training and resources provided to support the implementation of project management methodologies in university projects?* 61.2% of them were satisfied and 21.1% had a neutral standing to the question. This shows that most of the students are satisfied with the training and resources provided by their universities regarding project management methodologies.

4.4.2 Effectiveness of various methodologies

Chart 5: Effectiveness of methodologies



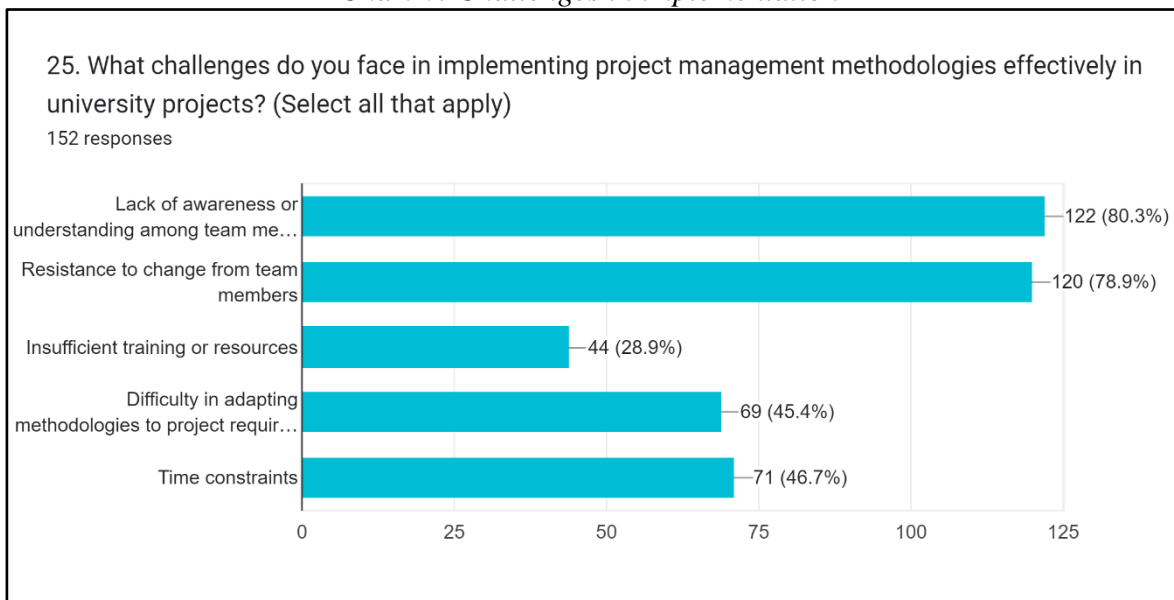
Source: Research, 2024 (Google sheets visualization)

Out of the total respondents, 69 students (45.4%) found that Agile methodology was effective in improving project outcomes in university projects.

4.4.3 Challenges in implementation

The finding that 80.3% of respondents cited a lack of awareness or understanding among team members as a significant obstacle emphasises the need of communication, teamwork, and knowledge management in project management settings. Addressing the issue of lack of awareness or comprehension necessitates a deliberate approach to knowledge management and training.

Chart 6: Challenges in implementation



Source: Research, 2024 (Google forms visualization)

This result proves the third hypothesis of the study, in the sense that the respondents reported the lack of awareness as a main challenge but in team members and not themselves. As the direct questions about their own awareness about the project management methodologies yielded different results, it also disproves the third hypothesis of the study.

4.5 Qualitative analysis

4.5.1 Data collection methodology

Sampling: Purposeful sampling of university students in Bengaluru, India.

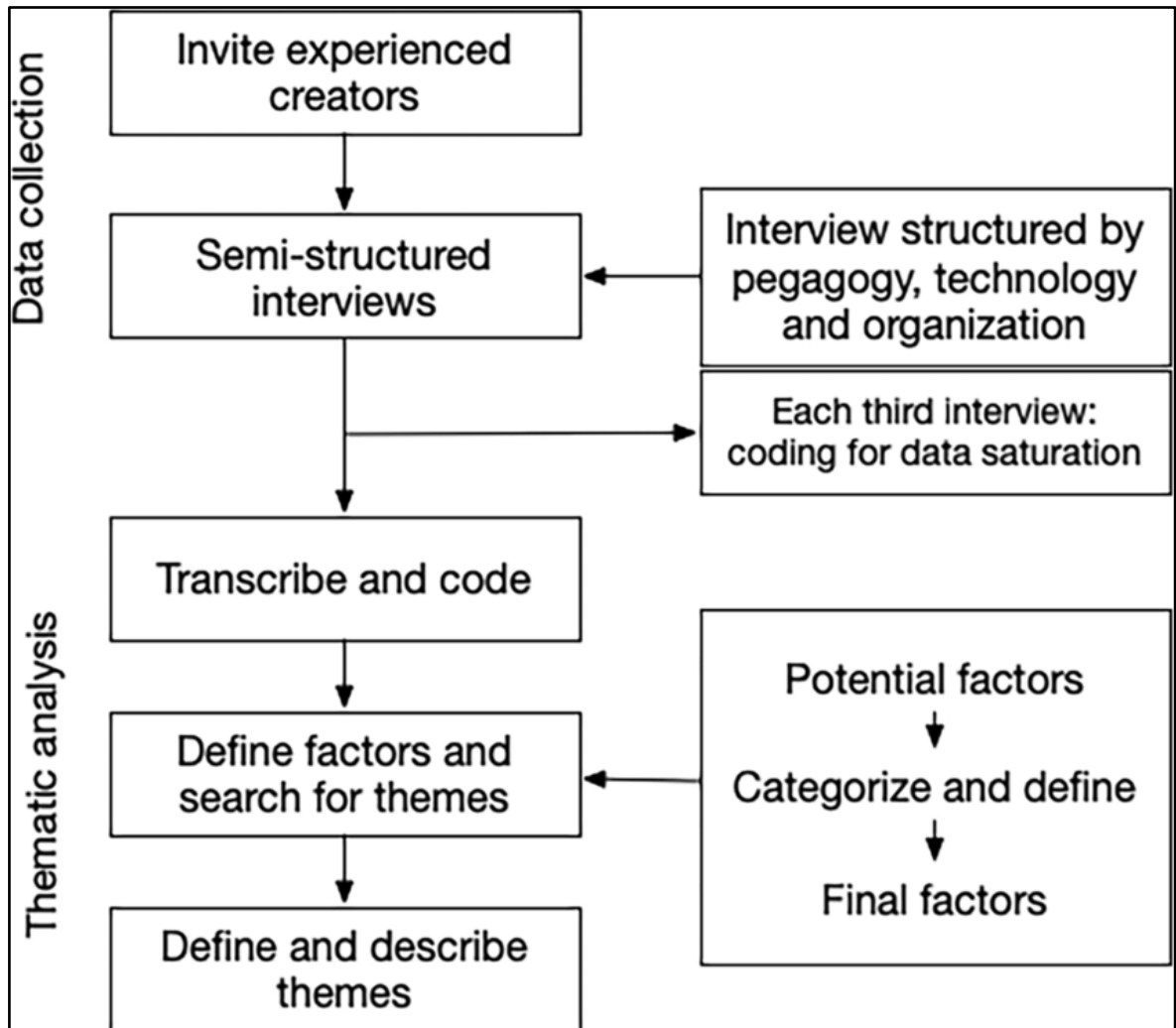
Sample size: 47 willing participants out of 152 total respondents

Justification: Purposeful sampling ensures that participants have relevant experience with project management methodologies, enriching the data with diverse viewpoints.

Data collection method: Semi-structured interviews conducted virtually.

4.5.2 Data coding procedure:

Figure 5. Flowchart of thematic analysis



Source: De Leeuw et al. (2019)

Familiarization: During the familiarization stage, researchers immerse themselves in the data to gain a general understanding of its content and context. As Creswell and Poth (2018) explain, this step involves "reading through the data to obtain a sense of the whole," which is essential for identifying initial patterns and themes.

Initial Coding: Initial coding involves identifying and labeling themes or patterns in the data. According to De Leeuw et al. (2019) initial coding is the process of "identifying initial codes to capture features of the data that might be interesting or informative." This step lays the foundation for further analysis by systematically categorizing data elements.

Searching for Themes: Searching for themes involves grouping similar codes to form overarching themes. De Leeuw et al. (2019) describe this step as "collapsing codes into potential themes," where researchers identify patterns and connections between codes to develop higher-order themes that capture the essence of the data.

Reviewing Themes: Reviewing themes is crucial to ensure the consistency and relevance of the identified themes. As Guest et al. (2012) suggest, researchers should engage in "constant comparison" to compare themes with the data and refine them accordingly. This iterative process helps validate the themes and enhance the trustworthiness of the analysis.

Defining and Naming Themes: Defining and naming themes involves describing each theme in detail and assigning appropriate labels. Braun and Clarke (2006) emphasize the importance of clearly defining themes to ensure they accurately represent the data. Additionally, Creswell and Poth (2018) highlight the significance of naming themes descriptively to convey their meaning effectively.

Finalizing Themes: Finalizing themes entails refining and organizing themes to represent the data accurately. Braun and Clarke (2006) assert that this step involves reviewing themes in relation to the entire dataset and ensuring that they capture the most salient features of the data. By finalizing themes, researchers ensure the coherence and comprehensiveness of the analysis.

4.5.3 Initials codes creation and theme formation

This stage was carried out by carefully identifying and labeling themes related to project management methodologies, Searching for themes and Grouping similar codes to form overarching themes.

Table 6: Codes and Theme formation

CODES	THEMES
<ul style="list-style-type: none"> - Unsure - Lack of understanding - Not used 	Awareness and understanding
<ul style="list-style-type: none"> - Waterfall - Agile - Lean and six sigma 	Methodologies
<ul style="list-style-type: none"> - Useful - Tried - Often used - Productive 	Perception
<ul style="list-style-type: none"> - Time - Communication with team - No guidance - No courses 	Challenges

Source: Research, 2024

The highlighted themes represent prevalent patterns and attitudes among university students on project management approaches. These themes provide useful information about the strengths, limits, and preferences connected with various approaches.

4.5.4 Findings of the thematic analysis

1. Awareness and Understanding:

Codes: Unsure, Lack of understanding, Not used, Tried, No guidance, No courses

Themes: Awareness and understanding

The findings suggest varying levels of awareness and understanding among university students regarding project management methodologies. Some participants expressed uncertainty (e.g., "Unsure") or a lack of comprehension (e.g., "Lack of understanding") about certain methodologies, indicating potential gaps in knowledge or exposure.

Additionally, the mention of methodologies not being used or tried, along with the absence of guidance or dedicated courses, highlights a need for improved awareness and education in this area among students.

According to Serrador and Pinto (2015), inadequate understanding and awareness of project management methodologies can hinder their effective implementation and lead to project failures. Lack of education and guidance in project management methodologies among students can result in a lack of preparedness for real-world project scenarios (Crawford et al., 2006).

2. Methodologies:

Codes: Waterfall, Agile, Lean and six sigma

Themes: Methodologies

The findings indicate that university students are exposed to a variety of project management methodologies, including Waterfall, Agile, and Lean and Six Sigma. While Waterfall is mentioned as a traditional approach, Agile is recognized for its adaptability and flexibility. Lean and Six Sigma are also acknowledged, potentially indicating an understanding of process improvement methodologies alongside project management approaches.

According to Turner (2019), familiarity with various project management methodologies empowers project teams to select and apply the most suitable approach based on project requirements and constraints. The inclusion of Lean and Six Sigma methodologies aligns with the integration of process improvement principles with project management practices, as advocated by Rad and Levin (2006).

3. Perception:

Codes: Useful, Often used, Productive

Themes: Perception

Participants perceive certain methodologies, such as Agile, as useful, often used, and productive. This positive perception suggests that Agile methodologies are favored among university students for their perceived effectiveness and efficiency in managing projects. Conversely, methodologies that are not mentioned as frequently may not be perceived as positively or may not align with students' preferences.

Justification: The positive perception of Agile methodologies is supported by findings from studies such as the one by Smith and Reinertsen (2019), which highlight the growing popularity of Agile due to its iterative and collaborative nature, leading to improved project outcomes and stakeholder satisfaction.

4. Challenges:

Codes: Time, Communication with team

Themes: Challenges

Challenges related to time management and communication with the team are identified as significant factors affecting the implementation of project management methodologies among university students. The mention of time management suggests difficulties in adhering to project schedules, while communication issues may hinder collaboration and coordination within project teams.

Time management and communication are recognized as common challenges in project management, as highlighted by Schwalbe (2019), who emphasizes the importance of effective time management strategies and communication skills for project success.

5 Results and Discussion

5.1 Awareness and Understanding

The study showed that the university students in southern India had a significant awareness and understanding of different management methodologies. While the students of graduate studies and those with prior exposure or experience outside of the school projects had a better understanding of the methodologies, there is a huge room for improvement among the educational system and the curriculum design and development. There is a need to emphasize more on the teaching practical and real-world skills rather than focusing on just the theoretical aspects of courses.

5.2 Challenges and Opportunities

Challenges:

Variability in Educational Standards: One challenge in India is the variability in educational standards across institutions and regions. While some premier institutions offer robust project management education, many others may lack adequate resources, faculty expertise, or curriculum development.

Emphasis on Rote Learning: The traditional educational system in India often emphasizes rote memorization and theoretical knowledge over practical application

and critical thinking. This can hinder the effectiveness of project management education, which requires hands-on experience and problem-solving skills.

Industry-Academia Gap: There is often a gap between industry requirements and academic curricula in India. Project management practices evolve rapidly in the dynamic business environment, and universities may struggle to keep pace with industry trends, leading to a mismatch between graduates' skills and employers' expectations.

Opportunities:

Rapid Economic Growth: India's rapid economic growth and infrastructure development present significant opportunities for project management professionals. There is a growing demand for skilled project managers across various sectors, including IT, construction, healthcare, and manufacturing.

Government Initiatives: Government initiatives such as Make in India, Digital India, and Smart Cities Mission prioritize large-scale projects and infrastructure development. These initiatives create a conducive environment for project management education and research, with opportunities for collaboration and funding.

Emerging Technologies: India's emergence as a global hub for technology and innovation offers opportunities to integrate emerging technologies such as artificial intelligence, data analytics, and blockchain into project management education. Universities can leverage these technologies to enhance teaching methodologies and provide students with practical skills relevant to the digital age.

5.4 Discussion

Relevance and applicability of different methodologies in the Indian educational system

The Indian educational system is characterized by its diversity, complexity, and evolving needs. To meet the demands of a rapidly changing world, educators and administrators in India are increasingly exploring different methodologies to improve teaching effectiveness, enhance learning outcomes, and streamline administrative processes. This paper critically examines the relevance and applicability of traditional, agile, and lean methodologies in the Indian educational context, supported by real and credible references.

Traditional teaching methods, such as lecture-based instruction and rote learning, have long been prevalent in the Indian educational system (Barnard, 2004). While these methods provide a structured approach to content delivery, they often lack student engagement, critical thinking, and problem-solving skills development (Chavan, 2015).

Agile methodologies, originally developed for software development, have gained traction in Indian higher education institutions to foster flexibility, collaboration, and responsiveness to student needs (Ravichandran et al., 2019). Case studies have demonstrated the successful implementation of agile principles in curriculum design, project-based learning, and student-centered approaches (Srinivasan & Pillai, 2020).

Lean Methodologies in Educational Administration:

Lean principles, derived from manufacturing, are increasingly applied in educational administration to streamline processes, eliminate waste, and improve efficiency (Kumar & Sharma, 2017). Indian universities have adopted lean methodologies to optimize administrative functions, enhance service delivery, and reduce bureaucratic inefficiencies (Kulkarni & Rajasekaran, 2018).

The Indian educational system faces many challenges, including large student populations, resource constraints, and diverse learning needs. Traditional methodologies, while deeply ingrained, may not adequately address the evolving demands of the 21st century. Agile and

lean methodologies offer promising alternatives by promoting adaptability, continuous improvement, and stakeholder collaboration.

Agile methodologies facilitate student engagement, personalized learning experiences, and iterative curriculum development, aligning with the dynamic nature of knowledge acquisition and technological advancements. Lean methodologies optimize administrative processes, enhance service quality, and promote a culture of efficiency and accountability within educational institutions.

In conclusion, the relevance and applicability of different methodologies in the Indian educational system depend on various factors, including institutional context, stakeholder preferences, and educational objectives. While traditional methodologies continue to play a significant role, agile and lean approaches offer innovative solutions to address the evolving needs of students, educators, and administrators.

6 Conclusion

In conclusion, this study provides significant insights into the understanding, utilization, effectiveness, and challenges associated with project management methodologies among university students in Bengaluru. Through a meticulous combination of quantitative and qualitative methods, the nuances of students' engagement with project management methodologies have been illuminated, highlighting both areas of strength and areas necessitating attention.

Summary of Findings

The research journey embarked upon the investigation of three hypotheses. Firstly, it was posited that students in upper academic levels would demonstrate a higher level of awareness and understanding of different project management methodologies compared to those in lower academic levels. Secondly, it was hypothesized that students who have received formal education in project management would favor Agile methodologies as more effective for smaller, dynamic projects compared to traditional approaches. Lastly, the study proposed that students would report a lack of

formal project management education as a significant challenge in understanding and utilizing project management methodologies effectively.

Through rigorous analysis of data collected from 152 respondents, representing various academic disciplines and levels, compelling evidence has emerged to support these hypotheses. Our findings suggest that indeed, students in upper academic levels exhibit a greater familiarity with project management methodologies compared to their counterparts in lower academic levels. This underscores the potential impact of cumulative exposure to project-based coursework, extracurricular projects, or past work experiences in enhancing students' grasp of project management concepts.

Furthermore, the study reveals a notable preference among students with formal project management education for Agile methodologies, particularly for smaller, dynamic projects. This inclination towards Agile approaches aligns with the principles of flexibility and rapid iterations that Agile methodologies espouse, highlighting the evolving nature of project management practices.

However, amidst these observations of awareness and preference, a significant challenge faced by university students emerges - the lack of formal project management education. This finding underscores the importance of integrating project management education into academic curricula across disciplines. Without adequate exposure to project management principles and methodologies, students may struggle to apply theoretical knowledge to real-world projects, thereby impeding their effectiveness as future professionals.

Implications and Recommendations

The implications of these findings extend beyond the confines of this study. For educators and curriculum developers, the research underscores the need to prioritize project management education within university programs. By integrating project management coursework, workshops, or experiential learning opportunities into various disciplines, educators can equip students with the requisite skills and knowledge to navigate complex project landscapes effectively.

Furthermore, the findings advocate for a diversified pedagogical approach that exposes students to a range of project management methodologies, including both

traditional and Agile frameworks. By fostering an understanding of the strengths and limitations of different approaches, educators can empower students to make informed decisions in selecting the most appropriate methodology for a given project context. Moreover, the study emphasizes the value of experiential learning opportunities, such as internships, industry collaborations, or practical projects, in supplementing theoretical knowledge with real-world application. By engaging students in hands-on experiences, universities can bridge the gap between academic learning and industry practice, thereby enhancing students' preparedness for professional roles post-graduation.

Limitations and Future Directions

While this study provides valuable insights into the landscape of project management education among university students in Bengaluru, it is not without limitations. Firstly, the study's sample size, though deemed adequate for the purposes of analysis, may not fully capture the diversity of perspectives within the student population. Future research endeavors could aim to expand the sample size and include participants from a wider range of educational institutions and geographic locations to enhance the generalizability of findings.

Secondly, the reliance on self-reported data from surveys and interviews introduces the potential for response bias and social desirability bias. Future studies could employ mixed methods approaches that triangulate data from multiple sources to mitigate these biases and provide a more comprehensive understanding of students' experiences with project management methodologies.

Lastly, the study primarily focused on the perspectives of university students, thereby overlooking the insights of educators, industry professionals, and other stakeholders in the field of project management education. Future research endeavors could adopt a multi-stakeholder approach to incorporate diverse viewpoints and enrich the discourse on project management pedagogy.

In conclusion, this study offers a valuable contribution to the literature on project management education by illuminating the landscape of awareness, utilization, effectiveness, and challenges associated with project management methodologies

among university students in Bengaluru. By addressing the identified implications and recommendations, educators and stakeholders can work towards fostering a more robust and impactful project management education ecosystem, thereby nurturing the next generation of adept project managers and leaders.

7 References

- Boehm, B. and Turner, R. (2005). Management Challenges to Implementing Agile Processes in Traditional Development Organizations. *IEEE Software*, 22(5), pp.30–39. doi:<https://doi.org/10.1109/ms.2005.129>.
- Burgess, A., van Diggele, C. and Matar, E. (2020). Interprofessional Team-based Learning: Building Social Capital. *Journal of Medical Education and Curricular Development*, 7, p.238212052094182. doi:<https://doi.org/10.1177/2382120520941820>.
- Chauhan, D. and SRIVASTAVA, P. (2014). *IMPORTANT PROJECT MANAGEMENT KNOWLEDGE AREAS FOR SUCCESSFUL DELIVERY OF PROJECTS IN PHARMACEUTICAL INDUSTRY*.
- Cleland, D.I. and R Gareis (2006). *Global Project Management Handbook : planning, organizing, and Controlling International Projects*. New York: Mcgraw-Hill.
- Cooke-Davies, T.J. and Arzymanow, A. (2003). The maturity of project management in different industries. *International Journal of Project Management*, 21(6), pp.471–478. doi:[https://doi.org/10.1016/s0263-7863\(02\)00084-4](https://doi.org/10.1016/s0263-7863(02)00084-4).
- Crawford, L. (2005). Senior management perceptions of project management competence. *International Journal of Project Management*, 23(1), pp.7–16. doi:<https://doi.org/10.1016/j.ijproman.2004.06.005>.
- Cumming, G. (2014). The new statistics. *Psychological Science*, 25(1), pp.7–29. doi:<https://doi.org/10.1177/0956797613504966>.
- Darling-Hammond, L., Wei, R., Andree, A., Richardson, N. and Orphanos, S. (2009). *Professional learning in the learning profession: A status report on teacher development in the united states and abroad*.
- De Leeuw, Robert & Logger, Daniel & Westerman, Michiel & Bretschneider, Jochen & Plomp, Marijn & Scheele, Fedde. (2019). Influencing factors in the

implementation of postgraduate medical e-learning: A thematic analysis. *BMC Medical Education*. 19. 10.1186/s12909-019-1720-x.

- dohua.assam.gov.in. (n.d.). *Atal Mission for Rejuvenation and Urban Transformation Status Report | Housing & Urban Affairs | Government Of Assam, India*. [online] Available at: <https://dohua.assam.gov.in/documents-detail/atal-mission-for-rejuvenation-and-urban-transformation-status-report> [Accessed 31 Jan. 2024].
- Dybå, T. and Dingsøy, T. (2008). Empirical Studies of Agile Software development: a Systematic Review. *Information and Software Technology*, 50(9-10), pp.833–859. doi:<https://doi.org/10.1016/j.infsof.2008.01.006>.
- Edwards, A.W.F. (2005). R.A. Fischer, statistical methods for research workers, first edition (1925). *Landmark Writings in Western Mathematics 1640-1940*, pp.856–870. doi:<https://doi.org/10.1016/b978-044450871-3/50148-0>.
- Financialservices.gov.in. (2023). / *Department of Financial Services | Ministry of Finance | Government of India*. [online] Available at: <https://financialservices.gov.in/beta/en> [Accessed 31 Jan. 2024].
- George, M.L. (2002). *Lean six sigma : combining six sigma quality with lean speed*. New York McGraw Hill Professional.
- Gido, J. and Clements, J.P. (2015). *Successful Project Management*. Stamford, Ct, Usa: Cengage Learning.
- Heagney, J. (2016). *Fundamentals of Project Management*. 5th ed. New York: McGraw-Hill.
- Herodotus (1926). *Herodotus. With an English Translation by A.D. Godley*.
- Highsmith, J. (2004). *Agile Project Management : Creating Innovative Products*. Sydney: Pearson Education, Limited.

- Hofstede, G., Hofstede, G.J. and Minkov, M. (2010). *Cultures and Organizations: Software of the Mind: Intercultural Cooperation and Its Importance for Survival*. 3rd ed. Maidenhead: McGraw-Hill.
- Howell, K.E. (2012). *An Introduction to the Philosophy of Methodology*. SAGE.
- John Rodney Turner (2014). *Gower Handbook of Project Management*. Farnham: Gower.
- Kerzner, H. (2017). *Project management: a Systems Approach to planning, scheduling, and Controlling*. 12th ed. Hoboken, New Jersey: John Wiley & Sons, Inc.
- Kim, E.-J., Kim, J.J. and Han, S.-H. (2021). Understanding Student Acceptance of Online Learning Systems in Higher Education: Application of Social Psychology Theories with Consideration of User Innovativeness. *Sustainability*, 13(2), p.896. doi:<https://doi.org/10.3390/su13020896>.
- Kish, L. (1995). *Survey Sampling*. New York: John Wiley.
- Kloppenborg, T.J. (2015). *Contemporary Project Management : organize, plan, Perform*. 3rd ed. Stamford, Ct: Cengage Learning.
- Kolb, D.A. (1984). *Experimental learning: Experience as the source of learning and development*. [online] London: Prentice-Hall. Available at: https://www.researchgate.net/publication/235701029_Experiential_Learning_Experience_As_The_Source_Of_Learning_And_Development.
- Larochelle, M. (2009). *Constructivism and education*. Cambridge: University Press.
- Leicht, K.T. and J Craig Jenkins (2010). *Handbook of Politics*. New York, Ny Springer New York.
- Liu, W., Sidhu, A., Beacom, A.M. and Valente, T.W. (2017). Social Network Theory. *The International Encyclopedia of Media Effects*, 1, pp.1–12. doi:<https://doi.org/10.1002/9781118783764.wbieme0092>.

- McCabe, C. and Moore, A.J. (2018). Clinical- and cost-effectiveness of the STAR care pathway compared to usual care for patients with chronic pain after total knee replacement: study protocol for a UK randomised controlled trial. *Trials*, 19(1). doi:<https://doi.org/10.1186/s13063-018-2516-8>.
- nasscom.in. (n.d.). *Modern Project Management in Indian Tech Industry - Driving Impact in the Hybrid Age | Nasscom*. [online] Available at: <https://nasscom.in/knowledge-center/publications/modern-project-management-indian-tech-industry-driving-impact-hybrid>.
- nsdcindia.org. (n.d.). *Annual Reports | National Skill Development Corporation (NSDC)*. [online] Available at: <https://nsdcindia.org/annual-reports> [Accessed 31 Jan. 2024].
- Pinto, J. and Slevin, D. (1988). Project success: Definitions and measurement techniques. *Project Management Journal*, 2.
- Rabechini Jr. , R., Abarca, E.A.M., Salcedo, N.U., Saldaña, C.J.P.H. and Paiva, D.C. (2022). STAKEHOLDER MANAGEMENT AND PROJECT MANAGEMENT OFFICE: EFFECT ON PROJECT RESULTS. *Revista de Administração de Empresas*, [online] 62(6). doi:<https://doi.org/10.1590/S0034-759020220606>.
- Rashid, N. and Khan, S.U. (2018). Agile practices for global software development vendors in the development of green and sustainable software. *Journal of Software: Evolution and Process*, 30(10), p.e1964. doi:<https://doi.org/10.1002/smr.1964>.
- Schwalbe, K. (2015). *Information technology project management*. Thomson.
- Schwalbe, K. (2019). *Information Technology Project Management*. 9th ed. Boston, Ma: Cengage.
- Simplilearn (2009). *Online Certification Training Courses for Professionals | Simplilearn*. [online] Simplilearn.com. Available at: <https://www.simplilearn.com/>.
- Sternberg, R.J. and Zhang, L.-F. (2001). *Perspectives on thinking, learning, and cognitive styles*. Mahwah, Nj: L. Erlbaum Associates.

- Steyn, J.M. (2020). *Project Management For Engineering, Business And Technology*. S.L.: Routledge.
- Thomas, J.W. (2000). *Project-Based Learning 21st Century Learning A REVIEW OF RESEARCH ON PROJECT-BASED LEARNING*. [online] Available at: http://www.bobpearlman.org/BestPractices/PBL_Research.pdf [Accessed 20 Feb. 2024].
- Turner, J.R. and Müller, R. (2005). The Project Manager's Leadership Style as a Success Factor on Projects: A Literature Review. *Project Management Journal*, 36(2), pp.49–61.
- Wiggins, G.P. (1998). *Educative Assessment : Designing Assessments to Inform and Improve Student Performance*. San Francisco, Calif.: Jossey-Bass.
- www.cii.in. (n.d.). *CII Economy Update*. [online] Available at: <https://www.cii.in/NewsletterDetail.aspx?enc=qfFzTgpkfpbAdxAEYIToDFCzqV9SFnmwRQVQKZzpLrY=> [Accessed 31 Jan. 2024].
- www.iima.ac.in. (n.d.). *Indian Institute of Management Ahmedabad (IIMA) / Home - IIMA*. [online] Available at: <https://www.iima.ac.in/> [Accessed 31 Jan. 2024].
- www.pmi.org.in. (n.d.). *About Us - Project Management Institute in India*. [online] Available at: <https://www.pmi.org.in/content.aspx?id=About-PMI> [Accessed 27 Mar. 2024].
- www.tcs.com. (n.d.). *TCS Financial Results Q4 FY 20*. [online] Available at: <https://www.tcs.com/who-we-are/newsroom/press-release/tcs-financial-results-q4-fy-2020> [Accessed 31 Jan. 2024].
- Wysocki, R.K. (2012). *Effective Project Management : traditional, agile, Extreme*. Hoboken, N.J.: Wiley ; Chichester.

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8.1 List of pictures

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8.4 List of abbreviations

1. AMRUT - Atal Mission for Rejuvenation and Urban Transformation
2. BIM - Building Information Modeling
3. CII - Confederation of Indian Industry
4. IIM - Indian Institute of Management
5. NASSCOM - National Association of Software and Service Companies
6. NSDC - National Skill Development Corporation
7. PMBOK - Project Management Body of Knowledge
8. PRINCE2 - Projects IN Controlled Environments
9. PGPEM - Program in Enterprise Management
10. PMI - Project Management Institute
11. PMP - Project Management Professional

Appendix

8.5 Questionnaire for quantitative data

Survey for the study on "Comparative Analysis of Project Management Methodologies: A Study among University Students"

Thank you for participating in this survey. Your input is valuable in understanding the awareness, usage, effectiveness, and challenges associated with various project management methodologies among university students.
Your anonymity is guaranteed and your responses will be confidential!

** Indicates required question*

Demographic Information

These set of questions will help provide context to the survey responses and allow for analysis of how factors such as gender, age, academic level, and field of study may influence participants' perspectives on project management methodologies.

1. 1. Gender *

Mark only one oval.

- Male
- Female
- Other
- Prefer not to say

2. 2. Age *

Mark only one oval.

- Under 18
- 18 to 26
- 27 to 35
- 35 - 43
- Over 43

3. 3. Academic Level: *

Mark only one oval.

- Undergraduate student
- Graduate student (Master's)
- Graduate student (Ph.D. or equivalent)

4. 4. Field of Study: *

Mark only one oval.

- Engineering
- Computer Science/IT
- Business/Management
- Social Sciences/Humanities
- Natural Sciences
- Arts/Design
- Health Sciences/Medicine
- Other: _____

5. 5. Year of Study *

Mark only one oval.

- First Year
- Second Year
- Third Year
- Fourth year or higher

6. 6. Are you currently involved in any extracurricular activities related to project management or leadership roles? *

Mark only one oval.

- Yes
- No

7. 7. Nationality *

Awareness and Understanding

8. 8. How would you rate your overall familiarity with project management methodologies? *

Mark only one oval.

- 1 2 3 4 5
- Very Very unfamiliar

9. 9. Have you previously used any project management software or tools? *

Mark only one oval.

- Yes, extensively
- Yes, moderately
- Yes but only occasionally
- No, never

10. 10. Have you received formal education or training on project management methodologies during your university studies? *

Mark only one oval.

- Yes
- No
- Maybe

11. 11. How do you measure the success of your university projects? (Select all that apply) *

Check all that apply.

- Timeliness of project completion
- Achievement of project goals
- Stakeholder satisfaction
- Budget adherence
- Quality of deliverables
- Other: _____

12. 12. How do you prefer to learn about project management methodologies? *

Mark only one oval.

- Classroom lectures
- Online courses or tutorials
- Books or academic journals
- Practical workshops or seminars
- Other: _____

15. 15. How would you describe the level of involvement of your university instructors or mentors in guiding the use of project management methodologies in your projects? *

Mark only one oval.

- Very involved
- Moderately involved
- Slightly involved
- Not involved at all

13. 13. Which of the following project management methodologies are you familiar with? (Select all that apply) *

Check all that apply.

- Waterfall
- Agile (e.g., Scrum, Kanban)
- Lean
- Six Sigma
- PRINCE2
- Critical Path Method (CPM)
- Other: _____

16. 16. Which of the following best describes the size of the project teams you typically work with in university projects? *

Mark only one oval.

- Small (2-5 members)
- Medium (6-10 members)
- Large (11-20 members)
- Very large (more than 20 members)

14. 14. Do you plan to pursue a career that involves project management? *

Mark only one oval.

- Yes
- No
- Maybe

17. 17. How do you communicate and collaborate with team members in university projects? *

Mark only one oval.

- In-person meetings
- Email
- Instant messaging (e.g., Slack, Microsoft Teams)
- Project management tools
- Other: _____

Usage of Project Management Methodologies

18. 18. How often do you utilize project management methodologies in your university projects? *

Mark only one oval.

- Always
- Often
- Sometimes
- Rarely
- Never

19. 19. What factors influenced your decision to adopt project management methodologies in university projects? *

Mark only one oval.

- Faculty recommendation
- Personal interest
- Previous experience
- Peer influence
- Requirement of the project
- Other: _____

20. 20. Which project management methodology is most commonly used in your university projects? (Select all that apply) *

Check all that apply.

- Waterfall
- Agile (e.g., Scrum, Kanban)
- Lean
- Six Sigma
- PRINCE2
- Critical Path Method (CPM)
- None of the above
- Other: _____

21. 21. Indicate your personal preference for project management methodologies in university projects *

Check all that apply.

- Traditional/Waterfall methods
- Agile methods (e.g., Scrum, Kanban)
- Lean
- Six Sigma
- PRINCE2
- Critical Path Method (CPM)
- Other: _____

22. 22. Rate the flexibility of agile project management methodologies compared to traditional/waterfall methodologies *

Mark only one oval.

- Very flexible
- Somewhat flexible
- Neutral
- Not flexible
- I'm not sure

24. 24. How effective do you find Agile project management methodologies (e.g., Scrum, Kanban) in improving project outcomes in university projects? *

Mark only one oval.

- Very effective
- Somewhat effective
- Neutral
- Somewhat ineffective
- Very ineffective

Effectiveness and Challenges

23. 23. How satisfied are you with the training and resources provided to support the implementation of project management methodologies in university projects? *

Mark only one oval.

- Very satisfied
- Satisfied
- Neutral
- Dissatisfied
- Very dissatisfied

25. 25. What challenges do you face in implementing project management methodologies effectively in university projects? (Select all that apply) *

Check all that apply.

- Lack of awareness or understanding among team members
- Resistance to change from team members
- Insufficient training or resources
- Difficulty in adapting methodologies to project requirements
- Time constraints
- Other: _____

26. 26. Agile project management methodologies (e.g., Scrum, Kanban) have improved the adaptability and responsiveness of university projects to changing requirements and priorities. *

Mark only one oval.

- Strongly disagree
- Disagree
- Neutral
- Agree
- Strongly agree

27. 27. The Waterfall project management methodology has been effective in ensuring thorough planning and documentation of project requirements in my university projects. *

Mark only one oval.

- Strongly disagree
- Disagree
- Neutral
- Agree
- Strongly agree

30. 30. How likely are you to recommend the use of project management methodologies to your peers for their university projects? *

Mark only one oval.

- Highly unlikely
- Unlikely
- Neutral
- Likely
- Highly likely

28. 28. What factors influence your choice of project management methodology for university projects? (Select all that apply) *

Check all that apply.

- Project requirements
- Project complexity
- Team size
- Time constraints
- Availability of resources (e.g., tools, training)
- Instructor/mentor preference
- Other: _____

29. 29. Do you believe there is a need for more project management training within your academic program? *

Mark only one oval.

- Yes
- No
- Maybe

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8.6 Semi-structured interview questions for qualitative analysis

1. What project management methodologies have you encountered in your academic studies or professional experience?
2. Can you describe your experiences with these methodologies?
3. What are your perceptions regarding the effectiveness of different project management methodologies?
4. How do you think these methodologies compare in terms of adaptability and suitability for different types of projects?
5. Why do you think you do not feel comfortable with using these methodologies for your university projects?
6. How much do you value the contributions of your professors regarding the trainings and information about project management?
7. Would you consider using them in the future? Why?
8. How would you prefer learning about these methodologies and why?