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# UNVEILING PROJECT MANAGERS' COMPETENCIES IN GREEN VS. NON-GREEN CONSTRUCTION USING THE CRAWFORD INTEGRATED MODEL

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**ABSTRACT**

The construction industry is undergoing a transformative shift toward sustainability, driving the need for specialized competencies among project managers in green construction projects. This study explores the critical differences in competencies required for managing green construction projects compared to non-green construction projects, using the Crawford Integrated Competency Model. Through an in-depth analysis, the classification matrix highlights the similarities and differences across competencies essential for effective project management in the green construction sector. The finding serves as a diagram for understanding the comprehensive skill set necessary for project managers operating in this specialized field, facilitating a clearer understanding of how knowledge, skills, and attitudes intersect in green construction project management. By identifying the core competencies required, this study provides a framework for professional development and training programs tailored to project managers in the green construction industry, ensuring that they possess the necessary attributes to succeed in the evolving landscape of sustainable building practices.

**Keywords:** Project Manager, Green Construction, Competencies, Crawford Integrated Competency Model, Malaysia.

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# 1. INTRODUCTION

Malaysia's government is investing in basic infrastructure like airports, communication utilities, roads, and power electricity to enhance social living standards. However, the construction sector, like other developing countries, should prioritize sustainable, ecological, and socially responsible responses to urbanization and development challenges (Ayarkwa et al., 2022; Chen et al., 2023). Integrating green practices into construction mitigates impacts on triple-bottom-line sustainability. In addition, the successful implementation of sustainable practices can mitigate the negative impacts on nature and the overall wellbeing of the nation. Malaysia, like other developing nations, is grappling with socio-economic challenges, yet industry stakeholders continue to disregard green principles (Durdyev et al., 2018). It perceived that a project manager with limited knowledge about green construction will impact the quality of outcomes during and after project completion. This limitation, which is attributable to the lack of clarity in the procedure or the absence of widely accepted standards among these practitioners, suggests that they may have inadequate competencies for conducting green construction practices (Chin Yee Ha et al., 2023).

The role of a project manager as a project leader is crucial for sustainable practices in the construction industry. Additionally, project manager is responsible for high-risk construction projects, where every decision is crucial for achieving sustainability goals. Hence, project managers must continuously acquire new skills and knowledge to effectively manage sustainable construction projects (Latiffi & Zulkiffli, 2022). Green construction projects are time-consuming, risky due to tight schedules, and require experience in sustainability management. Implementing new technologies can be challenging due to limited knowledge (Hwang & Ng, 2013a; Qazi et al., 2021). Project managers need experience in sustainability management to mitigate risks and implement new green technologies effectively (Qazi et al., 2021). Hence, understanding the essential qualities a project manager should possess is crucial for effectively managing green construction projects.

# 2. THE UNDERPINNING THEORY

## 2.1 Theory of Competency

Boyatzis' definition of competency, as per his 1982 work, refers to the underlying characteristics that contribute to effective and outstanding performance in a job (Makki & Alidrisi, 2022). Project managers' competencies involve the use of skills, knowledge, and personal characteristics to enhance their efficiency and effectiveness in their job performance, thereby increasing the likelihood of successful project completion (Moradi et al., 2020). Previous studies have highlighted that the project manager is a crucial factor in determining the success of a project (Sang et al., 2018). Thus, a competent project manager is a critical factor in determining the project's success. Federick W. Taylor introduced the concept of competency in the early 20th century, focusing on improving workplace efficiency and productivity. David McClelland expanded on Taylor's ideas in the 1970s, introducing competency-based management and the competency pyramid model, emphasizing innovative methods for predicting human performance (Mcclelland, 1973; Plonski, 2020). According to Boyatzis (2008), competency is a capability or ability that enhances job performance by balancing individual competencies, job demands, and organizational environment, resulting in consistent behavior with organizational policies and procedures. (Lišková & Tomšík, 2013). After that, Spencer & Spencer (1993) defined competency as an underlying characteristic related to effective or superior performance in a job or situation. They developed the iceberg model, which divides competencies into visible and hidden parts. Surface knowledge and skill competencies are easy to develop, while core motive and trait competencies are more challenging. Self-concept competencies are also important.

## 2.2 Competency using Crawford Integrated Model

From the perspective of project management, Crawford (2005) the earlier project management competence model, merging competency and attribute-based approaches. Based on Figure 1, the diagram includes input personal competencies from the attribute-based approach and output competencies from the performance-based approach (Crawford, 2005). In project management, a study identifies three key components of effective project management competence: knowledge, skill, and attitude. (Crawford, 2005; Horváth, 2019). In addition, competencies, as defined by Jabar et al., (2013) and Kelemen (2012) consist of knowledge, skills, and attitudes, not just technical skills, but also core personality characteristics. However, Hwang & Ng, (2013a); Zulkiffli & Latiffi (2019) highlight that core personality characteristics contribute to an individual's effectiveness and performance, beyond just technical skills or knowledge; it also includes the fundamental personality traits that

significantly influence an individual's effectiveness and performance (Crawford, 2000).

According to Spencer & Spencer (1993) emphasized that core personality traits, motivations, ability, image, and behavior are essential components of a person's personality. Moreover, Rahman et al (2022) assert that most reviewed articles agree that competencies refer to individual characteristics in terms of knowledge, skills, and behaviors. According to CIDB (2019), the term competency also refers to knowledge, skills, and attitudes. It acknowledges that the construction industry necessitates not only the possession of the necessary technical skills and knowledge, but also the adoption of the appropriate attitudes to effectively manage and execute construction projects. Therefore, this study aims to develop a conceptual framework based on Crawford's integrated model of competence, utilizing skills, knowledge, and attitudes as variables. The next section will provide an explanation of the use of attitudes as core personality characteristics.

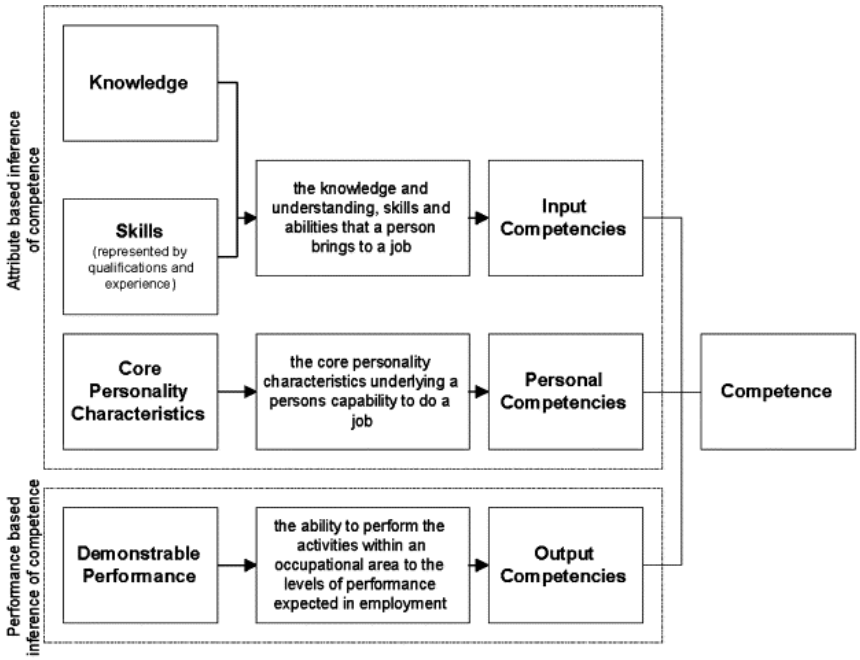


Figure 1: Crawford's Integrated Model of Competence (Source: Crawford, 2005)

### 2.3 Mapping Competencies Across Fields: A Diagram-Based Overview

The terms "competence" and "competency" are frequently used interchangeably in human resource management research (Ahadzie et al., 2008). According to Blanka et al (2022), Competency is the combination of skills and knowledge that leads to exceptional performance. Boyatzis, (1982); Crawford, (2005) argued that competence refers to an individual's comprehensive ability to succeed in a specific role or job. Competency is a combination of knowledge, skills, abilities, and personal traits essential for successful job performance, referring to the physical and intellectual qualifications of individuals in specific tasks (Salleh et al., 2015). In addition, the competency measurement involves integrating cognitive, affective, and psychomotor elements. Attitudes are commonly used as attributes in assessing competencies, as they vary depending on the situation and field (UNIDO, 2017). Personal attitude is a crucial competency attribute in performance, which is essential for reducing any risks during job execution (A. Salleh, 2017). Meanwhile, a project manager in the context of green construction, a is responsible for comprehensive project management, including defining work, establishing work plans and budgets, managing scope, issues, and risks, and overseeing all processes involved (Georgieva, 2016; Zulkiffli & Latiffi, 2019). The responsibilities extend beyond their standard roles in project management to include additional responsibilities in the context of green construction. In this capacity, the project manager is accountable ensuring sustainable building standards and facilitating the seamless integration of eco-friendly technologies.

Figure 2 illustrates the connection between competencies and their application across various fields. The specific competencies addressed (knowledge, skills, attitudes, awareness, self-concepts, characteristics, motivations, ability, image, and behavior), and the associated research field are all detailed in each entry. The works encompass various industries including construction, petrochemical, aviation, education, and human

resource management. For instance, Rahman et al., (2022) explore safety management in the construction industry, emphasizing knowledge and behavior, while Spencer & Spencer (1993) provide a comprehensive model of competencies in human resource management, incorporating traits, motivations, and image. Some studies, like Crawford, (2000), offer a holistic perspective, covering all competency aspects. In safety performance studies, Salleh (2017) and Majid et al. (2022) highlight the importance of attitudes in promoting proactive risk management and adherence to safety protocols emphasized that certified construction project managers must possess all three competencies: knowledge, skills, and attitudes. Similarly, attitudes play a crucial role in project management and education, fostering effective collaboration, adaptability, and a positive outlook towards learning and professional growth (Horváth, 2019; Kelemen, 2012). These qualities underscore the significance of attitudes in shaping behaviors and decision-making processes, ultimately enhancing individual and organizational performance. Hence, study examines the knowledge, skills, and attitudes of project managers, especially in green construction, in comparison to non-green construction competencies.

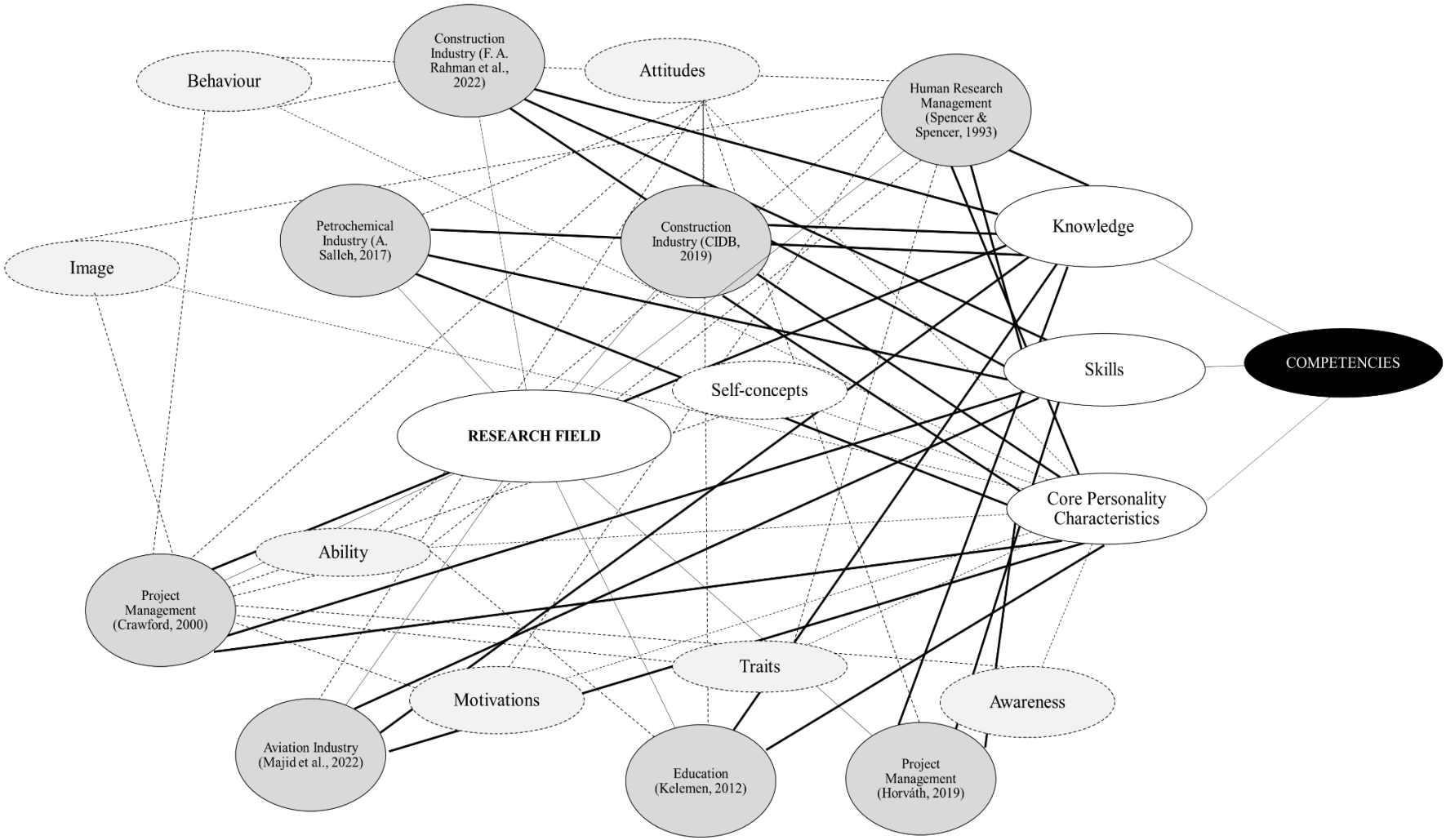


Figure 2: Overview The Differences of Competency Attributes Used From Different Research Fields

## 3. METHODOLOGY

In order to strengthen the project managers' competencies in green construction, this article makes use of secondary data obtained from websites, publications, and research reports. The study utilizes a matrix table for classification, which serves as the foundation for further analysis. The matrix is utilized for systematic identification and analysis of similarities and differences among different attributes. The matrix table is utilized to create a diagram that visually depicts the relationships and distinctions between attributes, providing a clearer understanding of the underlying patterns. The flowchart in Figure 3 outlines the methodology of this study. The process begins with a classification matrix table, then identifies similarities and differences, and culminates in creating a visual diagram to represent these relationships.

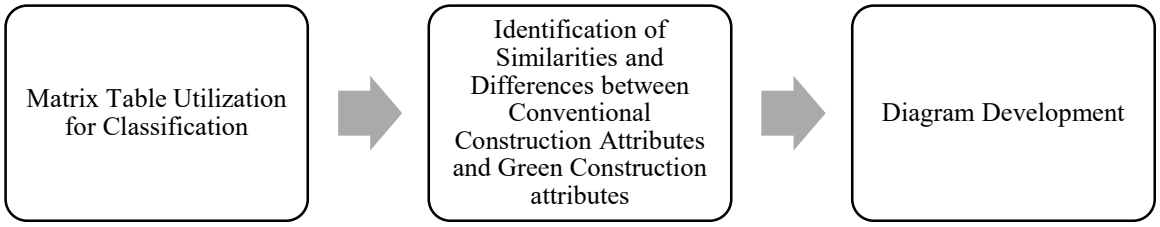


Figure 3: The Methodology of Diagram Development

## 4. DISCUSSION

Figure 4 visualizing the connection between conventional construction and green construction across various attributes. The dark grey nodes represent conventional construction attributes, while the light grey nodes represent green construction attributes, with edges indicating their corresponding relationships. This highlights the overlap and specific focus areas in green-related competencies. The diagram encapsulates the synergy between conventional construction and green construction by showcasing how traditional skills adapt and expand to include sustainability considerations. This reflects a global shift towards environmentally responsible practices in all domains.

The "Knowledge" category shows several attributes have evolved significantly to align with sustainability goals, shifting from conventional practices to incorporating green competencies. For example, basic knowledge has expanded from focusing on laws, regulations, and policies to include an understanding of sustainability concepts, green products, and their market dynamics (Liu et al., 2019; Lokman et al., 2017; Sarpin et al., 2021; Zhao et al., 2020). Similarly, to safety management should review changes in procedures for green implementation, particularly for green certification (Al-Qassab et al., 2019; Hwang & Ng, 2013a; Liu et al., 2019; Lokman et al., 2017; Sang et al., 2018). Human resources management has added the green material resources management, which addressed disputes over eco-friendly material sourcing or workers capability in executing the task relate to green concept (Hwang & Ng, 2013a; Lokman et al., 2017; Mairizal et al., 2023; Podgórska, 2022; Sang et al., 2018; Tabassi et al., 2016). Procurement management has shifted from traditional material sourcing to prioritizing sustainable procurement by selecting eco-friendly suppliers (Lokman et al., 2017; Mairizal et al., 2023; Tabassi et al., 2016). Project Management in GC emphasizes renewable energy systems, waste reduction tools, and technologies for life-cycle assessments (Hwang & Ng, 2013a; I. L. Jabar et al., 2018; Lokman et al., 2017; Mairizal et al., 2023; Zhao et al., 2020). These changes highlight the growing importance of green competencies across various domains.

In the skills category, there are generally no significant changes to traditional attributes except for the inclusion of innovation, which now places greater emphasis on green innovation. This shift highlights the growing need for creative solutions to sustainability challenges (Lokman et al., 2017; Podgórska, 2022; Ramli et al., 2020; Sarpin et al., 2021; Tabassi et al., 2016). Innovation has evolved to prioritize environmentally friendly approaches, such as developing eco-conscious technologies, implementing green construction methods, and finding innovative ways to minimize environmental impact. This demonstrates how sustainability has primarily influenced innovation within the skills category, making it a critical aspect of modern competencies.

In the attitudes category, several attributes have experienced notable changes as sustainability has become a

key focus. Attributes like dedication, goal orientation, and integrity remain foundational but have expanded to emphasize sustainability as part of their application (Ahmad Latiffi & Zulkiffli, 2020; Al-Qassab et al., 2019; Kordi et al., 2018; Lokman et al., 2017; Sang et al., 2018; Tabassi et al., 2016). For instance, dedication now includes a commitment to achieving green and eco-friendly project outcomes, while goal orientation has shifted towards prioritizing environmental and sustainable objectives (Al-Qassab et al., 2019; I. L. Jabar et al., 2018; Liu et al., 2019; Lokman et al., 2017). One of the most significant changes is in ethical behavior, which now places a strong emphasis on adhering to environmental ethics and promoting sustainable practices. Similarly, adaptability now involves adjusting to green innovations, sustainable technologies, and eco-friendly policies. While many attitudes retain their traditional core, their application has evolved to reflect a greater awareness and commitment to environmental and social responsibility. This indicates that attitudes have been significantly influenced by the need to incorporate sustainability into professional practices across industries.

## 5. CONCLUSION

In conclusion, this study has explored the project managers competencies for green construction vs non-green construction. The findings suggest that project managers must swiftly adapt to the ever-changing sustainability demands and develop new skills to remain effective in contemporary project environments. Project managers must embrace green innovation to implement eco-friendly technologies and sustainable practices as sustainability becomes a central focus. The development of a robust understanding of life-cycle assessment is crucial, ensuring that all project stages, from initiation to closure, consider environmental and social impacts. Project managers must enhance their ethical decision-making skills in addition to technical skills to promote sustainable values within their teams and align with environmental standards. Adaptability is another critical competency, as project managers must adjust to rapidly changing technologies, policies, and stakeholder expectations regarding sustainability. Effective stakeholder management involves collaborating with green-focused suppliers, investors, and communities, enabling project managers to lead projects that not only meet traditional goals but also contribute positively to environmental and social sustainability.

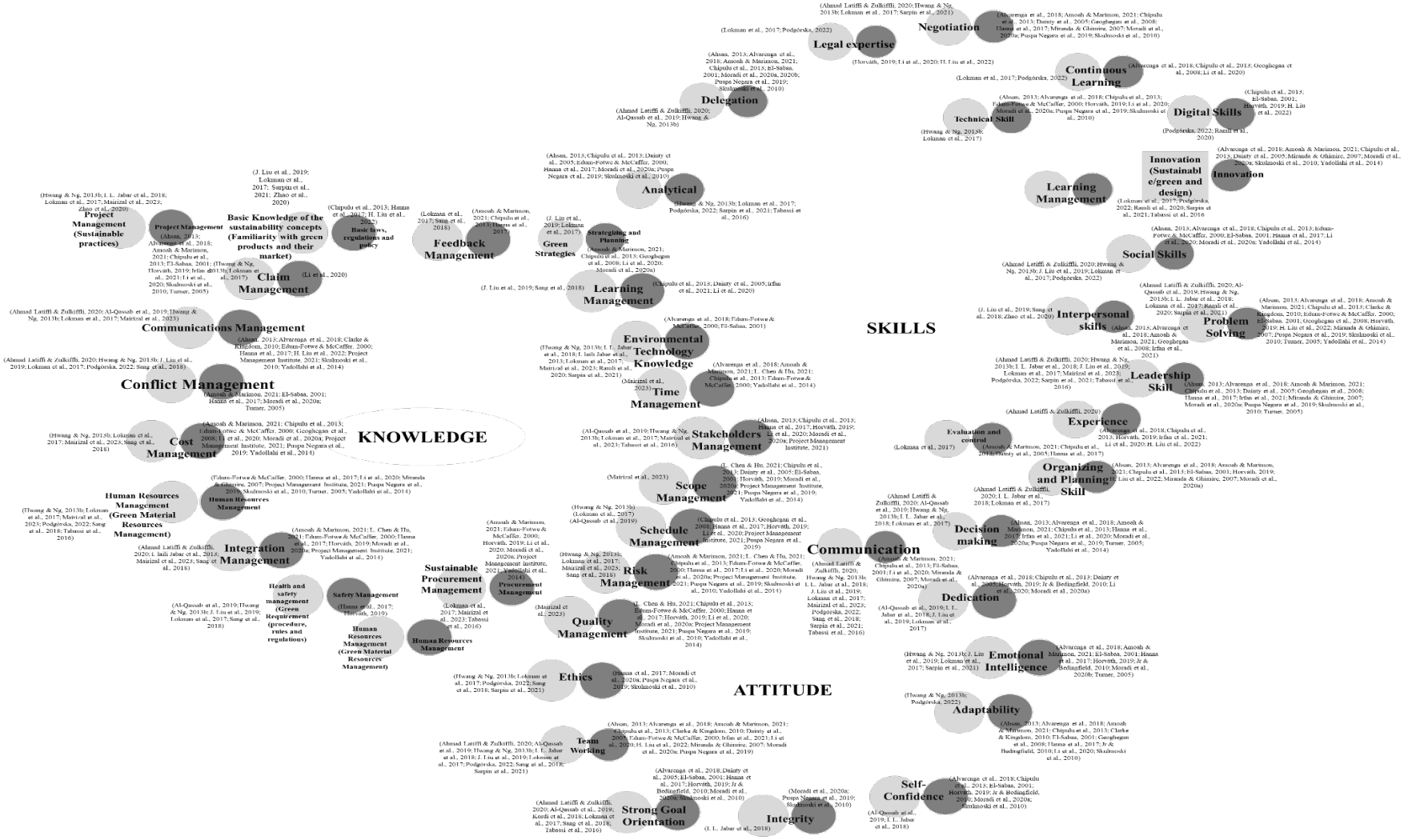


Figure 4 The Project Managers Competencies for Green Construction Vs Non-Green Construction

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