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Utilization of Artificial Intelligence in Early-Stage Startups

How early-stage startups are utilizing AI tools in their business operations, and what factors act as challenges and barriers to AI adoption?

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ABSTRACT:
Over the recent years, Artificial intelligence (AI) technologies have grown in a fast pace making advanced tools and software not only to the large firms but also to the small startups. AI has great potential to help startup journey by enabling the new techniques and ideas of innovation, improving efficiency and saving time. Even though there is increasing interest in AI, relatively less research has been done regarding how small startups adopt and use AI in their everyday business practices. This study helps to understand how founders of a small startup perceive and utilize AI tools and what benefits and challenges they face when adopting AI in their business operations.

This study is based on the Technology Acceptance Model (TAM) that describes the adoption of technology adoption through two main concepts of perceived usefulness and perceived ease of use. This study is a qualitative study based on semi-structured interviews with founders and co-founders of five startups. The interviews are emphasized on how startup founders use AI tools in daily business operations. The benefits they get and the challenges they have faced while adopting these technologies. The interviews were analysed using thematic analysis to identify key patterns in the cases.

The results indicate that startups engage in artificial intelligence in order to streamline their operations, make better decisions, and facilitate the process of innovation. AI tools help entrepreneurs to automate their routine processes, process a large amount of data, and get insights that will assist in product development and strategic planning. Simultaneously, the research indicates that founders of a startup actively experiment with the use of AI technologies in order to comprehend their potential and implement it in the everyday operations of the business. AI helps startup change with market conditions, refine their products and enhance their competitiveness in dynamic entrepreneurial environments through the process of iterative learning and data-driven experimentation.

KEYWORDS: Artificial Intelligence, Startup, Technology Acceptance Model, AI Adoption, Innovation

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1 Introduction

1.1 Background of the Study

Artificial Intelligence (AI) has gained a lot of popularity in recent years. Human lifestyles and productivity have shifted to a digital form due to the widespread use of digital tools, including computers, electronic devices and smartphones, and the contemporary modern age has become predominantly digital (Chen et al., 2022). The first foremost indication of AI was the launch of ChatGPT in 2022 which made conversational AI accessible to everyday users. Since then, updated models have kept improving and competition in the AI sector has increased. Artificial intelligence (AI) has emerged as a new and potential tool, generating significant interest for establishing new startup in business market as well. There is a keen interest in new AI solutions that enhance companies' efficiency and innovation (Haefner et al., 2021, p. 1). New AI tools are constantly entering the market, and AI features are being added to existing software (McKinsey & Company, 2023). Companies are eager to explore these new solutions but are also aware that AI integration requires preparation and planning to maximize the benefits and potential of AI (McKinsey & Company, 2023; Poland et al., 2024, p. 10).

There has been a projection that about 70% of the startups around the world are planning to adopt AI tools and technologies by the end of year 2030 (Bughin et al., 2018). AI-based systems like predictive analytics, chatbots recommendation engines, and customer relationship management (CRM) automatized are being deployed to make processes efficient, motivate customers, and discover new growth avenues (Chatterjee et al., 2021). The combination of AI and numerous other complementary technologies has revolutionized the way business is conducted, allowing a chance for startups with limited resources excel. The development of AI open the way to startup getting a competitive advantage by leveraging the big data offered by already established players in this area because it will help startups offer the personalized services based on the unique needs of a consumer (Kumar et al., 2019). AI has transformed the historic model of rule based expert system to deep learning and data centric model (Mullainathan and

Spiess, 2017). One of the most well-known disruptive technologies that are transforming the business is Artificial Intelligence that has the intellectual ability to analyze the outside data accurately, learn on the data, and use the insights of the data to collect the precise objectives and goals using an adaptable method (Kaplan and Haenlein, 2019). The World Economic Forum (2021) argues that the world is turning into a place of technological progress, and artificial intelligence is one of the pillars of such transformation.

Moreover, the major business benefits of AI compared to human intellect are that it has high scalability, which results in considerable cost reduction, is consistent, and has programs based on rules, which eliminates errors. The positive aspects of its long life, constant advancement, and the capacity to record procedures can be converted into a gratifying business experience (Palanivelu & Vasanthi, 2020). One of the recent study in the field of travel and tourism industry (TTI), AI is considered one of the most revolutionary and innovative technologies, capable of reshaping the industry through digital transformation, altering structures, practices, and value creation (Filieri et al., 2021).

There is also a growing use of AI technologies in startups in order to advance decision-making and optimize business processes. With the help of real-world data analysis, AI helps young companies to recognize the factors that affect growth prospects and investor attraction. The insights, trends prediction, and still improving strategic approaches can be extracted with the help of AI tools. Since startup operate in conditions of high uncertainty, scarce resources and quick change, where initial activities related to planning, experimental and decision-making are vital in market entry (Alvarez & Barney, 2007), AI can influence the way these activities are conducted through quicker analysis, assisting in experimentation and making early strategic decisions. Even Studies of Finnish startup indicate that artificial intelligence is becoming more actively used in the context of circular economy business models, where it can be used to make data-driven innovations in the form of predictive analytics, sustainable product design, and resource optimization, but obstacles such as costs and skills are still formidable (Ghoreishi et al.,

2025, pp. 48–57). Donaldson et al. (2025) demonstrate that startup have the potential to reach high levels of innovation performance by combining the use of generative AI with such factors as industry dynamism, external search, and absorptive capacity, often filling in resource shortages (p. 23).

According to recent studies, the use of AI has been made much more accessible to startup and small companies because cloud-based solutions, ready-made models, and generative AI tools have considerably lowered the financial and technical barriers to entry (Babina et al., 2024; Donaldson et al., 2025). AI in these settings does not appear as a tool of efficiency enhancement but as a shaping component of business model design, workflows and relationships with customers. There is empirical evidence that AI benefits startup in that they can offset the lack of resources through better decision-making, repetitive tasks automation, and faster learning (Babina et al., 2024). Although the available literature shows that the use of AI is gaining momentum, the researchers have minimal information on how founders use AI tools in practice in their businesses and the impact of AI tools on the decision-making process of business development. Such experiential and behavioral aspects are best captured using qualitative methods, as they are hard to observe using quantitative data collected in large amounts alone (Creswell, 2007; Kallio et al., 2016). This study is thus a reaction to the need to obtain a context-driven insight into the use of AI in startup at the critical initial stage of technological and organizational establishment.

1.2 Research Gap and Problem

However, previous literature has been more interested in AI in large companies or technology-intensive industries, where implementation is facilitated by the presence of well-built infrastructures, experience, and formal processes (Davenport and Ronanki, 2018; Dwivedi et al., 2021). Despite the growing literature on AI there is little research on how a startup in its initial stages perceive AI tools and how they use such tools in their day to day business operations and teh practical challenges of their use. The unique characteristics of startup including extreme lack of resources, informality, and decision-

making by the founders, are still little studied. The real application of particular AI tools by startups, its results, and the subsequent benefits and drawbacks in resource-limited settings are not thoroughly studied empirically (Bergmann et al., 2026; Schwaeke et al., 2025). The recent systematic reviews confirm that the literature is fragmented and overfocused on conceptual models, technical aspects, or large-firm examples instead of real-world operational integration in new entrepreneurial environments. Schwaeke et al. (2025), in their analysis of 106 peer-reviewed articles on AI adoption in SMEs, highlight that studies rarely examine the synergistic interactions among technological, organizational, and environmental factors that shape adoption in smaller, agile ventures. Similarly, Bergmann et al. (2026) emphasize the fact that the majority of studies are still conceptual, with little known about how AI is applied in the practice of entrepreneurship, as at early-stage startups, generative AI-based tools are used to optimization of entrepreneurship processes (e.g., idea generation, marketing, and operations) and not to displace human agency. Ethical issues of AI-based startups are also reported (Ali et al., 2023), but the operational barriers, including the lack of skills, data quality concerns, financial limitations, and integration difficulties, are relatively unexplored in the context of the early stage. Some scholarly articles suggest that more research should be done into the initial stages of AI adoption in the field of entrepreneurship, with the necessity to study the patterns of actual use, attitudes of founders, implementation styles, and structural obstacles of new businesses. Bergmann et al. (2026) observe that there is an urgent need to conduct empirical research to learn the impact of GenAI tools on the efficiency of the entrepreneur process. Schwaeke et al. (2025) also insist on the customized strategies that consider the interdependent factors to ensure that small businesses do not become less competitive because of slow, or ineffective, adoption of AI. Following these calls and drawing on previous findings about the differences between larger firms and startups in their constraints to AI application (Ellefsen et al., 2019) - this study will explore how startups in their initial stages are currently applying AI tools in their business activities, which factors are posing challenges and barriers to the implementation of AI.

The purpose of this study is to exploit the untapped research opportunity of Startup by providing an answer to the following research question:

How early-stage startups are utilizing AI tools in their Business operations? And what factors act as challenges and barriers to AI Adoption?

In this time when AI is a topical issue around the world, this research helps to understand current stage of implementation of AI in startup. The study seeks to find out what kind of AI operations startup have used in their business processes, how startup founders understand and embrace these technologies, and what productivity and efficiency such technologies promote. This study explores the nature of the AI tools and technologies being rolled out in startup and the current adoption level and obstacles and challenges related to adopting them. The research uses modern analytical models to determine the level of AI adoption in the new businesses. It is hoped that the findings will offer much information to future entrepreneurs by noting not only the opportunities but also the limitations of AI adoption in the process of recognizing and adopting relevant AI tools and technologies.

1.3 Thesis Structure

This thesis is divided into five chapters: Introduction, Literature review, Methodology of the study, Findings and Discussions. Chapter 1 introduces the study by outlining the motivation, identifying the research gap, and defining the main research questions. It also highlights the theoretical contributions of the study and provides context for the rest of the thesis.

Chapter 2 presents the literature review, that covers core concepts such as Overview of startup, Development style, artificial intelligence, AI and Business development, and AI adoption in startup. This chapter synthesizes prior research to frame the study's theoretical background and build up in formulating a conceptual framework that guides the research design and analysis.

In chapter three, the methodology of the study is explained. This research features the Qualitative approach with semi-structured interviews as the data collection method. The Qualitative method is explained as well as why it was chosen for this research. The data Collection method will also be introduced and after that, the method with which the data was analysed. Lastly in the chapter the research quality will be evaluated.

After the methodology, the findings of the study are presented in chapter four. In this chapter the extractions from the interviews will be introduced and explained. It identifies and explains key themes that emerged from the interviews, including how AI is currently used in startup. The results will be briefly discussed which is followed by the actual word-for-word answers from the interviews. The summary of the key findings and the revised framework will offers recommendations for future research, discusses the limitation of the current research and evaluates the achievement of research purpose.

Finally, the last fifth chapter is the discussion of findings followed by sections on Theoretical contributions managerial implications, limitations, and suggestions for future research. This chapter will introduce the contributions to the theory and practice. And Lastly the list of references and appendices, which feature the line of questioning used in interviews will also be presented in the end.

2 Literature Review

2.1 Overview of startup

In recent years, startup have emerged as a significant area of academic interest as there is rise of high-profile success stories and its growing impact on innovation. Startup have played a pivotal role in global economic development as well (Gedeon, 2017). Startup can be seen as a step-by-step process where the process starts with the ideation and recognition of the opportunity, then progresses to product development and finally transitioned into long-term sustainable operations. During the pre-startup stage, the founders aim at the development and testing of ideas, creation of a prototype, and the use of personal or informal resources (Nguyen-Duc, Kemell, and Abrahamsson, 2021, p. 9). The initial launch phase is usually associated with developing a minimum viable product (MVP), market validation, and the search of initial investment to facilitate the product development (Nguyen-Duc et al., 2021, p. 11).

2.1.1 Definition and Characteristics in Startup

Generally, Startup can be defined as newly established companies that aim to develop innovative products, services, or business models under conditions of high uncertainty and with a focus on rapid growth (Ries, 2011; Blank, 2013). Paternoster et al. (2014) note the variability in definitions, emphasizing that startups are typically young ventures designed to address unmet needs through novel approaches, often in high-velocity environments. This aligns with Zahra et al. (2006), who describe startups as entities that must continuously identify and exploit opportunities to build viable business models, underscoring their entrepreneurial core.

Startup have also been defined by their short existence and facing limited resources in an empirical setting, as well as their requirement to focus on innovation and agility (Freeman & Engel, 2007). As an example, Blank (2007) describes startup companies as organizations looking to find repeatable and scalable business models, this is in contrast

to mature companies whose processes are well developed. This view is also reflected in the technology-motivated start- up research where the focus is not on immediate profitability, but on developing exponential growth (Marmer et al., 2011). Altogether, the literature agrees on startups as a novel and development-oriented organization in uncertain conditions, whereas the actual definition also depends on other contextual factors, including industry and funding cycle (Shane & Venkataraman, 2000; Alvarez & Barney, 2013).

Startup typically adopt flexible structures and rapid experimentation to validate ideas, relying on customer feedback and quick pivots (Ries, 2011). In contrast to mature companies, startup do not have many resources to work with, and yet, their scaling possibilities are high (Blank, 2013; Ries, 2011). Startup demand an outstanding combination of various competences to attain fast growth (Zahra, Sapienza, & Davidsson, 2006). Among others, they have to be capable of continual learning and identifying new openings and transforming them into operational and commercially viable business models and execute those (Shane & Venkataraman, 2000).

In the context of emerging technologies such as artificial intelligence (AI), startups play a catalytic role by testing unproven ideas and creating entirely new markets. According to Tiwari et al. (2023), startup are usually constrained in terms of resources yet adaptive flexibility in terms of crisis situations, i.e., during the COVID-19 pandemic, when organizational flexibility became a primary determinant of crisis resilience (p. 13). Startup, as demonstrated by Szalavetz (2019), can serve as intermediaries of innovation within larger economic systems, allowing the process of digital transformation even in the less advanced ones regarding technological advances (p. 43).

The other important aspect of the startup environment is uncertainty. One of the main characteristics of a startup is that it is usually located in the emergent or non-defined market, the needs of customers, competitors, and ways of revenue modeling are not yet clear (Brown & Rocha, 2020). This indecisiveness goes on to the regulation variable,

technical performance, and market entry timing (Kuckertz et al., 2020). According to Zhang et al. (2022), startup were not spared of the volatility experienced during the COVID-19 pandemic, although these companies adapted rapidly on the basis of their agile structures, with startup trying digital sales channels and remote operations as well as virtual engagement of their customers (p. 19). Adaptability under pressure is thus not only a strategic advantage but it is a survival need in uncertain environments.

2.1.2 Business development Style in startup.

Most startups overcome these characteristics to control them and minimize risks by following systematic development practices, which focus on learning, iteration, and feedback. Eric Ries (2011) has created a framework that has become one of the most powerful tools of innovation in early stages, called Lean Startup. Ries developed five principles, which include: entrepreneurship is everywhere; entrepreneurship is a management skill; startup need to do validated learning; the fundamental process is build-measure-learn; and innovation needs metrics, which is innovation accounting (Ries, 2011, pp. 20-24). As a practical implementation, Lean principles have been applied by startups to create minimum viable products (MVPs), test them on real users as quickly as possible, and iterate and improve on evidence instead of assumptions. Such experimentation enables teams to evolve fast, prevent overbuilding and also keep pace with the real customer requirements (Ries, 2011, p. 75).

In addition to Lean, Agile development methods are commonly used to organize startup. Agile is a focus on iterative cycles, cross-functional cooperation, and the presence of constant responsiveness to feedback. Agile also offers synchronization of teams on a daily basis through rituals such as stand-up meetings, sprint reviews, which helps in creating alignment even on small remote teams with limited resources. In the case of startup where the speed of innovation is high, Agile is not only a software development method but also a more general organizational philosophy, which allows them to be responsive and resilient.

The other development strategy that can replace Lean and Agile is Design Thinking, which is a process that focuses on empathy, user observation, and ideation. The graphical and physical aspect of Design Thinking tools including empathy maps, journey mapping, and rapid prototyping also allow startup teams to have a better understanding of the customer journey, which improves the value proposal.

Practically, startup tend to combine the components of Lean, Agile, and Design Thinking based on their industry, stage of growth, and skills of the team. Tiwari et al. (2023) demonstrate that startup that adopted the hybrid development approaches were more resilient throughout the COVID-19 crisis because they could quickly digitalize their operations and adjust their offerings to the new consumer realities and streamline internal processes (p. 417). These companies did not strictly adhere to one particular model but instead cherry-picked principles of multiple approaches, allowing them to remain afloat and relevant in the past conditions that have never been experienced before.

2.2 Artificial Intelligence

Artificial Intelligence (AI) refer to a broad spectrum of technologies that have multiple benefits to organizations in regards to value added business benefits. In the last couple of years, there is a trend by organizations that are increasingly looking to AI so as to create business value after a downpour of data and a robust rise in computational power (Enholm et al., 2022, p. 1). The role of Artificial Intelligence (AI) in value creation in novel business practices is becoming more prominent (Hasan & Ojala, 2024). Kaplan and Haenlein (2019, p. 17) argued AI as the capability of a system to understand external information properly, learn by the means of the information, and apply the learnings to particular objectives and tasks via adaptive means. AI is a set of algorithms, programs, systems, and machines that attempt to mimic human intelligence, and is possibly the most promising emerging technology in the world (Huang & Rust, 2018; Shankar, 2018). It is based on more than one major technologies including machine learning (ML), natural language processing (NLP), deep learning, and neural networks, to mention few,

and it enables programs and machines to learn, sense, and act through human-machine interaction (HMI), and ML is often confused with Al, but the difference between them is that Al stands for machines and softwares that perform human intelligence, when ML stands for computer programs able to learn and adapt without detailed human instructions (Ma & Sun, 2020).

Glikson and Woolley (2020) have divided Al, depending on its form, into three types robotic, virtual, and embedded Al. Al-powered robots can carry out a great variety of various tasks, and can possess human characteristics, including the fact that the serving robots in restaurants or health care are sometimes made somewhat humanlike. Robots may be on site as in the prior example or may be elsewhere, say in a factory. It has been observed that personal confidence in robotic Al applications tends to be low initially but the more direct the interaction is with the robot the more confidence increases over time.

As technologies continue to evolve, virtual artificial intelligence (AI) has emerged as an increasingly prominent and widely adopted innovation in recent years as well. is a computer program, in which Al exists in cyberspace but does not have a physical body (Glikson and Woolley, 2020). Examples of virtual AI include advanced conversational agents such as Google’s Gemini, OpenAI’s ChatGPT, Apple's Siri or Google's Alexa. These virtual Al solutions are commonly stored in electronic de-vices, including computers and phones, and may contain some physical attributes in digital space, such as avatar or body, and are also capable of text or speech. The trust towards virtual Al solutions is often high in the beginning but tend to weaken with the number of interactions made with them. Lastly, embedded Al is embedded in apps like maps or search engines and is usually undisclosed to the end user of the application (Glikson & Woolley, 2020). The credibility of embedded Al depends on the reliability and transparency of the system, the tasks it is engaged in because people tend to be more positive about Al to do calculations rather than social duties, and the degree of expertise the application possesses.

2.2.1 AI and Business Development

And in order to leverage businesses, Artificial Intelligence (AI) is fast taking a more prominent place in the daily digital sphere and advertising and marketing is no different. Nowadays, artificial intelligence is being employed by many companies in such areas as personalized products recommendations (collaborative filtering algorithms) and detection of frauds (using anomaly detection systems). Contemporary online retail companies are actively implementing the AI-enhanced recommendation engines with hybrid recommendation strategies (collaborative filtering + content-based) that attain 50.91 percent precision in individually tailored recommendation (Stoica & Pelican, 2025). Artificial Intelligence (AI) is increasingly becoming a core driver of business development by enhancing efficiency, enabling more informed decision-making, and fostering innovation in products, services, and business models. AI is transforming business development by automating processes, analyzing customer data, and identifying new market opportunities. Companies leveraging AI can make faster, data-driven decisions, enhancing growth and competitive advantage (Machucho & Ortiz, 2025, p. 8-13). As an example, AI becomes faster in the development of new products: in industries where intellectual property or the discovery of a substance is vital, artificial intelligence can potentially increase the speed of innovation by a factor of two and more, and even more modest, yet significant, increases (20-80) in complex manufacturing industries (McKinsey & Company, 2025). The companies that have embraced AI often claim to have increased forecasting accuracy, enhanced customer service through personalization, and reduced costs due to automation of repetitive tasks. Nevertheless, the effectiveness of its implementation is contingent on managerial and technical AI capabilities, organizational culture, data privacy, and alignment of the AI projects with strategic objectives (Babina et al., 2024).

Furthermore, Artificial intelligence has quickly become a fundamental engine of business growth, transforming the way companies discover growth opportunities, diversify revenue bases, form strategic alliances, improve customer relationships, and create sustainable competitive advantages (Yu, 2025; Machucho, 2025). AI enhances the

strategic decision-making process by handling large amounts of data in real time, accurately modeling scenarios, predicting the market, and improving resource optimization (Okafor, 2025; Kumar, 2025). The systematic literature reviews emphasize the development of AI as a simple operational instrument to a strategic resource enhancing the innovation processes and the performance of the organization in general (Cao, 2024; Diyin, 2025). According to global surveys, organizations that actively employ AI often report tangible improvements in their innovation, especially in the marketing and sales functions, strategy, finance, and product or service development functions (McKinsey, 2025). These effects have been greatly hastened by generative AI. Empirical data indicates that generative models provide significant productivity benefits in terms of automating tasks, adding skills, and transforming operations and inner gains tend to be between 14 and more than 40 percent in the realms of writing, coding, and content generation (Calvino et al., 2025). Teams of humans and AI have always achieved higher quality, novelty and speed than their individual teams. Generative AI in innovation and entrepreneurship reduces entry barriers by enhancing quick idea generation, prototyping, business model optimization, and customer acquisition plans (Li, 2025; Kusetogullari et al., 2025). These tools are particularly useful with less-experienced users on clear tasks, but they also need domain knowledge and supervision to handle risks such as bias or output constraints (Calvino et al., 2025).

There is a significant difference between the adoption of AI by firms and by industry. The larger businesses are more likely to incorporate the technology further and are more likely to scale, whereas the small and medium-sized businesses (SMEs) continue to experience significant obstacles in terms of skills gaps, data access, and costs, along with infrastructure, despite the possibility of significant productivity and competitiveness improvements (OECD, 2025). These differences are recorded in recent studies and suggest adopter taxonomies that distinguish novices (who use off-the-shelf tools to perform peripheral tasks) and champions (who integrate the enterprise strategy) to inform specific support policies (OECD, 2025). Information and communication technology and professional services are sectors that are most adopted. This trend is

reflected in the 2025 global survey conducted by McKinsey, which states that although most organizations are still in piloting stages, those that have scaled to larger scales (typically big companies) have a more defined effect on their revenue and profitability (McKinsey, 2025).

2.3 AI Adoption in Startup

AI has a great benefit to startup because it allows them to be more innovative, scalable, and resource-attracting. According to Kipwise (n.d.), Many early-stage companies are adopting AI to automate routine tasks such as content generation, customer support, and data analysis, thereby freeing up resources for strategic initiatives. For instance, startup are leveraging AI-powered tools like Jasper for content creation and Intercom for customer engagement, facilitating streamlined operations without the need for extensive human resources. The presence of this massive adoption is demonstrated by the fact that AI application is widely used in many business functions, with 78 percent of businesses reporting AI integration in at least one of their business functions, compared to 72 percent of businesses in early 2024 (McKinsey & Company, 2025). Studies indicate that AI-based enterprises always attract more capital in the initial stage compared to non-AI businesses, as it becomes clear that investors believe in the disruptive potential of AI, and it could grow in the future (Gofman and Jin, 2024, p. 639). In addition to funding, AI also provides business owners with potent instruments to process big data, automate tasks, and enhance the work of startup in extremely competitive markets (Darwish et al., 2020, pp. 42-43). Additionally, AI helps startup to provide more personalized customer experiences, maximize the use of resources, and create new business models that would lead to improved market performance and sustainability (Darwish et al., 2020, pp. 42-43). When combined, these insights imply that AI is not only a technological benefit but a strategic facilitator that places startup on the frontline of economic and entrepreneurial change. The strategic use of AI is not restricted to operations; it is also instrumental in business expansion and innovation. Startup are also leveraging AI to understand their customers better, optimize their marketing efforts, and reach more people with the help of data-driven decisions. For example, Vibe.co, an

adtech startup, employs a generative AI creative studio (Vibe Studio) to produce video ads, aiming to increase the proportion of AI-generated content on its platform from its current level of more than 10**%** to over 30% by the end of 2026 (Vibe.co,2025).

2.3.1 Application Areas of AI

The use of artificial intelligence (AI) in startups extends across a variety of functional areas as evidence of the growing role of data-driven technologies in entrepreneurial life. Small-scale organizations have a high potential of implementing AI in all operational and strategic functions, unlike large organizations that tend to implement AI in specific units of the organization because of the lean structures and multi-skilled teams (Freeman and Engel, 2007; Nguyen-Duc et al., 2021). In the literature, there are a number of identified recurring areas of application. The figure presented below demonstrate the multiple functional areas of AI in startups :

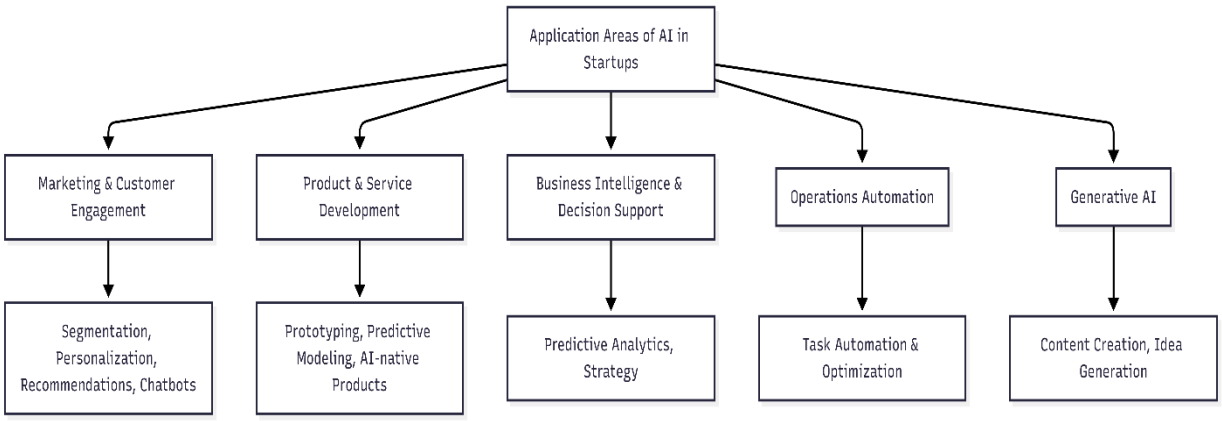

Figure 1 AI application areas across different functions in startups.

Marketing and customer engagement is one of the salient areas. Customer segmentation, personalization, recommendation systems, and predictive targeting are widely done using AI technologies (Kopalle et al., 2022; Ma and Sun, 2020). The AI-powered systems in service-driven businesses improve the customer experience by automating interaction, providing chat interfaces, and using data to personalize the experience

(Huang and Rust, 2018). Startups can use these applications to compete with bigger companies because they can provide custom experiences on a large scale.

Product and service development is also one area where AI is used especially in technology-based enterprises. Machine learning applications can be used to prototype, model the predictivity, and perform tests iteratively, allowing refinement faster and experimenting (Kraus et al., 2020). Artificial intelligence can become the foundation of the value proposition in AI-native startup, including decision-support systems, analytics systems, or personalization platforms (Garbuio and Lin, 2019). This is because such applications can help entrepreneurial firms to recognize the needs that are not met and come up with solutions that are in tandem with the changing market needs.

The other important area of application is business intelligence and decision support. AI systems analyze both structured and unstructured data to identify patterns that drive the strategies, identify opportunities, and distribute resources (Mullainathan and Spiess, 2017; Dwivedi et al., 2021). Predictive analytics and data forecasting tools help startup minimize information asymmetries and evidence-based decision-making in uncertain environments. The further utilization of AI is in the automation of operations and optimization of processes. Routine activities are simplified by automation tools, leading to better coordination of the working process and the precision of operations (Enholm et al., 2022; Dubey et al., 2020). These applications are especially applicable to resource-constrained ventures, which can achieve increased operational complexity without inappropriate proportional increases in labor input.

The new trends in generative AI have increased application in content creation, documentation writing, generation of ideas, and management of knowledge. Big language models and generative systems might complement the work of founders or employees by assisting in solving cognitive problems, which in turn increases the internal capacity (Donaldson et al., 2025; Dwivedi et al., 2021). All these tools are becoming part and parcel in the daily operations of entrepreneurial companies.

Overall It shows that the use of AI in startup is not restricted to one functional area only. Rather, AI use cases are in marketing, product development, analytics, operations, as well as strategy. This broad application highlights the increasing aspect of AI as an enabling technology in entrepreneurial ecosystems.

2.3.2 Benefits of AI adoption in Startup

Literature suggests that AI adoption has the potential to create both operations and strategic value to startup, especially since newer businesses tend to have a limited resource base to work with and the uncertainty levels tend to be high (Shane and Venkataraman, 2000; Freeman and Engel, 2007). Here, AI is often positioned as an enabler technology that reinforces internal implementation and promotes growth-oriented processes with the help of data-based intuition, automation, and learning (Dwivedi et al., 2021; Enholm et al., 2022).

2.3.2.1 Operational and Strategic Benefits

An ongoing body of research emphasizes the ability of AI to optimize operational performance by automating routine processes, enhancing the information processing process, and providing support to make decisions based on data (Dubey et al., 2020; Dwivedi et al., 2021). The aforementioned advantages are especially applicable to startup since lean teams need to execute several functions at the same time, and time savings and workflow optimization are core performance catalysts (Nguyen-Duc et al., 2021). Automation and analytics with AI can also help to allocate resources more efficiently and conduct operations more accurately by eliminating unnecessary work and guaranteeing more systematic decision-making (Enholm et al., 2022). Experience also indicates that the use of AI-related capabilities is linked to productivity and performance growth, in part due to the fact that AI can grow output without a matching growth in inputs (Babina et al., 2024).

The operational value can also be observed in the customer-facing situations where AI systems facilitate personalization, responsiveness and service automation. The marketing and service management literature has revealed that intelligent systems and data-driven personalization can enable AI to increase the quality of customer interaction and service delivery (Huang and Rust, 2018; Kopalle et al., 2022). Together, these studies suggest that AI is associated with operational discipline and execution capacity that is essential in startup that aim to scale without incurring unwarranted lean processes.

2.3.2.2 Innovation and Growth Benefits

In addition to efficiency, the literature is becoming more of an AI as an innovation and growth enabler. AI can enhance opportunity identification by discovering customer needs and competition tendencies trends using massive data analysis, therefore, aiding in quicker creation of products, services, and business models (Garbuio and Lin, 2019). This is especially significant in the case of entrepreneurship where startup frequently fight in terms of new solutions and quick iteration. Babina et al. (2024) maintain that AI may support innovation by increasing the ability of firms to discover, experiment, and implement new ideas, which will help to sustain learning through the cumulative process that leads to further growth.

Recent studies indicate that generative AI has the potential to enhance performance in terms of innovation in startup in case it becomes embedded in work routines and provided with complementary practices instead of being used as an independent tool (Donaldson et al., 2025). Generally speaking, AI may facilitate scalability, as it makes it possible to automatize complicated procedures and efficiently handle a large amount of data, which helps startup to grow operations without its margins rising too high (Brynjolfsson and McAfee, 2017). Practically, AI-based systems are capable of growth as individualized offerings at scale and enhanced product-market fit via predictive analytics (Chui et al., 2018; Kopalle et al., 2022). On the whole, the literature presents AI as the means of operational efficiency as well as the fact that it assists operational growth, learning, and

innovation within startup that can be scaled (Garbuio and Lin, 2019; Babina et al., 2024; Enholm et al., 2022).

2.3.3 Challenges and Barriers to AI Adoption

Although the opportunities of artificial intelligence are high, there are numerous challenges, which are interconnected and make the effective use and implementation of this method rather challenging among startup. Limited financial capacity has been mentioned as one of the most commonly cited challenges. Installing AI may involve spending on software subscriptions, infrastructure, data management, and qualified staff that may exert substantial strain on the already limited budgets of startup companies (Davenport and Ronanki, 2018). Although simple AI applications have become less expensive, the more sophisticated or specialized ones can remain expensive, especially when a subscription fee is charged monthly.

Besides financial limitation, startup usually have problems with the lack of access to quality data. To operate effectively, AI systems need large, structured, and reliable datasets, yet most of the startup do not have historical data, do not practice standardized data collection, or do not have enough of it to utilize AI capabilities to the maximum (Chui et al., 2018; Ellefsen et al., 2019). Consequently, AI applications can generate inaccurate or inconsistent results, which can decrease the confidence in such technologies and prevent their inclusion in the decision-making process.

The other major obstacle is skill gaps and limitations of human capital. The successful use of AI tools, even though they are becoming less complex, requires technical and analytical skills to be configured, interpreted, and integrated successfully. New small startup often do not have internal AI professionals and have to compete with large corporations in the attraction of qualified staff (Brynjolfsson and McAfee, 2017). As a result, founders use off-the-shelf solutions or external consultancies, thereby possibly limiting customization, strategic learning, and the creation of long-term AI capabilities (Donaldson et al., 2025; Lin & Maruping, 2025).

Absorptive capacity and organizational learning also determine the success of AI adoption in startup. Although generally light and lean, startup can become fast-mover-doers with no formal review and assessment, which can lead to perfunctory or haphazard application of AI tools. The fact that there are no clear procedures to interpret AI outputs and operationalize it into the workflow may affect how firms can turn AI-generated insights into actionable knowledge (Crossan et al., 1999; Sekliuckiene and Baltrunaite, 2020). This difficulty is especially visible when founders or employees are not confident about AI systems or do not even have a complete understanding of the way outputs are generated.

Ethical and regulatory issues are also a significant problem particularly to startup in customer-facing or data intensive sectors. Startup may also face reputational and legal threats in relation to the problem of data privacy, algorithm bias, and non-transparency (Floridi et al., 2018; Mittelstadt et al., 2016). In comparison with big organizations, startup are frequently poorly governed to handle these risks in a proper way, and therefore, it is specifically challenging to adhere to various regulations, including the General Data Protection Regulation (GDPR). These issues can make the founders pursue a conservative or trial-based approach to implementing AI, instead of integrating it on a wholesale basis.

Lastly, structural impediments to AI adoption are scalability and long-term alignment. The AI applications that work well in the small scale might be expensive, intricate, or ineffective with the startup and subsequent growth and expansion of operations (Davenport and Ronanki, 2018). Premature technological decisions can lead to vendor lock-in or lack of alignment with strategic requirements in the future, making it harder to be flexible and harder to switch. Startup are thus caught in the dilemma of whether to focus on efficiency in the short run or sustainability in the long run, so that the implementation of AI facilitates and not limits future development and innovation (Babina et al., 2024).

2.4 Theoretical Framework

The theoretical framework used in this study is the Technology Acceptance Model (TAM). TAM which was initially introduced by Davis (1989) describes the adoption of technology in terms of two key constructs which are perceived usefulness (PU) and perceived ease of use (PEOU). Perceived usefulness is a measure of how much people feel that the application of a certain technology improves performance at the job and perceived ease of use is a measure of how much individuals feel that the technology is easy to use (Davis, 1989). Such perceptions define the attitude towards technology and shape the process of adoption. The validity of TAM can be supported by its subsequent validation and extensive research which validates the strength of the TAM in both organizational and technological settings (Venkatesh and Davis, 2000).

TAM application is especially applicable when introducing artificial intelligence (AI) in startup. Early stage ventures are undertaken in the environment of uncertainty, scarcity of resources, and expedited decision processes. Technologies in such settings are normally adapted when they prove to have a definite performance-enhancing nature. It is indicated by the studies in the high-quality management and marketing journals that the AI capability has the potential to enhance the process of decision-making, increase the level of operational performance, and lead to new innovations (Huang and Rust, 2018; Kopalle et al., 2022; Babina et al., 2024). These results can be directly connected with the perceived usefulness dimension of TAM since the gains in performance and value creation are the key factors in driving adoption.

Meanwhile, AI value can be realized only based on the feasibility of implementation. The adoption might be limited by the learning effort, complexity of integration, reliability issues and organizational preparedness even when performance potential is high. In studies of technology adoption, it has been noted that perceived effort and system usability have a strong impact on continued use (Davis, 1989; Venkatesh and Davis, 2000).

In AI situations, the performance impact of AI capability can be mediated by implementation complexity and data related limitation (Enholm et al., 2022). These variables are related to the perceived ease of use construct of TAM.

TAM is not expanded in other theories in this study. Rather, the two constructs that are the foundation of the research are perceived usefulness and perceived ease of use, which act as the analytical perspective of the empirical research. Perceived usefulness organizes the analysis of the areas of application of AI and perceived benefits are experienced in startup, whereas perceived ease of use organizes the analysis of challenges and barriers affecting the adoption and further use of AI. In this context of the study the use of AI is not limited to expands productivity and help in business operations but also by how accessible and adjustable these tools are for founders in accordance with the expertise they have. Hence, TAM offers an appropriate theoretical framework to evaluate how startup founders evaluate, accept, and use AI technologies as well as to explore the advantages and challenges in their entrepreneurial settings. This theoretical foundation offers a consistent and theory-based point of view of explaining the empirical results.

TAM Construct	**Role of AI in business**	**Benefits(Perceived Usefulness)**	**Challenges and Barriers(Perceived Ease of Use)**
Perceived Usefulness	**Strategic Service Tool:** AI as the service delivery/marketing tool of augmented planning g (Huang & Rust, 2018) **Opportunity Recognition:** Predictive analytics of determining market needs that have been unmet((Garbuio & Lin, 2019)	**Scaling the Business:** Helps to grow company's output without needing to hire a large number of new employees (Brynjolfsson et al., 2021). **Competitive Parity:** Allowing small companies to be able to compete with large companies by automating processes	**Lack of trust:** Resistance to AI Adoption due to complexities and hallucinated results(Dwivedi et al., 2021 **Legal/Ethical Risks:** Difficulties with data privacy rules (like GDPR) and Ethical Responsibility (Floridi et al., 2018)
Perceived Ease of Use	**Agile Implementation:** Using ready-made "off-the-shelf" AI software and modular APIs to keep the technical setup simple and lean(Nguyen-Duc et al., 2021)	**Accessibility:** Lowering the technical entry barriers for non-technical founders through generative interfaces (Mullainathan & Spiess, 2017)	**Human Capital Scarcity:** Struggke to attract AI talent against large firm competition(Babina et al., 2024)

	Iterative Testing: Rapid "Build-Measure-Learn" cycles enabled by AI-driven feedback loops (Kraus et al., 2020)	**Cognitive Offloading:**Reducing mental workload through automation (Dubey et al., 2020)	**Data Scarcity:** cold start problem due to lack of historical data volume needed for robust AI training (Chui et al., 2018)

Table 1 Theoretical Framework based on Technology Acceptance Model(TAM)

3 Methodology

This section outlines the research design and methodology to analyze the utilization of the artificial intelligence (AI) by startup in their business operations. With startup making greater use of digital technologies to grow faster and enhance decision-making, AI has become a significant part of the current business development practices (Dwivedi et al., 2021). Since, startup are resource-constrained and their priorities are constantly changing, to study how the founders perceive and apply AI tools, it is essential to take an approach that could capture their real-world experiences.

3.1 Research Approach

This study was chosen to take a qualitative research design and examines the ways in which startup are using artificial intelligence (AI) in their operations and how entrepreneurs perceive the value and the challenges of these technologies. The qualitative research is especially appropriate in exploring new phenomena and knowing the experiences and perceptions of people in the real world (Creswell, 2007). As the practice of AI within the startup is a fast-changing field, and there is not much empirical research available to explore the phenomenon of how entrepreneurs practically incorporate AI tools into their activities in detail, an exploratory qualitative design enables gaining more knowledge about the experience of startup founders and managers and their views on the implementation of AI tools in their daily work. Even in the context of startup, where decisions are based on gut feeling, constraint and practical experimentation, qualitative inquiry can be more insightful than quantitative ones.

The analysis is aimed at knowing the application of AI tools in practice, but not quantifying the level of adoption of AI. Through the lens of opinions of entrepreneurs who actively implement AI technologies in their business practices, the study will attempt to find subtle information about the role of AI in startup operations, their perceived advantages and difficulties. The qualitative research approaches best fit such exploratory

studies wherein a researcher can explore phenomena that are intricate within an organization and learn in-depth stories about participants (Eriksson and Kovalainen, 2008).

Semi-structured interviews were the main method of data collection in order to obtain precise and significant information. Semi-structured interviews bring an equal level of both a predetermined list of guiding questions and the freedom of the interviewees to share their experiences in detail (Kallio et al., 2016). The approach will be especially useful in analyzing the adoption of AI since the founders can discuss their motives, perceived advantages, challenges, and practical experiences with AI tools freely. The open-ended questions type is useful in revealing the data that might have been missed during surveys or a highly structured interview.

Semi-structured interviews will allow studying the way of how founders choose AI tools, their applications priorities and the role of AI in their business activity. The approach also assists in determining issues like financial limitations, technical analysis or integration. These observations derive emphasis on the human and strategic aspects of using AI, which gives a comprehensive interpretation of what quantitative data alone could obtain. By applying this qualitative research method, the proposed study is expected to produce a detailed insight into the role of AI in facilitating business in startup. The methodology makes sure that the practical application of AI tools and decision making processes that underlie its adoption are both examined in detail, which will help to enhance the knowledge about the AI-driven practices in early-stage companies.

3.2 Research Sample

This research includes the interview of five startup founders whose companies are at the early stage and who have experience of using or considering AI tools in their operations. These respondents were selected due to the fact that they are directly involved in decision-making on the adoption of AI and their knowledge of how the latter assists in activities like customer acquisition, market research, automation of workflow, operational efficiency, and strategic planning. This qualitative research has used a sample size of five

because small and focused samples enable the in-depth exploration of complex experiences (Guest et al., 2006).

The study uses purposive sampling, where the participants are those with first hand experience in the implementation of AI. The research involved four founders and one co-founder who had startups. To ensure privacy and preserve anonymity of the organizations, the firms are anonymously membered as Startup A, Startup B, Startup C, Startup D, and Startup E. The startup are working in varying industries: Startup A is involved in conversational solutions based on AI functionality. Startup B is engaged in digital marketing agency. Startup C deals with digital platform that is focused on connecting users with on-demand local services for easy delivery. Startup D deals with technology consulting and software programming and Startup E deals with software development, data solutions, and digital business consulting. Even though the companies work in various industries, all of them rely on AI as a part of their business development, which offers a valuable area to explore the cross-cases. The size of the group five included related to the norms of qualitative research, which provides the opportunity to describe and construct relevant information thoroughly and to make the theme saturated. The nature of startup that have been interviewed are presented below.

Startup Name(Anonymous)	**Industry Sector**	**Description**
Startup A	Conversational AI Tech	It helps in developing AI-powered chatbots and conversational solutions for clients to enhance customer engagement and automate interactions in their websites or social media page.
Startup B	Digital Marketing Agency	It provides marketing services using analytics, social media campaigns, and automation to optimize client outreach.
Startup C	Digital Delivery Platform	It offers a peer-to-peer digital delivery platform connecting senders with travelers for affordable parcel transport.
Startup D	Tech Consultation and software development	It offers digital design, web and app development, and digital marketing services customized to client needs.

Startup E	B2B Digital Solutions	It Provides data-driven digital services for Business.

Table 2 Nature of Startup

3.2 Data Collection

The main data of this research were gathered using semi-structured interviews with the representatives of startup. Semi-structured interviews are very common in qualitative research owing to the fact that they enable the researcher to provide specific discussion on a particular topic, and the participants also have discretion to narrate their experiences and perceptions in details (Kallio et al., 2016). The method was especially appropriate in the current research, as it allowed the researcher to learn more about how startup use artificial intelligence tools in their operations.

Five interviews with the founders of five startup were held in total. The interviews were aimed at comprehending the ways the firms apply AI technologies in their business processes, what benefits they believe AI technologies have, and what are the obstacles to their implementation. To ensure that the same issues were discussed in all the interviews, an interview guide was drawn which included some similar subjects, but still gave the interviewer room to discuss issues they felt to be important.

The interviews have been undertaken in various modes of communication based on the availability and choice of the interviewees. Three interviews were done using Microsoft Teams, and two interviews were done using a telephone. Remote interviewing allowed the researcher to seek the responses of participants who were in new destinations and also offered an advantage in terms of time scheduling the interview.

The four interviews were recorded at the consent of the participants and transcribed to analyze them. One interview was not recorded because of technical constraints; hence, in-depth written notes were made throughout and immediately after the interview to record the main responses and insights given by the respondent. These notes were

subsequently compiled and included in the analysis of data along with the transcripts of the interviews. The interviews were carried out over November-December 2025 and each session took around 30-60 minutes.

One of the interviews was done in Nepali since the participant preferred to have the interview in this language. This was followed by the translation of the interview to English during the transcription so that there can be consistency in the analysis of data.

3.3 Data Analysis

The primary role of data analysis in this study was to systematically examine the collected interviews and identify patterns that explain how startup utilize AI tools in their business operations (Creswell, 2007). The thematic analysis was applied to the interview data in accordance with the offered strategy by Braun and Clarke (2006). Thematic analysis is a popular technique in the analysis of qualitative data that entails the identification, analysis, and reporting of patterns or themes in qualitative data. The reason why this method was selected is that it enables the researcher to organize and interpret interview data systematically and at the same time be flexible in determining any meaningful patterns.

The data analysis had a number of steps that uses thematic analysis approach. First, recordings of the interviews were transcribed and reviewed so as to be familiar with the data. Second, the transcripts and the interview notes were read with care in order to extract meaningful sections in the research questions. Third, the initial codes were extracted direcly from the interview transcripts that captures meaningful patterns across the participants. Then after these codes were grouped into different categories based on conceptual similarities which were later on developed into the findings theme. A detailed illustration of the coding process including interview extracts, initial code, category and findings theme is demonstrated in Appendix 3. In this way, some of the main themes were identified that demonstrate the way startup apply artificial intelligence in their

business processes. The findings in Chapter 4 are based on these themes. The primary themes that are identified are attitudes towards AI adoption, the areas of usage of AI, the perceived benefits, challenges, and barriers towards AI adoption. Direct quotes from participants were incorporated into the findings to support and validate the identified themes, providing evidence grounded in the interview data. Although the dataset is limited to five startup founders, the analysis offers rich, context-specific insights into how AI tools are perceived and applied in early-stage companies.

3.4 The assessment of the quality of the data

he data collected in this research is significant to the quality of the final results, which will enable the study to make significant and valid conclusions about the role of AI tools in the business operations of startup. In qualitative case study research, rigor is often evaluated by such criteria as construct validity, internal validity, external validity, and reliability (Gibbert et al., 2008; Yin, 2009). The research design, the collection process of data and analysis process have taken into consideration these criteria to enhance the overall credibility of the study.

Reliability is the invariance and transparency of the research, that is, the degree to which this research process could be repeated after another researcher in the same conditions and obtain the same findings (Yin, 2009). The reliability threats of the interview based research can be subject on the participant bias, social desirability bias and variation in the manner of conducting the interviews. All participants were introduced to the study randomly in an attempt to minimize such risks, and all of them were interviewed in the most general manner using a shared semi-structured interview guide. This was what made sure that the main themes were addressed in all five cases and at the same time gave some room to the participants to expound on their experiences. Four interviews were recorded, transcribed and one interview was written in detailed written notes since it was not recorded. Besides this, one of the interviews was in Nepali which was subsequently translated into English during the process of transcription so as to have

uniformity in analysis. These measures enhanced transparency and consistency of the data collection process.

Validity deals with whether the research can be able to measure the phenomenon it is aiming to determine (Edmondson and McManus, 2007). Construct validity was reinforced by having a clear chain of evidence in between the research questions, interview guide, data collected and final themes. The interview questions were structured to cover the main emphasis of the investigation that is the usage of AI tools by startup in their business activities, the perceived benefits, problems/ obstacles they face. By so doing, the interview guide was quite consistent with the theoretical basis of the study, which relies on the Technology Acceptance Model (TAM), specifically the notions of perceived usefulness and perceived ease of use. This was useful in making sure that the data obtained was pertinent to the phenomenon under investigation.

Internal validity is concerned with the credibility of the interpretations of the data (Eisenhardt, 1989). The internal validity in this work was strengthened by using a systematic analysis of the interview material based on the thematic analysis and in comparing the trends of the five startup. The multiple cases were also useful in enabling recurring themes to be detected in the various organizational situations and this enhanced the validity of the results. The findings chapter also relied on direct quotes of participants to help identify the themes and illustrate the relationship between the empirical content and the interpretations done.

In qualitative case study research external validity is addressed by use of analytical generalization as opposed to statistical generalization (Gibbert et al., 2008; Yin, 2009). This study is not aimed at generalizing the findings based on statistics and apply them to all startup, but focus on providing context-specific findings that can be applicable to other early-stage companies with similar circumstances surrounding AI adoption. Through the description of the startup, participants, and research process, the study

allows the readers to evaluate the possibility of the findings to be applicable to other similar situations of startup.

4 Findings

The findings section of the research provides four intertwined perspectives on the research question that were brought up by all five interviews. The structure corresponds to the overall purpose of the study as it is to learn how startups are using artificial intelligence tools to conduct their business. The initial section of the section discusses the adoption and attitudes toward AI, explaining the levels to which startups have already implemented AI into their operations and the perceptions held by founders, managers and staff about how AI has been integrated into their organizations. The second section looks into the uses of AI with the focus on identifying the business functions where AI tools are being used today, including marketing, customer service, operations, and decision-making.

The third section of the results is dedicated to the perceived advantages of AI, where the main aspects, which have been improved by interviewees, are the efficiency, productivity, the quality of decisions, and the general development of the business. Lastly, the fourth section is about the challenges and future plans on the AI implementation based on the barriers that include the cost, expertise, integration, and how the AI is expected to expand in the startups that are participating.

The combination of these four aspects provides a detailed and integrated perspective on the current and possible role of AI in the work of startups. Even though the respondents were representatives of various business fields and experienced by different degrees, their visions allowed compiling a solid basis to understand how AI is transforming the early business development.

4.1 AI Adoption and Attitudes

The results show that artificial intelligence adoption in the startup under analysis was not a strategic choice to be implemented later in the company and, instead, was a component of its initial stage. Since its inception, AI tools have been integrated into the

major business operations, especially those that involve software development processes, ideation, and initial planning processes. It implies that AI was not seen as a discretionary addition but rather as a necessity within the framework of operations that helped the startup to grow in the first stages and organize itself. The interviewees stressed that the main benefits of AI were seen in the fact that it was an efficiency-saving tool that allowed doing things quicker and spending less time on monotonically or cognitively challenging tasks. In this respect, AI served as a productivity lever, as it enabled the startup to maximize finite human and time resources, which is an extremely important factor to take into account in the initial phases of the venture development. Instead of overturning human judgment, AI was applied to its enhancement, boosting work flows, assisting in the preparation of decisions, and enhancing the speed of work in general.

In all the interviews, the respondents always gave the answer that they were using some form of artificial intelligence in their present business. Although the level of the AI application differed among startup, and the level of sophistication of the artificial intelligence application was also applied differently, there was a general trend in the way AI was applied to organizational processes. The implementation of AI systems was more often as helping and enabling technologies and not as fully independent decision-making systems. This shows a conservative and realistic view towards the use of AI where human control is at the heart and AI is a complement and not a replacement of managerial and operational experience.

“We’ve been using it since from the beginning… so we don’t have to start from a blank screen basically.” (Startup D)

“What we were taking days to do, we were able to do the same amount of work in so less time.....with AI tools I always feel like I have a extra member in a team. Apart from my human team AI tools help me handle many tasks.” (Startup B)

The interviewees cited multiple inter-linked reasons why they initiated the introduction of AI tools in their startup. Instead of having a single driving force, expectations regarding the future of the business operation as well as the growing market competition drove AI adoption. The perception of AI was that it was a new technological power with a high potential in the future, and thus startup were eager to experiment with it, pilot it, and test it out at an early stage.

Some of the interviewees also cited that their driving force was associated with an evolutionary inclination to technology. In their case, the interaction with AI was perceived by these respondents as the possibility to experiment with new tools and analyze their applicability and become familiar with technological advances that were anticipated to gain greater significance. A particular interviewee pointed out that they did not go to AI because it was their performance that they found themselves under pressure to perform immediately, but because they understood that there was a greater technological transformation and that they wanted to stay relevant in the long term.

“I started using these tools mostly to try them out. Technology is clearly moving fast, every day there is something new and AI is going to be something big in the future, so I wanted to understand early.” (Startup A)

I’ve been into AI even before the hype. I have been interested in AI even before it became a big trend, and I didn’t want to miss another technological boom like I did with Bitcoin. So I wanted to explore AI early. When I started the company, AI tools had just become accessible to everyone. It felt natural to explore how they could support the business. It’s similar to when Bitcoin was very popular I didn’t believe in it back then, and I missed out. Now AI is following the same pattern. (Startup B)

On the contrary, one of the interviewees described that competitive pressure contributed significantly to their decision to use the AI tools. In the view of this interviewee, AI has been seen to be especially applicable in industries in which

dynamism and saturation are high, and firms constantly struggle to achieve efficiency, speed, and differentiation. In this kind of surrounding, the interviewee believed managing AI, at least as the integration of the available tools into the current processes, had become more and more a challenging task to escape.

The interviewee also reasoned that turning down the implementation of AI would possibly put a startup in a disadvantaged situation compared to other companies that were already utilizing similar technology. This belief was not always associated with immediate performance improvement but just a fear of missing out(FOMO) behind the current technological changes in the market as opposed to risking losing track with the new trends in the industry.

'So yes anyways....Nowadays competition is very high. And those who don't try out AI tools might left behind'', employees who don't use AI are likely to get left behind. That's just how the tech work right now.. (Startup B)

In general, the responses indicate that the use of artificial intelligence in startup is no longer perceived as a future event but more of a reality and a practice going on. Within the startup in question, the concept of AI seems to be viewed as a part of the daily business routine, which can be deemed as a quite optimistic approach to the use of AI. The interviewee has detailed AI as more of a helping and empowering tool that will assist the employees in their work as opposed to replacing human ability or knowledge. Meanwhile, the interviewee pointed out that AI utilization should be done with great care by humans. A special focus was on the necessity of balancing the outputs of AI generated with human judgment, learning, and verification. The interviewee added that outputs of AI are not taken as is because they are reviewed, analyzed, and honed by human participants, which underscores the persistence of human decision-making. This commentary shows that the concept of AI as an additive tool is based on a realization that its usefulness is limited to proper use and continuous human supervision.

4.2 Application Areas of Business

Among the startup that the interviewed mentioned one of the most common applications of AI as marketing and content-related tasks. Various interviewees clarified that with the help of AI solutions, it became easier and timely to support the development of marketing materials, social media content, and customer communications, coding and documentation.

The implementation of AI was even called a natural extension in certain situations and not a strategic change. This was frequently associated with the career experience of the interviewees, which seemed to affect the extent of the easily adopted AI tools into the daily operations. As an example, one interviewee who had previously worked as a social media manager and currently runs a digital marketing agency explained that AI is a rational or logical development of the current digital workflows and practices. In this light, AI was considered an extension of the current digitalization processes and not a disruptive shift in the business process.

''I started as digital marketing at first. Then after worked as a social media manager, Now I see AI as a natural extension of what we already do. It helps to generate idea and refine the content very fast.'' (Startup B)

As mentioned above, the other interviewee also indicated that marketing and content-related operations were also some of the prevalent applications of AI in the startup. According to the interviewee, tasks like creating content, developing campaigns, and marketing communication were assisted with the help of AI tools. When explaining this process, the interviewee described AI as deployed in a similar way to an employee, to help generate ideas and first drafts instead of providing complete results.

Practically, artificial intelligence was first of all used in the initial phases of content production, where it was used to provide rough editions which were later checked and edited and polished by humans. Such a working mode is a manifestation of the

perception of AI as a partner that improves productivity and innovation, and decision-making, accuracy, and responsibility are still the responsibilities of human actors.

"I utilize AI as a team member a lot, especially for marketing purpose.....Sometimes when I am not able to come up with anything and I am too busy with other things, I usually go for AI and Just ask what should be my campaign. It gives a caption and ideas and then I improvise it and post it." (Startup C)

Along with the marketing and content-related processes, AI was used in more professional business development documentation and sales-related planning activities. Some of the interviewees described how the AI tools were employed to aid the preparation of the official business documents especially when it comes to structuring and organization of the business requirements. This form of application was more frequently documented in technically oriented startup where documentation is a very important aspect in leading development and aligning stakeholders.

AI, in such instances, was called particularly helpful in terms of helping with the creation of Business Requirement Documents (BRDs). The interviewees revealed that AI assisted in structure of requirements, logical organization, and assisted in the completeness of documentation by pointing to the gaps or contradictions. Instead of substituting the role of technical teams, AI was used as a supportive device contributing to clarity and consistency, with ultimate validation and decision-making being under the authority of human experts.

In business development, we use AI for BRD business requirement documents(Startup D)

Other than documentation-related work, AI was also used in business development processes associated with sales, specifically in ideation and planning in customer engagement and lead generation. Interviewees talked about applying AI to assist with

thinking at the early stages of sales planning, which assists in organizing thoughts and finding possible strategies to be applied, prior to actual execution.

One interviewee explained that the company planned to apply AI to facilitate conversations within the firm, related to the creation of in-house lead generation tools. This strategy was inspired by the fact that the current external solutions were expensive, whereas the company had the capacity to come up with its own solutions. In that regard, AI was regarded as a helpful tool to plan internal solutions and conceptualize them instead of taking the role of sales or development functions.

We use AI to take ideas for marketing and sales-related activities, especially when we are working on internal lead generation tools.(Startup D)

Similarly the other interviewee indicated that AI is applied in various areas of business development, but the marketing, communication with customers, and analysis of data are the most common. Marketing practices were outlined as the key field of implementation, with close support of communication-related activities and functions of analysis. Moreover, AI can be utilized in the process of strategic planning, helping to interpret the data and identify patterns in it in scenarios when the process would be too time-intensive to be performed manually. Another point that was emphasized by the founder during the startup stage was the application of AI in content creation and the initial design of the web site.

...So we use AI in several business development areas like in marketing and also with customer communication as well as data analysis.
is also there. It also helps strategic planning by for us by interpreting data and identifying patterns that will be difficult to detect manually or it's just too time consuming. So since

I'm a bit old, I take AI to generate contents as well. In the start, AI also helped to design the websites and similar other stuff (Startup E).

Another major application area was coding and technical development parts as well. Some startup that have technologic centric expressed AI as a meaningful tool in building platforms, writing codes and doing in tecnical work quickly. One interviewee has mentioned that AI has been helpful from the very beginning of the company as it reduced the need to work from a blank chapter.

"Yes....from the very very beginning we have been using AI when it comes to coding and understanding how coding work has been like.....
We had a lot of help from AI basically, so we don't have to start from a scratch. We usually have some certain idea how this entire structure of the code will look like... And then we get a basic version from the AI and do some changes in it.....like we give it to the AI and then we have a certain new idea instantly.
It's like how how fast we can do these certain work rather than doing it from scratch of testing, failing and trying again."(Startup D)

Similarly another interviewee also emphasized coding as important AI function while emphasizing the need for human knowledge as well.

"I will give four out of five for coding because you have to understand what you are doing. Sometimes AI also give wrong coding then you have to fix it yourself." (Startup A)

In contrast. The use of AI tools in other fields like financial analysis and higher-order data analytics were cited as minimal especially because of the infancy of startup. The interviewees described the fact that, being rather young companies, they lacked enough amounts of data and internal capabilities to use AI in those areas in any meaningful way. Subsequently, the process of AI implementation in financial and analytical operations was not prioritized at this point.

Financial sensitivity related tasks were thus normally managed by core team members or at some point assisted by external mentors or advisors as opposed to being delegated to AI tools. The given approach corresponds to the current level of development of the startup, as primary frameworks, credibility, and experience are yet to be developed before more complex AI applications can be explored.

For the finance part we were not totally comfortable utilizing AI because none of us is very pro at it. And we don't want to make mistakes.(startup C)

Overall, the results indicate that the AI was mostly applied in the business development processes where the results could be reviewed, modified, and verified by humans easily. On the contrary, regions seen as more important or more complicated were handled with much caution, and decision-making was mostly human-centred. This trend indicates selective application of AI, in which its implementation was preferable in areas that could be easily controlled by humans and amended repeatedly.

4.3 Perceived Benefits

In the majority of the interviewed startup, AI usage was linked to various perceived benefits associated with efficiency, cognitive support, and business continuity in the business development activity. As the interviewees explained, these advantages were predominantly qualitative and focused on the ways AI made the daily work process easier and addressed the limitations caused by the lack of time and resources. AI was often represented as the useful support tool that helped startup to continue with their operations despite the structural and capacity-related constraints.

The enhancement of efficiency in the management of routine and time-consuming tasks was one of the most common benefits perceived. According to the interviewees, AI can be characterized as a workload mitigation tool and productivity sustaining, especially when there is an increased amount of operational pressure. This advantage was

particularly applicable to the early-stage ventures, in which the timely constraints were considered an essential issue and human resources tend to be scarce.

“When my brain is not working at all to create any content, I just go for AI and ask it to give me some suggestions.” (Startup C)

“The biggest benefit is that it has immensely saved our time. We don’t need to waste our time in small things.”(Startup E)

Other than efficiency-related advantages, interviewees also mentioned the value of AI in terms of cognitive support and idea development. The AIs were said to provide alternative perspectives and methodical contributions that allowed the founders to think it through, investigate opportunities, and ponder over alternative strategies. This kind of support was especially appreciated in the cases when reflection, creativity, or problem framing, instead of its implementation, was needed. The interviewees observed that this cognitive help proved particularly beneficial to founders who were still in the learning and formalization of their daily process of decision-making. In this respect, AI was used as an additional thinking tool that facilitated the process of learning and sense-making, but ultimate interpretations and choices were closely tied to human judgment.

It gave us a very interesting perspective that we weren’t thinking of.”
(Startup C)

“Sometimes it gives me an idea or a suggestion and I think, ‘Damn, why didn’t I think of that earlier?(Startup E)

Another aspect that AI was found to be helpful with was minimizing the chances of incomplete or poorly-structured outputs, which it provides a second point of reference or an initial perspective. According to the interviewees, AI-assisted feedback allowed them to recognize inconsistency, gaps, or sections that needed to be clarified more,

particularly when drafting or planning their work. This, in a manner, helped AI to enhance the overall quality and coherency of outputs without supplanting the human input.

Simultaneously, interviewees stressed that any quality improvement implemented with the help of AI was implemented in collaboration with human judgment but not in the autonomous mode. The reasons possible were that AI-generated proposals were reviewed, interpreted, and validated by founders or team members, which created the impression that AI was an assistant and not a decision-maker on its own.

AI gives me a base idea so I don't have to start from a blank screen.(Startup D)

One of the interviewee also mentioned about AI being useful to do boring and repetitive tasks more efficiently than humans while dealing with large volume of information and communication task.

"AI Does boring tasks like emailing hundreds of clients better than we humans as it collects information about individual customers helping us to send customized marketing materials and emails." (Startup B)

4.4 Challenges and Barriers to AI Adoption

One of the biggest challenges that were found during the interviews is associated with the credibility of AI-generated outputs and their stability. Even though AI was frequently referred to as the technology that will be able to give valuable initial responses or first drafts, interviewees emphasized that such results should not be trusted unconditionally. Consequently, AI-created content could hardly be taken at face value.

According to the interviewees, the application of AI often demanded extra work as fact-checking, refinement, and contextual adjustment. This requirement of continuous human attention was identified as a hindrance since it may counteract part of the

efficiency benefits that may be equivalent to the use of AI in the first place. The need to have close human supervision restricted the autonomy use of AI in situations where accuracy and contextual correctness was crucial.

It's not always accurate…..the verification has to be done.(Startup D)

The interviewees have noted that AI tools have a tendency to generate generic or insufficiently customized results unless tailored to the details of the startup. To produce outputs that are genuinely relevant, AI was reportedly demanding repeated prompting and sustained context input based on the business model of the firm, its industry nature as well as its business setting.

As observed by interviewees, this task of making AI specific to the organization was not only time-intensive but also extremely situational. It took continuous effort in making the proper inputs, fine tuning prompts, and changing the use as the startup would change over time. Consequently, preliminary installation and ongoing optimization of AI solutions were perceived as an obstacle, especially to small companies with a shortage of time and resources.

At first it was very hard to tell it who we are and what we want… we had to iterate again and again….otherwise the responses are too generic. (Startup C)

In addition to the technical and quality-related limitations, cost factors were also presented as a significant challenge, especially to startup with a small financial base and a low initial stage of operations. Most of the AI tools were referred to as cost-effective in general in comparison to the worth they deliver, but more advanced and specialized solutions may turn out to be costly in the long-term according to interviewees. Specifically, the recurring subscription fees were also noted as an area of concern because such costs have a tendency to build up as the usage increases or because of using several tools at a time. In the case of early-stage startup, these recurring costs were

perceived as a factor that can act as a barrier to the broader or more advanced adoption of AI, even though there is general awareness of the potential benefits of AI.

My startup is small and so is my team so sometimes I also feel like AI tools are a bit expensive to use….I mean it's a lot to pay that much of amount every month. (Startup A)

Besides, some of the interviewees highlighted that human reliance and supervision were still necessary as a structural constraint of AI use. Although the capabilities of AI were universally accepted, the responsibility for actions and results has always been the emphasis of the interviewees that should be left to human players. AI was not seen as a separate entity, but rather a tool, the results of which need to be monitored and confirmed.

This constant need to monitor human beings was defined as a constraint to the degree to which AI could be trusted to act independently. Consequently, there was a limited trust to the AI especially where accountability, judgment or possible risk are concerned. The need to preserve human control was then perceived as one of the essential limits to further AI engagement in the work of startup.

We cannot trust AI Blindly…… It is risky…in the end it is you who makes the decisions.Never put AI in a position where it supervises you. AI is a tool, not a master. Subconsciously, some might feel like slaves to AI, but it's still just a machine—it predicts and processes based on algorithms. (Startup B)

Some interviewee has stated that AI should not be place to make decision as it cannot be fully reliable. And human judgement act a superior in terms of decision- making.

…Yeah, definitely. I mean, AI is good, but you cannot be fully reliable on that. There are tasks which require human judgment, for example, financing money related tasks and there are ethical responsibilities in maintaining a team culture.

And I believe that AI should not replace human decision making. It should support it, but it should not replace it. And so I don't rely on AI for making decisions that much as well.(Startup E)

One of the interviewee also highlighted on the originality and creativity of the work as AI relies heavily the eisting data and sometimes it can produceoutputs that are biased or lack novelty making the human supervisionvery important to ensure results make align with the desired goal.

''Another is originality. AI is trained on existing data, which can make it biased toward that data. That's why human creativity needs to come in. You have to intentionally guide AI…it might otherwise produce outputs in a direction you don't want. Not everyone is intentional, but for my kind of business, I have to infuse colors, loops, shapes, and creative ideas. Otherwise, AI just does its thing. It's hard, and you need to be very intentional.''(Startup B)

4.5 Summary of the key findings and the revised framework

This section is a summary of the primary findings of the study and presents the amended framework according to the findings of the empirical evidence. This purpose of this section is to point out the most important patterns obtained due to the interviews and link them to the framework introduced in the previous part of the research.

The findings on the whole show that artificial intelligence tools are slowly getting integrated into the daily operations of startup. According to the data gathered in the course of the interview with the entrepreneurs, AI is primarily utilized to facilitate the processes, but not to be seen as a fundamental element of their business models. Specifically, AI tools were applied in the idea generation process, content creation, documentation, and information search. Such tools assist business owners to accomplish work much faster and organise it in a better way.

It also reveals that experimentation and curiosity are significant factors that lead to the adoption of AI in startup. A number of entrepreneurs said that they started using AI tools because of their interest in learning more about the evolving technologies and learning how to utilize them in their companies. It implies that the use of AI in small startup is often unofficial and experimental as opposed to a planned technological policy.

The other important discovery is the perceived advantages of AI application. In their attempts to explain how AI technologies enhance productivity, the entrepreneurs highlighted that they assist them in coming up with ideas, preparing drafts, and getting information processed in a more efficient way. Besides time-saving, a number of participants also reported improvement in quality and clarity of work outputs with the help of AI-assisted tools.

Although there are these advantages, the interviews have also found that there are a number of challenges and limitations related to the use of AI. Entrepreneurs have claimed that the products of AI-generated outputs may need careful evaluation and verification as it may be lack contextual knowledge. Similarly, the effective use of AI tools and softwares needs proper learning to formulate the prompts generation to get the results. Moreover, the price of some AI tools and the training process to be able to use it efficiently was listed as the possible impediments, especially to small startup with limited funds.

Together the results indicate that the usefulness of AI tools in startup is based on two factors first the degree to which the entrepreneurs think that they can use the tools to make their work more efficient and the level of accessibility to these tools (i.e. how easily the entrepreneur can fit them in his/her everyday life). These two dimensions are related to the fundamental components of the Technology Acceptance Model (TAM), that is, the perceived usefulness and perceived ease of use. According to the results of the conducted empirical investigation, the framework is thus narrowed down to indicate the particular mechanisms by which these variables influence the adoption of AI in startup.

The table presented below summarizes the revised framework by linking the TAM constructed earlier with the empirical findings identified in this study.

TAM Construct	Role of AI in startup	Benefits (Perceived Usefulness)	Challenges and Barriers (Perceived Ease of Use)
Perceived Usefulness	**Empowering Tools:** Mainly Used for Ideation, Planning and overcoming the blank screen in document writing and coding **Operational Support:** Applied in low-risk areas like research, marketing concepts and content generation	**Task Efficiency:** Huge time savings on small matters allowing founders to focus on high level strategy **Cognitive support:** Helps as thinking partner to give alternative perspective and creative ideas	**Credibility/Originality Gap:** lack of stable outputs as results are often hallucinated or too generic for specific business needs. And sometimes biased. **Accountability Risk:** Cannot trust AI blindly that requires constant human verification for final decisions
Perceived Ease of Use	**Competition and Curiosity:** Adoption is driven by competitive pressure, trend and individual curiosity rather than formal organizational strategy **Plug and Play Integration:** High use of conversational agents (ChatGPT/Gemini) because they require no technical setup	**Low Barrier to entry:** Ability to integrate sophisticated tech without hiring expensive data scientists or building infrastructure. **Workload Reduction:** Sustains productivity during large volume of work without adding a team members.	**Financial challenge:** Heavy recurring cost of subscription model even though tools are easily accessible **Supervision Burden**: Need of constant Monitoring and prompt engineering makes tool less easy

Table 3 Revised Theoretical Framework Based on Empirical Findings

5 Discussions

5.1 Theoretical Implications

This paper is part of the research literature on the use of artificial intelligence in the entrepreneurial context, as it will analyze how startup adopt AI technology in their daily business processes using the Technology Acceptance Model (TAM). According to TAM, the adoption of technology depends mainly on two important perceptions, including perceived usefulness and perceived ease of use (Davis, 1989; Venkatesh and Davis, 2000). The extensive application of TAM in the investigation of information systems and digital technologies has been accompanied by a wider concentration on organized organizational settings in which the adoption of technology is a comparably formal procedure. In comparison, the current research examines the concept of AI adoption in a startup setting, where decisions are more experimental, resources are limited, and technologies are often implemented by curiosity as opposed to official analysis. The research in this way adds to the existing literature as it shows the ways that TAM constructs can be applied in an entrepreneurial scenario that is typified by uncertainty, fast experimentation, and changing technological environments.

One of the initial contributions is related to the position of perceived usefulness in the adoption of AI tools in startup companies. In previous studies, it has always been stressed that organizations implement artificial intelligence technologies when they see the evident advantages in the form of enhanced productivity, efficiency, and decision-making options (Davenport and Ronanki, 2018; Enholm et al., 2022; Fosso Wamba et al., 2024). In the same way, research on AI-enabled innovation emphasizes the role of artificial intelligence in increasing performance at work and making data-oriented strategic choices (Haefner et al., 2021; Babina et al., 2024). The results of this research confirm the applicability of perceived usefulness as a key motivation to AI adoption. The most common aspects of work where entrepreneurs incorporated AI tools included marketing contents, documentation, developing ideas, and interpreting data since they minimized work and helped to speed up routine tasks. Yet, the empirical data also

indicate that the perceived usefulness in startup settings can also be developed in the course of experiential learning as opposed to an evaluation. Rather than implementing AI due to its perceived usefulness which was already well-evaluated, founders often found that it was useful when applied to specific tasks. This observation expands TAM by suggesting that the perceived usefulness can be formed as a result of a mindfulness process, which happens as a result of a practical overlap, especially in entrepreneurial contexts, where technologies are experimented with in real time. These results are consistent with the other studies that have investigated the topic of entrepreneurial experimentation, including the point that startup often discover the usefulness of new technologies through trial-and-error mechanisms, but not as part of a planned framework (Ries, 2011; Garbuio and Lin, 2019).

The second theoretical contribution is associated with the perceived ease of use interpretation regarding generative AI technologies. TAM defines ease of use as the level of technology that is seen to be effort free (Davis, 1989). Although the results suggest that AI tools are typically available and even not very difficult to start using, AI-driven use presupposes the ability of users to practice prompting, providing context, and critical analysis of AI-generated output. This implies that generative AI systems lack a simplicity of use that is only tied to interface or technical simplicity. Rather, it also implies the ability of the user to create effective interaction patterns with the AI systems. The recent studies on human-AI interaction also emphasize that successful implementation of AI technologies requires the users to learn how to control, interpret, and optimize AI content (Haefner et al., 2021; De Bruyn et al., 2020). The results thus come to formulate TAM by implying that ease of use in AI situations is a learning aspect whereby users develop over time to be able to communicate effectively with AI systems and to integrate them into their operations.

The third contribution is related to the association between perceived usefulness and trust in AI outputs. Conventional understandings of TAM tend to suggest that any technology that is perceived to be helpful tends to be adopted and incorporated into the

working processes. Nevertheless, according to the results of the conducted study, the introduction of AI in startup has a more conservative and selective pattern of usage. Though business owners could see the advantages of AI tools in helping to develop efficiency and aid business operations, they always stated that they have to check and critically review AI-generated data and apply it to reality. The issues of accuracy, contextual comprehension, and reliability also imply that the perceived usefulness does not necessarily mean the complete dependency on AI technologies. The same has been highlighted in recent studies on the dangers and constraints tied to the use of AI in organizations (De Bruyn et al., 2020; Floridi et al., 2018). The findings narrow down TAM-based explanations of technology adoption by identifying the role of verification and selective use in showing that the translation of perceived usefulness into sustained use might require the user to believe in the reliability and interpretability of AI outputs.

The fourth contribution is associated with the contribution of exploratory experimentation in adoption of technology. The general assumption of TAM is that users will embrace technologies depending on the usefulness and easiness to use. Nevertheless, the results indicate that not all startup founders initiate the use of AI-assistants on the basis of the clearly defined operational needs but to investigate new technological opportunities. In fast changing digitalized settings, business men can embrace new technologies just in order to be technologically aware, and to know what the technology can presuppose to them in the future. The observation is a complement to the studies on entrepreneurial learning and experimentation with the technology that emphasize the repeated experimentation and discovery in startup interacting with emerging technologies (Ries, 2011; Garbuio and Lin, 2019; Haefner et al., 2021). The results thus indicate that TAM-grounded models of technology adoption can be enhanced to include technological curiosity and exploratory learning as other determinants of formative technology adoption in entrepreneurial tasks.

The findings also indicates that AI may not be applied to augment the existing tasks but can also have a more fundamental role in facilitating entrepreneurial activity in a startup

situation. In particular, some founders applied AI tools during their part-time employment in other companies, which enabled them to start and build startup operations without investing finance and human resources fully. By this, AI acted as a productivity enhancing tool and a facilitating mechanism that reduced the barriers to entry into entrepreneurship. Similarly, the results show that AI technologies are also effective as a productivity aid but also as a means to support the entrepreneurial activity as a cognitive assistant. The AI tools were often utilized by the entrepreneurs to create new ideas, arrange information, and view the issues in new ways. This implies that the perceived usefulness of AI is not just limited to the improvement of efficiencies to support creativity and uncertain decision-making. The current studies about generative AI also point out its role in enhancing human cognition, as well as assisting with creative problem-solving (Brynjolfsson and McAfee, 2017, Haefner et al., 2021, and Enholm et al., 2022). The study can add to the literature by demonstrating the role of AI in helping entrepreneurs navigate complex and unpredictable settings by highlighting the cognitive aspect of AI usefulness in the startup environments.

5.2 Managerial Implications

The Findings of this study have a number of practical implications to entrepreneurs and managers working in start up settings who are trying the artificial intelligence tools in their business operations. Instead of implying that AI is a wholesome technological solution, the findings reveal that it is more of an incremental and task-based solution in startup.

AI tools can be especially helpful when it comes to assisting the work of entrepreneurs at the initial stages, as at that point, the founders will have to deal with various functions at the same time, including marketing, communication, documentation, and strategic planning. In such scenarios, AI technologies seem to be the most helpful ones with the application to creating initial drafts, brainstorming, or organizing information that will be further developed by the entrepreneur. In the case of most startup, this will lower the

friction of commencing tasks on a blank slate and enable founders to switch between various duties at a faster rate. The practical implication does not lie in the fact that AI will be used to substitute human labor, but it can assist founders with managing the plethora of activities that need to be performed at the stage of early development of a business.

The findings suggest that the usefulness of AI tools is determined by the interaction of the users with the tool. Entrepreneurs have noted that the quality of AI results tends to become better in cases where users give clearer prompts, context, and feedback on the iterative basis. This indicates that the advantages of AI implementation are tightly connected with the familiarity of the user with the technology and not only technical capacities of the tools. In the case of startup, it means that the key practical skill of dealing with AI systems may grow over time and become essential to the founders and other employees.

It also emphasize the fact that the outputs of AI cannot be considered automatically trustworthy. Entrepreneurs kept on noting that they had to consult and check AI generated answers before applying them in business. This is practically to say that AI is more of a helping analytical tool as opposed to a substitute of human judgment. This means that the best application of AI to startup managers can be through the integration of AI-based insights and human interpretation, in particular where contextual interpretation and business judgment cannot be eliminated.

Furthermore, AI tools used in startup is frequently implemented as an experiment, instead of a an established plan. Some entrepreneurs start working with the AI just to learn about the new trends and define its possible significance to their field. The field of application that AI can save time or increase efficiency is more evident with time, as founders discover certain tasks they can do without, or better, faster through AI. Assuming through managerial lens, it would mean that the adoption of AI within startup

can have the most significant effect when they are treated as a continuous process of exploration instead of as one strategic implementation.

There is also evidence of findings suggesting that cost factors are still a significant factor to early-stage ventures. Most of the AI tools are useful but some of the advanced services have subscription fees which might not be easily affordable by small start ups. Business people are thus more likely to judge AI tools on a pragmatic basis and consider the ones that bring forth tangible benefits against cost. This implies that managers in startup are better bestowed with selective adoption of AI tools which are concentrated on a few use cases which yield immediate benefits rather than trying to enact wider systems based on AI.

5.3 Limitations of the Study

Although this work was aimed to learn how startup use the tools of artificial intelligence in their work and how entrepreneurs view the benefits and challenges linked to it, the research also has some limitations that must be admitted.

Firstly, A single individual conducts the study, which inevitably brings a certain level of subjectivity of the research process. In qualitative research, perspective of the individual affects interpretation of the interview responses, themes coding as well as synthesis of the findings. Even though the objectivity was maintained by paying attention to the interview procedure documentation and conducting systematic thematic analysis, the threat of biasing seems less impossible to exclude.

Secondly, the study relies on a more or less small amount of interviews in its empirical data. The research includes five startup, which are established in various fields and business scenarios. Although this enabled the research to get a wide range of the entrepreneurial views, the sample size is small. Consequently, the results offer analytical views and not statistically applicable conclusions. The experiences narrated by the

interviewed founders might not wholly reflect on the practices of startup in other industries or countries or stages of development.

The other limitation is associated with the type of data of the interview. The research is mostly based on the opinions of the startup founders or representatives, which implies that the conclusions are made with regard to how these people view the role of artificial intelligence in their companies. These perceptions do not necessarily always relate to quantifiable organizational results. Moreover, the recording of one of the interviews was not done, but they were captured in a form of detailed notes, which can restrain the depth of details as opposed to the recorded interviews.

Moreover, the artificial intelligence in itself is one of the rapidly developing technological areas. The mentioned tools and applications represent the present phase of the AI evolution when the discussed interview was conducted. Nevertheless, AI technologies are evolving rapidly, and the manner, in which startup implement and incorporate such tools, can evolve considerably in the nearest future. Consequently, this research should be understood in the framework of the contemporary technological world.

Lastly, the study only pays major attention on application of AI tools in early-stage startup especially in the fields of marketing, idea generation, documentation and business development. Although this has given in-depth information on how entrepreneurs apply AI in their daily operations, the study fails to look at the wider organizational implications of how AI can transform over time, large-scale automation, and advanced integration of AI. This reduced scope enabled the analysis to take a deeper look at the phenomenon in the context of startup, but it also implies that the results do not reflect the entire spectrum of ways AI can be applied in organizations.

5.4 Suggestions for the Future research

There are several ways this research can be directed in the future based on the limitation and findings of this study. These recommendations should further enhance the

knowledge on the adoption and application of AI in startup as well as fill the gaps that could not be adequately covered in the context of the current study.

Although the results primarily emphasize the application of AI in the processes like idea generation, marketing support, and information processing, future research may focus on how AI influences other domains of startup such as product development, strategic decision-making, customer relationship management, or human resource management. Knowledge of the way AI technologies are incorporated into these various functions of organizations would be more informative about the role of AI in the context of entrepreneurship.

The other possible research direction that can be implemented in the future would be to explore the exact nature of the artificial intelligence technologies employed by startup. In the given research, AI is described rather generally and involves a range of solutions, including generative AI websites, language models, and other digital applications. Nevertheless, these technologies vary greatly in their possibilities and what they can be used. The future research might thus take a narrower perspective and explore how specific AI tools, such as machine learning systems, predictive analytics tools, or natural language processing models are applied within the startup operations and their impact on the business development and innovation processes.

Thus, the hard business results of AI implementation in startup may be researched in the future as well. Although this paper is mainly concerned with how perceive the entrepreneurs in terms of usefulness, benefits, and challenges of AI tools, one of the future researches might be investigating whether the AI use can be associated with any measurable results in terms of higher productivity, higher ratio of innovation performance, or higher competitiveness. Specifically, scholars might examine the growth patterns of startup that actively incorporate AI technologies and those that use traditional digital tools as the main ones.

The adoption of AI technologies would also be an interesting research direction to explore the impact of organizational culture and entrepreneurial mindset. This research indicates that a lot of entrepreneurs venture into trying AI tools due to their curiosity and the urge to keep up with new technological advancements. Future studies might investigate the effect of these types of attitudes toward experimentation and technological exploration on the adoption of AI in the context of entrepreneurial ecosystems.

Since AI technologies are rapidly developing, longitudinal studies will be a good source of information about the change in the role of AI in startup with time. Although nowadays many startup apply the AI tools as auxiliary tools to achieve their daily routine, there is a possibility that in the future such technologies will become more intrinsic to the business procedures. The analysis of the evolution of AI use with the increase in size and expansion of startup would thus be an interesting area of the future research.

References

Ali, S. J., Christin, A., Smart, A., & Katila, R. (2023). *Walking the Walk of AI Ethics: Organizational Challenges and the Individualization of Risk among Ethics Entrepreneurs*. New York, NY, USA: ACM. https://doi.org/10.1145/3593013.3593990

Alvarez, S. A., & Barney, J. B. (2013-01-01). Epistemology, Opportunities, and Entrepreneurship: Comments on Venkataraman et al. (2012) and Shane (2012). The Academy of Management review, 38(1), 154-157. https://doi.org/10.5465/amr.2012.0069

Babina, T., Fedyk, A., He, A., & Hodson, J. (2024). Artificial intelligence, firm growth, and product innovation. *Journal of financial economics, 151*, 103745. https://doi.org/10.1016/j.jfineco.2023.103745

Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of Management, 17*(1), 99-120. https://doi.org/10.1177/014920639101700108

Bergmann, H., Crelier, T., & Mayr, J. (2026). The use and impact of AI-tools in early-stage startups. *International journal of entrepreneurial behaviour & research,* 1-20. https://doi.org/10.1108/IJEBR-10-2024-1089

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. Qualitative research in psychology, 3(2), 77-101. https://doi.org/10.1191/1478088706qp063oa

Blank, S. (2007). The four steps to the epiphany: Successful strategies for products that win (2nd ed.). Quad/Graphics.

Brown, R., & Rocha, A. (2020). Entrepreneurial uncertainty during the Covid-19 crisis: Mapping the temporal dynamics of entrepreneurial finance. Journal of Business Venturing Insights, 14, e00174. https://doi.org/10.1016/j.jbvi.2020.e00174

Brynjolfsson, E., & McElheran, K. (2016). The rapid adoption of data-driven decisionmaking. American Economic Review, 106(5), 133–139. https://doi.org/10.1257/aer.p20161016

Brynjolfsson, E., & McAfee, A. (2017). The second machine age: Work, progress, and prosperity in a time of brilliant technologies. W.W. Norton & Company.

Bughin, J., Seong, J., Manyika, J., Chui, M., & Joshi, R. (2018, September 4). *Notes from the AI frontier: Modeling the impact of AI on the world economy*. McKinsey Global Institute. https://www.mckinsey.com/featured-insights/artificial-intelligence/notes-from-the-ai-frontier-modeling-the-impact-of-ai-on-the-world-economy

Calvino, F., J. Reijerink and L. Samek (2025), "The effects of generative AI on productivity, innovation and entrepreneurship", *OECD Artificial Intelligence Papers*, No. 39, OECD Publishing, Paris, https://doi.org/10.1787/b21df222-en.

Chatterjee, S., Rana, N. P., Tamilmani, K., Sharma, A., & Sharma, R. (2021). Adoption of AI-integrated CRM systems in agile organizations. Technological Forecasting and Social Change, 168, 120783. https://doi.org/10.1016/j.techfore.2021.120783

Chui, M., Manyika, J., & Miremadi, M. (2018). Notes from the AI frontier: Applications and value of deep learning. McKinsey Global Institute. https://www.mckinsey.com/featured-insights/artificial-intelligence/notes-from-the-ai-frontier-applications-and-value-of-deep-learning

Creswell, J. W. (2007). *Qualitative inquiry & research design: Choosing among five approaches* (2nd ed.). Sage Publications.

Crossan, M. M., Lane, H. W., & White, R. E. (1999). An Organizational Learning Framework: From Intuition to Institution. *The Academy of Management review, 24*(3), 522-537. https://doi.org/10.5465/amr.1999.2202135

DAVENPORT, T. H., & Ronanki, R. (2018-01-01). Artificial intelligence for the real world: Don't start with moon shots. Harvard business review, 96(1), 108-116.

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly, 13*(3), 319-340. https://doi.org/10.2307/249008

De Bruyn, A., Viswanathan, V., Beh, Y. S., Brock, J. K. U., & von Wangenheim, F. (2020). Artificial Intelligence and Marketing: Pitfalls and Opportunities. Journal of Interactive Marketing, 51, 91–105. https://doi.org/10.1016/j.intmar.2020.04.007

Donaldson, C., Linton, G., & Bendickson, J. (2025-04-30). Generative artificial intelligence use and configurational pathways to innovation performance in startup. *Journal of small business management,* 1-58. https://doi.org/10.1080/00472778.2025.2492215

Dubey, R., Gunasekaran, A., Childe, S. J., Bryde, D. J., Giannakis, M., Foropon, C., Roubaud, D., & Hazen, B. T. (2020). Big data analytics and artificial intelligence pathway to operational performance under the effects of entrepreneurial orientation and environmental dynamism: A study of manufacturing organisations. International Journal of Production Economics, 226. https://doi.org/10.1016/j.ijpe.2019.107599

Dwivedi, Y. K., Hughes, D. L., Coombs, C., Constantiou, I., Duan, Y., Edwards, J. S., ... & Wade, M. R. (2021). Artificial Intelligence (AI): Multidisciplinary perspectives on emerging challenges, opportunities, and agenda for research, practice and policy. *International Journal of Information Management, 57*, 101994. https://doi.org/10.1016/j.ijinfomgt.2019.08.002

Edmondson, A. C., & Mcmanus, S. E. (2007). Methodological fit in management field research. *The Academy of Management review, 32*(4), 1246-1264. https://doi.org/10.5465/amr.2007.26586086

Eisenhardt, K. M. (1989). Building Theories from Case Study Research. *The Academy of Management review, 14*(4), 532. https://doi.org/10.2307/258557

Eisenhardt, K. M., Graebner, M. E., & Sonenshein, S. (2016). Grand Challenges and Inductive Methods: Rigor without Rigor Mortis. *Academy of Management journal, 59*(4), 1113-1123. https://doi.org/10.5465/amj.2016.4004

Ellefsen, A. P. T., Oleśków-Szłapka, J., Pawłowski, G., & Toboła, A. (2019). *Striving for excellence in AI implementation: AI maturity model framework and preliminary research results*. *LogForum, 15*(3), 363–376. https://doi.org/10.17270/J.LOG.2019.354

Enholm, I. M., Papagiannidis, E., Mikalef, P., & Krogstie, J. (2022-10). Artificial Intelligence and Business Value: A Literature Review. Information systems frontiers, 24(5), 1709-1734. https://doi.org/10.1007/s10796-021-10186-w

Eriksson, P., & Kovalainen, A. (2008). *Qualitative Methods in Business Research*. SAGE Publications Ltd.

Filieri, R., D'Amico, E., Destefanis, A., Paolucci, E., & Raguseo, E. (2021-11-17). Artificial intelligence (AI) for tourism: An European-based study on successful AI tourism startup. *International journal of contemporary hospitality management, 33*(11), 4099-4125. https://doi.org/10.1108/IJCHM-02-2021-0220

Fosso Wamba, S., Queiroz, M. M., Pappas, I. O., & Sullivan, Y. (2024). Artificial Intelligence Capability and Firm Performance: A Sustainable Development Perspective by the

Mediating Role of Data-Driven Culture. *Information systems frontiers, 26*(6), 2189-2203. https://doi.org/10.1007/s10796-023-10460-z

Floridi, L., Cowls, J., Beltrametti, M., Chatila, R., Chazerand, P., Dignum, V., . . . Vayena, E. (2018). AI4People—An Ethical Framework for a Good AI Society: Opportunities, Risks, Principles, and Recommendations. *Minds and machines, 28*(4), 689-707.

Freeman, J., & Engel, J. S. (2007). Models of innovation: Startups and mature corporations. California Management Review, 50(1), 94–119. https://doi.org/10.2307/41166418

Garbuio, M., & Lin, N. (2019-02-01). Artificial Intelligence as a Growth Engine for Health Care Startups: Emerging Business Models. California management review, 61(2), 59-83. https://doi.org/10.1177/0008125618811931

Gedeon, S. A., & Tynjälä, P. (2017-01-01). Measuring Student Transformation in Entrepreneurship Education Programs. Education research international, 2017(2017), 1-12. https://doi.org/10.1155/2017/8475460

Ghoreishi, M., Bolund Nielsen, I., & Pynnönen, M. (2025). *Adaptation of Artificial Intelligence by Startup for a Data-Driven Circular Economy: Evidence from Multiple Case Study in Finland*. Taylor & Francis. https://doi.org/10.4324/9781003433743-4

Gibbert, M., Ruigrok, W., & Wicki, B. (2008). What passes as a rigorous case study? *Strategic management journal, 29*(13), 1465-1474. https://doi.org/10.1002/smj.722

Guest, G., Bunce, A., & Johnson, L. (2006). How Many Interviews Are Enough?: An Experiment with Data Saturation and Variability. *Field methods, 18*(1), 59-82. https://doi.org/10.1177/1525822X05279903

Haefner, N., Wincent, J., Parida, V., & Gassmann, O. (2021-01). Artificial intelligence and innovation management: A review, framework, and research agenda. *Technological forecasting & social change, 162*, 120392. https://doi.org/10.1016/j.techfore.2020.120392

Hasan, R., & Ojala, A. (2024). Managing artificial intelligence in international business: Toward a research agenda on sustainable production and consumption. Thun-88derbird International Business Review, 66(2), 151-170. https://doi.org/10.1002/tie.22369

Huang, M.-H., & Rust, R. T. (2018). Artificial Intelligence in Service. Journal of Service Research, 21(2), 155-172. https://doi.org/10.1177/1094670517752459

Jorzik, P., Yigit, A., Kanbach, D. K., Kraus, S., & Dabić, M. (2024). Artificial intelligence-driven business model innovation: A systematic review and research agenda. Journal of Business Research, 182, Article 114764. https://doi.org/10.1016/j.jbusres.2024.114764

Kallio, H., Pietilä, A., Johnson, M., & Kangasniemi, M. (2016). Systematic methodological review: Developing a framework for a qualitative semi-structured interview guide. *Journal of advanced nursing, 72*(12), 2954-2965. https://doi.org/10.1111/jan.13031

Kaplan, A., & Haenlein, M. (2019). Siri, Siri, in my hand: Who's the fairest in the land? On the interpretations, illustrations, and implications of artificial intelligence. Business Horizons, 62(1), 15-25. https://doi.org/10.1016/j.bushor.2018.08.004

Kopalle, P. K., Gangwar, M., Kaplan, A., Ramachandran, D., Reinartz, W., & Rindfleisch, A. (2022). Examining artificial intelligence (AI) technologies in marketing via a global lens: Current trends and future research opportunities. *International journal of research in marketing, 39*(2), 522-540. https://doi.org/10.1016/j.ijresmar.2021.11.002

Kraus, M., Feuerriegel, S., & Oztekin, A. (2020). Deep learning in business analytics and operations research: Models, applications and managerial implications. European Journal of Operational Research, 281(3), 628–641. https://doi.org/10.1016/j.ejor.2019.09.018

Kuckertz, A., Brändle, L., Gaudig, A., Hinderer, S., Reyes, C. A. M., Prochotta, A., Steinbrink, K. M., & Berger, E. S. C. (2020). Startups in times of crisis – A rapid response to the COVID-19 pandemic. Journal of Business Venturing Insights, 13, e00169. https://doi.org/10.1016/j.jbvi.2020.e00169

Kipwise. (n.d.). *AI tools for startups & small businesses*. https://kipwise.com/blog/ai-tools-for-startups-small-businesses?utm_source=chatgpt.com

Kumar, V., Rajan, B., Venkatesan, R., & Lecinski, J. (2019). Understanding the Role of Artificial Intelligence in Personalized Engagement Marketing. *California management review, 61*(4), 135-155. https://doi.org/10.1177/0008125619859317

Lin, Y., & Maruping, L. M. (2025). Organizing for AI Innovation: Insights From an Empirical Exploration of U.S. Patents. *MIS quarterly, 49*(3), 1095-1122. https://doi.org/10.25300/MISQ/2025/18765

Marmer, M., Herrmann, B. L., Dogrultan, E., & Berman, R. (2011). Startup genome report: A new framework for understanding why startups succeed. Startup Genome.

McKinsey & Company. (2025). *The next innovation revolution—powered by AI*. Retrieved from https://www.mckinsey.com/capabilities/quantumblack/our-insights/the-next-innovation-revolution-powered-by-ai

McKinsey & Company. (2025). *The state of AI*. https://www.mckinsey.com/capabilities/quantumblack/our-insights/the-state-of-ai?

McKinsey & Company. (2023). The state of AI in 2023: Generative AI's breakout year. QuantumBlack. Retrieved from https://www.mckinsey.com/capabilities/quantumblack/our-insights/the-state-of-ai-in-2023-generative-ais-breakout-year

McKinsey & Company. (2025). The state of AI in 2025: Agents, innovation, and transformation. McKinsey Global Survey. https://www.mckinsey.com/capabilities/quantumblack/our-insights/the-state-of-ai

Machucho, R., & Ortiz, D. (2025). The Impacts of Artificial Intelligence on Business Innovation: A Comprehensive Review of Applications, Organizational Challenges, and Ethical Considerations. *Systems (Basel), 13*(4), 264. https://doi.org/10.3390/systems13040264

Ma, L., & Sun, B. (2020). Machine learning and Al in marketing - Connecting compu-ting power to human insights. International Journal of Research in Marketing, 37(3), 481-504. https://doi.org/10.1016/jijresmar.2020.04.005

Mittelstadt, B. D., Allo, P., Taddeo, M., Wachter, S., & Floridi, L. (2016). The ethics of algorithms: Mapping the debate. *Big data & society, 3*(2), . https://doi.org/10.1177/2053951716679679

Mullainathan, S., & Spiess, J. (2017). Machine Learning: An Applied Econometric Approach. *The Journal of economic perspectives, 31*(2), 87-106. https://doi.org/10.1257/jep.31.2.87

Nguyen-Duc, A., Kemell, K., & Abrahamsson, P. (2021). The entrepreneurial logic of startup software development: A study of 40 software startups. *Empirical software engineering : an international journal, 26*(5), . https://doi.org/10.1007/s10664-021-09987-z

OECD (2025), *AI adoption by small and medium-sized enterprises: OECD discussion paper for the G7*, OECD Publishing, Paris, https://doi.org/10.1787/426399c1-en.

Okafor, N. G., & Murphy, P. J. (2025). Utilizing AI in Business and Entrepreneurship: Implications for Complex Decision-Making in Engineering and Product Development Settings. *Applied AI letters, 6*(3), -n/a. https://doi.org/10.1002/ail2.70001

Palanivelu, V. R., & Vasanthi, B. (2020). Role of artificial intelligence in business transformation. International journal of advanced science and technology, 29(4), 392-400.

Paternoster, N., Giardino, C., Unterkalmsteiner, M., Gorschek, T., & Abrahamsson, P. (2023-07-24). Software development in startup companies: A systematic mapping study. *arXiv.org*. https://doi.org/10.48550/arxiv.2307.13104

Poland, S., Sharad, S., & Wigen-Toccalino, G. (2024). Powering Innovation: The Compre hensive Impact of Generative AI. Climate and Energy, 40(7), 1–11. https://doi.org/10.1002/gas.22385

Ries, E. (2011), The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Business. Crown Business.

Schwaeke, J., Peters, A., Kanbach, D. K., Kraus, S., & Jones, P. (2025). The new normal: The status quo of AI adoption in SMEs. *Journal of small business management, 63*(3), 1297-1331. https://doi.org/10.1080/00472778.2024.2379999

Sekliuckiene, J., & Baltrunaite, V. (2020). The Use of Organisational Learning Practices in Startup Growth. *Entrepreneurial Business and Economics Review, 8*(1), 71-89. https://doi.org/10.15678/EBER.2020.080104

Shane, S., & Venkataraman, S. (2000). The promise of entrepreneurship as a field of research. Academy of Management Review, 25(1), 217–226. https://doi.org/10.5465/amr.2000.2791611

Shankar, V. (2018). How Artificial Intelligence (AI) is Reshaping Retailing. Journal of Retailing, 94(4), vi-xi. https://doi.org/10.1016/S0022-4359(18)30076-9

Stoica, F., & Pelican, E. (2025-05-15). A machine learning approach of enhancing eCommerce solutions. Expert systems with applications, 274, 126997. https://doi.org/10.1016/j.eswa.2025.126997

Szalavetz, A. (2019). Artificial intelligence-based development strategy in dependent market economies – Any room amidst big power rivalry? *Central European Business Review, 8*(4), 40–54. https://doi.org/10.18267/j.cebr.219

Tiwari, A., Punia, D., & Aithal, A. (2023). Does technology make startups resilient amidst COVID-19? Qualitative Market Research: An International Journal, 26(4), 408–427. https://doi.org/10.1108/QMR-03-2022-0053

Venkatesh, V., & Davis, F. D. (2000). A Theoretical Extension of the Technology Acceptance Model: Four Longitudinal Field Studies. *Management science, 46*(2), 186-204. https://doi.org/10.1287/mnsc.46.2.186.11926

Vibe.co. (2025, September 30). *Vibe.co Raises $50M Series B to Bring AI-Powered, Hyper-Targeted Advertising to TV*. GlobeNewswire. Retrieved from https://www.globenewswire.com/news-release/2025/09/30/3158376/0/en/Vibe-co-Raises-50M-Series-B-to-Bring-AI-Powered-Hyper-Targeted-Advertising-to-TV.html

World Economic Forum. (2021). *Shaping the future of artificial intelligence*. Global Technology Governance Summit. https://www.weforum.org/meetings/global-technology-governance-summit-2021/sessions/shaping-the-future-of-artificial-intelligence/

Yin, R. K. (2009). *Case study research: Design and methods* (4th ed.). Sage.

Yu, J., Zhan, X., & Bojja, G. R. (2025). Exploring artificial intelligence for sustainable business development: A review. *Data science and management*. https://doi.org/10.1016/j.dsm.2025.10.001

Zahra, S. A., Sapienza, H. J., & Davidsson, P. (2006). Entrepreneurship and dynamic ca pabilities: A review, model and research agenda. Journal of Management Stud ies, 43(4), 917–955. https://doi.org/10.1111/j.1467-6486.2006.00616.x

Appendices

Appendix 1. List of Interviewees

Interviewees	**Position**	**Interview Length**
Startup A	Founder	51 min 02 s
Startup B	Founder	57 min 51 s
Startup C	Co-Founder	41 min 59 s
Startup D	Founder/CEO	44 min 32 s
Startup E	Founder	41 min 47 s

Appendix 2. Semi- Structured Interview Questions

RQ: How do startup utilize AI in business development, and what factors act as barriers and triggers for AI adoption?

General information of the interviewee

- Age:
- Total years of experience:
- Position:
- Start date of the company:

1. Can you briefly describe your startup and your role within the company?
2. How would you describe the role of technology in your startup's business model?
3. When did your startup start using AI tools in its business activities?
4. What motivated your startup to adopt AI tools?
5. How did you personally and as a team initially perceive AI before adopting it?
6. To what extent did leadership or team attitudes influence the decision to adopt AI?
7. In which business development activities does your startup currently use AI? *e.g.* marketing, customer engagement, sales, lead generation, analytics
8. What kind of AI tools are you using in your business operations?
9. Can you describe how AI is used in one or two specific business development processes?
10. Why were these particular areas prioritized for AI implementation over others?
11. What benefits has your startup experienced since adopting AI tools?
12. How has AI influenced efficiency, decision-making, or customer interaction?
13. In your view, has AI helped your startup gain any competitive advantage? If so, how?

14. What challenges or barriers did your startup face when implementing AI tools? *e.g:* cost, technical expertise, data quality, integration
15. How did your startup respond to or manage these challenges?
16. Are there any areas where you chose not to use AI? Why?
17. Do you plan to expand AI usage in the future? Under what conditions would this be possible?
18. Based on your experience, what advice would you give to other startup considering AI adoption?
19. Is there anything else you would like to add regarding AI use in startup that we have not discussed?

Appendix 3: Data Analysis Coding Process

Interview Extracts	Initial Code	Category	Findings Themes
"We are a very small team…. limited people…." (Startup C)	Resource limitations, small team	Drivers of AI Adoption	AI adoption and Attitudes
"I started using AI to try out…. technology is moving fast"(Startup A)	Curiosity, Experimentation	Motivational drivers	
"We use AI for marketing and sales related activities……" (Startup D)	Marketing support, coding, content generation	AI Application areas	Application areas
"The biggest benefit is that it has immensely saved our time… sometimes it gives me an idea…."(Startup E)	Productivity cost reduction, Sales, New Ideas, Time Saving	Benefits of AI	Perceived benefits of AI
"Sometimes AI gives wrong answers with high confidence…" (Startup C)	Reliability issues	Technical challenges	Challenges and Barriers
"AI is trained on existing data….AI does its thing…. It's hard…"(Startup B)	Data Privacy concern	Risk concerns	
"It is risky…in the end it is you who makes the decision…"(Startup B)	Human control and decision authority	Limitations to AI use	