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Integrating Bricolage into Project Management: Evidence from a Software Startup Leveraging Limited Resources

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ABSTRACT:

Software startups are frequently categorized as organizations operating under uncertainty and resource constraints, making their operational context distinct from mature organizations. As a result, prior literature has provided limited understanding of project management practices and framed such practices as informalities and deviations from standard methodologies such as agile or lean practices. The current study aims to shift this perspective by introducing the foundations of "Bricolage" into project management, which has been underexplored in prior studies. Bricolage is a concept which has been widely used in contexts where resources are scarce and enables creative, unconventional and strategic use of existing resources. However, the application and use of bricolage in project management is in its embryonic stages. Therefore, the study employs a single organization case study as the primary source of data collection which includes semi-structured interviews with the co-founders and active participant observation by the researcher. Similarly, the data is triangulated using an informal subjective survey which has been minimally used to validate the primary data. The data is collected based on an interpretivist and inductive approach where the collection is based on the observed practices and interactions as the project progresses. Consequently, the data has been coded thematically and key themes for the study has been generated which are based on empirical data collection. The key themes generated by the study include pragmatic adoption of tools, maximization of resources, informal execution, usage of generative and agentic AI tools and normalization of informalities. Finally, the data has been analyzed through the theoretical frameworks of bricolage, agile and lean enabling the findings to be grounded to the theoretical instances. The analysis reports that the foundations of bricolage could better describe the project management approaches in startups and could possibly accelerate agility in certain conditions. Finally, the study contributes to the body of project management by providing a novel direction towards the exploration of bricolage practices in agile approaches and practically, it encourages practitioners to view constraints as catalyst for creative and strategic resourcefulness. However, the resulting effect of bricolage in the long run requires a longitudinal study which has been realized, and future researchers are directed to explore further to uncover the aftermath of bricolage in diverse contextual settings.

KEYWORDS: Bricolage, Software Startup, Resource Constraints, Adaptive Project Management

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Abbreviations

PM	Project Management
APM	Agile Project Management
MVP	Minimum Viable Product
QA	Quality Assurance
QC	Quality Control
AI	Artificial Intelligence
JIT	Just-In-Time
TDD	Test Driven Development
BDD	Behavior Driven Development

1 Introduction

In the recent years, there has been a spike in the creation of software startups, partly due to the wide availability and access to digital ecosystem, the growth of internet and mobile users, and the global tendency to use online and digital services (Javdani Gandomani et al., 2024). As a result software startups have become a central hub for innovation, experimentation and economic growth, particularly within the technology-driven industries (Berg et al., 2018). However, unlike established and mature organizations, startups operate under the condition of high uncertainty, resource limitations and rapidly evolving requirements and goals, especially during the early stages of development (Ries, 2011; Blank & Dorf, 2012).

Although software startups typically work towards business model validation and rapid hypothesis testing regarding the model, product, customer or the possible solution, they are fundamentally involved in a project-based work. Consequently, the dynamic environment necessitates some practices and approaches to project management requiring teams to continuously learn, manage tasks, collaborate and deliver incremental solutions despite the absence of formal organizational structure and management processes (Giardino et al., 2015; Unterkalmsteiner et al., 2016). As a result, project management, either formal or informal becomes crucial in delivering the incremental outcome.

The environment and the domain in which a startup functions limits its usage of a plan-driven approach. A plan-driven approach requires comparatively higher level of certainty, stable requirements, clear problem definition, and the knowledge of the prospective customer segments (Cobb, 2023). However, startups typically function in an environment where the market is turbulent, customer needs are undefined or in a nascent stage and requirements are continuously evolving (Sutton, 2000; Ries, 2011). As a result prior research have advocated some form of evolutionary, incremental, adaptive and iterative approaches like agile or lean to manage the projects in startup environments (Giardino et al., 2014; Choma et al., 2022).

1.1 Context and the Research Gap

Although agile and lean practices are presented as the standard approach for project management in startups, prior research also argue that these practices are often implemented in informal, selective, partial or ad-hoc state (Ambler, 2002; Giardino et al., 2015; Tegegne et al., 2019; Choma et al., 2022). The implementation has been fundamentally attributed to the uncertainty and resource constraints in the form of human resource, funding, time, skills or tools. As a result, startups typically focus on speed-related practices instead of resource-intensive quality-related approaches as their primary goal is to launch the product and iteratively validate the outcome (Giardino et al., 2014; Pantiuchina et al., 2017).

Eventually, the existing literature has typically addressed these informal practices in startups as challenges or limitations to successfully adopt standard methodologies and practices. Additionally, the literature is limited in the understanding of how these practices are shaped by the underlying operational conditions of the startup. In this perspective, prior studies in diverse literature have explored how organizations can navigate such limitations by creatively recombining existing resources and mobilizing whatever is available under resource constraints and uncertainty (Baker & Nelson, 2005; Mahajan, 2014; Jewer et al., 2024). This is the fundamental idea of “Bricolage”, which can be utilized as a conceptual lens for examining practices and approaches under uncertainty and constraints.

However, the application, realization and usage of “Bricolage” in project management, especially under the resource constraint setting of a startup remains limited. This research aims to fill this research gap by investigating the approaches through which software startups practice bricolage in their project management practices when faced with uncertainty and resource constraints. Rather than framing such practices as limitations or challenges, the research aims to provide a different perspective to such actions. Additionally, the study also aims to examine how such practices intersect with the agile and lean philosophies. By focusing on the micro-level activities and daily practices rather

than methodologies, this research aims to offer a more nuanced view of how software startups manage their projects. Accordingly, Table 1 surmises the research gaps from the literature.

Table 1. Overview of the research gaps

Key insight from the literature	**Identified Research Gap**
PM in startups are characterized by resource constraints and uncertainty.	Limited pragmatic understanding of how PM practices emerge and shape daily activities at micro-level under such conditions.
Agile/Lean approaches are dominant PM practices in startups, but are implemented in an ad-hoc, informal, selective or partial nature.	The deviation has diverse analysis and are typically framed as limitations or challenges in adoption of the standard methodologies.
"Bricolage" provides a theoretical lens on how to handle tasks under resource constraints and uncertainty.	Limited application of "Bricolage" within PM, particularly in the context of software startups.
Bricolage and Agile/Lean are explored independently in separate literature domains.	Lack of understanding on how bricolage interacts with agile/lean approaches.

1.2 Research Questions and Objectives

Accordingly, following the brief introduction of the study and the research scope, the study aims to answer the following research questions:

1. How do software startups enact bricolage in project management practices when operating under uncertainty and resource constraints?

2. How do bricolage practices interact with agile and lean project management approaches in resource-constrained startup contexts?

Therefore, the primary object of the study is:

1. To identify and describe bricolage practices in the context of project management within a software startup.
2. To analyze how bricolage emerges as an adaptive response to resource constraints in startup project environments.
3. To examine how bricolage practices relate to agile and lean project management approaches in software startups.

2 Literature Review

2.1 What is a startup?

Ries characterizes a startup as a “human institution” formed for the purpose of creating novel products or services functioning under highly unpredictable and uncertain circumstances. This uncertainty stems from a variety of factors including turbulent market conditions, constant time pressure and extremely limited resources (Choma et al., 2022). The limited resource might be evident in the form of human resource, financial resource, technological resource or some physical resource.

However, the uncertainty and organizational newness do not set startups apart from other organizations. What differentiates startups is their continuous experimentation and validation of their business model to find a scalable and sustainable solution. In this context, Giardino et al. (2014, p. 28) defines a startup as “a company exploring new business opportunities, working to solve a problem where the solution isn’t well known, and the market is highly volatile”. As a result, startups are challenged externally by the volatile market conditions and internally by the need to validate their own business models under resource constraints.

While these are the shared characteristics of general startups, software startups specifically face other crucial challenges in the vibrant technological landscape. According to Sutton (2000) and Unterkalmsteiner et al. (2016), software startups are further challenged by the technological changes frequently happening and evident in the software industry. As a result, software startups need to adapt to new development workflows, architectures, tools and frameworks, where the team must continuously learn and work with stringent adaptability and iteration.

Customer-centricity is central to startups as it is in other established organizations; however, a startup should not be viewed as a smaller version of established firms. While the problems and solutions are not clear in the early stages, most software startups have

few or no customers resulting in a minimal customer knowledge as well (Blank & Dorf, 2012). This eventually makes the startup operate in “search” mode, where the startup needs to validate underlying assumptions about customers, problems and solutions and continuously iterate on the findings. In the same line, Pattyn (2024) argues that startups normally strive in disrupting traditional norms and work towards innovative and creative products, a process that requires experimentation rather than routine execution.

2.2 Operational Context of a Software Startup

Building on Ries’s (2011) characterization of startups as a “human institution”, a startup typically consists of a small group of people who function as an organization. Despite functioning as an organization, startups often lack formal organizational structures in their early stages. As noted by Bach (1998), such organizations tend to function with minimal and informal organizational structure and, in many cases, without a clear project management approach. Along the same line, such organizations tend to be founder-centric and everyone in the organization have shared responsibilities diminishing the immediate need for upper management (Giardino et al., 2014).

Such dynamic structure demands team members in the startup to exhibit exceptional skills. As a result, team members need to be ready for a chaotic environment, where each member holds multiple roles, context switching is evident, iteration is the norm, failure is a new learning opportunity and continuous learning is integrated into daily activities without a definite roadmap to follow (Blank & Dorf, 2012). As startups is closely studied in the entrepreneurship domain, exhibiting entrepreneurial characteristics like courage, enthusiasm, commitment and leadership are also the important traits of a startup employee’s skillset (Giardino et al., 2014).

Beyond the aforementioned traits, immaturity, lack of experience and lack of operational knowledge have been stated as some unique characteristics of startups as opposed to an established firm (Sutton, 2000; Giardino et al., 2014). The organizational and team

immaturity leads to a significant knowledge gap regarding both the customer, the process and the solution, forcing the organization to rely on unrefined hypotheses and instantly evolving requirements. As a result, such organizations are unable to rely on standardized workflows and practices typically found in mature organizations (Bach, 1998). Such circumstances demand a need for an approach where resource constraints are explicitly acknowledged, and the team must focus on adaptive, effective and sustainable utilization of the limited resources available.

2.3 Project Management in Software Startup

Although software startups initially work on business validation and navigating towards exploring solutions to a problem, the execution of the possible solution is inherently project-based which dictates that some level of project governance is needed to succeed. However, prior research indicates that startups typically adopt a loosely structured organizational arrangements lacking a traditional management hierarchy and standardized processes (Yu et al., 2012; Giardino et al., 2014). While such loosely coupled arrangements allow learnings-based experimentation of novel innovation and ideas, it typically escalates the risks related to operations inefficiencies and coordination challenges. The following sub-sections are structured such that existing project management practices and approaches can be studied scoping the study to the context of an uncertain and resource-constraint environment of a startup.

2.3.1 Plan-Driven Approaches

The inherent nature of a plan-driven approach is to be predictable and be able to have higher level of clarity on the problem, requirement and the solution to solve the challenges and problems (Cobb, 2023). While the level of clarity is specific to projects and incremental versions of the plan-based approaches like a stage-gate model have been implemented to address such inconstancies, the existing literature typically posits that

software startups generally do not adopt a plan-driven approach in their project management practices (Ambler, 2002; Choma et al., 2022; Giardino et al., 2014; Tegegne et al., 2019).

The distinctive characterizations of a software startup, driven by uncertainty and resource constraints provide strong evidence that plan-driven approaches might not be suitable for a startup at least during the early stages of development. Similarly, a typical plan-driven approach is driven by controlling the cost, schedule and scope of the project (Cobb, 2023), demanding a strong organizational hierarchy, clearly-defined roles and mature management, which is typically not present in software startup.

As for instance, Yu et al. (2012) and Giardino et al. (2014) state that the informal organizational arrangement results in the members operating under multiple roles, diminishing a centralized leadership and ownership of the solutions. While Giardino et al. (2014) argues that startups tend to be founder-centric, the members in the team have to work under multiple roles. When members have different roles and responsibilities in the project, each member must be self-directed and work under minimum supervision. The organizational context is self-evident that plan-driven approach would result in cumbersome processes and hinder the progress of the project.

In addition, plan driven approaches are typically sequential in nature, where each phase is dependent on the completion of the previous phases. The underlying assumption of such approach is to release a stable solution after full cycles of testing have completed and the product or service is completely ready for use (Blank & Dorf, 2012). However, startup's operational circumstances and significant knowledge gap in crucial aspects like customer, problem and the solution restricts the implementation of such linear approach. As the domain is uncertain, risks cannot be predicted and analyzed upfront (Giardino et al., 2014) which is crucial for a plan driven approach. Without an appropriate risk register, a phase fails to transition to the other, and the implementation becomes unstable which puts the organization at a risk of delivering the wrong product or service. Consequently,

the startup's emergent need to validate the hypotheses and formulate the business model demand an alternative practice to project management.

2.3.2 Need for a Strategic and Adaptive Approach in startups

Given the limitations and drawbacks of plan-driven approaches for startups operating under uncertainty and resource constraints, there is a need for a strategic and adaptive approach for managing projects in the startup context. While the dynamic nature of the startup enables flexibility in approaches and processes, Pattyn (2024) argues that such flexibility comes with its own set of challenges. The challenges are exacerbated by the absence or inadequate requirements planning and selection process, lack of control, inefficient resource allocation and inadequate market research, leading to a high failure rate in early stage startups (Pattyn, 2024).

As noted by Giardino et al. (2014), startups are characterized by a lack of experience as opposed to a established organization. The lack of experience stems from the lack of operational history and lack of experience within the team members to function as a dynamic team. When combined with the aforementioned organizational, managerial and strategic shortcomings, such inexperience could eventually intensify operational inefficiencies and increase the likelihood of startup failure (Pattyn, 2024).

While inexperience and operational immaturity results in significant challenges in startups, such organizations also possess certain structural advantages. Sutton (2000) argues that startups can easily incorporate new technologies and services without the need to support and handle legacy systems and workflows. As opposed to a mature organization, where the adoption of new technologies and tools might disrupt established workflows and organizational strategies, startups can easily adapt to changing technologies and practices with minimal effect on the workflow. The adoption of new tools and technologies is further supported by the organizational culture inherent in the startup. Startups typically consists of people with diverse skillsets, reduced hierarchical gaps

between junior and senior members, fostering an environment of collaboration and continuous learning (Warnakulasooriya & Abeysekera, 2025). While these characteristics emphasize learning and experimentation, startups need a strategic and sustainable approach to guide, control and integrate the use of new tools and technologies within project activities.

Although the initial environment and operational circumstances are uncertain and unpredictable, the ultimate aim of the startup is to work towards solving a problem and creating value for the customers (Ries, 2011; Blank & Dorf, 2012). From this perspective, customer involvement becomes a significant process from the earliest stage of the startup formation. Prior researches highlight the importance of involving the customer in project activities such as requirement gathering, refining, analysis and so on, which enables rapid experimentation and validation of the hypotheses (Giardino et al., 2014).

However, Giardino et al. (2014) also underscores the inherent immaturity evident in startup context, which extends beyond the organizational structures to include the key customers. The primary stakeholders, which are the customers themselves can be inexperienced, partially identified, or represent only a limited segment of the target market, resulting in unstable and evolving requirements. Consequently, the turbulent market combined with the volatile customer needs demand a strategic approach to product development processes, explicitly handling such inconsistencies.

Consequently, due to the volatile nature of the market and the customer, prior research argues that startups need to handle the problems with an incremental, iterative and evolutionary approach (Giardino et al., 2014). A tightly coupled and rigid workflow limits the experimentation resulting in development of a product which would eventually fail to meet the customer needs. As startups need to iteratively validate new hypotheses, craft new solutions, validate the solution and continuously learn from failure and immediately work towards a new solution, they typically prioritize speed of market entry over

comprehensive quality control and assurance (Giardino et al., 2014; Pantiuchina et al., 2017; Sahtiya et al., 2021).

While quality is initially compromised, the speed enables startup to rapidly test and validate their product in the market with the prospective customers and real use cases, eventually leading to improvement of the product, validation of their hypotheses and business models (Sahtiya et al., 2021). However, such approach necessitates a need for an adaptive and strategically aligned project management practices capable of balancing turbulence, experimentation, learning and coordination under uncertain circumstances and resource constraints.

2.3.3 The dominant PM approaches in software startups

While startups need to quickly release their product or service in the market, the process and management methodologies they choose might be dependent on diverse factors. The factors influencing their methodological adoption might stem from the maturity of the organization, level of uncertainty, resource constraints, team size, market analysis and the customer value the company is aiming to achieve. As a result, the literature is fragmented on the prescribed approach for organizational structure, management approach and project management practices (Coleman & O'Connor, 2008; Tegegne et al., 2019).

As for instance, a startup might have different levels of uncertainty or knowledge of the customer than another startup operating under similar but diverse circumstances. Therefore, the literature is adamant on prescribing a definite methodology that the startups must follow, as success or failure on using such methodology has been sparsely studied due to inherent generalization difficulties (Tegegne et al., 2019).

However, lack of such structures might result in loss of control and coordination among the team members ultimately leading to failure of the startup and the project combined.

So, startups are driven to adapt a methodology which allows maximum flexibility with limited but controlled execution of the project. Similarly, such organizations also seek to generate revenue and receive external fundings which is needed to continue their project, leading to a higher focus on speed to market than quality of the product (Ambler, 2002; Giardino et al., 2014).

Therefore, prior research in this context has provided strong evidence that agile, lean or a combination of the two has been dominantly used by startups in managing their projects (Giardino et al., 2014; Choma et al., 2022). As for instance, among the professionals interviewed from 40 software startups, Nguyen-Duc et al. (2021) concluded agile approaches to be mentioned as the best approach to achieve speed and agility. Similarly, a large-scale survey of 1526 software startups concluded that different agile approaches are used by different startups to different extents (Pantiuchina et al., 2017).

2.3.4 Applicability of agile/lean approaches in startups

The uncertain environment of startup provides a strong suitability to apply iterative and learning-based methodologies like the agile or lean practices. As for instance, in a fast-paced and resource constrained settings of most startups, these methods foster continuous improvement, cross-functional communication, iterative and evolutionary delivery enabling startups to navigate convoluted and rapidly changing requirements (Choma et al., 2022; Bansal, 2024).

Additionally, the values provided by the Agile Manifesto (Beck et al., n.d.), which include prioritizing interactions over processes, minimal functioning software over descriptive documentations, customer value delivery over contractual alignments and quick response to changing requirements over following a rigid plan provide a roadmap, which startups can adopt in their project management practices.

The nature of startups is such that not only the product needs to evolve, the process and structure need to evolve as well. According to Cobb (2023), agile approaches provide flexible and adaptive approaches for both the solution and the product, which is typically the fundamental reason prior researches have shown an inclination of startups towards agile approaches. Agile enables teams to start with a minimal clarity on the requirements, allowing incremental adaptation and development of the product or the service with simultaneous validation from the customers. This ultimately enables rapid validation of the hypotheses and delivering the product as demanded by the market and the customer.

While Ries (2011) states that startups might have no customers in the initial stages and the value to be delivered might be known sparsely, agile enables team to work with the minimal specs and simultaneously improve clarity about the market and the customer, by enabling direct experimentation in the possible market with minimum resources. From this perspective, agile prioritizes releasing a MVP, which enables the startup to instantly test their product in the market and update or change the product as directed by the market and prospective customers (Giardino et al., 2014; Sahtiya et al., 2021). This makes agile approaches not a predefined PM methodology, but a necessary mechanism to control, iterate, learn and update the project under uncertainty and resource constraints.

Similarly, according to Cobb (2023), agile prioritizes continuous learning environment, which leads to the team continuously changing their processes and approaches by analyzing what creates value and what diminishes value. This enables teams to adopt new technologies and solutions as compared to other mature organizations as well (Sutton, 2000). As agile approaches promote short working and learning cycles, adoption and use of emerging technologies might boost productivity and efficiency the team. According to Bansal (2024), combination of emerging technologies like Artificial Intelligence and automation with agile approaches not only boosts productivity, but enables the startup to innovate, compete and scale in an increasingly turbulent market. By automating routing processes and development workflows, and ethically using the AI tools and

technologies, startups can allocate the limited human resources towards higher value tasks and rapid experimentation.

While the product development is heavily dependent on agile for execution, the driver of agile are conceptually influenced from the lean principles. The five principles of lean which include value identification from the customer's perspective, identification of value stream, making the value flow, implementing pull and striving for perfection (Womack & Jones, 1996; Thangarajoo, 2015) imply that agile approaches are fundamentally based on lean principles. As prior research has demonstrated that resource constraint is an inherent characteristic of a software startup (Giardino et al., 2014), wasting significant effort on building the wrong product and using the wrong approaches might result in a wasted time and productivity for the startup.

Lean emphasizes removing any processes and approaches that do not add value to the customer, which results in the adoption of agile approaches such as frequently releasing incremental updates, learning from the MVP and possible customer outcomes and continuously improving the processes and the product. This eventually leads to the minimization of the risks related to overengineering and wasteful development of the product, which allows startups to rapidly experiment and develop the possible product in the market without the loss of significant resources.

Table 2. Mapping Lean Principles to Agile Practices in Startup Context

Lean values (Womack & Jones, 1996; Thangarajoo, 2015)	**Corresponding Agile Approaches**	**Startup context**
Specify value	Customer feedback and validations	Enables testing and refining the assumptions about customer needs, initially when customers are not clearly identified

Lean values (Womack & Jones, 1996; Thangarajoo, 2015)	**Corresponding Agile Approaches**	**Startup context**
Identify the value stream	Incremental delivery and prioritization of high-value tasks	Enables startups to focus limited resources on features with highest priority
Create flow	Release in small batches and frequent releases	Supports rapid experimentation and reduces delays in validating product assumptions
Establish pull	Demand-driven development as per the customer and market conditions	Enables startups to develop features based on real market demand, reducing wasted efforts
Pursue perfection	Continuous improvement through learning and adaptation	Encourages startups to improve both process and product over time under evolving circumstances

2.3.5 Challenges in the dominant approaches for software startups

While prior research demonstrates agile and lean approaches as the preferred project management practices in startups, the resource constraints of these organizations typically act as a significant barrier leading to a compromised and incomplete adoption. Multiple studies report their findings from their study that they operate with limited resources in the form of human resource, financial resource or temporal resources (Giardino et al., 2014; Putrianasari et al., 2024; Warnakulasooriya & Abeysekera, 2025).

While agile allows incremental adoption as needed, startups lack the needed resources to maximize agile adoption which leads to unforeseen difficulties in the process and

product development (Putrianasari et al., 2024), which exacerbates the complexity of coordinating roles, maintaining control and delivering value to the customer.

Rather than a full cycle of agile implementation, such resource constraints lead to partial, selective or incomplete agile practices. Consequently, the teams may adopt short-term agile practices such as daily standups, short iteration cycles and informal meetings, and skip long-term resource-intensive approaches such as test-driven development, improvement in processes based on retrospective, dedicated role assignment and so on (Warnakulasooriya & Abeysekera, 2025). Under the resource constraint settings of a startup, such approaches might showcase a pragmatic approach to agility (Putrianasari et al., 2024). However, such practices might lower the effectiveness of agile practices over time and introduce challenges, when the team lacks resources to sustain iterative learning and processes over time.

Additionally, prior research suggests that due to the lack of resources and uncertainty, startups work on immediate tasks for the development of the product instead of process formalization (Giardino et al., 2014; Tegegne et al., 2019; Putrianasari et al., 2024). Therefore, uncertainty and resource constraints might not only shape the approaches for agile and lean management, but they ultimately might also guide the project management practices in the startups over time.

As Ries (2011) defines startup as a “human institution”, the value is ultimately delivered by the people working in the startup. As startups initially lack a formal organizational structure, culture and methodologies in the process, people working towards delivering value to the customer are typically the enablers of agile and lean approaches and practices. This demands a high level of maturity, collaboration and continuous effort from the team members. However, immaturity, and inexperience has been a recurrent characteristic of startups (Giardino et al., 2014; Warnakulasooriya & Abeysekera, 2025). Additionally lack of resources and uncertainty (Giardino et al., 2014) exacerbates the condition when the team is unable to scale their approaches, prioritize customer needs and

set up a minimal organizational structure. As a result, project management and its approaches are initiated on personal level rather than organizational level, which might affect how the processes evolve.

Similarly, the limited human resource in a software startup typically leads to each member handling multiple tasks and taking on multiple responsibilities. In agile approaches, this is typically results in context switching, which is the process of stopping the progression of the current task, switching to another task, and returning to the main task when the incoming task is fulfilled (Kohl et al., 2020). While this is done as needed or as scheduled, recurring practices of context switching results in delays, interruptions and reduction in productivity of the team (Abad et al., 2018; Kohl et al., 2020).

However, in a limited resource context of the startup, this is unavoidable due to recurring changing requirements, task prioritization conflict, unreasonable and unsystematic change requests and lack of project management procedure to handle the tasks (Sachdeva et al., 2018; Marnada et al., 2022). This situation can quickly exacerbate the issue where startups typically prioritize speed related agile approaches as compared to quality related approaches (Giardino et al., 2014; Pantiuchina et al., 2017), leading to incomplete and incompetent solution which could lead to delivering the product which fails to deliver the expected customer value.

Table 3. Challenges in the adoption of agile/lean approaches for software startups

Challenge Area	**Result**	**Key References**
Resource constraints	Restrictions on full adoption of agile cycle	(Giardino et al., 2014; Putrianasari et al., 2024; Warnakulasooriya & Abeysekera, 2025)
Speed over quality	Prioritize rapid delivery over quality assurance and stability, resulting in	(Giardino et al., 2014; Pantiuchina et al., 2017)

	incomplete and sub-optimal solutions	
Context Switching	Interruptions and multitasking resulting in loss of productivity	(Abad et al., 2018; Kohl et al., 2020)
Selective Adoption	Prioritize short-term practices over resource-intensive approaches leading to a partial sub-optimal adoption	(Putrianasari et al., 2024; Warnakulasooriya & Abeysekera, 2025)
Organizational Immaturity	Lack of defined role, experience and stable structure resulting in loss of control	(Giardino et al., 2014; Warnakulasooriya & Abeysekera, 2025)
Process Informalization	Focus on immediate tasks over formal process development resulting in poor scalability	(Giardino et al., 2014; Tegegne et al., 2019)

2.4 Bricolage as an Adaptive Perspective in Project Management

While agile and lean have been preferred by startups as a suitable approach in project management, the current literature indicates that these approaches are often utilized under an informal, situational, selective or partial use case due to uncertainty, resource constraints and organizational immaturity. As a result, the literature presents a fragmented and loosely coupled study of such practices as these approaches typically cannot be formally prescribed and standardized within the existing project management frameworks. As the challenges identified from the existing literature in the previous sections stem from the inherent traits of the startups and are seemingly unavoidable, such challenges need a theoretical perspective that would explicitly focus on action and decision-

making under uncertainty and resource constraints. The following sub-sections explore the theoretical concept of “Bricolage” from the existing literature and how it can be used to provide a conceptual lens to respond to the immediate project challenges.

2.4.1 Origin and Introduction to Bricolage

Originally a multidisciplinary concept rooted in social science literature, and introduced by Claude Lévi-Strauss, bricolage was introduced as a mechanism for problem-solving with the resources currently available at hand, rather than looking for resources or waiting for resources to be available (Lévi-Strauss, 1966). Lévi-Strauss further used the term ‘bricoleur’ to describe a person who engages in bricolage and strives to solve the problem with whatever resources, tools, ideas and skills are available.

However, Lévi-Strauss did not provide any formal definition of bricolage, and later Baker & Nelson (2005, p. 333) provided an integrative and organizational definition of bricolage from their study of the multidisciplinary literature as “making do by applying combinations of the resources at hand to new problems and opportunities”. This perspective shifts from an objectivist view of resources as a static asset, where resources are seen as a fixed input. Rather, the value of the resource is actively constructed through the specific context of its application (Baker & Nelson, 2005). Moreover, this view challenges the traditional views and emphasizes resourcefulness over resource acquisition (Mateus & Sarkar, 2024).

This view resonates with the limitations and themes of startups as noted by prior literature such as resource constraints and uncertainty (Sutton, 2000; Giardino et al., 2014; Unterkalmsteiner et al., 2016). However, current studies on bricolage are fragmented and tend to provide an understanding of bricolage through empirical studies by exploring bricolage in diverse entrepreneurial, corporate and innovative settings, rather than within project management specifically (Jewer et al., 2024; Mateus & Sarkar, 2024). Therefore, bricolage could offer a theoretical perspective for studying project

management approaches under the conditions of resource constraints and uncertainty, without assuming the specific organizational setting.

2.4.2 The 3 foundational pillars of Bricolage

Based on the foundational concepts of Lévi-Strauss (1966), Baker & Nelson (2005) grouped the concept of bricolage into three inter-related categories. The categories - "resource at hand", "making do", and "recombination of resources for new purposes" are still used as a guideline for empirical research in the related fields (Mateus & Sarkar, 2024).

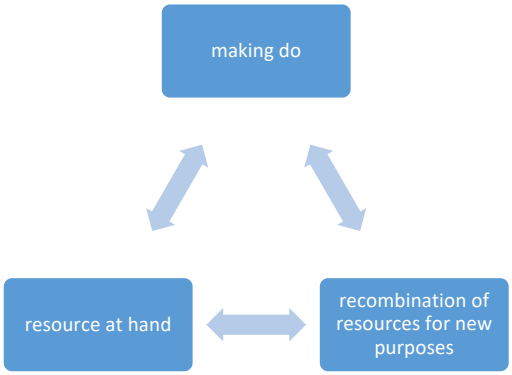

Figure 1. The foundational pillars of Bricolage (Baker & Nelson, 2005)

The notion of "resources at hand" often emphasizes the use of existing, often undervalued or under-looked resources instead of investing in or looking for other resources. This challenges the conventional view that prioritize planning and resource acquisition before execution (Baker & Nelson, 2005). The principle of "making do" complements this view by emphasizing the problem and the solution with whatever resources is available. Instead of looking for resources or working for the best-case, an average or worst-case solution creation with whatever solution is available is prioritized. Consequently, this might create or guide towards a better solution and even if a sub-optimal solution is created, it can later be further optimized (Baker & Nelson, 2005). Finally, "recombination of resources for new purposes" highlights how innovative and novel solutions can be

achieved by strategically and creatively grouping existing resources, often producing outcomes that could not have been possible otherwise (Baker & Nelson, 2005).

While analytically distinct, the three core pillars provide a mechanism and a strategy to tackle constraints and uncertainty. Access to resources at hand enables the bricoleur to act towards the solution and creatively navigating the resource gap, while recombination of existing resources allows bricoleur to create and think about new approaches and solutions to the problem. However, Baker & Nelson (2005) also mention that while such approaches are valuable under resource scarcity and uncertainty, it might not be scalable and over-reliance on such approaches might result in scalability issues when the organization uses bricolage as the default way of organizing and managing their work. This typically suggests bricolage as an adaptative mechanism which should be complementary with a broader management approach.

However, the three pillars could provide an analytical and structured framework for examining the project management approaches and practices under constraints and uncertainty. It allows the researcher to focus on the empirical study, move beyond the assumption and approaches for “best practices” and focus on how the bricoleur navigates with available resources under constraints. Therefore, bricolage provides a theoretical lens for examining project management without depending on specific tools, methods or outcomes.

2.4.3 The different variants of Bricolage

According to the structured systematic analysis of the bricolage literature by Mateus and Sarkar (2024), the findings presented a conceptual breakdown of various subtypes within the bricolage literature. The subtypes stem from the variety of contexts where bricolage has been used from entrepreneurial to organizational and social to local contexts. While different subtypes have been drawn from the recent literature, they are still

based on the conceptualization of Lévi-Strauss (1966) and later Baker & Nelson (2005) under resource constraints and uncertainty.

As per the review, bricolage can be divided into three groups according to their analytical and contextual usage. According to Mateus and Sarkar (2024), the first group focuses on the actor's or the bricoleur's characteristics and interactions. In this perspective, bricolage can be enacted not only on an individual level but can be enacted as a group or on the organizational level. Additionally, sharing of resources which can be in the form of skills and experience of one individual can be combined with different skill set and experience of the other to achieve bricolage. Similarly, the informal interactions and collaboration among bricoleurs would result in creative exploration of the solution for the problem within the existing resources (Mateus & Sarkar, 2024).

The second group focuses on the pattern and strategic use of bricolage under certain conditions, distinguishing between different ways in which the bricoleur may be involved in bricolage (Mateus & Sarkar, 2024). For instance, bricolage may be enacted simultaneously in multiple tasks or may be achieved by selectively applying it to the tasks where there are uncertainty and limited resources. The third group focuses on the resources and the type of resources mobilized under constraints and uncertainty. It relies on looking for immediately available resources by utilizing personal or professional networks rather than investing or seeking new resources. This group further focuses on going around the established standards, rules and practices to create novel and innovative changes that could be sustainable and guide the organizational structure (Mateus & Sarkar, 2024).

While the systematic literature review provided different sub types and the types have been generalized based on different empirical contexts in which bricolage has been manifested, the foundational pillars of bricolage by Baker & Nelson (2005) – "making do", "resource at hand" and "recombination of resources for new purposes" remain the foundational concept in bricolage (Mateus & Sarkar, 2024). These foundations allow the study

to maintain analytical clarity while providing variations in how bricolage emerges in project-based works under uncertainty and resource constraints.

2.4.4 Implications of Bricolage in diverse project contexts

While the bricolage strategy has been utilized and expanded under different organizational, institutional and resource-scarce environments, the underlying conceptualization and foundations proposed by Lévi-Strauss (1966) and Baker & Nelson (2005) remains the same across multiple studies. Although the systematic literature review by Mateus & Sarkar (2024) provides insights into the fragmentation and context-specific usage of bricolage, the studies converge on the understanding of bricolage as an action taken under the condition of resource scarcity, uncertainty and organizational limitations. Moreover, bricolage has been presented as a possible mechanism in value creation, project performance improvement, and a strategic approach for adaptation under constrained conditions (Mahajan, 2014; Jewer et al., 2024; Glasbeek, 2025).

While these studies are focused on diverse context and environment, resourcefulness has been prioritized over resource acquisition demonstrating the significance of bricolage-based adaptation. In particular, Mahajan (2014) presents bricolage at the organization level, demonstrating how technology-based firms can provide value by recombining existing technological, organizational and local resources rather than relying on external capital and pre-existing business models. In this perspective, bricolage has been emphasized as early-stage value creation strategy, especially in environments where resources are limited, and market conditions are evolving.

Similarly, Jewer et al. (2024) examines bricolage under extreme resource constraint environment of social enterprise projects, and presents bricolage as a technique where project teams adapt goals, processes and resources to achieve project goals and outcomes. Their findings emphasize bricolage in project management context, where traditional approaches are infeasible. Glasbeek (2025) further presents bricolage in a

situational context of crisis and uncertainty highlighting its strategic significance. This study particularly underscores how bricolage is shaped by local norms, organizational limitations, collective and collaborative practices, especially during the period of prolonged uncertainty and instability.

A significant implication from the prior research presents bricolage as a dynamic concept capable of driving projects under uncertainty and resource constraints in diverse environments. While Mahajan (2014) provides a firm-level application, Jewer et al. (2024) focuses on a project-level adaptation and Glasbeek (2025) provides situational analysis highlighting individual and collective action. This suggests that bricolage is not confined to a particular organizational setting, but manifests differently based on availability of resources, creative use of existing resources, contextual constraints and uncertainty.

However, prior studies also provide nascent insights into the scalability of bricolage (Baker & Nelson, 2005; Mahajan, 2014; Jewer et al., 2024; Mateus & Sarkar, 2024; Glasbeek, 2025). While prior research demonstrates the benefits of applying bricolage, they also state that bricolage might have trade-offs related to scalability, formalization and long-term stability which needs further research and analysis to provide substantial evidence. Therefore, according to the current literature, the bricolage is suggested as a situationally effective mechanism to handle resource constraints and uncertainty, rather than a comprehensive approach to structured management approaches.

2.5 Synthesis of the literature review

The existing literature presents startups as an organization unique from traditional, mature and established organizations, characterized by uncertainty, resource constraints and flexibility in organizational and project management structure. As a result, such organizations must continuously validate their hypotheses regarding the customer and the market at least in the initial stages. This demands a highly iterative, experimental and evolutionary approach to project management, as the solution needs to be iteratively

validated with the prospective customer and market segment. Such approaches cannot be achieved from applying a plan-driven approach, where the problem, requirements and the customer segment the product or the solution is targeting must be known and uncertainty must be minimal. Therefore, startups typically do not adopt such plan-driven methodologies in project management and move towards agile and lean approaches.

Although iterative and optimal approaches like agile and lean are preferred by the startups due to uncertainty, resource constraints and evolving requirements, such approaches are also challenged by the same leading to an informal, partial or selective adaptation. As a result, startups focus on short-term approaches and skip resource-intensive approaches which would eventually result in scalability and stability issues within the organization. While prior research typically categorizes these as challenges and limitations in the context of resource constraints and uncertainty, empirical studies in different environments has presented bricolage as an analytical model to examine how firms navigate such constraints. However, the application of bricolage to systematically analyze how startups navigate these challenges in project management context remains limited and in its embryonic stage.

This gap motivates the present study, which aims to bridge the gap between bricolage and project management approaches, specifically under the uncertain and resource constraint setting of a software startup. Rather than presenting the informal, partial and selective approaches of project management as challenges or limitations, this study seeks to present them as a potentially feasible, adaptive, purposeful actions shaped by combination of available resources and contextual constraints. By examining how bricolage can be utilized in startup project contexts and how it interacts with standard approaches like agile or lean, the study aims to contribute to a situational and qualitative understanding of project management in startup contexts and address the existing limitations of empirical evidence on bricolage-based practices in this domain.

While the literature provides rich contextual insights, it provides only a partial answer to the research questions of this study. Firstly, the research clearly presents software startups as organizations operating under resource constraints and uncertainty. Eventually, the literature presents sufficient research on the partial, selective or ad-hoc adoption of agile/lean approaches in startups. Similarly, a different domain of literature has presented “Bricolage” as a theoretical lens for understanding how organizations can respond to uncertainty and constraints. However, the literature provides limited and partial insights into how these constraints are handled in practice in the PM context of a startup. Moreover, the interaction between agile/lean approaches and “Bricolage” remains in its nascent stages.

Therefore, an empirical study is needed to gain an elaborative practice-based understanding of how startups navigate such constraints in PM practices. The study aims to address the gap by immersing in real-time practices, interactions, deviations and experiences of a startup leveraging limited resources and navigating uncertainty.

3 Research Methodology

The study follows a qualitative research paradigm, where the main goal is to explore how project teams implement and enact bricolage into their project management practices under uncertainty and resource constraints. While prior studies (Mahajan, 2014; Jewer et al., 2024) have explored bricolage into their specific contexts, the implementation of bricolage in project management practices in startups remain in its embryonic state. Therefore, the research is also exploratory in nature and rather than measuring specific performance or relationships, the study aims to study how project-related activities are carried out in practice.

Moreover, a fundamental objective of a qualitative research is to provide the contextual relevance and nuances on the topic through human interactions, perspectives and experiences (Lim, 2025). Accordingly, a qualitative approach has been chosen for this study as bricolage is an informal and empirical phenomenon that emerges through daily activities and actions taken by the people involved in the organization (Mateus & Sarkar, 2024).

3.1 Research Philosophy and Methodological Approach

This study is guided by an interpretivist research philosophy. According to Saunders et al. (2007), organizational practices are socially constructed and guided by a series of human interactions, interpretations and experiences. So, the practices and approaches cannot be generalized or interpreted as a universally acceptable process. In the context of a software startup, the project management practices are not uniformly applied, but are continuously adapted in response to uncertainty, resource constraints and evolving requirements. Therefore, an interpretivist approach has been taken as the generalization or standardization of such approaches is convoluted and is not feasible. As a result, the research questions and objectives of this study are guided by the aim to understand how

the actors or team members navigate and enact bricolage through their actions and decisions under resource constraints and uncertainty.

Accordingly, the research is guided by an inductive and empirical approach. Rather than abiding by a standard or predefined theory, the inductive approach allows the generation of themes from subjective analysis and empirical data through systematic analysis (Saunders et al., 2007). Although agile, lean and bricolage are the conceptual framework for the study, they are not used as the core testing frameworks. Instead, these frameworks are used as an analytical lens to interpret how project practices unfold in the context of a startup.

Methodologically, the study is grounded to a single-organization case study approach. A case-study approach provides an in-depth analysis of the phenomenon in the real-world context and is flexible in the options for data collection and analysis (Priya, 2021). The chosen organization is an instrumental case, that is the case organization only provides an environment to interpret and understand bricolage under resource constraints and uncertainty. The organization itself is not the primary object of evaluation. However, the case organization provides significant insights into the working approaches and processes, which is suitable to investigate an informal and empirical concepts of bricolage.

The study adopts a cross-sectional time horizon, focusing on the project management and organizational practices within a definite time frame. The objective of such time frame is to examine how bricolage is enacted in response to current conditions and operational demands (Saunders et al., 2007). As qualitative research is about human experiences and behavior (Lim, 2025), the data collection chosen for this study are participant-observation, semi-structured interviews, and a subjective anonymous survey response. Consequently, data analysis is shaped by the triangulation of data collected from these sources. Additionally, themes are generated using thematic analysis, which is a flexible qualitative method used to identify patterns across diverse data sources while preserving the original context and rigor (Braun & Clarke, 2006).

3.2 Case Selection and Research Context

A case study in itself is not only a research strategy, but also provides a versatile platform for robust data collection (Priya, 2021). In this perspective, the selection of case organization is pivotal in such study, where the findings and analysis would be significantly based on the practices and processes in the selected organization. In the context of the research objectives of the study, two major criteria have been identified. The organization must be a software startup in its early stages, and the organization must have some informal project management practices.

Accordingly, a remote-first Helsinki-based software startup in its early stages has been selected as the case organization, which is leveraging limited resources, has informal project management practices, has changing requirements and goals and is navigating in a turbulent market. The characteristics of the selected case organization are closely aligned with the unique traits of a startup as identified in prior literature (Giardino et al., 2015; Unterkalmsteiner et al., 2016; Bansal, 2024).

Additionally, the operational condition of the case organization also closely aligns with the foundational concepts of bricolage which emphasizes combination of existing resources for new problems and opportunities (Baker & Nelson, 2005; Mateus & Sarkar, 2024). Therefore, the selected case organization provides a vivid information source and context for studying bricolage in project management approaches of a startup.

3.3 Unit of Analysis

A case study is flexible in its unit of analysis, which can span from individuals, communities, processes, practices, events or even decisions (Priya, 2021). However, according to the practice theory, organizations are guided by the practices in their organizational processes and the unit of analysis should be those practices that shape the organization (Nicolini, 2013). This aligns with the study, where the main objective is to have an

empirical understanding of bricolage in project management. Therefore, the unit of analysis chosen for this study is the approaches to enact bricolage in project management practices. Rather than focusing on individuals or the organization, the study concentrates on the practices through which the project is managed and executed. Such practices might be evident in problem solving approaches, resource allocations, workarounds, improvisation, adaptation and reuse of resources. The practice-oriented approach allows the study to capture how bricolage is enacted in daily project activities and provides a nuanced view of such activities by revealing the series of actions taken by the practitioners under uncertainty and resource constraints. By using practices as the unit of analysis, the study provides insights into how project activities are carried out under resource constraints and uncertainty.

3.4 Data Collection

The credibility and authenticity of a qualitative research is bolstered by the strategic use of multiple data sources (Lim, 2025). As qualitative research rarely generates numerical and statistical results, the triangulation of subjective findings from multiple sources enhances the validity of the research. Therefore, along the same lines as interpretivist, inductive and practice theory guidelines, the following sections provide an overview of the data collection methods considered for this study.

3.4.1 Participant Observation

One of the earliest and key sources of data in the study is the researcher's knowledge and experience working in the case organization. The researcher has been directly involved in the case organization as a freelance contractual employee primarily working as a Software Developer for a period of five months. This has led to a data collection methodology of participant-observer, where the researcher has been directly involved in the daily activities and processes of the organization and simultaneously collecting data as

needed and observed (Chand, 2025). This approach is particularly useful for studying bricolage in project management context, as bricolage practices often emerge informally and are not formally documented or standardized by the team members.

A significant advantage of observational based approach is that it allows the researcher to study the events and actions in a natural and real-time sequence as they appear (Chand, 2025; Lim, 2025). Accordingly, the researcher has maintained a record of observations in an informal and unstructured format. A unstructured observation allows the researcher to collect open-ended and subjective data without relying on a predefined criteria, and document the notes as they happen in the process (Chand, 2025).

The notes are collected based on the participation in diverse project activities including software development, project planning, sprint planning, sprint reviews, retrospectives, informal meetings, task breakdown and internal communication channels. The unstructured and informal notes are collected focusing specifically on practices which are defined by uncertainty, resource constraints, improvisations and recombination and reuse of existing resources.

3.4.2 Semi-structured Interviews

Interviews are one of the widely used qualitative data collection methods which enables the researcher to collect the perspective and experience of the participants by engaging in a dialogue and discussing comprehensibly to uncover detailed insights (Chand, 2025). The study follows a semi-structured interview protocol, where the interview is guided by some predefined questions and concepts, but allows open-ended discussions and follow-up questions based on the participant's responses (Chand, 2025). While participant observation allows the researcher to be an observer of events and actions that occur in the real-time, semi-structured interview allows the study to gain a detailed understanding into the participant's personal perspective and motivation behind their actions.

The case organization, which is a startup has limited team members which is also a unique trait of a startup according to Giardino et al. (2014). Therefore, the study has selected two co-founders who have multiple roles and responsibilities within the organization as the participants of the interview. One of the participants is the Head of Product and other is the Head of Technology in the organization. However, both hold multiple responsibilities in the project. Their involvement in the organizational activities, strategic decision making and operational execution make them the key members with comprehensive insights into how bricolage is enacted into project management practices within the organization. Table 4 surmises the roles of participants in the interview, the timing of the session, and the total duration of each interview.

Table 4. Interview Participant Roles and Session Details

Participant ID	**Primary Role**	**Date / Duration**	**Platform**
Interviewee 1	Co-Founder / Head of Product	March 07, 2026 45 minutes	Microsoft Teams (video meeting)
Interviewee 2	Co-Founder / Head of Technology	March 08, 2026 60 minutes	Microsoft Teams (video meeting)

The key factors of an effective interview which include developing an interview guide, building trust and rapport among the participants, active listening and ensuring accurate recording and transcription have been taken into account in this study (Chand, 2025). The interview guide is developed such that the guiding questions include the key themes of the study, which include bricolage, uncertainty, resource constraints and project management. Accordingly, follow-up questions based on the response of the participants have been thoroughly discussed. Similarly, as the researcher is also a contractual employee of the case organization, the participants have provided honest and detailed information on their experiences. To ensure a flexible and comfortable dialogue, the interview has been conducted in the participants native language in Microsoft Teams platform and recorded with the consent of the participants.

3.4.3 External Online Survey

In addition to the internal organizational data and the researcher's involvement in the case organization, the study uses an external anonymous online survey which is subjective in nature and has questions related to the key themes of the study. However, the online survey is for external people who are not from the case organization but have experience of working in software startups. These people might be project managers, produce owners, scrum masters, software developers, designers or QA personnel. The base sample for this survey consists of 19 people.

The purpose of this survey is not to generalize or compare the findings but provide a contextual and supplementary perspective on how startups manage projects under uncertainty and resource constraints. The questions in the survey are subjective and open-ended, and participants are encouraged to provide informal descriptions of their experiences working in the startup. While the data from the survey remains secondary to the study, the data collected from this survey contributes to the overall interpretive depth of the study by highlighting recurring patterns across project management approaches in startups.

3.5 Data Analysis

A qualitative research aims to transform the collected raw and informal data into meaningful insights by not only describing the data, but exploring meanings, patterns and relationship between them through a systematic and structured approach (Lim, 2025). Therefore, the study follows both independent and holistic approach to analyze the data collected from observational notes, interviews and open-ended surveys to uncover meaningful information, patterns and relationships. For this study, the main objective is to analyze the data to identify patterns in how bricolage is enacted in project management practices by focusing on project practices and participant's experiences.

3.5.1 Data Analysis Technique

The study follows a thematic data analysis which is a flexible qualitative data analysis technique to minimally organize and describe the data set, leading to a systematic identification, analysis and discovery of themes and patterns (Braun & Clarke, 2006). Given the empirical nature and limited data set of the study, thematic analysis has been chosen as it can be theoretically flexible and provide detailed insights into some specific themes in relation to the research question. Rather than aiming to develop several themes based on their occurrences in the data set, the study aims to use a limited themes based on the impact and significance of the theme on the research questions of this study (Braun & Clarke, 2006).

Accordingly, the study is initially guided primarily by an inductive and data-driven approach. Such analysis prevents premature analysis by restricting a theory-based interpretation or the researcher's preconceived personal analytic opinions (Braun & Clarke, 2006). In this perspective, no predefined coding schemes or guidelines were used. Rather, the codes were generated from detailed engagement with the data set enabling meanings, actions and practices to emerge from the observational notes, interview transcripts and reflexive notes, and external survey. While the study is guided by the existing literature review on agile, lean and bricolage practices, they are used for interpretation at later stages. This approach helped in removing possible biases and theoretical assumptions at initial stages and facilitated in robust code and theme generation.

3.5.2 Coding and Themes Development

The study follows a standard and systematic thematic analysis with a series of steps, which serves as a roadmap for data analysis and ensures consistency and replicability of the findings (Braun & Clarke, 2006; Naeem et al., 2023). The steps are sequentially elaborated in the subsequent paragraphs.

The first step in the process is to have a comprehensive understanding of the collected data. Firstly, observational and unstructured notes collected by the researcher during the period working with the company are carefully studied, scanned, skimmed and read multiple times. Simultaneously, the audio from the interviews have been transcribed in the original language using the auto-generated transcription and manually verified by the researcher. The researcher then performed a translation of the transcriptions into English using an AI tool. Finally, this translation has been verified and validated by the researcher making changes to the text where hallucinations were evident by the AI tools.

To maintain the validity of the translation, the translation focused on a conceptual equivalence rather than a strictly verbatim substitution preserving the emotions and experiences of the participants. Finally, the survey responses from the open-ended survey were read thoroughly. Consequently, significant information from the observational notes, survey responses and quotes from the interview which align with the research question and objectives are funneled out recursively reading and extracting key information.

An intermediate second step is taken before the code generation phase to have a high-level simplification of the information funneled in step one. In this step, primary keywords are selected from each information block which provides an overall understanding of each individual information. At this moment, each information block should have a single or multiple keywords assigned to it.

Consequently, the keywords are carefully analyzed with a quick skim on the original text that generated the keyword. Eventually, words or phrases, particularly called codes are assigned to multiple keywords which align with the code. This led to a many-to-one relationship between the keywords and the codes, where multiple keywords have been assigned to a single code.

The next step involves the abstraction of multiple codes to a single theme creating a many-to-one relationship between the codes and the theme. Multiple codes are analyzed which unfolds meanings, relationships and diverse patterns. This has also been done manually through rough sketches and diagrams, connecting one code and the other leading to a better understanding and clarity among the related codes. Eventually, a thematic mapping diagram has been created which depicts the relationship and convergence between multiple codes and themes. A careful consideration has been given to conflicting themes and sanitizing them to finally create independent themes which unfold diverse meanings.

The themes are then reviewed and refined by analyzing them holistically, looking back at the codes, keywords and the information that generated them. The groupings are re-analyzed and themes are renamed and broken down if needed.

At this stage, it is crucial to note that the themes are generated entirely based on the information from the preceding steps, without any predefined theoretical foundations or analytic assumptions. This aligns closely with the research philosophy and design of the study which is guided by an interpretivist and inductive approach. The foundational frameworks for this study which are agile, lean and bricolage are introduced only in the subsequent stages of interpretation and discussions, where the themes are analyzed through these theoretical lenses. This ensures that the study is inductive and empirically driven, allowing project practices and patterns to be analyzed and validated by the underlying theoretical foundations in the final stages of data interpretation and analysis.

3.5.3 Reflexivity, Researcher Positionality and Triangulation

Reflexivity is a crucial part of this study as it is guided by an interpretivist approach where the researcher has a primary role in data collection, analysis and interpretation (Braun & Clarke, 2006; Lim, 2025). Additionally, the researcher has a dual role in the organization, both as an employee and an observer in the study. While the dual nature provided

privileged and comprehensive access to internal data and project management practices, it introduced potential risk of subjective bias, premature assumptions and normalization of observed practices.

The possible biases were minimized using several strategies. Firstly, the researcher has tried to maintain a neutral and reflexive stance throughout the data collection process informally documenting actions and events as they occur without passing any judgements. Consequently, as the data for this study are collected from multiple sources, the study prioritizes a methodological triangulation to ensure the authenticity and credibility of the findings and reduce the possibility of bias that might arise due to the limited data sample (Lim, 2025). Accordingly, notes taken by the researcher are considered as observational data, data collected from interviews as primary data and data from the survey as supporting data to provide external contrast and resonance.

More importantly, the study tries to remove the bias of the researcher's involvement in the case organization by critically challenging and confirming the observational notes with the transcript of the interview and the survey responses. The multiple data sources are iteratively reviewed and refactored by maintaining a neutral perspective. The multiple sources are analyzed both independently and holistically to uncover patterns, resonance and relationships. Additionally, the participants of the interview and the open-ended survey are not explicitly informed of the theoretical foundations of the study. This allows the raw data from interview and survey to be empirically based on the personal experiences of the participants and not biased by the researchers' position and knowledge of the theoretical frameworks.

4 Results and Findings

The section presents the outcomes of the data analysis through the systematic triangulation and thematic analysis of multiple sources - participant observation notes collected over 5 months of work, semi-structured interviews with 2 co-founders (Head of Product and Head of Technology), and 19 anonymous survey respondents.

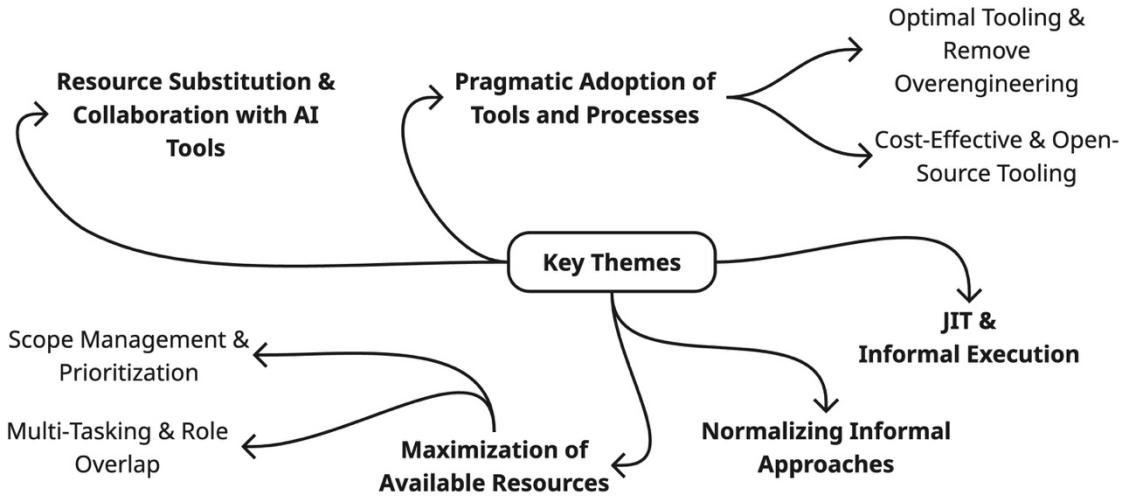

Figure 2. Key Themes generated from the findings

Table 5. Survey Respondents Profile (n=19)

Category	**Sub-category**	**Count (n)**	**%**
Current Role	Software Developer	9	47
	Project Manager / Scrum Master	4	21
	Product Owner	3	16
	Mixed / Other	3	16
Experience	Above 5 years	13	68
	3 – 5 years	4	21
	0 – 3 years	2	11
Startup Exposure	Yes (current / past)	15	79
	No	4	21

The following sub-sections provide an elaborative description of the 5 key-themes generated by the analysis.

4.1 Theme 1: Pragmatic Adoption of Tools and Processes

A dominant pattern across all data sources was the pragmatic and deliberate selection and adoption of project management tools and techniques. This was primarily based on immediate practical needs rather than adherence to standard methodologies. As for instance, the case organization adopted the tools and techniques based on 2 significant criteria – Optimal usage for the team and Cost-effectiveness.

4.1.1 Optimal Tooling and Remove Overengineering

The decision to use a comparatively cheaper tool over another tool with much more features highlighted this pragmatism. In the case organization, the team used a project management tool “Jira” with six paid licenses for a few months, but eventually found the tool misaligned with the immediate needs and the outcome. As Interviewee 1 stated:

> *The purpose and the capability provided by the tool didn't map or match. Because of that, we dropped it. To avoid over-engineering, or let's understand it this way: to kill a small bird, we would have had to bring a cannon, that kind of situation would have happened if we used Jira.*

Interviewee 2 supported this claim and added that the transition was driven by the need for centralization and reduction of waste:

> *We dropped Jira because, as much as possible, if we can reduce noise, or unnecessary tool switching or context switching. If that doesn't happen, it's easier for people to work... We opted to Github’s native project management features. Once you go to GitHub, the tasks are there, the code is there, pushes happen, changes happen, and it's all connected, right? Interconnected*

The researcher’s observational notes were complementary to this philosophy. The project progressed smoothly without the intervention and cognitive load to use multiple

PM tools and technologies. The notes recorded the ease-of-use and centralization of the repository - the tasks, requirements, CI/CD pipelines, and documentations were all centralized in the “Github” platform. The need or limitations were not realized as opposed to using “Jira”.

To avoid friction in the future and ensure smooth execution with available resources, the optimal tooling philosophy even guided the initial adoption of technologies and tools as interviewee 2 responded:

> *We analyzed the industry standard and the market and found it would be easier to hire where there is a large pool of qualified candidates. Also, AI models are trained on data that have higher market presence and adoption rates. So, choosing such technological stacks would allow us to use AI based tools with less hallucinations in the future.*

The quote aligned with the observational notes of the researcher, where the researcher has worked on daily tasks with programming languages and databases that have the highest market adoption rates.

Similarly, the survey data highlighted that among 19 respondents, 14 reported using scrum framework of agile and 10 reported using informal or ad-hoc practices frequently in combination with scrum. When describing challenges with this approach, multiple respondents reported process overhead as a problem. A Software Developer with 3-5 years of experience noted:

> *While practicing scrum in projects, often, we end up spending a lot of our time in meetings. That takes a toll on our productive time windows during work week heavily... There is always a risk of developers facing unnecessary pressure.*

The researcher’s observational notes also highlighted the length of weekly meetings. While initially, the length of meetings was comparatively lower, as the project progressed, meetings started becoming longer and discussions started becoming brainstorming sessions. While questioned in the interview, the two co-founders stated that they are looking for ways to reduce the meeting time which is causing an overhead.

Along the same lines, the observational notes of the researcher stated that the team opted for a comparatively modular and informal documentations based on user-story mappings of the roadmap and tasks to reduce meeting times. Similarly, although daily standups were not part of the PM practice, short informal meetings on a need basis reduced the overhead on weekly meetings.

The triangulation of data sources resulted in a consistent pattern across startups that is the teams tried to optimize the tools and processes based on pragmatic needs rather than a prescribed methodological approach. Both co-founders underscored the need for centralization and noise reduction when selecting PM tools. Similarly, around 53% of the survey respondents realized the need to reduce process overhead which might manifest in the form of meetings. Finally, the observational notes aligned with the survey responses and interviewee's response.

4.1.2 Cost-effective and Open-Source Tooling

A second factor driving the pragmatic adoption, which appeared across most data sources was cost-effectiveness. This was particularly evident in the initial stages, where investing in a paid tool might not be the best approach. As interviewee 1 explained:

> *If we don't know if the product will even come or not, if it might not work, then in that case, taking paid tools doesn't only make sense. But if a paid tool is for a product that is already working, and we have pending customers, we have use cases for it, but there are some bottlenecks that can be solved by paid versions or paid software, then of course, why not? But in the starting, the experimentation phase, as much as possible, open source, freely available tools.*

The quote provides insights into how tools and technologies are selected. While budget constraints hindered the adoption of paid tools, customer requirement and project demands were the primary drivers of the cost-conscious tool selection in the organization. Similarly, some form of budget constraints was identified as a constraint type by around

58% of the survey participants where a survey response by a Project Manager with experience above 5 years stated:

> *In one project, we could not buy a new automation tool due to budget limits. Instead, we used open-source frameworks like Selenium and built simple automation scripts internally.*

Similarly, a Product Owner with over 5 years of experience reported a similar strategy:

> *When facing budget and time constraints, we repurposed existing modules from a previous project instead of building new features from scratch. We also used free tools for tracking and collaboration, allowing us to deliver a functional solution quickly without increasing costs.*

In the case organization, the observational notes of the researcher reported that the choice of open-source solutions was not purely driven by financial constraints. While budget limitation was one of the factors, the open-source solution provided flexibility in delivering value in uncertain and turbulent market where requirements were frequently changing. Moreover, open-source solutions were customized and tailored as the requirements changed without incurring costs and adding licensing barriers. As opposed to this, the sprint planning meetings in the case organization stressed that a paid solution could provide a richer experience for the customer but added the risk of vendor lock-in and financial loss when committing to the solution early in the development stage.

Similarly, around 79% of the survey respondents reported open-source software or open-source solution usage as a recurring pattern in one or many phases of their project management. A Software Developer with above 5 years of experience noted that budget constraints along with strict timing constraints prevented them from hiring people with relevant skills. So, they opted to use freely available resources which aligned with their team's current skill sets.

Some from of const-conscious tool selection was confirmed across all data sources, where the adoption and tailoring of open-source solutions appeared as a strategic choice rather than a purely constrained decision.

4.2 Theme 2: Maximization of available resources

A second theme identified across all data sources was the active and continuous maximization of available resources including human resources, skills, time and tooling.

4.2.1 Multi-tasking and Role Overlap

The case organization was operating with a limited human resource of a maximum of 4 members. Both interviewees acknowledged that human resource limitations directly affected the scope and timeline of the project, and required trade-offs as the project progressed. Interviewee 1 stated:

> *If we had enough resources, maybe we could have finished that project in three months instead of five months…we had to trade off many things. Maybe we wouldn't have had to compromise on product quality if we had more human resources.*

As reported in the researcher's observational notes, due to the limitation in human resources, the existing members were consistently multi-tasking and had multiple roles and responsibilities. Interviewee 1 held multiple responsibilities across operations, project and product management, business development and sales pipeline management. Similarly, Interviewee 2 held multiple roles across technical leadership, infrastructures and project management. Both co-founders described this as the maximization of their skills and their several years of previous working background largely complemented their dual roles in the organization. However, while this maximization has resulted in positive results for the organization, both participants stated that the approach is not scalable and should only be used for reaching a certain milestone.

The pattern resonated in the survey responses as well. 58% of the survey respondents attributed limited team size as a constraint in PM. A Project Manager with over 5 years of experience noted that:

> *Small company or startups have limited team size. Therefore, it is required for a single person to do both backend, frontend, testing works. This would pressure the worker or sometimes we might need to learn new skills, which would affect the project timeline and slow down the progress.*

The observational note of the researcher aligned with the survey response, where the researcher was responsible for feature research where the requirements were uncertain, feature development, quality assurance, bug reporting, testing and bug fixes as well. Timing constraints were always present, and requirements were consistently evolving, which escalated the challenges and hindered maximization.

While trade-offs and limitations have been realized across all data sources, role overlap and multi-tasking emerged as an unavoidable pattern in the findings. While the interviewees stressed on strategic necessity for role overlap and multi-tasking, the observational notes and survey participants noted an increase in cognitive load and pressure while working that could affect the project timeline. However, role overlap and multi-tasking evolved as a maximization technique of available resources although having trade-offs and shortcomings.

4.2.2 Scope Management and Prioritization

In the case organization, resource limitations also shaped how project was scoped and tasks were prioritized in the product roadmap. While specific prioritization in the initial stages was not possible, both co-founders re-prioritized and reanalyzed the tasks as the project progressed deferring non-critical tasks to later stages in the roadmap. The roadmap itself was dynamic, and product features were reordered as the project evolved. As interviewee 1 explained:

> *We set what to achieve in this duration. And while building that,when we saw constraints, we determined what could be omitted and what could be placed in different stages of the roadmap or in different segments.We moved them out that way. The roadmap didn't change. But from the timeline perspective, if we needed to include five features in this timeline, but we didn't have the resources, we had to drop two out of these five.*

The features were consistently reanalyzed and reprioritized based on customer needs and resource availability. The features that were strictly necessary based on the customer needs were retained, and tasks which could be progressively added were deferred. The observational note of the researcher confirmed this pattern where tasks that had been groomed for the next sprint session were deferred, and new tasks were added informally.

Similarly, the survey respondents resonated similar pattern where a Product Owner with above 5 years of experience explained that “We had to prioritize core features, postpone non-critical tasks, and adopt short sprint cycles to stay flexible”. In the same perspective, a Project Manager with 3-5 years of experience described that “We reduced the scope, focused on core features, postponed minor enhancements.”

The scope reduction and prioritization emerged as a consistent pattern across all data sources. The interview responses confirmed this as a deliberate strategy for managing resources and achieving maximum value under resource constraints, survey responses confirmed this as a prevalent practice and observation notes confirmed the deferring of tasks and dynamic nature of the initial roadmap.

4.3 Theme 3: Just-in-Time (JIT) and Informal Execution

The case organization had a weekly sprint planning meeting and a short mid-week review meeting to facilitate the sprint. However, as the customer requirements were evolving and uncertain, the discussion in the standard meetings and the timeframe of the

meetings were uncertain as well. This resulted in a execution as stated by interviewee 2 as “Just-in-Time” execution. Similarly, Interviewee 2 added:

> *Unexpected things do happen in projects, and specially in startup projects…we have to be extremely dynamic in responding to change and requirements…at that exact moment we need to analyze, plan, evaluate, take action and manage it.*

The observational note of the researcher aligned with this approach, where "unexpected things” as characterized by interviewee 2 were reported to be immediate customer demands, requirement changes, priority changes and critical bugs being reported (as speed-to-market was prioritized over quality). Similarly, as resources were low, the absence of even one team member due to natural causes like illness or immediate leave demanded informal and JIT planning of the previously planned features and scope.

The pattern resonated in the survey data as well where around 83% of the respondents attributed timing constraints for rapid and informal adjustments. A Project Manager/Scrum Master with above 5 years of experience stated that they “Had to plan immediately and roughly and make changes to previously finalized plans.” Similarly, another respondent with similar profile state that:

> *When there was a sudden focus/priority change during the sprint or when suddenly a majority of tech resources is absent, the ongoing sprint had be re-discussed via a meeting and focus was changed from product-specific tasks to tech-debt discovery and resolution for the rest of the sprint.”*

Rapid, Informal and JIT execution was a recurrent factor across data sources where projects frequently face unexpected and constrained interruptions. The interview responses recorded the need for such approach, the observational notes validated and elaborated on the approach and survey responses provided broader industry prevalence of such practices.

4.4 Theme 4: Resource Substitution & Collaboration with AI tools

While resource constraints and uncertainty have been reported in all data sources, resource substitution leveraging AI tools and technologies was evident across data sources. Interviewee 2 state that:

> *Earlier, there was only the speed of one (human resource). If there was only the speed of one, now with AI, in my opinion, it's one and a half.*

Interviewee 2 further elaborated that having AI is like having a human counterpart, who does the work as instructed and added AI counterpart as having a "technical assistant".

However, interviewee 1 added that AI has also been utilized across diverse business needs and described:

> *For analyzing customer and market requirements...For analyzing requirements, for brainstorming, especially. Because, in my personal opinion, one good thing about Generative AI is, for brainstorming, sometimes it brings angles you hadn't thought of.*

The findings are complemented by the researcher's observational notes, where generative AI tools have been widely used for brainstorming feature development ideas and alternatives. While AI has been informally adopted in the case organization, both co-founders and the researcher's observational notes claim that a human must validate and verify the information generated by the AI. And in most cases, all participants claim that the results have been accurate and AI has largely complemented their work.

Similarly, the use of AI has not been only limited to generative AI. The case organization has been using agentic AI in multiple phases to partially substitute a human counterpart. The researcher's observational notes report that the AI counterpart has been writing most test cases for the code they wrote enabling a TDD workflow, which would have been difficult to achieve given the timing and human constraints. Similarly, interviewee

2 described another usage of the AI counterpart as a tool to reduce cognitive load in context switching:

> *Context switching is necessary in a startup, as the same person is doing many things..It is beneficial…to manage context switching…for example, in the code review phase…we are a startup right, so a single code review request might contain many files and code to review. It takes up a lot of time to review it. But I let AI summarize it and hand me the summary of each changes...then I validate it and ensure the business requirements are fulfilled. It might make stupid mistakes sometimes, but comparatively it has saved up a massive amount of time for me while I am involved in other tasks.*

The automated code review by the AI agent was one of the significant use cases of agentic AI as reported in the researcher's observational notes. It provided an opportunity to fine tune and refine the feature before being reviewed by the human counterpart. Apart from these, interviewee1 mentioned routine works like developing a disposable prototype, developing user stories in an interactive way, and developing test components to validate with the stakeholders as some of the tasks handed over to an "AI assistant" and validated and fine-tuned by the human counterpart.

However, the survey data was limited in the explicit adoption and usage of AI tools and technologies with only 2 members explicitly advocating the use of AI tools in their workflow. A Project Manager/Scrum Master with over 5 years of experience stated that:

> *We use AI to pair programme and quickly come up with a solution. We have to validate the worth, but it has made routine tasks easier. While AI is not the norm yet where I work, the AI tools do make routine tasks easier.*

Similarly, a Product Owner with over 5 years of experience described that:

> *We have been immensely using AI tools to speed up our work. Even with the customer, when they are unaware of what they precisely want, the AI tool has supplemented us in brainstorming and thinking about new possibilities.*

The findings reveal a gradual adoption of AI tools in different stages of PM. To summarize, Interviewee 1 described the usage of AI in planning, brainstorming and rapid prototyping

in different stages, and interviewee 2 elaborated the usage of AI as a mechanism to manage context switching. Similarly, participant observation reported the usage of AI in complementing their work, and finally few survey responses report them as pair programmers and handlers of the routine tasks.

4.5 Theme 5: Normalizing Informal Approaches

Lastly, a final recurrent theme across all data sources was the realization of the need to normalize informal PM approaches, at least in the early stages. As reported in the observational note, In the case organization, PM decisions were also made through some informal channels like an informal company chat thread, need-based meetings, open discussion in the documentation report of the user story and demonstration of a quick prototype made with an AI tool. Interviewee 1 stated that "Small team size made formal governance unnecessary and such informality leads to better speed and continuous productivity." However, both interviewees stated that normalizing such informalities is only productive in the initial stages where interviewee 2 described that such practices should be gradually formalized as the organization and the product starts generating revenue.

Similarly, the survey respondents also highlighted the need for informal approaches where a Project Manager with above 5 years of experience stated that "Going out of the box, working informally and understanding business requirements is a must." Similarly, a Software Developer with above 5 years of experience described that:

> *Project management should be about delivering customer values and the customer values are hard to achieve as the customer might not be fully aware of the deliverables. So some informalities would always be there, which should be handled at some point.*

While trade-offs relating to scalability has been realized, informal approaches to PM in coordination, collaboration and documentation have been evident in all data sources.

Both co-founders described informal practices as a standard approach for the stage of the organization and the team size. Participant observation reported such informalities in daily project activities and survey responses provided insights into the pattern among broader practitioners.

5 Discussions

The primary motive of the study was to examine the integration of “Bricolage” in PM practices specifically in resource-constrained settings of a software startup and to validate if there is an interaction of such approaches with agile and lean practices. Thematic analysis and triangulation of the data sources resulted in 5 themes which are empirically based on human experience, observation, and interaction. These practices are difficult to standardize and framed as deviations in the standard agile/lean approaches (Giardino et al., 2014; Tegegne et al., 2019; Warnakulasooriya & Abeysekera, 2025). However, they may be theorized as situational resourcefulness consistent with the 3 foundational pillars of “Bricolage” which are “making do”, “resource at hand” and “recombination for new purposes” (Baker & Nelson, 2005; Mateus & Sarkar, 2024).

5.1 Interpretation of the Findings

RQ1. How do software startups enact bricolage in project management practices when operating under uncertainty and resource constraints?

The key themes identified in the study provide empirical evidence on how uncertainty and resource constraints itself serves as a catalyst for bricolage to be manifested in daily project activities and processes. While the participants in the interview and survey respondents are unaware of the theoretical foundations and applications of bricolage, they have provided evidences of actions and activities that closely align with the theoretical foundations of bricolage (Lévi-Strauss, 1966; Baker & Nelson, 2005).

The findings align with the existing literature in PM that project activities and practices in software startups are informal and standard methodologies like agile or lean are partially or selectively adopted (Giardino et al., 2014; Putrianasari et al., 2024). However, the present study does not frame these adoptions as limitations or challenges in the adoption of standard methodologies. The observed practices like abandoning one tool

over other, use of AI to complement missing resources and human roles and selective deferring of features should be categorized as strategic decisions taken under resource constraints and uncertainty. The project practices are highly situational and dynamic, where the value delivery is dynamic and evolving as well. The context of the startup suggests that such situational practices are better answered by the 3 core principles of bricolage (Baker & Nelson, 2005). The tools used for PM need to be minimal yet optimal which aligns with the foundational pillar of “making do”. Similarly, the use, modification and tailoring of open-source software aligns with the foundational pillar of “recombination of resources for new purposes” and strategic use of AI tools and agents align with the pillar “resources at hand”. These theoretical foundations are independent but interdependent among each other and in cases of uncertainty and constraints, they might result in “brilliant unforeseen results” (Baker & Nelson, 2005).

A crucial finding was the gradual adoption and usage of AI tools which have been considered a partial substitution for human resource and cognitive load. Prior studies on bricolage have examined bricolage by repurposing physical objects, skills, or networks (Baker & Nelson, 2005; Mateus & Sarkar, 2024). However, the current study shows how AI can be a value multiplier whose scope goes beyond text and image generation, and can be flexibly used for versatile, routine and mundane tasks across different PM stages.

The use of AI can be clearly aligned with the “resources at hand” and “recombination of resources for new purposes” pillar of bricolage and extends the existing literature to incorporate digital and on-demand resource AI could provide at a marginal cost. The findings suggest that for a resource-constrained and uncertain nature of the startup, AI could accelerate value delivery, maximize existing resources and improve customer engagement. A systematic literature review extends the significance of AI in PM and concludes that AI improves PM by easing integration of multiple data sources, enhancing collaboration and enabling strategic decision-making (Prasetyo et al., 2025).

Similarly, multi-tasking and role overlap has been a key mechanism to enact bricolage practices. While such practice results in context switching and is generally considered a bad practice, it is unavoidable in startup and in some cases it increases productivity (Abad et al., 2018). However, the findings suggest that with the limited resources in startup, role-overlap and as a result multi-tasking is much more evident than an established organization. However, with the strategic and optimal use of AI tools, the productivity loss due to context switching can be reduced to some extent. In this perspective, role overlap and multi-tasking can also be categorized as practices that validate bricolage's "making do" pillar. While validation and verification are required from a human counterpart, such practices provide insights into validation for the principles of bricolage.

Finally, the team's normalization of informalities in various stages of PM reflects the mindset that embraces uncertainty and strives for creative and unconventional ways to handle resource constraints. It strongly resonates with the entrepreneurial nature of startups, where experimentation and iteration are valued over following a formal methodology (Blank & Dorf, 2012; Ries, 2011). However, the current literature presents limited research into effective integration of bricolage in the resource constrained context of a software startup. Therefore, the inductive nature of the study provides some evidence on framing bricolage as a way of attributing constraints and uncertainties as opportunities rather than challenges or limitations.

While opportunities and advantages of having a bricoleur's mindset has been presented in the findings, the results also provide insights into the shortcomings and trade-offs of adopting such practices. Baker & Nelson (2005) explicitly mentioned the threats of bricolage on scalability and over reliance on such approaches. In this perspective, the findings reveal that over reliance on such approaches might result in technical debt, burnout and product instability in the long run. Consequently, the enactment of bricolage in startups depends on a pragmatic equilibrium by balancing the dynamic nature of bricolage with standard frameworks through strategic and balanced leadership.

In summary, software startups enact bricolage as a pragmatic and strategic survival mechanism, maximizing and creatively using available resources. The 3 operational pillars of bricolage are evident across data sources which provide empirical evidence on the enactment of bricolage. Moreover, the uncertainty and resource constraint serve as a catalyst for adequately handling available resources and maximizing value delivery. Moreover, the enactment of bricolage is highly realized by practices such as pragmatic tools selection, informalities in decision making, strategic deferring of features and tasks, adoption of AI tools for resource substitution, multi-tasking and role overlap. Figure 2 below presents the overall enactment of bricolage practices in the context of a software startup which is built upon the key pillars of bricolage.

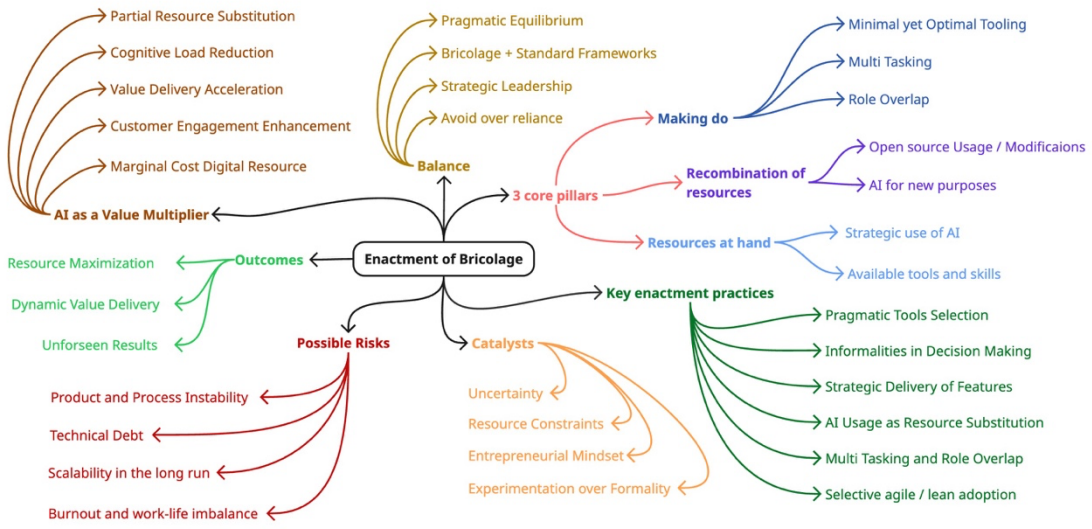

Figure 3. Enactment of Bricolage (Extending on Baker & Nelson, 2005)

RQ2. How do bricolage practices interact with agile and lean project management approaches in resource-constrained startup contexts?

The findings reflect that the standard approaches which are applied on a partial or selective level is most clearly answered by the bricolage-enabled PM. Rather than existing in opposition, bricolage often accelerated the adoption of agile and lean practices.

Prior research has consistently presented that startups prioritize speed over quality in their project management approaches (Pantiuchina et al., 2017; Sahtiya et al., 2021). However, with the bricolage mindset, the team could utilize AI as a partial replacement for human skills to enable a robust TDD environment. Similarly, with the access to AI at a minimal cost, the quality of the product can be escalated with various strategies like automated testing suites, user's behavior-driven testing and integration testing. In this perspective, bricolage can be the enabler of quality-based practices of agile that would otherwise have made them difficult to achieve. Similarly, brainstorming with the large knowledge base of AI platforms could provide data-driven direction for the uncertain and evolving requirements of the user. This enhances the effectiveness of a working software over comprehensive documentation mentioned in the Agile Manifesto by enabling rapid prototype development and validation.

Similarly, bricolage tends to normalize role overlap and multi-tasking as a maximization strategy. The absence of a definite product owner or a scrum master could be compensated by the multiple roles of the founder, retrospectives and formal meetings could be substituted by informal collaborations, and human skills could be complemented by pair programming with the AI agent. Lack of monitoring and control in such approaches might lead to technical debt and context switching which might have a long-term effect on the scalability and stability of the product. However, in the initial phases where resources are scarce and requirements are uncertain, such approaches might result in minimization of waste, maximization of customer value and optimal use of available resources which aligns with the principles of lean management (Womack & Jones, 1996).

Therefore, the relationship between agile/lean practices and bricolage is evident in the findings across all data sources. While agile / lean approaches provide the basic scaffolding and foundations for the PM practices to be operational, bricolage serves at the micro level which normalizes and enables selective, situational and strategic application. The unification of two approaches allows team to accelerate agility and enables creative and

unconventional combination of limited resources to maximize their effort and value delivery.

Table 6. Examples of Bricolage & Agile/Lean Interaction

Dimension	**Agile/Lean Practices**	**Bricolage Interaction**
Quality	TDD and Automated Testing	Using AI to integrate tests and partially complement human skills *Result: Increase in product quality at minimal cost*
Value Delivery	Working Software over Comprehensive Documentation	Using AI for brainstorming, rapid prototyping, user story mapping & data driven direction *Result: Faster validation of uncertain requirements and faster delivery of product*
Team Structure	Self-organizing team and role clarity	Role overlap, multi-tasking and handling multiple responsibilities *Result: Maximization of human resources and informal collaborations*
Development	Continuous Integration and Pair Programming	AI-Human Pair Programming *Result: Accelerated development speed and enhanced efficiency*
Lean Efficiency	Waste Minimization	Creative and unconventional use of existing resources *Result: Minimal yet optimal mobilization of resources through open-source and existing artifacts*

5.2 Theoretical and Practical Implications

The primary theoretical implication of this study is to extend the principles of bricolage into the domain of PM, especially in the context of resource constraints and uncertainty. In this perspective, the study contributes to the literature by providing an alternative approach to categorize and frame agility and informal practices in APM and lean literature by positioning such approaches through the lens of bricolage. The study also provides nascent insights into the application and extension of the bricolage foundation by incorporating the development and usage of generative and agentic AI technologies.

Similarly, the study challenges prior literature by framing uncertainties and resource constraints as opportunities to creatively explore resource optimization and combinations. By reinterpreting selective, partial, ad-hoc and resource acquisition approaches in PM, the study provides a positive vocabulary that acknowledges the functionalities of these practices under constraints.

For practitioners who can be early-stage founders, entrepreneurs, project managers or project team members, the key take way is the mindset shift towards resourcefulness from resource acquisition. The ability to pragmatically and strategically optimize, combine and reuse existing resources is a core skill the bricoleur must exhibit. The leadership should be the driver of these practices where constraints should be manifested as opportunities rather than barriers or limitations. The team should also be reflective whether bricolage is maximizing resources and customer value or increasing burnout and instability.

5.3 Limitations

While the primary strengths of this study are the participant observation and semi-structured interviews which enabled qualitative and authentic insights into the topic of study, there are several key limitations to this study. Firstly, the case organization is an early-

stage startup with no more than 4 members, with only 2 semi-structured interview participants. While the limited human resource is a key characteristic of startup (Giardino et al., 2014), the single organization case study and limited sample for the interview reduces the generalizability of the thematic findings (Priya, 2021). Similarly, the startup operates on a fully remote context and is in the early stage of product development where the customers are extremely limited. This restricts the findings to be resonated with startups at different stages and operating under different operational context as opposed to the case organization.

Secondly, the dual nature of the researcher as both participant and employee in the case organization could contribute towards the possible biasness towards the findings of the study. While the researcher has applied several theoretical strategies to remain neutral towards data collection and analysis, they are difficult to verify the complete removal of biasness (Braun & Clarke, 2006). Similarly, the data collection, refinement, coding, verification and theme generation are independently done by the researcher, without verification by a second analyst, which might increase confirmation bias and reduce credibility towards the findings.

Thirdly, the subjective anonymous survey of 19 participants is treated as a supplementary data source to provide a minimal validation to the primary data source. However, the sample size constraints the generalizability of the findings and limits the robust triangulation of the main data source. Similarly, the subjective nature of the survey increases the biasness towards analysis of the response which has been independently done by the researcher.

Finally, the cross-sectional nature of the study has attributed the findings to be drawn from a definite period and a particular stage of the case organization. Longitudinal research and study at different stages of the startup is needed to have a holistic understanding of the findings.

5.4 Future Research Direction

The study unfolds multiple research directions to be attributed in future research. Firstly, the question on scalability and long-term consequences of bricolage as attributed by the interview participants and prior literature require longitudinal research that follows startups through different phases and circumstances. Future research should investigate the dynamics of bricolage in PM in startups through longitudinal study analyzing how bricolage practices are enacted, modified, abandoned or scaled through different phases.

Secondly, bricolage is underexplored and in its nascent stages in PM literature. Future research should sufficiently explore bricolage as an adaptive perspective and approach in PM. Similarly, the adoption and usage of generative and agentic AI tools enable resource creation which have not been categorized as a resource type in prior bricolage literatures. Future research should possibly extend the bricolage literature, encompassing AI tools as a resource multiplier.

Finally, future research should encompass contextual diversity by employing multiple case-study design incorporating startups across various stages and diverse operational settings, cultural diversity and views towards bricolage and informal practices. Similarly, a quantitative approach measuring performance and outcome of bricolage practices is needed to underscore the credibility and authenticity to the overall domain of bricolage in PM.

6 Conclusion

The study intended to explore the enactment and integration of bricolage into PM practices of a software startup operating under uncertainty and resource constraints, and how such practices align with the standard agile/lean principles. Consequently, applying an interpretivist and inductive approach with a single organization case study as the primary source of data collection, the study provides pragmatic insights into the possibilities and application of bricolage-enabled practices and mindset. The findings reveal that bricolage might be theoretically unknown, but evident in software startups in early stages through optimal use and organization of resources in their daily project activities. Rather than considering these approaches as deviations from the standard methodologies, the findings consolidate that they could accelerate product development and enable creative reuse of scarce resources at least in the early stages of product development.

Moreover, the study aims to extend the literature of bricolage into the context of PM, enabling informalities and ad-hoc practices to be justified by the core foundations of bricolage. For practitioners, the key implication is the mindset shift that constraints and uncertainties should be considered as a catalyst to look for unconventional and better ways to manage the available resources. The shift from resource acquisition to resourcefulness unfolds patterns for optimal utilization of limited resources. However, the findings also indicate that over-reliance on such approaches might not be scalable and could result in technical debt, burnout and instability in product and processes. As a result, the study provides a novel direction for future researchers to verify and validate the findings over a longitudinal time frame with diverse software startups and varying contextual and operational differences.

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Appendices

Appendix 1. Semi-structured Interview Guide

The semi-structured interview was guided by the following core questions, allowing the participant to elaborate on their experiences and following back with additional follow back questions.

1. Can you briefly describe your role and involvement in the projects?
2. What kind of resource constraints do you commonly encounter in project management?
3. When requirements are uncertain and resources are insufficient, how do you proceed with the project?
4. Could you provide examples of instances where you handled resource constraints and what approaches you applied?
5. How often do project goals or requirements change during execution?
6. How do such changes affect project management practices?
7. What is the approach for project management in your organization and what are your personal views on how you manage such projects?
8. How do you usually solve unexpected barriers in project execution?
9. To what extent do informal project practices support or hinder project execution?
10. Looking back, which approaches have worked and which approaches have caused an overhead?
11. Do you think such approaches are scalable?
12. Is there anything you would like to add regarding project management practices under uncertainty and resource limitations?