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**Module Tittle: Postgraduate Study Skills, Research Methods and Ethics**

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# Agile in Action: Evaluating the Role of Agile Practices in Managing Global Civil Infrastructure Projects

## 1. Introduction and Background to the Study

Civil engineering is the sector responsible for global infrastructure development, encompassing large-scale, multi-stakeholder, and often cross-national projects. Traditional project management (PM) methodologies, such as Waterfall and CPM, have long dominated the delivery of civil infrastructure. These linear-based methodologies, however, rarely support complexity, variability, and stakeholder coordination common in global settings (Conforto et al., 2016).

For this purpose, Agile Project Management (APM) is now a viable option. Developed initially to be applied in software development, Agile focuses on incremental progress, stakeholder interactions, and adaptability to change that are increasingly becoming the case in infrastructure provision (Dong et al., 2024). As Moreno et al. (2024) observe, APM enables teams to dynamically adjust to project requirements, primarily through planning in the initial stage where uncertainty and design modifications are the order of the day.

Civil engineering has traditionally adopted strict compliance-based management systems, specification control, and sequential decision-making. The pre-construction process, often hindered by political, financial, and urban development pressures, is significantly enhanced by Agile's feedback circle, as noted by Moreno et al. (2024). The authors demonstrate how the implementation of Scrum in pre-construction activities increased transparency, member agreement, and scheduling reliability in Mexican and Chilean construction projects.

Furthermore, the increasing adoption of Building Information Modelling (BIM) is driving the adoption of Agile. Ahmed and Altaie (2021) highlight the synergy between BIM's collaboration-based 3D modeling and Agile's incremental scheduling. Their Iraqi construction project case study identified that the simultaneous use of these technologies improved coordination among teams and reduced time slippage. Similarly, Tomek and Kalinichuk (2015) demonstrate that an Agile-BIM hybrid construction scheduling framework provides real-time task adjustment, enhancing infrastructure project agility.

However, its application to civil engineering is contentious. Although Agile performs well where flexibility and self-management by teams are pertinent, infrastructure projects are largely governed by regulations, client customizability, and fixed funding schedules (IPMA, 2017). These may hinder the complete application of Agile without considering context adaptation. The 2017 International Project Management Association conference proceedings report that Agile does not necessarily have to replace conventional models but can complement them where particularly tailored for specific stages of a project, e.g., procurement or initial design.

Critically, as Agile becomes more high profile, research indicates that its complete global civil infrastructure potential is under-realised. Chathuranga et al. (2023) note that Agile adoption targets high-tech or home design stages with few empirical acceptances for large-scale, internationally fragmented engineering projects. This leaves a lacuna which makes this proposal's emphasis justifiable: an investigation of Agile's capacity to solve such large-scale projects.

# 2. Research Problem

Despite the widespread adoption and application of Agile Project Management (APM) in various sectors, its utilization in large civil infrastructure projects, particularly globally, has not yet been fully leveraged. Most infrastructure projects are traditionally controlled by sequential and hierarchical methods that are usually incompatible with Agile's adaptive and iterative nature (Conforto et al., 2016; Dong et al., 2024).

The assessment is also one of the steps in situating Agile in civil engineering to shift from conventional complexity in stakeholder frameworks, procurement stiffness, and cross-border governance patterns. Moreno et al. (2024) and Tomek and Kalinichuk (2015) have demonstrated through research that integrating Agile methodologies with tools like Building Information Modeling (BIM) can help coordinate and schedule teams. Yet, such evidence is largely confined to the pre-construction or design phases, and there is limited evidence of Agile adoption throughout the entire cycle of international infrastructure projects.

In addition, resistance to cultural transformation, a lack of proper training, and disagreement between Agile philosophy and regulatory requirements for engineers make it challenging to adopt (Elseknidy et al., 2024; Kineber et al., 2024). While some hybrid models, for example, the HAL system of Power and Sinnott (2025), outline a framework for developing an Agile philosophy in restrictive frameworks, these models have not yet been effectively tested for globally scattered civil projects.

Thus, the research problem is that there is a lack of adequate empirical analysis of how well Agile methodologies guide international civil infrastructure projects, particularly in light of real-world constraints such as size, culture, and compliance with regulations

# 3. Research Aim, Objectives and Research Question

### Research Aim

This research aims to critically examine the effectiveness of Agile Project Management (APM) practices in managing global civil infrastructure projects, with a special reference to the integration of Agile methodologies with tools such as Building Information Modelling (BIM) and hybrid environments, within the constraints of real-life projects.

### Research Objectives

1. To assess the impact of Agile practices on time, cost, and teamwork efficiency in globally distributed civil infrastructure projects.

2. To explore how Agile integrates with existing tools such as BIM and Lean Planning to augment coordination in grand engineering contexts.

3. To determine the most important barriers and critical success factors influencing the uptake and long-term viability of Agile in global civil projects.

4. To test the utility of hybrid frameworks (e.g., HAL) as a compromise between traditional and Agile methodologies in regulated infrastructural contexts.

### Research Questions

1. To what extent do Agile approaches perform in leading international civil infrastructure projects, and what are the drivers and barriers for integrating them into existing project delivery systems?

2. What are the Agile practice changes required in accommodating the complexity, scale, and regulatory constraints experienced by international civil infrastructure projects?

3. How does the adoption of Agile approaches influence collaboration, communication, and risk management among stakeholders in international civil engineering projects?

### Rationale and Contribution

There is an emerging evidence base for the benefits of Agile in software development, and to some degree in residential construction and architecture (Chathuranga et al., 2023; Moreno et al., 2024). There is, though, very little synthesized literature on the real-world effectiveness of Agile in large civil engineering projects. Power and Sinnott (2025) illustrate the HAL hybrid approach, which combines Agile and Lean principles in Irish infrastructure projects; however, more extensive reviews are necessary in cultural, regulatory, and technological environments.

This research will fill the knowledge gap by providing a critical review based on a mixed-methods analysis of secondary data sources, case records, and reports on Agile-BIM integration. The outcome will inform project managers, engineers, and policymakers on the applicability of scaling Agile in typical strict environments.

Furthermore, the study will provide insight into where and when Agile is most valuable, such as in the pre-construction versus execution phase, and what changes are necessary to enable its flourishing. This is particularly critical with the shift in the industry towards digitally enabled, collaborative modes of delivery,

in which software such as BIM and Agile can cooperate to facilitate dynamic, multi-stakeholder coordination (Ahmed and Altaie, 2021; Zech et al., 2025).

### Research Design Approach

The pilot study will be conducted using a mixed-methods approach based on:

•Qualitative analysis of past project case studies (e.g., HAL, BIM-Agile integrations)

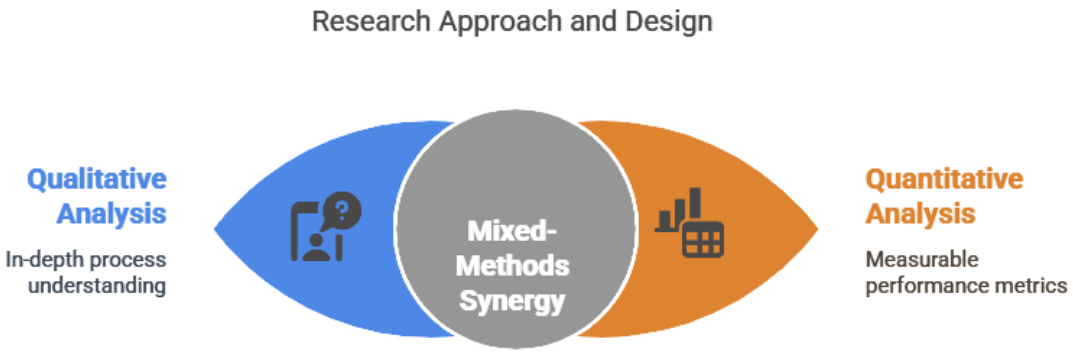
•Quantitative data as is available (e.g., time/cost savings from past Agile adoptions)

This design enables triangulation of data, enhancing reliability while mitigating the limitations of survey- or interview-based studies. It is especially suitable given the limited access to live civil infrastructure sites and the feasibility constraints of conducting primary data collection on global projects.

# 4. Methodology

## 4.1 Research Approach and Design

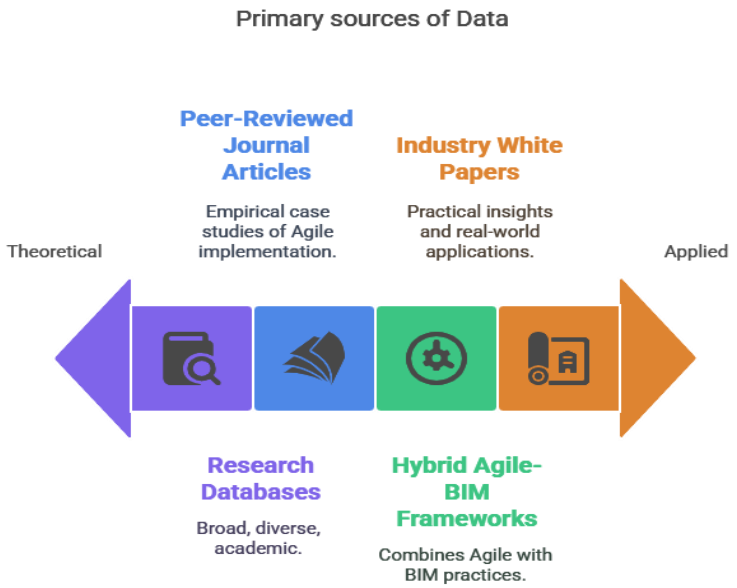
A mixed-methods research strategy is employed in the study, which combines qualitative and quantitative analysis using secondary data. The application of a research methodology is warranted to comprehensively evaluate the competency of Agile methodologies in managing global civil infrastructure projects, which are multidisciplinary, complex, and lack direct access for primary research (Dong et al., 2024).




The mixed-methods approach is best suited for global civil engineering settings, where both process understanding (qualitative) and performance measurement (quantitative) are required (Conforto et al., 2016). This enables the researcher not only to investigate how Agile is being implemented but also its impact on project outcomes, such as cost reduction, scheduling correctness, and collaboration in global teams.

## 4.2 Data Collection Strategy

Secondary data collection will be the primary research approach employed in this study, utilizing data from open-source academic and business sources relevant to the application of Agile methodologies in international civil infrastructure projects. The strategy is feasible and acceptable given the enormous scale, confidential character, and extensive geography of infrastructure projects limiting access points for face-to-face interaction with infrastructure project stakeholders (Dong et al., 2024).



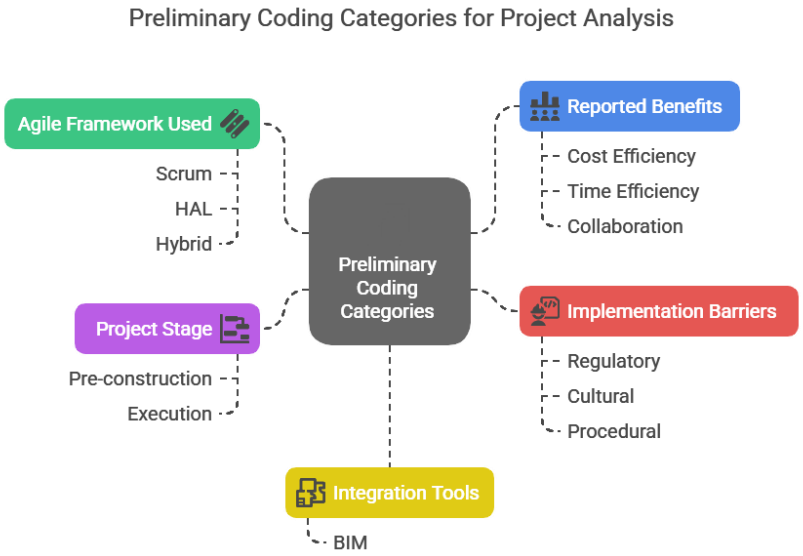

This approach will ensure that the thematic quality and quantitative applicability of the data enhances an overall evaluation of Agile performance across project phases and global conditions.

### 4.3.1 Thematic Analysis (Qualitative)

The qualitative component of the current research will employ thematic analysis to investigate the application, benefits, and constraints of Agile Project Management (APM) in global civil infrastructure projects. Thematic analysis is a method that enables researchers to systematically identify, analyze, and interpret recurring patterns of meaning (themes) in qualitative data, making it ideal for synthesizing conclusions from complex, multidisciplinary sources (Dong et al., 2024; Conforto et al., 2016).

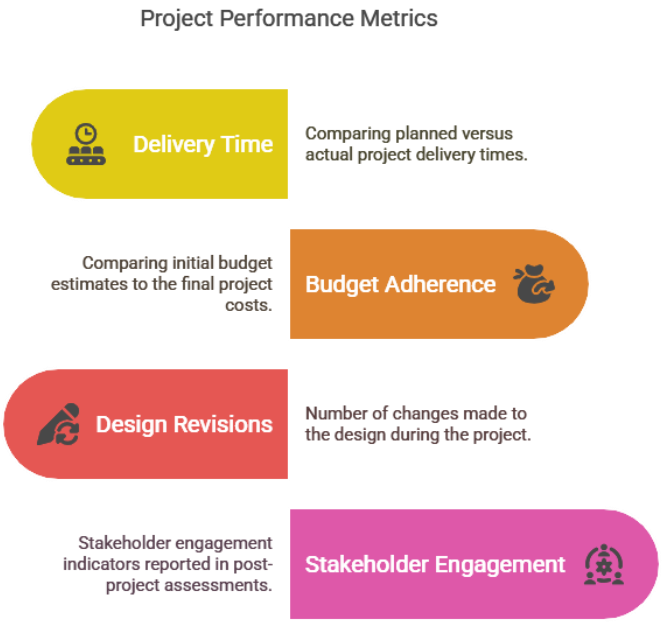
The current study will utilize Braun and Clarke's (2006) six-stage thematic analysis plan, which involves data familiarization, coding, theme identification, review, naming, and reporting. The textual data will be obtained using secondary resources, including peer-reviewed articles, BIM-coupled Agile guidelines, and case studies of Agile implementation in construction, exclusively from sources such as Moreno et al. (2024), Chathuranga et al. (2023), and Power and Sinnott (2025).

These themes will then be summed up under overarching themes such as "collaborative agility," "technological integration," and "institutional resistance." This will allow cross-case synthesis of Agile practices in the varying geographical and regulatory environments (Tomek and Kalinichuk, 2015; Elseknidy et al., 2024).




### 4.3.2 Descriptive Statistical Analysis (Quantitative)

To supplement thematic findings, descriptive statistical analysis will also be employed within this study to ascertain the quantitative effects of implementing Agile in civil infrastructure projects. Descriptive statistics are appropriate for summarizing and comparing quantifiable project outcomes such as cost and time reductions, defect rates, and stakeholder satisfaction (Zech et al., 2025; Kineber et al., 2024). Quantitative information will be accessed from documented case studies and project evaluations that have employed Agile models (i.e., Scrum, Hybrid Agile-BIM, HAL). For example, the evaluation of nine infrastructure projects against the Hybrid Agile Lean (HAL) model by Power and Sinnott (2025), and the Agile-BIM schedule models mentioned in Tomek and Kalinichuk (2015).



This review will enable cross-case synthesis of quantifiable improvement where Agile has been applied. Where exact figures are not determinable, relative or approximate change (e.g. "25% speedup of delivery with Agile-BIM integration") will be recorded based on source claim (Ahmed and Altaie, 2021; Moreno et al., 2024).

### 4.4 Method Justification

The use of a mixed-methods strategy that combines thematic and descriptive statistical analysis is justified by the complex, multi-dimensional nature of international civil infrastructure projects.

Such projects are not merely technical and financial in concern, but organizational culture, cross-border co-ordination, and regulation, each requiring both qualitative and quantitative data (Conforto et al., 2016).

Compared with one-method approaches, such as interviews or questionnaires, the mixed-method approach allows triangulation, validating the study through cross-verification of evidence with diverse data sources. Thematic analysis may be applied, for example, to describe in-depth Agile deployment processes, whereas descriptive statistics can be employed to quantify project performance metrics such as time elapsed or the number of stakeholders involved (Moreno et al., 2024; Zech et al., 2025).

Surveying or official interviewing techniques of primary data were excluded due to practical and ethical constraints. Global civil infrastructure projects typically have distant time horizons, are confidential, and span multiple jurisdictions, making direct access to data unachievable. Interview-derived data would also cause bias or inconsistency based on varying respondent levels of knowledge (Dong et al., 2024).

On the other hand, the use of secondary data by Dong et al. (2024) and utilized by Power and Sinnott (2025) to examine the HAL framework lends credibility and feasibility. It allows researchers to leverage high-quality, peer-reviewed project documentation and case studies without compromising on ethical standards.

Therefore, this method enables the study to present a balanced, fact-based evaluation of Agile's success in what has historically been an inflexible and underutilized sector.

### 4.5 Research Scope and Boundaries

The study targets explicitly the application and effectiveness of Agile Project Management (APM) in global civil infrastructure projects. The query lies in the general field of international project management but with a specific focus on cross-border, multidisciplinary civil engineering works like roads, bridges, power, and water infrastructure.

The scope is narrowed to the extent of big government-funded or globally funded infrastructure works. It will focus on the planning and pre-construction phases, where Agile approaches, such as iterative scheduling, stakeholder feedback cycles, and cross-functional teams, are better positioned to deliver real benefits (Moreno et al., 2024; Chathuranga et al., 2023).

The research will not feature exclusively software or exclusively residential projects unless Agile-BIM models or HAL models have been realized and critiqued in a transferable form (Power and Sinnott, 2025; Tomek and Kalinichuk, 2015). Only IT or local and small building project literature derived from Agile only will be omitted unless they feature releasable hybrid methods or process comparisons.

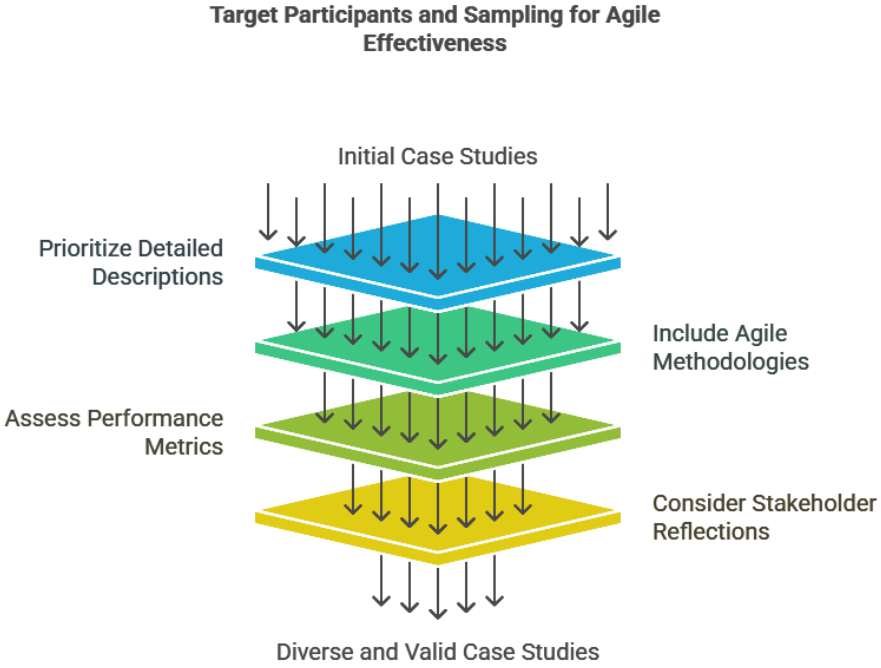
Besides, a geographical setting that encourages cross-cultural and multi-stakeholder or international case studies is one where Agile needs to be extended to different regulatory, technological, and organizational settings (Ahmed and Altaie, 2021; IPMA, 2017).

By setting such limits with specificity, the research allows for contextual application, with continuous emphasis on an under-researched but increasingly significant role in world infrastructure supply.

### 4.6 Target Participants and Sampling

Although the present study does not involve direct interaction with the participants, it bases its arguments on second-hand evidence collected from case studies that yield indirect information about the opinions of the principal stakeholders of the main projects. They are project managers, BIM coordinators, engineers, contractors, and public-sector clients in Agile-led civil infrastructure projects (Moreno et al., 2024; Chathuranga et al., 2023).

Purposive sampling methods will be employed to locate rich, high-quality case studies and project reports. Sources with detailed process descriptions, Agile practices, performance measures, and stakeholder commentary will be prioritized in the selection process (Power and Sinnott, 2025; Elseknidy et al., 2024).




The objective is to create variation in geographies by project type, thereby enabling the consideration of cross-cultural, regulatory, and technological diversity in the analysis. The validity and transferability of the results are facilitated by the sampling technique used in measuring the practical effectiveness of Agile in global civil engineering environments.

### 4.7 Project Plan and Timeline

| Activities | Week | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Data Collection | Week 1 | Week 2 | Week 3 | Week 4 | Week 5 | Week 6 | Week 7 | Week 8 |
| Literature Review | | | | | | | | |
| Theme Develop | | | | | | | | |
| Statistical analysis | | | | | | | | |
| Quantitative Findings | | | | | | | | |
| Qualitative Findings | | | | | | | | |
| Review Draft | | | | | | | | |
| Final Report | | | | | | | | |

### 4.8 Limitations

Even though the methodology adopted is appropriate and suitable for the research goal, there are certain limitations that need to be ascertained.

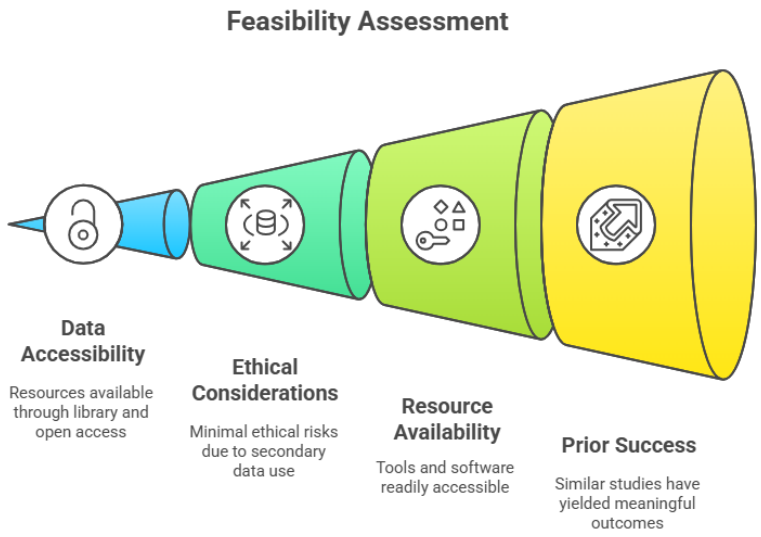
Above all, secondary data restricts the scope of first-hand information. Although thematic and statistical analysis enable triangulation, they cannot capture the live dynamics or nuanced decision-making that can be achieved through primary interviews or observation (Dong et al., 2024).

Secondly, publication bias also exists because successful implementation case studies and project reports of Agile will be published as opposed to those reflecting failure or adverse outcomes (Conforto et al., 2016). This would result in overstated benefits and underreported challenges.

Third, the difference between projects in context, i.e., geographical, cultural, and regulatory context, can decrease the extent of generalizability. Effective in one nation (e.g., the HAL mechanism within Ireland) will not be applicable elsewhere (Power and Sinnott, 2025).

Finally, due to time limitations, it is not feasible to carry out a longitudinal analysis or a wide cross-sectoral comparison. These limitations can be overcome through rigorous source criticism, transparent reporting, and a focus on analytical depth rather than breadth.

## 4.9 Feasibility Analysis




The research is highly feasible to carry out as postgraduate research based on its secondary data utilisation and systematic mixed-methods approach. It eliminates the need for the time-consuming process of primary data collection since all required sources, such as journal articles, project reports, and case studies, can be accessed through university databases and open-access websites (Dong et al., 2024). Analysis is facilitated by Excel and NVivo software. Similarly, research by Power and Sinnott (2025) on the HAL framework evaluation supports the viability of this desk-based strategy. The research is practically, ethically, and academically aligned with the module learning outcomes and requirements.

# 5. Ethical Considerations

Ethical integrity is a critical component of all academic research, particularly in postgraduate study. This research complies with the ethical guidelines of Anglia Ruskin University (ARU), and although it does not involve human participants or primary data collection, several ethical considerations remain relevant.

The research is based entirely on secondary data sourced from peer-reviewed journal articles, case studies, and public-domain project documentation. As such, issues related to informed consent, physical harm, or psychological risk do not apply. However, ethical diligence is still required in areas such as intellectual property, accurate representation of data, and avoidance of plagiarism (Dong et al., 2024).

All sources will be appropriately cited using the ARU Harvard referencing style. Where project-specific data is used (e.g., from Agile-BIM case studies or HAL framework reports), proper attribution will be maintained to avoid misrepresentation or manipulation of outcomes (Power and Sinnott, 2025). Furthermore, the use of project performance metrics will be carefully contextualized to ensure fairness and avoid drawing unsupported generalizations.

The researcher will ensure that data extracted from open-access journals and grey literature respects copyright permissions and retains source credibility. Any charts or models adapted from existing work will be credited and labelled.

There is also an ethical obligation to report both the strengths and limitations of Agile methodologies, even when they challenge the study's initial expectations. This commitment to balanced, unbiased reporting reinforces the academic rigour of the research (Conforto et al., 2016).

The researcher has completed the ARU Ethics Quiz, and the certificate will be submitted as part of the project appendix, in line with university submission requirements.

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