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The Role of Artificial Intelligence in Evolving the Theory of Efectuation Within Entrepreneurial Practice

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Foreword

We wish to extend our heartfelt gratitude to all who supported us throughout this study. Special thanks are due to our interview participants and our professor and advisor.

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Sincerely,

Viktoria Henriksveen

Karoline Hannisdahl Haaland

Gard Natvig

Abstract

The Fourth Industrial Revolution, characterized by rapid advancements in artificial intelligence (AI), is transforming industries and redefining business practices globally. This thesis examines how AI impacts the application of Sarasvathy's Effectuation Theory within the entrepreneurial processes of early-stage startups. Effectuation Theory, which focuses on leveraging available means and making adaptive decisions under uncertainty, is re-evaluated considering AI's capabilities. The research employs a qualitative methodology, utilizing in-depth interviews with startup founders and AI experts to gather insights.

Findings reveal that AI significantly enhances entrepreneurial efficiency by automating routine tasks, enabling sophisticated data analysis, and facilitating rapid decision-making. AI's ability to predict market trends and optimize operations allows entrepreneurs to navigate uncertainties with greater precision and agility. However, the reliance on AI for innovation presents limitations, as AI excels in optimization but falls short in generating truly disruptive ideas. Human creativity and strategic thinking remain indispensable for groundbreaking innovation.

The study also explores the ethical considerations and challenges associated with AI integration, including data privacy, potential biases, and job displacement. Despite these challenges, AI democratizes access to advanced technologies, leveling the playing field between small startups and large corporations.

This research contributes to the ongoing dialogue on entrepreneurship in the digital era, suggesting that Effectuation Theory should incorporate AI as a core resource. The enhanced decision-making and operational capabilities provided by AI necessitate an augmentation of entrepreneurial strategies, blending AI's analytical strengths with human creativity to drive sustainable growth and innovation.

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List of Abbreviations

1. 4IR - Fourth Industrial Revolution
2. AI - Artificial Intelligence
3. IoT - Internet of Things
4. ML - Machine Learning
5. DL - Deep Learning
6. RP - Respondent
7. AGI - Artificial General Intelligence
8. API - Application Programming Interface
9. MVP - Minimum Viable Product
10. NLP - Natural Language Processing
11. GDPR - General Data Protection Regulation

Chapter 1 - Introduction

1.1 Background

The Fourth Industrial Revolution (4IR), a term coined by Klaus Schwab in 2016 (Schwab, 2016), is fueled by several key developments, including the expansion of data and connectivity, advancements in analytics, enhanced interfaces for human-machine interaction, and significant improvement in robotics technology (McKinsey & Company, 2022). The growing utilization of new technologies such as artificial intelligence (AI), blockchain, and the Internet of Things (IoT), are being applied across multiple industries (Chalmers et al., 2020). This revolution marks a significant shift in the way societies operate and businesses compete. Unlike previous industrial revolutions, the fourth industrial revolution is evolving at an exponential rate, rather than linear pace, profoundly impacting almost every sector in every country and redefining what it means to conduct business in the modern world (Park, 2016).

At the heart of this revolution is artificial intelligence (AI). AI refers to machines that mimic human intelligence processes. They learn from external data and use this learning to achieve specific goals (Shepherd & Majchrzak, 2022). Recent advancements in AI have equipped machines with the capacity to analyze extensive datasets (Chalmers et al., 2020), and machine learning uses algorithms that learn from data to make predictions (Nichols et al., 2018). Deep learning, a subset of the wider machine learning methodologies, has the capabilities to intelligently process and analyze data on a vast scale (Sarker, 2021). AI's significance lies therefore not just in its ability to process large volumes of data at speeds humans cannot match, but also in its capacity for machine learning, enabling systems to learn from data patterns and improve over time.

In this evolving technological landscape, the traditional theories of entrepreneurship are put to the test. AI is seen as a driver of change, enabling new ways of operating, innovating and competing in the entrepreneurial world (Roundy, 2022). From facilitating the identification of business opportunities to refining decision-making with predictive analytics; and from enhancing organizational performance and reducing the need for manual intervention through automating routine tasks to marketing and sales strategies, the influence of AI is profound (Giuggioli & Pellegrini, 2022).

Within the context of today's rapidly evolving and technologically disruptive landscape, this research aims to explore how the widespread integration of AI impacts entrepreneurial theory, focusing on Sarasvathy's Effectuation Theory. Developed prior to the digital and AI revolution, Effectuation Theory has been instrumental in articulating the cognitive frameworks and decision-making processes that characterize entrepreneurial action under uncertainty (Sarasvathy, 2001). The theory has its proponents, such as Coviello and Joseph (2012) who value effectuation as an explanation of success in product development. Fisher (2012) who regards effectuation as one of the few viable alternative theoretical perspectives describing entrepreneurial action. On the other hand, it also faces criticism from scholars like Bluedorn, Chiles and Gupta (2007), who argue that the theory is underdefined and lacks originality; Baron (2009) believed that the “focal agents” posited by Effectuation Theory are unlikely to exist as depicted; Chandler, Markova and Perry (2012) conclude that the theory has not been sufficiently empirically tested.

As articulated by Arend, Sarooghi, and Burkemper (2015), we agree that any proposed theory of entrepreneurship, especially one that has persisted for over two decades and continues to polarize opinion, merits thorough examination. Considering Chandler, DeTienne, McKelvie, and Mumford's (2011) assertion that understanding the actions and behaviors of entrepreneurs is vital to comprehending an entrepreneurial economy, it follows that studying these actions is crucial. Consequently, a critical analysis of any new conceptualizations of these actions, becomes imperative. Combining this perspective with the growing utilization of artificial intelligence in various sectors, we believe that digitalization and AI-driven changes present a compelling case for examining whether and how this cornerstone of entrepreneurial theory necessitates modification or augmentation.

Therefore, the purpose of this study is twofold: to explore the transformative impact of AI on the application of Effectuation Theory within the entrepreneurial processes of early-stage startups,

and to ascertain whether the digital era's advancements necessitate a recalibration of entrepreneurial theory itself. By delving into the interactions between AI and entrepreneurial practice, this research aims to contribute to the ongoing dialogue on entrepreneurship in the age of digital and AI innovations, offering insights that could inform both theoretical refinement and practical application.

1.2 Research Question

This master thesis aims to explore the following research question:

How does Artificial Intelligence (AI) transform the application of effectuation theory in the entrepreneurial processes of early-stage startups?

1.3 Framework

In the pursuit of understanding the dynamics of AI on entrepreneurship, this research utilizes a qualitative methodology anchored in in-depth interviews. This approach is chosen for its ability to capture the subtle influences of AI that may not be immediately quantifiable. By engaging directly with startup founders and key personnel who use AI in their daily operations, the research provides a firsthand perspective of the technological transformation within the entrepreneurial landscape. The research design includes conducting semi-structured interviews, which offer both the flexibility to explore complex topics and the structure to ensure coverage of specific research areas. The study's exploratory design is ideal for delving into emerging phenomena, facilitating an examination that builds a robust foundation for understanding the impact of AI technologies on entrepreneurial ventures.

This study explores the role of AI in the early stages of startup development, revealing how AI serves as both catalyst and a complement in the entrepreneurial landscape. Initially, AI acts as a support tool, optimizing the complexities of launching and operating a new business. This allows

startups to function effectively with leaner teams, potentially altering the traditional model that heavily relied on diverse, expansive teams and robust networks. The findings illustrate a dynamic interplay between technology and human expertise, highlighting how each contributes uniquely to the growth and differentiation of startups in a rapidly evolving market. This study sets the stage for a deeper discussion on the nuanced roles of AI and human talent in shaping the future of entrepreneurship.

Chapter 2 - Literature Review

For our literature review, we utilized prominent databases including Elsevier, JSTOR, ResearchGate, Emerald, ScienceDirect, SAGE Publications, and predominantly Google Scholar. It was primarily through Google Scholar that we accessed and were directed to these other publishers. Google Scholar served as our main tool for conducting searches, using specific strategies to refine our search. These strategies included defining key terms such as "artificial intelligence," "effectuation theory," and "entrepreneurial practice" relevant to our thesis on the role of artificial intelligence in evolving entrepreneurial practice. We employed advanced search options to include exact phrases, exclude certain words, and to combine search terms using operators like AND, OR, and NOT to filter results. Additionally, we consulted our professor to see if he could recommend articles on the topic, further enriching our research resources. This approach helped us gather a broad array of scholarly articles, ensuring the relevance and depth of our literature review.

2.1 Overview of Effectuation Theory

2.1.1 Genesis of Effectuation Theory

Effectuation theory, as developed by Saras D. Sarasvathy, represents a significant paradigm shift in the field of entrepreneurship research (Perry, Chandler, & Markova, 2012). Before her contributions, the dominant approach in entrepreneurship research focused on a causation framework, grounded in the principles of traditional strategic management and economic theory. This mindset was characterized by a strong focus on opportunity recognition, systematic planning and rational decision-making to maximize expected returns (Knight, 1921; Ansoff, 1965; Porter, 1980; Shane & Venkataraman, 2000). The old framework assumed a more deterministic view of the entrepreneurial process, where success was largely attributed to the entrepreneur's ability to predict and plan effectively (Shane & Venkataraman, 2000; Porter, 1980).

This paradigm dominated the field of entrepreneurship research until scholars like Sarasvathy challenged its applicability to the entrepreneurial process, particularly in environments recognized by high uncertainty and rapid change. Effectuation, as a proposed theory, describes a process of entrepreneurial action based on the interpretation and extrapolation of a think-aloud lab protocol involving twenty-seven expert U.S based entrepreneurs in the late 1990s (Sarasvathy, 2008). It follows an approach that Suddaby, Hardy, and Huy (2011) call "problematization" - where an existing theory of business processes fails to adequately explain observed patterns of behavior, in this case the start-up behaviors of expert entrepreneurs. The empirical study of expert entrepreneurs led Sarasvathy to articulate distinct patterns that differentiated entrepreneurial experts from novices. Her findings demonstrated that while novices tended to follow more predictive or causal reasoning models, the experts frequently engaged in what she identified as effectual reasoning. This form of reasoning is characterized by its adaptive nature and its focus on leveraging new opportunities that emerge during the entrepreneurial process (Sarasvathy, 2001). Effectuation is offered as an improvement in depicting a specific phenomenon – that is, where a resource-poor entrepreneur acts to create a new market artifact (new and successful firm), in an environment characterized by uncertainty (Sarasvathy, 2001; Arend, Sarooghi, and Burkemper, 2015).

Sarasvathy drew upon the work of Herbert Simon in bounded rationality and the concept of satisficing, which challenges the classical model of rational choice under uncertainty. Simon's idea suggests that decision makers opt for a course of action that is good enough, rather than optimal, under the constraints of limited information and cognitive capacity (Simon, 1955).

Sarasvathy's findings aligns with this perspective by suggesting that entrepreneurs often start with what they know and what they can do, making use of available means rather than striving for optimal solutions in highly uncertain situations (Sarasvathy, 2001). Simon (1979) also emphasized the role of problem-solving processes and the adaptation to the task environment as key aspects of decision-making. He posited that decision makers utilize what he referred to as "adaptive toolboxes". Simon defined this as a set of heuristics or simplified rules crafted from past experiences and cognitive processes that help navigate decision-making under uncertainty. These toolboxes are adaptive in the sense that they continually revised and expanded based on feedback from the environment and outcomes of past decisions. This notion resonates with Sarasvathy's (2001) description of the entrepreneurial process, where decision makers use their creativity and resources at hand to evolve their goals and adapt to emerging opportunities and constraints – principles encapsulated in effectuation's *bird in hand* and *lemonade*. Sarasvathy's introduction of effectuation theory proposed a shift towards a more dynamic, flexible, and creative approach to entrepreneurship, emphasizing the ability of entrepreneurs to shape their opportunities and environments rather than merely responding to them. This marked a fundamental shift from a predictive, planning based approach to one that values adaptation, flexibility, and co-creation in the face of uncertainty (Sarasvathy, 2001; Wiltbank et al., 2006).

2.1.2 Core Principles

From her initial research on entrepreneurs in 2001, Sarasvathy proposed a new framework for understanding entrepreneurial decision-making, which includes five core principles:

- 1. Bird-in-Hand Principle:** Start with your means. Entrepreneurs begin with their resources and competencies and ask what they can achieve with them rather than targeting predetermined goals.
- 2. Affordable Loss Principle:** Risk only what you can afford to lose. This principle suggests focusing on ventures where the potential downside is tolerable, rather than optimal expected returns.

3. Crazy Quilt Principle: Form partnerships. Entrepreneurs build networks and leverage contingencies, engaging stakeholders who are willing to commit, thereby co-creating the market and its opportunities.

4. Lemonade Principle: Leverage contingencies. Entrepreneurs embrace surprises that arise and adapt flexibly, using them to redirect and reshape their ventures.

5. Pilot-in-the-Plane Principle: Control over prediction. This principle shifts focus from predicting an uncertain future to controlling aspects of the future that are truly controllable (Sarasvathy, 2001).

2.1.3 Effectuation Theory in Entrepreneurial Practice: Applications and Limitations

Entrepreneurs employ effectuation theory by starting with available resources and capabilities, including personal knowledge, networks, and skills, and progressively determining achievable goals through iterative interactions with stakeholders (Sarasvathy, 2001). This iterative process allows for opportunities to be co-created with partners and customers, adapting to changes and inputs in a manner that traditional predictive planning might not accommodate (Perry, Chandler, & Markova, 2012). However, the application of effectuation also faces criticisms and limitations. Critics argue that the theory may oversimplify the complexities of venture creation and might not be as effective in highly structured markets or where the entrepreneurial goals require highly specific outcomes (Arend, Sarooghi, & Burkemper, 2015). Furthermore, the emphasis on leveraging available means can potentially limit scalability or lead to suboptimal resource utilization, particularly when broader, more ambitious market opportunities might be seized through a causation approach (Wiltbank et al., 2006).

2.2 Recent Advances in AI and Technology

2.2.1 Advancements in AI

AI's progression from a theoretical concept to a suite of technologies that support significant innovations across sectors is due to the exponential growth in computing power, increase in data generation and the evolution of deep learning. According to Gams and Kolenik (2021), Moore's law refers to the observation that the count of transistors on computer chips doubles each year. The advancement in computing power at a fixed cost (Shalf, 2020) described by Moore's law has made it possible to process and analyze the vast amounts of data required for machine learning. The latest development in sensors and IoT technology has resulted in the collection of large quantities of data. Data are generated from various sources such as social media, smart phones and sensors (Rahmani et al., 2021). This provides the machines with training data to learn from (Santos, 2022). Improvements in algorithms, particularly deep learning, a technique inspired by the human brain (Fan et al., 2020), have significantly enhanced AI's capabilities (Wang et al., 2020).

2.2.2 Evolution of digital technology: Transforming the Landscape from 2001 to today

In 2001, when Sarasvathy introduced the theory of effectuation, the digital technology landscape was markedly different from today's landscape. At that time, the internet was less pervasive, broadband access was not as widespread, and the most cutting-edge devices were significantly less powerful than current standards. In 2000, only half of Americans had broadband at home, a figure that has now reached above 90%. This growth is mirrored globally, with internet users increasing from less than 7% to over half the world's population. Mobile phone subscriptions have surged from 740 million in the early 2000s to over 8 billion in 2023. Apple launched its first iPhone in 2007, catalyzing a shift towards more personal technology. The social media landscape transformed drastically too, from less than a million users on Myspace in 2004 to

Facebook amassing over 2.26 billion users by 2018, alongside other platforms achieving similar growth (*Here's How Technology Has Changed the World Since 2000*, 2023).

2.2.3 AI and the Fourth Industrial Revolution: Integration and Impact on Industry Dynamic

The decade from 2013 to 2023 witnessed significant technological advancements shaping entrepreneurship. AI, the IoT, and blockchain were pivotal, offering tools and frameworks that enabled start-ups and established businesses to address complex challenges. Particularly, AI transformed business operations by improving efficiency, personalization, and real time decision-making, enhancing sectors from e-commerce to healthcare. This technological shift has not only improved operational efficiencies but also driven innovation, creating a competitive edge in various industries. Furthermore, this period also saw the rise of platform-based businesses and financial technologies that improved access to capital, allowing for greater financial inclusivity and risk management strategies (Daraojimba et al., 2023).

2.2.4 Regulatory and Ethical Considerations

Discussions around AI deployment in entrepreneurial areas have centered on the pressing need for ethical governance and regulatory oversight. As AI enhances operational efficiencies and opens new job possibilities, it simultaneously comes with challenges such as the displacement of traditional jobs, biases in algorithmic decisions, and complex ethical questions that stretch the boundaries of traditional moral reasoning. For instance, incidents such as the bias observed in Amazon's AI recruitment tools and the inappropriate responses from Microsoft's chatbot Tay emphasizes the potential ethical pitfalls, including discrimination and harmful biases (Sisón et al., 2023).

Privacy concerns are particularly significant as AI systems, which rely on extensive data, could potentially infringe upon personal privacy rights. This underlines the urgent need for privacy and

ethical practices in AI development to prevent these technologies from worsening social disparities. The ongoing discourse suggests that the rise of AI should be managed within the Montréal Declaration for Responsible AI Development, requiring that AI systems to be developed and deployed conscientiously. This approach emphasizes the necessity of incorporating ethical considerations from the outset of technological design and throughout the lifecycle of AI applications, ensuring that AI governance is transparent, accountable, and inclusive of all societal impacts (Miller & Wendt, 2021, pp. 3-11).

2.2.5 Digital Divide

According to Chalmers et al. (2020) the structure of the technology sector is significantly influenced by the concentration of AI resources among a few dominant firms, creating an “oligopoly” where major tech companies control essential assets like data, hardware, intellectual property, and algorithms. This concentration not only drives the direction of technological innovation but also limits the scope for new ventures by establishing entry barriers. This environment, characterized by high "skyscrapers" of data and knowledge, often leaves smaller firms reliant on licensing or partnering with these larger entities to access necessary AI resources.

Furthermore, the access to AI technologies varies across sectors, enhancing disparities in healthcare, education, employment, and financial services. Urban and affluent regions benefit from AI-enhanced healthcare and educational tools, while rural and economically disadvantaged areas lack essential infrastructure and access, widening health and educational inequities. In employment, access to AI training shapes job market opportunities, leaving those without it increasingly marginalized. Similarly, financial services augmented by AI cater predominantly to wealthier individuals, perpetuating economic disparities by restricting financial advancement opportunities (Božić, 2023).

2.2.6 Technical Domain

Advancements in AI, which facilitates the automation of tasks once reliant on human intelligence, emphasizes the importance of technical proficiency for understanding and deploying AI applications. As these technological developments continue at a rapid pace, they necessitate a deeper technical skill set, heightening the demand for a robust understanding of technology. The emergence of new technology necessitates knowledge updates, requiring individuals to learn how to utilize it effectively. Given AI's relatively recent introduction to the entrepreneurial landscape, there remains a dual emphasis on both technical expertise and interpersonal skills. This recognition stems from AI's inherently technical nature, where a gap exists between the perceived capabilities of the technology by novice entrepreneurs and its actual feasibility (Chalmers et al., 2020).

2.3 AI's Effect on Entrepreneurship

2.3.1 AI-driven Decision Support Systems

AI has redefined traditional decision-making processes by providing organizations with advanced analytical capabilities (Prasanth, 2023). AI as a tool has evolved from being a technological concept to becoming a central element in strategic business decision-making, transforming the way businesses approach challenges and opportunities (Kaggwa et al, 2024).

The integration of AI with human expertise in decision-making processes illustrates a convergence between technological insights and human experience. According to Prasanth (2023), this synergy narrows the gap between human capabilities and technological advancements. These collaborative dynamic addresses and anticipates customer needs more accurately, ensuring that businesses can respond more adeptly to market demands.

For entrepreneurs, AI is used for prospecting and improving business ideas. It enables them to conduct experiments and explore new technological solutions simultaneously (Roundy, 2022). AI can be utilized in shaping advertising and forming analyses from consumer data. Much of the focus on entrepreneurship and AI is directed towards the potential benefits such as increased

speed and efficiency in projects, as well as the ability to detect unidentified patterns. At the same time, it is emphasized in the article that the use in entrepreneurial projects is still relatively underexplored (Roundy, 2022). AI is changing well-established business practices, marking a shift from conventional methods to more AI-driven approaches.

2.3.2 Enhancing Agility

Startups operate in environments characterized by uncertainty and rapidly changing market conditions, necessitating the ability to iterate and adapt swiftly. AI algorithms automate tasks, analyze extensive data sets, and interact with customers, thereby enhancing operational efficiency and accuracy (Davenport, Guha, Grewal, & Bressgott, 2019; Weber et al., 2021; Kagawa et al., 2024). These capabilities enable startups to optimize business processes, predict trends, and manage customer relationships with minimal errors. AI's automation of routine tasks and delivery of predictive insights enhances the agility of startups.

2.3.3 Shaping Business Models

AI facilitates changes in business practices by enabling automation and enhancing data processing capabilities. Generative AI can create text, images, audio and other content, which is noted for its role in simplifying business processes. This technology automates tasks that were traditionally manual and time-consuming, such as customer interactions and administrative functions, thereby reshaping the business landscape to be more efficient and adaptive (Ratten, 2024). Furthermore, the integration of AI in business also extends to the creation of smart cities and the automation of services such as healthcare and transportation. This affects how businesses interact with and serve their customers, indicating a shift towards more personalized and efficient service delivery systems that leverage AI capabilities (Ratten, 2024).

2.3.4 AI and Creativity

According to Jia, Luo, Fang and Liao (2023), AI has a nuanced role in augmenting employee creativity by automating routine components of tasks, thereby allowing individuals more time to engage in higher-order creative thinking. This automation not only speeds up the ideation process but also enriches the quality of creative outputs by providing diverse perspectives and solutions that might not be immediately obvious to human thinkers. As noted by Townsend & Hunt (2019), AI's capacity to quickly generate a broad array of options and alternatives can facilitate rapid prototyping and iteration of concepts, which is helpful in the dynamic, fast-paced environments that startups typically operate in. This capability allows entrepreneurs to explore more innovative solutions and respond more flexibly to market feedback.

While AI can enhance the efficiency and scope of creative outputs, there is an ongoing debate about its ability to genuinely replicate the depth of human creativity. Boden (1998) argues that while AI has made considerable advances in the areas of combinational and exploratory creativity, transformational creativity remains a significant challenge. This form of creativity, which fundamentally changes the rules or dimensions of the conceptual space, requires not only advanced AI capabilities but also a deep integration of cultural, emotional, and contextual understanding that AI currently lacks.

2.4 AI and Born Global Firms

2.4.1 Characteristics of Born Global firms

Born global firms are companies that engage in significant international activities shortly after their establishment. Unlike traditional businesses that graduate through a gradual process of internationalization, Born Globals are characterized by their rapid entry into foreign markets, often within a few years of their inception (Knight & Cavusgil, 2004). These firms typically arise from sectors where the borders are less relevant, such as in technology and digital services, and

are usually founded by entrepreneurs with a global vision and international market experience (Oviatt & McDougall, 1994).

Key features of born global firms include a proactive commitment to international markets, extensive use of network relationships, and significant reliance on advanced technologies from the outset. These companies leverage global networks for resources, innovation, and market access, and they tend to be highly knowledge-intensive, utilizing the latest technological advancements to maintain competitive advantages across multiple countries (Madsen & Servais, 1997). The reliance on technology not only facilitates their rapid international expansion but also allows these firms to overcome the traditional size and scale disadvantages faced by new entrants in global markets.

2.4.2 Role of AI in Accelerating Globalization

AI plays a pivotal role in accelerating the globalization process for born global firms. AI technologies facilitate the rapid scaling of operations and entry into international markets by enhancing decision-making, automating processes, and personalizing customer interactions across diverse markets (Cano-Kollmann et al., 2016). AI-driven tools such as machine learning algorithms, natural language processing, and robotics help these firms navigate the complexities of multiple regulatory environments, cultural differences, and customer preferences without the need for extensive localized human resources.

AI applications are instrumental in overcoming traditional barriers to international market entry and operations. For instance, AI enhances the efficiency of supply chain management through predictive analytics and demand forecasting, enabling born globals to optimize their inventory and logistics in real-time across different countries (Autio et al., 2018). Furthermore, AI-driven customer relationship management systems allow born globals to maintain close interactions with customers globally, adapting their offerings to local preferences while maintaining a consistent brand experience.

AI also democratizes access to international market intelligence, providing born global firms with insights into market trends, competitor analysis, and potential entry strategies without the traditionally high costs associated with such research. This capability is particularly crucial for born globals, whose swift international expansion relies on quickly understanding and adapting to new markets.

Chapter 3 - Research Methodology and Methods

Although quantitative research usually involves systematic and empirical investigation, and therefore sometimes might be a more reliable method since it is not influenced by feelings or opinions (Basias & Pollalis, 2018), qualitative research empowers the study participants to share their experiences and perspectives (Pathak et al., 2013). In inquiries concerning the impact of AI on the entrepreneurial process, participants noted that they observed significant efficiencies in their work processes, achieving more in less time. Though they lacked metrics to substantiate this improvement. Given the absence of numerical data and statistics to gauge this efficiency, capturing the perspectives, experiences and insights of individuals directly involved in the integration and utilization of AI becomes crucial for evaluating AI's effect on business strategies and decision-making under uncertainty.

As outlined by prominent scholars (Merriam, 2009; Hennink et al., 2010; Denzin & Lincoln, 1994), qualitative research might provide benefits such as “(a) supporting the researcher to understand the nature and complexity of the phenomenon being considered, (b) enabling research in relative new areas of research and (c) supporting the investigation of a phenomenon in its natural environment”. Consequently, given that this thesis seeks to understand the nature and complexity of a relatively new area of research, we believe that the approach outlined is the most suitable for our study.

3.1 Research Design

We have chosen an explorative research design for this thesis as we seek insights, and a deeper

understanding of the effects AI has on the principles of entrepreneurship. The purpose for utilizing an explorative research design is for its attempt to discover something new (Swedberg, 2020) generate ideas for further research or new ideas (Cargan, 2007), and it is useful when the important variables to examine are unknown (Creswell, 2009). It is important to acknowledge certain limitations inherent in an exploratory research design. Although our study is based on interviews with 20 individuals, which may not provide a comprehensive representation of the entire sector (Taylor, n.d), this sample size is sufficient to reach saturation as per criteria defined by Rusu Mocănașu (2020). Consequently, while this study provides an understanding of the subject matter, it should not be considered a complete representation of the sector's experiences and perspectives.

3.2 Data Collection

Data collection for this research was achieved through conducting in-depth interviews with key personnel within startups leveraging AI to influence the entrepreneurial process. Additionally, we engaged in interviews with individuals who are considered experts on the subject matter. With regards to the term “expert”, we adhere to the definition as having specialized knowledge or skills in a certain field, which is not commonly available or accessible to everyone (Meuser & Nagel, 2009). The definition emphasizes that an expert's knowledge is distinct from every day or common-sense knowledge, and it is inherently linked with the power of defining situations within their field of expertise. Expert interviews constitute a valuable component of research due to the depth of context and insight they offer, especially in “unknown or hardly known fields” (Döringer, 2020).

We identified the subjects for our interviews through our network and industry events where we introduced ourselves and our research project to startups. We reached out to acquaintances in various industries and inquired if they possessed a direct or second-degree acquaintance. We contacted university students whose field of study is AI. Additionally, we posted on social media platforms (Instagram, LinkedIn) that we were looking to speak with individuals working with AI and/or experts in the field. The response was substantial, and we received numerous referrals from potential candidates. Subsequently, we contacted those who were recommended, informed

them about our study, and asked more about their background to determine if they were interested in participating in an interview.

In our study, we implemented purposeful sampling to select the most informative participants from a large pool (Palinkas et al., 2013). Initially, 101 individuals were contacted, and through a strategic selection process, we narrowed down our interviewees to 74, based on criteria that aligned with our research focus. This included key personnel from AI startups and experts in the field, chosen for their potential to provide rich, relevant, and diverse insights. 54 individuals were eliminated due to practical considerations such as time constraints. The remaining 20 individuals were interviewed. Out of these, 18 were key personnel in AI startups and 2 were experts.

3.3 Interview Execution

We conducted semi-structured interviews with an interview guide that we had thoroughly designed in advance and distributed to participants. To ensure data consistency, we adhered to the same interview guide and asked identical questions from the interview guide to all interviewees. The interview guide also provided participants with the chance to familiarize themselves beforehand and understand our role as researchers. The semi-structured format was purposely chosen to allow a natural conversational flow, enabling us to ask follow-up questions and allowing interviewees the opportunity to delve into topics that we may not have anticipated (Horton et al., 2004).

The research aims to uncover the depth and variety of experiences rather than quantifying them, qualitative interviews are advocated for their ability to capture words and descriptions, and not numbers. Qualitative interviews are preferred as they are designed to elicit nuanced accounts of interviewees experiences and perceptions (Brinkmann & Kvale, 2014, p. 30). Such detailed narratives are important for understanding the complex dynamics of AI's influence on entrepreneurial decision-making processes and strategic development during the initial phases of a startup. The specificity that qualitative interviews offer can provide insights into situations, decisions, and actions (Brinkmann & Kvale, 2014, p. 30) that startups take regarding AI. This specificity can shed light on the contextual factors influencing these decisions, which might be

lost in more quantitative approaches. With qualitative interviews, researchers can explore the meanings behind the participants' statements. This can be critical in understanding the "why" behind startups' approaches to AI. This allows for iterative validation of the findings, wherein interpretations of data can be revisited with participants for confirmation or disconfirmation (Brinkmann & Kvale, 2014, p. 30). Constraining the findings within predefined categories or theories can be avoided when using qualitative interviews, which is essential when investigating an emerging phenomenon like the influence of AI in startups. Approaching the interviews with naïveté allows the researcher to remain open to new insights (Brinkmann & Kvale, 2014, p. 30) about the influence of AI might not considered, which is crucial when researching a rapidly advancing field.

Interviews were conducted either by individual group members or collectively as a team. Two of the interviews were carried out in person, while 18 were conducted virtually via Teams, due to availability, geographical location and time efficiency. All interviews were recorded and subsequently transcribed with the software Cockatoo AI. This method allowed for complete engagement with the interviewee during the conversation without the distraction of notetaking. This approach enabled us to attentively listen to and understand the significance of what was being said (Gubrium & Holstein, 2002, p. 85). The number of interviews conducted in Norwegian versus English was determined by the preference of the interviewee. 12 interviews were done in Norwegian, while 8 interviews were done in English. On average, each interview lasted approximately 40 minutes. At the conclusion of each session, we extended our gratitude to the participants for their time and inquired if they had any additional insights to share.

3.4 The Use of AI

In our methodology section, we have used ChatGPT 4 to help identify academic articles related to our specified topics. While this approach has been successful at times, there have also been instances where the suggested articles either did not exist or did not address the requested themes. Additionally, when faced with messy transcription data from recordings, ChatGPT 4 has been employed to organize and accurately rewrite the transcripts. We have also used ChatGPT 4 for brainstorming how to structure the findings and discussion sections of our thesis. In these

instances, ChatGPT 4 has provided inspiration, though it struggled to maintain the coherent narrative we aimed for, thus limiting its utility.

Furthermore, we have utilized ChatGPT 4 to format references according to APA standards, when direct citation from sources like PDF files was not feasible. While this task could have been performed manually, using ChatGPT 4 for this purpose proved more efficient. ChatGPT 4 served as a translator when we needed to find the correct or best English terms for specific Norwegian words, such as translating "annengradsbekjentskap". Although tools like Google Translate or traditional dictionaries could have been used, we found ChatGPT 4 to be more effective in this role, providing alternatives when the initial suggestions were not satisfactory.

Finally, we utilized the Cockatoo AI program to transcribe our recordings. The recordings, made using a smartphone, were input into Cockatoo AI, which then converted these audio files into Word documents containing the transcribed text. This method facilitated an efficient transformation of spoken content into a written format, allowing for easier analysis and reference in our research.

3.5 Data Analysis

Following the transcription of all interviews, we conducted a thematic analysis and qualitative coding of the data. The analysis was divided into three stages: initially identifying relevant quotations, then sorting recurring themes versus distinct ones, and finally categorizing these codes while eliminating irrelevant or misunderstood data.

In the analytical phase of our research, we applied a collaborative approach to coding, ensuring that all three researchers actively participated in the codings of the findings. This collective effort to analyze and categorize ensured a full exploration of the data and enabled us to capture a broad spectrum of perceptions and identify a diverse array of themes (Cornish, Gillespie, & Zittoun, 2014, p. 79, p. 81). Each of us individually analyzed the transcripts to identify recurring themes and standout quotes. This process was not only aimed at establishing consistency across our observations but also at honoring the unique perspectives that each researcher brought to the table.

Unique codes were developed for both recurring quotes and those that stood out. Initially, we considered categorizing recurring quotes as those mentioned in at least half of the interviews. However, due to the high degree of consensus among interviewees, this threshold was adjusted to approximately $\frac{3}{4}$. Categorizing reoccurring quotes was made to gain a deeper understanding, observe connections, and ascertain if a majority shared the same perceptions. Distinct themes were identified where a clear majority expressed these opinions and viewpoints. Distinct themes are valuable as they can challenge assumptions, refine theories, and contribute to a more comprehensive understanding of the research topic (Namey & Trotter, 2015). Furthermore, data points that fall outside the norm can be crucial for developing new theories, as they challenge assumptions about how things typically work (Gibbert et al., 2020).

3.6 Preparations

Before initiating the main interview sessions, we executed a pilot interview, which informed refinements to our interview guide, enhancing its structure and efficacy. This preparation ensured that our interviews were systematic, allowing us to stay on course and extract the necessary data and information needed.

3.7 Validity and Reliability

External validity can be challenging to achieve in qualitative studies, as the data collected often comes from small samples. In our study, we interviewed only 20 individuals, limited by time and resources, which may have restricted the study's external validity (Ali & Yusof, 2011). Many extrinsic factors can impact the internal validity of interviews, affecting both the subject and the interviewer. Variables such as sleep, nutrition, stress can affect mood, concentration and memory (Beilharz et al., 2015; Mehta, 2022; Staal, 2004, pp. 31, 45). Acknowledging the challenge of mitigating factors such as sleep quality, stress and nutrition for interviewees, we ensured that as interviewers, we maintained optimal sleep and nutritional status. This approach was aimed at

enhancing our focus and mood, thereby contributing to the interviews' overall quality and effectiveness.

The test effect, or the perception of being evaluated, can induce subjects to embellish or alter their responses, potentially skewing the authenticity of the outcomes (Campbell & Stanley, 1959). To mitigate concerns, all in-person interviews were conducted in a private setting to ensure the comfort of the interviewees. Additionally, each session commenced with light conversation, serving as a preliminary engagement activity to facilitate a smooth start to the interview process. In terms of selection bias, our cohort comprised 70% male and 30% female participants. While this sample provides valuable insights, a more balanced gender representation could offer a broader perspective and enhance the study's internal validity (Campbell & Stanley, 1959)

Furthermore, reliability can also be challenging to achieve in qualitative research due to the difficulty of replicating social settings with exact precision (Lincoln & Guba, 1985, p. 299). The section articulates that “the repetitions...be applied ‘to the same units’” is impossible, like how one cannot “cross the same stream twice.” This suggests that social settings are constantly changing and recreating them perfectly for research purposes is not achievable. However, according to Knott et al. (2022), the article argues that replicability, often used to test research robustness and reliability, is less applicable for in-depth interviews. Instead, criteria like transparency are recommended for ensuring stringency, suggesting that traditional notions of replicability may not be paramount in qualitative research contexts. Therefore, to compensate for lack of reliability, we have enhanced transparency by detailing our research processes, such as interview settings, respondent recruitment, and coding methodologies (Kapiszewski & Karcher, 2020).

Given that a certain number of interviews were conducted via Teams, rather than in person, this may have impacted the quality of the interviews as potential clues such as body language and facial expressions might have been missed (Opdenakker, 2006). The interviews were conducted with cameras activated, enabling the observation and analysis of a broader range of non-verbal communication cues than would have been feasible in audio-only formats. However, video meetings impose a greater cognitive load, requiring more effort to send and receive signals. Additionally, excessive amounts of close-up eye contact can be demanding (Bailenson, 2021).

3.8 Ethical Considerations

Prior to commencing the interviews for our research, we adhered to the necessary legal and ethical standards regarding the handling and storage of personal data, as stipulated by SIKT's (the authority tasked with ensuring ethical standards and ensuring the protection of information within Norway's higher education sector) guidelines for research involving personal data. In alignment with these requirements, we completed the mandatory notification form provided by SIKT, designed to ensure that our research practices were in full compliance with applicable privacy laws and regulations. This process involved a thorough assessment of our research methodology, particularly focusing on how we intended to collect, use, and store sensitive information gathered from participants. The notification form, required to be submitted at least 30 days (about 4 and a half weeks) before the initiation of data collection, served as a review mechanism allowing us to evaluate and confirm that all aspects of our data handling procedures were secure, ethical, and legally compliant.

Furthermore, following ethical guidelines, we ensured that no sensitive personal data were included in the audio recordings submitted to AI transcription tools. This precaution was taken to protect participant privacy and comply with data protection regulations, thereby protecting the integrity of the research process.

Chapter 4 - Results and Findings

In this chapter, findings from the interview analysis will be detailed. These findings are organized according to the principles of Effectuation. Additionally, we extend our analysis to encompass challenges and ethical considerations. This offers a comprehensive lens through which the implications of AI on startup processes and strategies can be understood. The six themes explored are informed by our literature review, the objectives of our research, and the

recurring responses from interviewees. Throughout this analysis, we will present quotations from the interviews to illustrate, support, and substantiate our findings.

4.1 Bird in Hand Principle

Bird in Hand principle emphasizes starting with available resources—including who you are, what you know, and whom you know. Early-stage startups heavily rely on human capital, requiring a diverse range of skills and networks to navigate the complexities of launching and sustaining a business.

4.1.1 The Need for Human Resources

“Certainly, AI finds practical application within our data science initiatives. It serves as an exceptionally efficient tool for exploratory data analysis, significantly speeding up the process in my experience. This advancement allows us to shift away from the exhaustive use of human effort in deriving value from research. Nonetheless, it's imperative to underscore that possessing the requisite domain knowledge remains crucial, alongside other fundamental skills.” RP – 7

According to this respondent, AI speeds up research processes and minimizes the human labor required to extract insights from data. The respondent acknowledges that while AI enhances efficiency, the necessity for domain-specific knowledge persists, suggesting that AI complements rather than replaces human expertise.

“Traditionally, brainstorming required the participation of numerous individuals. However, I've shifted towards using technology as a primary assistant in this process, complementing it with my whiteboard for visualization. After formulating ideas, I consult with a select few domain experts for validation. This approach significantly simplifies and enhances the efficiency of my brainstorming sessions.” RP – 12

RP-12's approach to using AI as a primary tool in brainstorming sessions demonstrates a significant shift in how collaborative creative processes are structured. By leveraging AI for initial idea generation and visualization, the need for extensive human involvement is reduced.

“For instance, in legal matters, AI has been helpful. When I have inquiries regarding the Norwegian legal system, AI can provide insightful answers. For example, when I needed to register a company, much of the required information was region-specific. Instead of manually transferring information from a website to ChatGPT, I could directly ask it, “I want to create a company in Norway”. Furthermore, when needing to draft legal documents such as a nondisclosure agreement, AI proves to be a cost-effective and efficient solution. Hiring a lawyer for such a task could cost approximately €200 and take several days for document preparation. In contrast, ChatGPT can accomplish this in just a minute, offering a swift and economical alternative.” RP - 13

RP – 13 explains that AI enables entrepreneurs to bypass costly and time-consuming legal consultations, allowing for the efficient use of digital tools to manage legal aspects, thereby reducing the need for extensive legal personnel and optimizing human and financial resources.

“Leveraging AI allows me to optimize operations without the need to assemble a large team or rely extensively on partners possessing domain knowledge and credibility, particularly in the complex field of lifestyle medicine involving numerous doctors and complications. By outsourcing certain tasks and employing AI tools, we can operate more cost-effectively, eliminating the immediate need for hiring full-time staff. Consequently, we benefit from reduced personnel expenses and enhanced efficiency, underscoring AI's role in optimizing our resource allocation.” RP – 10

In the context of this healthcare startup, AI's role in minimizing the need for a large operational team exemplifies strategic resource management. By automating tasks that would typically require extensive human intervention, AI allows the company to operate more cost-effectively.

4.2 Principle of Affordable Loss

The Principle of Affordable Loss emphasizes the importance of risk management in entrepreneurial decision-making, urging entrepreneurs to limit exposure by risking only what they can afford to lose. This section examines how AI technologies transform this principle by enhancing the precision and effectiveness of risk assessments.

4.2.1 Risk Assessment and AI

The principle of affordable loss within Sarasvathy's Effectuation Theory relates to risk management by encouraging entrepreneurs to consider in advance how much they are willing to lose on an endeavor, rather than focusing purely on potential profits.

“We utilize AI primarily for risk assessment, where it serves as a tool to identify potential risks. While it is employed to analyze data, the extent of its use is limited. Our approach does not involve feeding extensive datasets into the system to generate outcomes directly.” RP – 2

This quote highlights a cautious approach to the use of AI in risk assessment. This restraint could be interpreted as an effort to maintain control over the decision-making process and to avoid overdependence on automated systems which could introduce new risks, particularly from errors in large-scale data analysis.

“We are developing a prototype aimed at enhancing efficiency within our operations. Central to this endeavor is the improvement of our risk assessment procedures, which traditionally involve a significant amount of documentation and analysis. By leveraging technology, specifically AI, we can automate much of this writing and analytical work. This innovation not only streamlines the process but also enables us to understand and interpret data more swiftly than conventional methods allow.” RP – 20

This respondent points out the efficiency gains from using AI versus traditionally labor-intensive risk assessment processes. By automating these tasks, AI saves time and might reduce the chance of human error.

“In risk assessment, AI has been utilized to identify potential risks relevant to the subject matter. It's an efficient tool since it's not always feasible to cover everything manually. AI offers valuable strategies for tackling problems, including writing and analyzing needs crucial for problem solving.” RP – 3

The use of AI in risk assessment described by RP – 3 supports the idea of using technology to cover areas that are impractical to manage manually, thus providing a strategic advantage in identifying potential risks. This approach can optimize the use of human resources and let individuals focus on tasks that require deeper insights and human judgement.

4.2.2 Efficiency and Resource Optimization

The integration of AI for increased efficiency can optimize the use of resources and minimize potential financial and operational losses. This aligns with the principle's focus on limiting risk exposure to what the entrepreneur can afford to lose.

“The use of generative AI offers an efficiency advantage by accelerating the output of the average data scientist beyond the typical results, making it particularly beneficial for routine tasks. However, for high-performing data scientists, those in the top 10%, who engage in more complex and advanced use cases, generative AI may not significantly speed up their work. These top performers excel in individual tasks that require their specific skill set. Nonetheless, the advantage for them lies in the ability to focus more on critical aspects of their work. Therefore, while the efficiency gains from AI are universal, they are most pronounced in simplifying and automating the more straightforward tasks.” RP - 5

This respondent highlights how generative AI boosts the productivity of data scientists by automating routine tasks, allowing them to focus on more complex and critical projects. While AI may not drastically change the workflow for the top tier of data scientists, it enables these

high performers to allocate their skills to areas where they can make the most impact, thereby optimizing their contribution without risking their resources on less critical tasks.

“As the CEO and co-founder of my company, I frequently manage a high volume of correspondence. Utilizing AI doesn't just save time; it significantly enhances my efficiency and capacity to engage with and respond to numerous messages. This capability proves invaluable at a foundational level. Moreover, I can input extensive contextual information about our company and market into various models, like ChatGPT or Gemini, and engage in a dynamic exchange with these systems. This process allows for a deeper exploration and understanding of relevant topics, further boosting my productivity and the strategic oversight I can provide.” RP - 12

This CEO's experience demonstrates AI's role in managing vast amounts of communication efficiently, which traditionally could overload an individual and compromise their ability to focus on strategic tasks.

4.3 Crazy Quilt Principle

The Crazy Quilt principle in effectuation theory highlights the significance of forming partnerships and building networks through available means and stakeholder commitments. This section explores how AI technologies influence the Crazy Quilt principle by facilitating more extensive and effective collaboration opportunities.

4.3.1 Enhancing Collaboration

“We have experimented with an AI note-taker that essentially transcribes meetings, capturing what is said, summarizing topics, and identifying action points. By employing this technology in numerous meetings throughout the day, it becomes possible to revisit these sessions afterwards and aggregate the information efficiently. The key advantage lies in enhancing the structure and effectiveness of conversations and deriving actionable insights from discussions.” RP - 5

RP-5's account of utilizing an AI note-taker to transcribe and summarize meetings exemplifies how AI can optimize information management and enhance the effectiveness of collaborative discussions. This technology not only captures the essential elements but also structures and organizes them into actionable insights, thereby augmenting the decision-making process and ensuring that strategic actions are derived efficiently from team interactions

“In the future, the use of both networking and AI will likely become more integrated, and one can envision networking becoming less crucial as technology offers more opportunities to those with weaker networks.” RP – 20

RP-20's prediction regarding the future integration of networking and AI highlights a pivotal shift in how entrepreneurial networks might operate. As AI technologies become more sophisticated, the traditional reliance on extensive personal networks could diminish, offering more opportunities to entrepreneurs who previously might have been constrained by weaker or less extensive networks.

“Networking is extremely important. AI cannot now, nor in the near future, replace the benefits a good network provides, such as: finding the right stakeholders, reliable suppliers and trustworthy partners and help with solving conflicts —challenges that most entrepreneurs face.”

RP – 9

In contrast to RP-20, RP-9 emphasizes the sustained significance of human networks, articulating that the unique and irreplaceable benefits of human interactions cannot be fully replicated by technological advancements. These divergent viewpoints highlight the crucial debate in the field of entrepreneurship: the extent to which AI can substitute for or enhance human touch.

“Networking has helped me connect with a lot of impactful people in the industry - this has provided opportunities I would not get without building on these relationships. In addition to finding new opportunities and business partners – the firsthand experiences solid connections

share has made me avoid a couple of pitfalls I could easily find myself struggling to solve on my own.”

RP – 12

The favorable view of networking continues when RP - 12 addresses the dual benefits of networking: it not only broadens their opportunities through connections with key industry figures, but also furnishes them with crucial insights and guidance. This resonates with the crazy quilt principle, which advocates for building a network of self-selected stakeholders committed to jointly creating the future, irrespective of initial market research or competitive analyses. In essence, the principle suggests that who you know and who joins you in your entrepreneurial journey can be more predictive of success than traditional competitive strategies.

4.4 Lemonade Principle

This principle emphasizes the importance of remaining flexible and responsive to unexpected events and changes in the business environment, using them as opportunities to create new strategies and directions. AI, through its capacity for data and trend analysis, equips businesses to effectively respond to these dynamics and use these changes for innovation and growth.

4.4.1 Data and Trend Analysis

“AI plays an increasingly significant role in product development, offering diverse applications. For instance, AI can enhance customer understanding through detailed data analysis, suggest improvements in product design, and automate testing processes to ensure quality. Additionally, AI's ability to predict market trends allows companies to stay ahead of their competitors. AI also enhances the personalization of products, tailoring them more effectively to individual customer preferences.” RP – 3

This ability to adapt quickly to new information aligns with the Lemonade Principle’s emphasis on turning surprises into opportunities. When AI reveals unanticipated customer needs or market

trends, companies can use this information to pivot their strategies or create innovative products that meet these emerging demands.

“Without AI, analyzing this data manually could be extremely time-consuming. However, by automating the data analysis process, AI frees up valuable time. This allows for a deeper development of market analysis or brand understanding because less time needs to be spent on basic data processing. This shift not only speeds up analytical tasks but also enhances the quality of insights derived from the data.” RP – 1

The freed-up resources from analyzing data with AI can allow companies to explore these insights more deeply and respond creatively to new information that might have gone unnoticed without AI.

“Trend analysis, when backed by robust data, enables the identification of patterns and trends that might otherwise remain unnoticed. However, the effectiveness of this analysis hinges on its integration with our product. It's essential to establish a connection between the trend analysis and the product to leverage these insights effectively.” RP – 20

The quote emphasizes the role of data-driven trend analysis in uncovering patterns that may not be immediately apparent. The effectiveness of this analysis is dependent upon its integration with the product. By connecting trend analysis with product strategies, businesses may leverage these insights to pivot and adapt, turning potential challenges into opportunities for innovation and growth

4.5 Pilot in The Plane Principle

This principle emphasizes the entrepreneur's active role in shaping their venture's future rather than being driven solely by predictive strategies. AI can assist in this process by providing realtime data analysis and decision-making tools that support entrepreneurs in steering their enterprises. It allows for quicker adaptations to changing market conditions and enables

entrepreneurs to experiment with new ideas, thereby co-creating the venture's path with stakeholders.

4.5.1 Entrepreneurial Decision-Making Enhanced by AI

Drawing on insights from respondents, particularly generative AI, plays a pivotal role in shaping decision-making processes within organizations. From influencing strategic direction to enhancing product design and development:

“In the context of strategic planning, the advent of generative AI has significantly influenced our strategic team. Its impact has been markedly precise, especially in guiding decisions related to product development, determining the scale of financing rounds, and steering investment choices. Generative AI makes it easier for us to acquire new customers and has made it easier for us to acquire new capital for the company. It has also contributed to faster innovation.” RP -

17

RP-17 discusses how generative AI has revolutionized strategic planning within their organization. By providing precise and actionable insights for product development, financing, and investment strategies, AI has enabled the strategic team to make more informed and effective decisions.

“For instance, I might consult ChatGPT with a request such as, “I need to design a dashboard focused on speed. Assuming you're an expert in psychology and color technology, which colors should I use to positively impact the user's psychological process?” This approach enables me to receive guidance on color selection despite having no prior knowledge in the field, thus aiding in my decision-making process.” RP – 12

RP-12's use of ChatGPT to aid in designing a dashboard based on psychological principles and color technology illustrates the practical application of AI in enhancing decision-making

processes. This example highlights how AI can extend an entrepreneur's capability to make specialized decisions without prior expertise in a specific area.

4.5.2 Brainstorming and Idea Generation

AI's role in brainstorming and idea generation can be seen as a tool for control and co-creation. AI technologies involved in generating and refining ideas enable entrepreneurs to explore a broader array of options and alternatives quickly. This capability supports the entrepreneurial process by allowing for rapid prototyping and iteration of concepts.

All respondents have indicated that AI can assist them in the generation of ideas, thereby enabling a more rapid presentation of concepts or pitching of products. Examples of this include the brainstorming of designs for various items, product development, marketing, and content generation:

“And so, it just opens things up. It also allows someone like me, who has a lot of different roles, to not have to be extremely proficient in drawing. I can take an idea and put it into some sort of visual product without any drawing skills”. RP - 1

According to this respondent, AI allows individuals without specific skills, such as drawing, to visualize and develop products. This capability enhances the entrepreneur's control over product development by removing traditional skill barriers and expanding the range of creative outputs they can personally generate.

“Generative AI plays a crucial role in the ideation process and copywriting, significantly contributing to business development in data media, as well as in the formulation of pitches.”

RP - 5

This use of AI contributes to business development by optimizing the creation of content and strategic communications, thereby enabling entrepreneurs to effectively communicate their vision and business value. By integrating AI into these creative processes, entrepreneurs can steer their ventures proactively.

"It possesses the capability for brainstorming, which I extensively leverage across various stages, from product development to content creation and marketing." RP - 8

RP-8 notes how AI tools can support the entrepreneur in navigating through the creative and operational aspects of the business, enhancing both the ideation phase and the execution phase. This ability to utilize technology to expand creative and operational capacities captures the essence of navigating through uncertainty with informed actions.

4.6 Challenges and Ethical Considerations

4.6.1 Personal Data Security

At the outset of the project, we held the belief that there was a widespread consensus regarding personal data security as a significant challenge associated with AI usage. To our expectations, most respondents expressed caution. Nonetheless, a segment of the participants recognize that AI is here to stay, and failure to adopt it could result in falling behind.

"Companies, particularly those dealing with personal data security, have taken a cautious stance towards adopting new AI tools. They've decided not to use these technologies in their operations until they have comprehensive guarantees regarding data protection and privacy."

RP – 11

The reluctance to employ AI tools until there are strong assurances on data security reflects a challenge in the wider integration of AI technologies. It emphasizes the need for robust regulatory compliance that ensures the integrity and confidentiality of personal information.

“The impact of AI is significant and complex, eliciting fear and skepticism due to a general lack of understanding, even among its creators. Despite this, “the cat is out of the bag,” and as I mentioned in the podcast, you just have to “throw yourself on it”.” RP – 9

This respondent addresses the broader societal and operational fears associated with AI, acknowledging the complexities of its use. The phrase “the cat is out of the bag” suggests that despite the challenges surrounding AI, its integration and influence into various sectors are inevitable.

“Small companies may not prioritize data security or personal data management initially, as their main focus is on developing a commercially viable model that solves a problem. Consequently, considerations such as data security might be overlooked. This is evident when observing how few companies and startups have a privacy policy, and even when these policies exist, they are rarely read. It's not always about safeguarding personal information for these businesses.” RP - 18

When interviewed about the differences in willingness or capability to integrate AI with respect to data security in startups versus larger companies, this respondent noted that startups do not necessarily prioritize personal data management initially. Instead, their focus is more on developing their product. This approach may contribute to startups finding it easier to integrate AI compared to larger companies. Startups typically face fewer bureaucratic hurdles and possess the ability to quickly adapt to new technologies, facilitating a swifter integration of AI innovations into their operations.

4.6.2 Technical Skills Required

With new technology comes the need for new knowledge, thereby necessitating specialist's adept at utilizing this technology. A concern we had at the outset of this project was that such talents

might be exclusive to large, established companies possessing the financial resources to offer high salaries.

However, from the interviews conducted, while advanced AI technologies may demand a higher level of expertise, access to this expertise is not exclusively reserved for larger companies. Startups, potentially, can offer more agile and engaging work environments, making them equally attractive to highly skilled professionals.

"Effectively utilizing AI, especially in product development, requires substantial knowledge and expertise. For instance, to enhance the safety and ease of image sharing within our domain, we've developed a model that can recognize facial features. This technology allows us to automatically blur all faces except the subjects in a photo upon user request. Consequently, this enables personalization of images for sharing, while ensuring privacy when disseminated across networks. Implementing such features necessitates a deep understanding of both the technology and the privacy considerations involved." RP – 11

The first quote comments on the complexity involved in using AI for specialized tasks. Developing features like facial recognition and selective blurring necessitates a grasp of both the technical elements and the ethical implications.

"For instance, in my product, we incorporate AI, which results in a solution that demands certain technical abilities. Consequently, if one intends to utilize AI for more complex, technical purposes, it will require additional time to master its usage." RP – 14

The second excerpt discusses the learning curve and the time investment required to utilize AI for complex functions. This reflects a challenge in AI adoption where organizations may have to allocate resources and funds for the integration of AI.

"We collaborate with a PhD researcher specialized in AI, engaging in various research projects together. Despite having the option to select among the top positions across Norway and Europe, this individual chooses to work with us. The appeal lies in our focus on cutting-edge, exciting

technology and our dynamic, startup-like environment. It's this commitment to innovative and compelling projects that enables us to attract brilliant minds to our team.” RP - 4

The third quote exemplifies how startups can attract top talent in the competitive field of AI. The allure for such potential team members often lies in the opportunity to work in a dynamic environment that prioritizes technology and innovative projects. This setting may be attractive because of the energetic and less bureaucratic environment it offers compared to larger, more established companies.

4.6.3 Innovate with Uniqueness

AI's strength in optimization does not necessarily extend to creating groundbreaking, disruptive ideas critical in innovation and entrepreneurship, suggesting its limitation in replacing human creativity and ingenuity:

“In the realms of innovation and entrepreneurship, where breakthroughs and originality are paramount, success often hinges on introducing novel, disruptive ideas that no one has previously conceived. In these instances of seeking major disruptive innovations, relying solely on AI may not be as beneficial, as it tends to excel in optimization rather than pioneering new frontiers.” RP – 2

This quote from RP – 2 points out that AI is better suited to improve existing processes rather than creating entirely new concepts. AI systems operate on data they have been trained on; hence, their capability to innovate is limited by the data available to them and the patterns derived from this data.

“I find AI's capabilities to be quite restricted. In attempts to engage in discussions with AI, it becomes clear that it can only be as insightful as the data it's been fed. To me, AI excels at addressing straightforward problems efficiently. However, our work often involves navigating uncertainties, revealing a significant limitation of AI: it operates solely within the realm of pre-

existing information. This constraint is not widely acknowledged, yet it's crucial. Innovation typically occurs beyond the current knowledge frontier, implying that relying on AI for innovation might paradoxically mean taking a step back rather than forward." RP – 4

This respondent emphasizes a considerable caveat: innovation often requires venturing into uncharted territory, beyond the current knowledge frontier. Here, AI might not be the best tool due to its reliance on pre-existing data.

"AI is not at a place where it can replace human creativity. When it advances in the future, it may be possible to be as creative or even innovative as some people are capable of. At this point, I am only able to use it as a tool to spike my own imagination, still being dependent on my own creativity and rational thoughts to make something desirable out of it. However, the combinatory delivery with myself and AI is better than what I can achieve by myself, considering I am not an above average creative person." RP – 16

RP-16 emphasizes that, while AI has not yet reached a level where it can replace human creativity, it serves as a valuable tool that can enhance and stimulate the human creative process. This quote suggests that AI, as it stands, is best used to augment human creativity rather than act as a standalone source of creative output. The respondent acknowledges a synergy between human creativity and AI, indicating that their combined efforts yield better results than what they could achieve alone

"I wouldn't particularly describe today's AI as creative or entrepreneurial thinking. I would rather refer to it as a competent assistant, akin to a smart individual with some creative ability and entrepreneurial understanding. However, if I were to start a company today, I would be able to take on more responsibilities and scale faster with these tools." RP – 19

RP-19 describes AI more as a supportive tool rather than a source of creative or entrepreneurial thinking. By likening AI to a "competent assistant," the respondent highlights AI's role in handling operational and possibly some creative tasks which are not supremely complex. This perspective sees AI as an enhancement that allows an individual to scale operations more efficiently and take on greater responsibilities within a startup environment.

“I believe there will always be people responsible for the most creative tasks. However, it will also be about who has the best data to train these models. Until we achieve what is called AGI (Artificial General Intelligence), which we think will happen in about 10 years, human creativity will continue to play a significant role. AGI aims to develop a system that thinks as intelligently or more intelligently than an average human today.” RP – 6

RP-6 touches on the future potential of AI, specifically the development of Artificial General Intelligence (AGI), which could rival or surpass human intelligence. This respondent believes that while AGI is not yet realized, human creativity remains paramount, especially for the most innovative tasks. The statement also hints at the importance of data quality in training AI models, which indirectly influences how creatively or effectively an AI can function. The anticipation of AGI suggests a significant shift in the balance between human and machine contributions to creativity and innovation once AGI is achieved.

4.6.4 Replacement of Jobs

Some of the respondents recognize AI's dual role as both a disruptor, with the potential to automate a significant portion of current jobs, and as a catalyst for the creation of specialized positions. However, there's an underlying concern that the jobs created may not compensate for those it displaces. Furthermore, the adoption of AI is seen as a critical determinant of future business success, with companies that fully integrate AI expected to gain substantial competitive advantages.

"Numerous tech companies have begun downsizing their teams as AI starts to supplant various roles, a trend likely to continue. While AI may generate more specialized positions, it's doubtful these will outnumber the jobs it replaces. Certain tasks, such as devising company-specific ideas, may prove more challenging for AI to take over. However, many other processes are already being easily automated with today's AI technologies." RP - 18

RP-18 notes the trend of downsizing within tech companies as AI begins to replace various roles. This development brings forth ethical considerations about the displacement of workers and the social responsibility of companies to manage such transitions thoughtfully.

"Within the next 2 to 4 years, AI has the potential to replace up to 90% of jobs, even in sectors primarily driven by knowledge. This shift is likely to lead to significant consolidation in the industry. Companies that integrate AI across all their operations will thrive, dramatically enhancing their efficiency, increasing their workload capacity, and reducing costs. Conversely, businesses that fail to leverage AI extensively across their organization risk obsolescence." RP -

15

The scenario from this respondent further elaborates on the ethical considerations. This could have broader socio-economic implications, and it argues for a fair allocation of AI's benefits and the responsibilities of businesses to ensure that their embrace of technology does not drive societal inequalities.

4.6.5 Potential Bias

Most of respondents address concerns regarding the reliability and ethical implications of using AI. They touch on the challenges of trust, the perpetuation of societal biases through AI, and the critical importance of data selection to mitigate the risk of AI-generated biases.

Firstly, AI can produce seemingly accurate information, but it can also mislead users:

"My issue with AI stems from a lack of trust. It often provides information that, while seemingly convincing, can be misleading. This necessitates a cautious approach to accepting its outputs. The need to verify every piece of information AI provides negates its convenience, leading me to consider handling tasks personally instead." RP - 6

Secondly, AI can perpetuate racial stereotypes and unrealistic body images, intensifying limited social standards:

“Our work with AI in image generation has unveiled deep-seated biases in the data, including racial stereotypes and unrealistic body images, reflecting narrow societal norms seen in stock photos. For instance, a query for “lawyer” often defaults to images of white, older men, highlighting racial bias, while women are depicted as unrealistically idealized, emphasizing body image issues.” RP - 3

Lastly, uncritical feeding of data into AI systems can result in biased outcomes. Without meticulous data selection, AI can unjustly reinforce stereotypes or produce ethically questionable suggestions:

“The issue of machine bias underscores a critical challenge in AI development: feeding AI systems data without careful curation can inadvertently lead to biased outcomes, including racism. For instance, if an AI is trained on data where a particular group is disproportionately represented in criminal statistics, the AI might unjustly associate higher crime rates with that group. Similarly, when determining compensation bonuses, the AI could suggest higher bonuses for certain demographics based on skewed statistical representations. While these outcomes might align with the data provided, they are ethically problematic, highlighting the importance of vigilance in AI training to prevent perpetuating such biases.” RP – 16

4.6.6 Accessibility

At the outset of the project, there was an initial perception that AI technology was costly and that this might create disparities, being reserved predominantly for wealthy and large companies with access to extensive resources, potentially excluding entrepreneurs in less economically favorable regions from access. However, responses from our participants indicate that this may not be the case, and that engaging in the market with AI might be more accessible than previously assumed.

“It is those who do not have a team and do not have the infrastructure that get the most profit from this technology. I would say that generative AI in many ways is an outstanding force between big and small companies”. RP – 7

RP-7 notes that those without substantial teams or sophisticated infrastructure derive benefits from AI, positioning it as an equalizer in the competitive landscape

"Generative AI is highly accessible because it operates on an API-based model. All you need to do is subscribe to the service, and you can begin integrating and utilizing it in your projects immediately." RP – 2

RP-2 emphasizes that the ease of access allows businesses to rapidly adopt and implement AI capabilities without needing extensive technical know-how or infrastructure, making advanced technology tools feasible for startups and smaller enterprises.

"In terms of cost-effectiveness, considering the advanced capabilities of this technology, it is remarkably affordable. For example, when comparing the expenses, using this AI for language processing is significantly less costly than employing tools like Google Maps for data and mapping services." RP – 4

RP-4 further elaborates on the economic advantages of using generative AI particularly its cost-effectiveness compared to other technologies.

“The more advanced use cases, the threshold is still quite high. Where it will create more value for large companies than for small companies, is primarily about different degrees of complete automation, large volumes of data, but in my opinion, there are not so many use cases where much data actually has a big profit” RP - 7

RP-7's observation highlights a nuanced perspective on the accessibility and utility of AI technology across different business sizes. While generative AI offers significant advantages to smaller companies by leveling the playing field, the benefits tend to scale with the complexity and sophistication of the use cases.

Chapter 5 - Discussion

5.1 Unlocking Entrepreneurship: A New Era of Universal Access

5.1.2 Rethinking Human Resources and Early-Stage Startups

The advent of AI in early-stage startups challenges the conventional reliance on human specialists for a range of tasks. Traditionally, effectuation theory emphasizes leveraging available means, including diverse human skills and co-creation, to navigate the uncertain terrains of startup development. However, our findings suggest a pivotal transformation: entrepreneurs can now progress significantly further in the startup phase independently. These tools can perform tasks that previously required a team of diverse talents, such as coding, marketing, communication, and data analysis. AI can even act as a creative sparring partner, generating ideas and facilitating brainstorming sessions.

Given these advancements, it is argued that effectuation theory may be expanded to include AI as a core component of the entrepreneur's means. This adjustment not only reflects the growing independence facilitated by AI but also acknowledges the enhanced capacity of entrepreneurs to control and direct the startup journey with fewer yet more powerful resources.

5.2 Challenges and Limitations

5.2.1 Driving Disruptive Innovation

The deployment of AI technologies offers substantial efficiencies in operational management and decision-making processes, enhancing capabilities across diverse business sectors. However, as businesses attempt to integrate more sophisticated AI functionalities, they encounter

escalating complexities and costs, which could limit their ability to fully utilize AI (Chalmers et al., 2020).

One of the profound limitations, as indicated in our research, is AI's reliance on existing data for innovation, which confines its ability to drive truly disruptive changes:

“In these instances of seeking major disruptive innovations, relying solely on AI may not be as beneficial, as it tends to excel in optimization rather than pioneering new frontiers.”

This aligns with Boden’s theoretical framework about creativity and artificial intelligence, illustrating that while AI can successfully create combinational and exploratory creativity by reconfiguring known elements within established boundaries, it is transformational creativity, where entirely new ideas and conceptual frameworks are developed – that poses the greatest challenge. This type of creativity requires altering the fundamental structures of thinking, a task that currently exceeds AI’s capabilities because it often depends on contextual and cultural insights that AI cannot access or generate on its own (Boden, 1998).

“AI is not at a place where it can replace human creativity. When it advances in the future, it may be possible to be as creative or even innovative as some people are capable of. At this point, I am only able to use it as a tool to spike my own imagination, still being dependent on my own creativity and rational thoughts to make something desirable out of it.”

Moreover, as startups scale and face the need to differentiate in crowded markets, the unique creative touch that humans bring becomes even more valuable. AI generated solutions can be generic or lack a nuanced understanding of customer needs and cultural contexts. Our findings indicate that you are more likely to capitalize on AI in a creative process by not fully relying on it, but rather exploit it to complement and streamline your own creativeness.

5.2.2 AI in The Workforce and Society

The integration of AI is associated with socio-economic implications, particularly concerning job displacement. AI's capability to automate not only routine but increasingly complex tasks presents a risk of job losses across various sectors, potentially exacerbating unemployment and

income inequality (Daza & Ilozumba, 2022; Chalmers et al., 2020). We advocate for the development and implementation of policies that promote continuous learning and retraining programs. This could adequately prepare the workforce for the evolving demands of an AI-driven economy.

5.2.3 Data Privacy and Bias

Beyond technological and financial challenges, ethical concerns such as data privacy and the potential for AI-driven biases present significant hurdles. AI systems, dependent on large and often sensitive datasets, are prone to breaches and misuse, raising concerns about data protection and user privacy (Sisón et al., 2023). AI systems reflect the biases present in their training data, often perpetuating existing societal prejudices, as noted from our findings:

“For instance, if an AI is trained on data where a particular group is disproportionately represented in criminal statistics, the AI might unjustly associate higher crime rates with that group”

This requires an approach to ensure AI systems are designed and monitored to promote fairness and equity, involving continuous algorithm updates and human oversight.

5.2.4 Data Manipulation

AI’s effectiveness is inherently tied to the quality and quantity of the data it processes. The risk associated with data breaches and unethical data use poses substantial threats, not only to individuals' privacy but also to societal trust in AI technologies (Sisón et al., 2023). Building on the concerns highlighted by Sisón et al. (2023) our findings underscore a related vulnerability, the susceptibility of AI to manipulation:

“The ease with which AI can be manipulated poses a significant concern”

This observation suggests that while AI technologies can process data to drive innovation and efficiency, they also introduce risks of manipulation that could undermine their integrity and the trust placed in them by users and society at large. Such risks highlight the critical need for robust

data governance frameworks and ethical AI practices to protect against manipulation and ensure AI's reliability and ethical use.

5.2.5 Data Dependency

During our literature review, concerns emerged about the accessibility of digital resources as Chalmers et al. (2020) highlighted that these resources are predominantly reserved for larger companies and therefore digital divide may widen as entities with access to larger, more comprehensive datasets have a distinct advantage. Additionally, Božić (2023) points out that rural and economically disadvantaged regions face significant barriers to accessing AI technologies. This lack of access could impact entrepreneurs in these areas, hindering their ability to compete and innovate effectively within the broader market.

However, our findings suggest that AI serves as a tool to level the playing field between small and large companies:

“It is those who do not have a team and do not have the infrastructure that get the most profit from this technology. I would say that generative AI in many ways is an outstanding force between big and small companies.”

Despite the challenges with access to larger data sets, our data reveals that those without extensive teams or advanced infrastructure benefit the most from generative AI, leveraging its capabilities to compete more effectively against larger entities. AI is not merely an auxiliary tool but capable of democratizing access to technology across business sizes.

5.3 AI and Effectuation: Transforming Entrepreneurial Strategy and Operations

5.3.1 Bird in hand

5.3.2 Resource Utilization

AI technologies can enhance the bird-in-hand principle by allowing entrepreneurs to leverage their existing resources in more innovative and efficient ways. It can help with individual productivity during the initial stages of a startup. Entrepreneurs may not need to seek out others with different competencies, as AI can assist with various tasks. This technological support allows for a more efficient and independent approach to early-stage development, enabling founders to manage more aspects of their ventures without extensive external input.

For instance, AI's capability to perform advanced data analysis can transform data into a source of actionable insights. AI can contribute to the optimization of operational processes. By automating routine and time-consuming tasks, AI frees up human resources, allowing entrepreneurs and their teams to focus on more strategic activities that align with their core competencies and business goals. Here, an excerpt from Weber et al. (2021) illustrates how AI assists in the legal industry:

“For example, in the legal industry AI technology can increase the efficiency of operations by taking over routine tasks and assisting humans with non-routine tasks. Here, especially the use of NLP is expected to play a major role, because it enables the automated analysis of documents”

A finding that was also confirmed by a respondent in our study:

“Hiring a lawyer for such a task could cost approximately €200 and take several days for document preparation. In contrast, ChatGPT can accomplish this in just a minute, offering a swift and economical alternative.”

These developments imply that the bird-in-hand principle might need to be broadened to include the dynamic nature of resource identification and utilization facilitated by AI. The theory should account for how AI enables entrepreneurs to see beyond their immediate means and consider data analysis and automation as strategic tools for revealing new opportunities. By doing so, the principle becomes not just about starting with what one has, but also recognizing how technology can amplify, expand, and leverage these initial resources in innovative ways.

5.3.3 Skill Augmentation

Integration of AI technologies into various domains facilitates skill augmentation by alleviating the necessity for exceptional proficiency in specific tasks. As exemplified by the quotation from a respondent, the utilization of AI driven tools can transcend traditional skill barriers. Individuals can produce outputs without extensive external assistance:

“And so, it just opens things up. It also allows someone like me, who has a lot of different roles, to not have to be extremely proficient in drawing. I can take an idea and put it into some sort of visual product without any drawing skills.”

The principle traditionally includes personal skills and knowledge as resources. With AI, the notion of what constitutes personal skills is expanded because individuals can leverage AI tools to perform tasks beyond their natural or trained abilities. This increases the entrepreneur's capabilities and resource base without requiring additional personal mastery or external hiring.

This further aligns with the way AI is used for brainstorming as RP-12's portrays, AI aids in generating and visualizing initial ideas, thereby streamlining brainstorming sessions and reducing the need for extensive human resources. This capability supports the creative process by allowing entrepreneurs to experiment with numerous scenarios and outcomes, hence expanding the “creative space” available to them (Townsend & Hunt, 2019). This new approach to solving creative tasks, even with limited resources at hand, highlights AI's potential to

augment the 'Bird in Hand' principle, which emphasizes starting with available means (Sarasvathy, 2001).

“...at this point, I am only able to use it as a tool to spike my own imagination, still being dependent on my own creativity and rational thoughts to make something desirable out of it. However, the combinatory delivery with myself and AI is better than what I can achieve by myself, considering I am not an above average creative person.”

This symbiosis between human and machine intelligence fosters an augmented creative capability in humans, wherein AI tools do not replace the need for human creativity but instead expand the boundaries within which human creativity can operate. This becomes a valuable resource when less creative entrepreneurs overcome an otherwise personality-related weakness.

To effectively broaden the Bird-in-Hand principle to include AI-driven skill augmentation, effectuation theory might incorporate a more nuanced understanding of resources. This would recognize not only the traditional tangible and intangible assets but also the extended capabilities provided by digital technologies. Additionally, it would highlight the evolving nature of what an individual or enterprise can do with the resources at their disposal.

5.3.4 Affordable Loss Principle

5.3.5 Risk Assessment

AI enhances the effectiveness of risk management strategies. Advanced analytics and predictive modeling refine the risk assessment process, ensuring more accurate risk identification and reducing the time required compared to traditional methods (Daraojimba et al., 2023). AI's capabilities extend into predictive analytics, where it excels at processing vast datasets to quickly identify emerging risks and enable timely organizational responses. This predictive capacity is critical in anticipating and mitigating potential threats before they escalate. Furthermore, AI's

integration into cybersecurity enhances a company's resilience against disruptions (Kalogiannidis et al., 2024).

The advantages of AI for risk assessment are corroborated by our interviews:

“In risk assessment, AI has been utilized to identify potential risks relevant to the subject matter. It's an efficient tool since it's not always feasible to cover everything manually.”

To adjust the affordable loss principle due to integration of AI for risk assessment, it may be useful to expand the theory to emphasize more continuous, data-driven decision-making. This could involve integrating concepts of flexible thresholds and real-time risk management into the entrepreneurial process, where decisions on what constitutes an affordable loss are regularly updated based on the latest AI-generated insights.

5.3.6 Cost Efficiency

AI contributes to cost efficiency, which is an important aspect of adhering to the affordable loss principle. Automation technologies powered by AI, such as machine learning algorithms for process optimization and natural language processing for customer service automation can take over repetitive and time-consuming tasks, thereby reducing labor costs and minimizing human error. For example, AI systems can automate financial bookkeeping and customer inquiries, tasks that would otherwise require significant human resources and financial investment (Ghosh, 2021; Santos, 2022). Supporting this view, a respondent highlighted the practical impact of these efficiencies, stating:

“You need less capital to start up on your own because you don't need as many employees and spend money on the same services.”

This testimony emphasizes the tangible benefits of AI in reducing the initial capital required for new ventures.

Traditionally, the affordable loss principle suggests entrepreneurs should limit their risk to what they can afford to lose. With AI-driven cost efficiencies, the notion of what constitutes an "affordable loss" might shift. Lower operational costs and improved efficiency reduce the financial burden of trials and potentially risky ventures. This allows entrepreneurs to reassess and potentially increase their risk tolerance, as the cost savings from AI can buffer against financial setbacks.

5.3.6 Crazy Quilt Principle

5.3.7 Partnership Formation

Established research highlights the critical role of networking in the early stages of business development, where fostering connections are essential for survival and growth (Kubberød, Viciunaite & Fosstenløyken, 2019). The Crazy Quilt principle emphasizes the importance of forming strategic partnerships suggesting that entrepreneurs leverage their networks to co-create market opportunities and engage committed stakeholders (Sarasvathy & Dew, 2005).

The crazy quilt principle is reflected in our findings, with RP-9 emphasizing the essential role of human networking. This respondent highlights that AI cannot replace the benefits provided by human networks, such as finding the right stakeholders, securing reliable suppliers, forming trustworthy partnerships, and resolving conflicts. Our findings indicate that AI is not yet utilized for navigating complex interpersonal dynamics, suggesting that the unique benefits of human interaction, such as trust-building, empathy, and understanding cultural nuances, remain important in networking.

“Networking has helped me connect with a lot of impactful people in the industry - this has provided opportunities I would not get without building on these relationships. In addition to finding new opportunities and business partners – the firsthand experiences solid connections share has made me avoid a couple of pitfalls I could easily find myself struggling to solve on my own.”

This participant's experience further underscores the value of human networking. These firsthand insights shared through human connections are often the result of serendipitous interactions and the deep trust that develops over time, aspects of networking that AI is yet to fully emulate.

Conversely, while AI lacks the social and emotional nuances that human interactions provide, it still serves as an efficient and knowledgeable co-creator or assistant. As illustrated by RP-5, AI effectively supports networking by managing logistical tasks. Our findings indicate that AI can handle a variety of challenges that entrepreneurs face when starting and operating new ventures, reducing reliance on external human expertise or labor. This includes automating routine tasks, optimizing operational efficiencies, seeking out opportunities, providing knowledge and guidance, and even enhancing creative processes. Therefore, it is reasonable to assert that AI can reduce the necessity for extensive mentoring, collaborators, and team members, thereby enabling entrepreneurs to navigate the early stages of venture creation with less dependence on a broad human network.

For entrepreneurs with limited access to large networks, AI could level the playing field by providing them with tools that compensate for these limitations, thus democratizing access to essential entrepreneurial resources. Moreover, RP-20's prediction about the future of networking suggests a continued decrease in the reliance on extensive personal networks.

AI can bolster the 'Crazy Quilt' principle by offering analytical tools and enhancing information flow in business settings. We contend that AI diminishes the reliance on human expertise, co-creation, and mentorship to some degree by providing additional resources. However, our findings also emphasize that AI cannot substitute for the vital elements of trust, empathy, and contextual understanding that are essential for forging dependable and strategic partnerships. Consequently, AI should be regarded as a supplementary tool that enhances, but does not replace, the human facets of networking. While AI can aid in identifying potential partners and opportunities, integrating these tools with the intuitive and relational skills of entrepreneurs will likely yield the best outcomes.

5.3.8 Lemonade Principle

5.3.9 Adaptability to Market Changes

AI's role in continuously monitoring market dynamics and customer behaviors significantly enhances an entrepreneur's capacity for agile response to market changes. This real-time adaptability facilitates rapid pivoting and iterative development in alignment with customer feedback and shifting trends. Consequently, this capability allows startups to stay competitive and lead market shifts by seizing emergent opportunities (Weber et al., 2021; Kaggwa et al., 2024).

The lemonade principle traditionally emphasizes the ability to turn surprises or unforeseen changes into opportunities, using available means and personal ingenuity. However, our research indicates that the integration of AI tools alters this dynamic by enhancing the speed and accuracy with which entrepreneurs can respond to these changes. We argue that this proactive adaptation extends the scope of effectuation theory by introducing an element of predictive control. It suggests that the environment in which entrepreneurs operate can be partially anticipated and shaped by their actions and influenced by the predictive insights provided by AI. This is a departure from the traditional view that focuses predominantly on reaction and adaptation, moving towards a more dynamic interaction with the future where entrepreneurs can actively influence outcomes.

5.3.10 Pilot-in-the-Plane Principle

5.3.11 Strategic Decision-Making and Enhanced Control

While AI can generate numerous ideas quickly, the human entrepreneur remains central in evaluating, refining and integrating these ideas into valuable outputs and business strategies.

"It possesses the capability for brainstorming, which I extensively leverage across various stages, from product development to content creation and marketing."

"...At this point, I am only able to use it as a tool to spike my own imagination, still being dependent on my own creativity and rational thoughts to make something desirable out of it."

Despite the capabilities of AI to assist in the brainstorming process, the entrepreneur acknowledges a fundamental dependence on their own creativity and rational thought to refine and transform these ideas into valuable outputs. This reaffirms the entrepreneur's role as the central figure in the decision-making process, aligning with the "Pilot in the Plane" principle where the entrepreneur actively controls and shapes the venture's direction.

AI systems can analyze historical data to identify patterns that are not immediately apparent to human analysts (Chalmers et al., 2020). These patterns can inform critical decisions about product development, marketing strategies, and customer engagement plans. By leveraging these insights, entrepreneurs can optimize resources, refine product offerings, and tailor marketing messages to better meet market demands and customer needs. Our findings support this:

"Trend analysis, when backed by robust data, enables the identification of patterns and trends that might otherwise remain unnoticed".

However, our results also suggest that robust data are essential for this process, and that some domain knowledge is required, though not necessarily to the extent previously needed.

We argue that this enhanced control directly extends principle by not just focusing on actions that can be directly controlled, but also leveraging advanced analytics to shape those actions in a more targeted and effective manner. The integration of AI into the decision-making process supports the 'Pilot in the Plane' principle by using technology to bolster, not replace, human creativity and leadership. Consequently, the principle should be broadened to incorporate AI as a tool that amplifies entrepreneurial control over business trajectories. By doing so, effectuation theory would more accurately reflect the contemporary entrepreneurial landscape where

decisions are increasingly supported by intelligent systems, thus enhancing the practical relevance and applicability of the theory in leveraging technological advancements for entrepreneurial success.

5.3.12 Accelerating MVP Testing Through AI

Effectuation theory emphasizes an entrepreneurial approach characterized by starting with available means to navigate uncertainty and create new opportunities, rather than setting fixed goals and trying to achieve them with predictable plans. This aligns closely with the role AI plays in rapidly testing Minimum Viable Products (MVPs) in startups. AI's capability to analyze market responses and gather user feedback enables startups to quickly adapt and pivot based on new data (Davenport et al., 2019). Our findings further affirm that AI reduces the time from concept development to market testing. This is accomplished by automating the gathering and analysis of data, thus facilitating faster product iterations informed by user feedback:

“AI can enhance customer understanding through detailed data analysis, suggest improvements in product design, and automate testing processes to ensure quality”

We argue that by automating data collection and analysis, AI not only expedites the development and testing of MVPs but also reshapes effectuation principles by fostering a more dynamic application of effectuation theory, where decision-making is continuously informed and updated through immediate data insights.

5.4 Redefining entrepreneurship: The convergence of technical mastery and people skills in the AI era

5.4.1 Blending human insights with AI

In addressing the research question of how AI transforms the application of effectuation theory in the entrepreneurial processes of early-stage startups, our research delves into how AI reshapes traditional entrepreneurial principles.

In the initial stages of startup development, the need for specific expertise, extensive networks, and particular personal traits can be significantly mitigated by AI's capabilities. By compensating for gaps in an entrepreneur's skill set, AI enables them to perform tasks without the traditional barriers of extensive training or experience. This accessibility allows entrepreneurs to advance further in developing their business without immediate need to expand their team or seek external expertise.

However, as companies grow, the limitations of AI in driving truly disruptive innovations become apparent. AI, while powerful, typically excels in environments characterized by predictable patterns and data-driven decisions. It does not inherently possess the creativity required to pioneer new markets or create revolutionary products. This emphasizes the increasing importance of human qualities, creativity, intuition, and the ability to engage in complex problem solving, that AI cannot replicate.

This dynamic illustrates that while AI transforms the application of effectuation theory at the early stages of startup development, the essence of entrepreneurship, characterized by human insight, innovation, and network building, remains indispensable. The challenge for modern entrepreneurs, therefore, lies in effectively blending AI's analytical and operational benefits with the irreplaceable value of human creativity and strategic thinking, ensuring that both elements merge to drive sustainable growth and innovation.

Overall, AI's integration across the spectrum of effectuation principles facilitates entrepreneurs' ability to navigate uncertainties with more informed and strategic decisions. Acting as an assistant, AI extends the means available to entrepreneurs, enabling the launch of successful businesses with fewer resources and promoting higher efficiency and quicker scaling. The pervasive influence of AI has thus become an integral component of modern entrepreneurial practice, shaping the very fabric of how businesses operate and evolve.

Chapter 6 – Conclusion

This thesis explores the transformative impact of AI on applying Effectuation Theory in early-stage startups. AI enhances entrepreneurial efficiency by automating tasks, enabling sophisticated data analysis, and facilitating rapid decision-making. Its ability to predict market trends and optimize operations helps entrepreneurs navigate uncertainties with precision and agility. However, AI excels in optimization but falls short in generating disruptive ideas, highlighting the ongoing importance of human creativity and strategic thinking for innovation.

In conclusion, the principles of Effectuation Theory, as articulated by Sarasvathy in 2001, remain profoundly relevant in today's entrepreneurial landscape. The theory's core tenets—starting with available means, affordable loss, leveraging contingencies, partnerships, and controlling an unpredictable future—continue to provide a robust framework for understanding and navigating the entrepreneurial process.

However, the advent of AI as a democratized resource presents a compelling augmentation to each of these principles. AI technology enhances the effectuation framework by introducing advanced tools that allow entrepreneurs to execute tasks with greater speed and efficiency, often requiring fewer personnel than previously necessary. For instance, AI's capacity for data analysis and predictive modeling can transform the 'bird in hand' principle by expanding what is considered 'available means.' Entrepreneurs can now access and interpret vast amounts of data to make informed decisions, effectively increasing their resources without significant capital investment.

AI also redefines the 'affordable loss' principle by minimizing risk associated with decision-making and reducing the initial capital required for building new ventures. Furthermore, AI can facilitate the 'lemonade principle' by quickly adapting strategies in response to new information, enabling businesses to pivot more effectively than ever before.

The 'Crazy Quilt principle' - the notion of forming partnerships and building a network of stakeholders - experiences the least enhancement from AI technologies. This observation stems from the inherently human aspect of networking that AI currently cannot compete with. However, we propose that as AI technologies increasingly replicate expert labor and can offer guidance and co-creation typically provided through interpersonal interactions, the reliance on extensive networks may diminish.

Finally, the principle of 'pilot in the plane', which emphasizes controlling the future, is significantly empowered by AI. Entrepreneurs can use AI tools to shape their business trajectories more directly by leveraging real-time data and predictive analytics, thus exerting greater control over their ventures' outcomes.

In light of these advancements, while the foundational aspects of Effectuation Theory remain unchanged, the integration of AI provides a powerful enhancement, enabling entrepreneurs to navigate the complexities of modern business environments more effectively. The fusion of effectuation principles with AI not only reflects the adaptive and dynamic nature of entrepreneurship but also signifies a shift towards more agile, informed, and efficient venture creation. As such, the marriage of Sarasvathy's Effectuation Theory with contemporary AI technologies not only validates its ongoing relevance but also expands its applicative breadth and depth, offering new pathways for entrepreneurial success in the digital age.

6.1 Theoretical Implications

The study advances the understanding of AI's influence on entrepreneurial activities, particularly in startup development, providing empirical evidence of AI's role in enhancing efficiency, resource optimization, and informed decision-making. The research suggests expanding Sarasvathy's Effectuation Theory to include AI as a fundamental resource, recognizing entrepreneurs' enhanced capacity to control and direct their journey with fewer yet more powerful resources. Entrepreneurs can leverage AI to achieve higher efficiency and effectiveness in their ventures, thus redefining the 'means' available to them as outlined in the original theory.

By incorporating AI into the theoretical framework, Effectuation Theory can better address the contemporary challenges and opportunities faced by entrepreneurs. This adaptation not only enhances the theory's relevance in the digital age but also provides a more comprehensive understanding of how technological advancements are reshaping entrepreneurial strategies and practices.

6.2 Practical Implications

Through this study, we have identified several issues that can be beneficial for entrepreneurs and startups who are daily engaged in developing innovative solutions and adapting to a dynamic market. The results of this study can inform entrepreneurs about the advantages of integrating AI into startup processes, as well as the challenges and limitations entrepreneurs should be aware of when incorporating AI into their business operations.

We also believe that this study can inform educational institutions focused on innovation and entrepreneurship about the importance of including AI in their curricula. Integrating AI into the coursework can better prepare students for an increasingly digitalized world.

6.3 Limitations

While this study provides valuable insights, it has several limitations. Firstly, the gender distribution among respondents might influence the findings, as perspectives and approaches in entrepreneurship can vary between men and women. Secondly, the geographical distribution of informants, with some based in Norway and others in the USA, could impact the results due to differences in business environments and practices between these regions. Thirdly, some of the research literature reviewed is not the most current, which is significant given the rapid pace of development in the AI field. This could affect the relevance and applicability of certain findings.

With three people cooperating we were aware that this could impact how we perceived and interpreted the information we received from our participants. Therefore, research bias was something we were attentive to. An example of this is that researcher's assumptions shape how they interpret with findings and social desirability bias, where respondents may answer or behave in a manner they perceive as desirable to the researcher (Bell et al., 2022).

Chapter 7 – Further Research

The research from this Master Thesis has uncovered several intriguing issues that could warrant further research. One of them is AGI, or Artificial General Intelligence, which represents a significant frontier in AI development. It typically refers to machine intelligence possessing human-like cognitive abilities, capable of understanding, learning, and performing any intellectual task that a human can. AGI stands out for its capacity to adapt and evolve in response to new knowledge and changing circumstances, much like humans do. This adaptability suggests potential transformative impacts across various sectors, including healthcare, finance, transportation, and education. As AI continues to advance rapidly, exploring the potential implications, challenges, and opportunities of AGI in these sectors will be crucial for future research endeavors. Additionally, considering the historical trajectory of AI development since its inception in 1951 provides valuable context for understanding the current landscape and projecting future trends (Thomas, 2024).

AI is expected to continue its trajectory of transformative impact across various industries, including healthcare, manufacturing, and customer service. Through advanced algorithms and automation, AI holds the promise of enhancing efficiency, accuracy, and innovation, ultimately resulting in higher-quality experiences for both workers and customers alike. In healthcare, AI-powered diagnostics and personalized treatment plans can revolutionize patient care, while in manufacturing, AI-driven predictive maintenance and robotic automation can optimize production processes. Moreover, in customer service, AI-enabled chatbots and virtual assistants can streamline interactions and provide tailored support. However, as AI proliferates, it also faces challenges that necessitate further research and development. These challenges include the need for increased regulation to ensure the ethical and responsible deployment of AI technologies, addressing data privacy concerns to safeguard sensitive information, and mitigating worries over potential job displacement. Continued research efforts are essential to overcome these challenges and unlock the full potential of AI for the benefit of society.

Future research should consider larger, more diverse samples to enhance generalizability and include a balanced representation of genders and geographic locations. Additionally, longitudinal studies could provide deeper insights into the long-term impact of AI on entrepreneurial processes. Further exploration of the ethical implications of AI integration, such as data privacy concerns and potential biases in AI decision-making, is also necessary. Investigating how different industries adapt AI in their entrepreneurial practices could provide a more nuanced understanding of its applications and benefits. It's safe to say that we will see more AI in the future. As technology advances and AI continues to evolve.

Chapter 8 - Bibliography

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