Chapter 16
Agile and IoT Methodologies in Managing IoT Projects: A Comparative Study

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ABSTRACT

The internet of things (IoT) is revolutionizing industries by connecting physical objects to the internet through technologies like RFID and short-range wireless communications. To develop IoT solutions, various software development approaches have been adapted, including Scrum, Kanban, Large-Scale Scrum, and Scaled Agile Framework. However, these methodologies often lack flexibility and struggle to handle the unique challenges of IoT projects. This study aims to analyze and evaluate existing agile and IoT methodologies such as DSDM, DAD, Less, and ELDAMeth, comparing their capabilities, characteristics, and behaviors. By providing this comprehensive comparison, the goal is to assist in selecting the most suitable methodology for IoT projects and identify their respective advantages and limitations of each approach to suggest a new, approved IoT management methodology.

INTRODUCTION

The development of IT can be categorized into three distinct waves. The first wave, which took place in the 1960s and 1970s, aimed to automate individual activities in the value chain and increase productivity by analysing large amounts of data. The second wave emerged in the 1980s and 1990s with the rise of the internet, allowing for coordination and integration across various activities, suppliers, customers, and

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locations. The current third wave of IT involves the integration of technology into products themselves, with embedded sensors, processors, software, and connectivity, along with a cloud-based system for storing and analyzing product data. This has led to significant improvements in product functionality and performance (Sanchez, 2020).

Agile software development has come a long way since its inception in the 1990s. Early Agile methods, such as Extreme Programming, Scrum, and Crystal, focused on iterative and incremental development, frequent releases, and close collaboration between the development team and the customer. As Agile gained popularity, more organizations began adopting it, leading to the creation of new Agile frameworks such as Kanban and Lean Agile. However, as Agile adoption continued to grow, organizations faced challenges with scaling Agile to larger teams and complex projects. This led to the development of new frameworks such as Scaled Agile Framework (SAFe), LeSS, and Nexus, designed to help organizations scale Agile while maintaining its core principles (Cohn, 2005; Ebert & Paasivaara, 2017; Schwaber & Beedle, 2002).

The Internet of Things (IoT), also referred to as the Internet of Everything, is a disruptive computing concept that brings together various technologies such as Radio Frequency Identification (RFID), short-range wireless communication, and research disciplines to enable the connection of physical objects to the internet. This connection allows data to be collected and exchanged among these objects, which can then be analyzed to provide insights and inform decision-making processes. The IoT has the potential to revolutionize several industries, such as healthcare, transportation, and manufacturing, by facilitating the creation of novel applications and services that can enhance customer experiences, reduce costs, and improve efficiency (Elhadi et al., 2018; Feki et al., 2013).

Over the years, the IoT has evolved, and IoT project management has become a distinct field of study and practice. The management of IoT projects differs from the management of traditional IT projects that focus on hardware or software. IoT solutions are usually centered around cloud computing, which can introduce additional security and privacy challenges. Furthermore, hardware is crucial in IoT solutions, as it is responsible for collecting data and executing specific tasks. To keep up with the changing landscape, Agile and DevOps methodologies have been adapted for IoT projects, emphasizing collaboration, flexibility, and continuous improvement. Furthermore, many organizations developed IoT-specific project management methodologies and frameworks like Ignite and IoT Methodology to manage the complexity of IoT projects. Today, IoT project management continues to evolve rapidly, with a growing focus on security, data privacy, and interoperability. The integration of AI and machine learning into IoT projects is also becoming increasingly common, presenting new challenges and opportunities for project managers (Hurtoi & Avadanei, 2020; Moedt et al., 2023).

To assess the success of projects, it is common to evaluate four factors, namely project efficiency, customer impact, business success, and future preparedness (Moedt et al., 2023).

LITERATURE REVIEW

Agile Software Development

Agile software development methodologies are iterative and collaborative approaches to software development that prioritize flexibility, adaptability, and customer collaboration. Unlike traditional waterfall