

Master Thesis

Paradoxes in Transformative AI Entrepreneurship

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Abstract

Artificial Intelligence (AI) has become a key technology that is shaping today's world. Consequently, a large number of AI startups are currently emerging that are spreading this transformative technology into industrial regimes. However, these AI ventures repeatedly encounter paradoxical tensions that hinder the socially responsible implementation of their innovations. It is, therefore, imperative to examine how entrepreneurial paradoxes are perceived and addressed by transformative AI startups. For this, the study follows a qualitative, inductive research design, drawing insights from eight AI startups. The findings not only show how paradoxes are perceived, but also reveal a grounded theory model that illustrates how AI startups respond to these entrepreneurial paradoxes. The emerging model enriches existing literature on AI entrepreneurship, provides new perspectives on paradox theory and offers avenues for future research.

Keywords Artificial Intelligence, Entrepreneurship, Sociotechnical Transitions, Paradox Theory, Gioia Analysis, Grounded Theory

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List of Abbreviations

AI Artificial Intelligence

AIA Artificial Intelligence Act

1. Introduction

The widespread adoption, scientific activity, and ongoing advancements in Artificial Intelligence (AI) technologies have made them essential in today's society, transforming the way businesses operate (Parteka and Kordalska, 2023; Ratten, 2024). Currently, AI is prominently used in various domains such as industrial robotics, healthcare services, and virtual applications like digital assistants, search engines, or cybersecurity (Brühl, 2023), thus making it also crucial for the startup scene.

AI offers significant societal benefits by addressing global challenges and enhancing lifestyles (Khogali and Mekid, 2023). By automating workflows and optimizing processes, AI improves for example efficiency and generates cost savings in healthcare (Singh et al., 2024). Furthermore, it frees individuals from repetitive tasks, boosts productivity, and enhances creativity and problem-solving skills (Khogali and Mekid, 2023). Moreover, it can support the energy transition and promotes sustainability, by making environmental monitoring more effective (Yin et al., 2023). Additionally, AI plays a crucial role in fostering for example sustainable entrepreneurship by driving innovation and technology deployment, thus increasing interest in eco-friendly business practices (Gupta et al., 2023).

In contrast, the negative social implications of AI can create internal tension within companies (Kumar et al., 2023). Common risks include data privacy and protection concerns that come from extensive data collection, analysis, and use by AI algorithms (Stahl and Wright, 2018). Additionally, risks of gender and ethnicity bias (Enholm et al., 2022) and resulting discrimination may occur when AI systems rely on uneven data sets (Stahl and Wright, 2018; Moore et al., 2022). Furthermore, the automation of jobs brings social and economic challenges such as the fear of job losses and the need to retrain affected workers (Khogali and Mekid, 2023).

Given the potential risks of AI and extensive development in recent years, regulation efforts are made on national, regional and global level (Neuwirth, 2023). The proposal for the European Union Artificial Intelligence Act (AIA) represents thereby a significant step forward in the establishment of regulatory standards for the development, deployment, and use of AI technologies (European Commission, 2021). The imminent entry into force of the AIA requires actors of the AI innovation system to actively address ethical and

social principles and make them an indispensable aspect of their operations in the near future.

Within the AI innovation system prominent tech giants such as Google and Microsoft are at the forefront (Montes and Goertzel, 2019) of the digital transformation, focusing on fundamental AI development and data collection (Jacobides et al., 2021). However, AI also plays a crucial role in empowering new ventures to develop innovative business models, products, and services around AI (Chalmers et al., 2021). Especially AI startups focus on "application and analytics software on-device and predicate their Edge technology on specific use cases" (Jacobides et al., 2021, p. 419), thereby spreading the transformative technology throughout society, and becoming an affected actor by the AIA.

Despite the regulatory frameworks, AI startups also face systematic challenges while trying to bring about change. First, AI startups are part of an ecosystem that is heavily dependent on tech giants for key data and enabling technologies (Jacobides et al., 2021). Secondly, they operate in a highly competitive market driven by rapid technological advances in AI (Jacobides et al., 2021; Kaggwa et al., 2023), which leads to immense pressure to succeed quickly while ensuring their own viability. Especially the implementation of AI poses economic barriers, primarily due to the significant costs involved, which can push ethical and social considerations such as data protection to the periphery (Oldemeyer et al., 2024). Furthermore, the young ventures must deal with securing funding from investors and meeting their stringent requirements (Kaggwa et al., 2023). In addition to these demands, AI startups also strive to create economically oriented value through their innovations (Lammers et al., 2022) and need to align their goals with societal expectations for safe and useful AI technologies (Willems et al., 2023).

With competing interests and the aim of succeeding in the existing regime, AI startups find themselves in a paradoxical situation with "contradictory yet interrelated elements that exist simultaneously and persist over time" (Smith and Lewis, 2011, p. 382). Especially stress, discomfort, and the sense of being pulled in opposing directions while facing these tensions (Putnam et al., 2016; Smith and Lewis, 2022; Moschko et al., 2023), can make it difficult to implement the necessary ethical and social principles. However, to responsibly take advantage of the positive impacts of AI, it is necessary for these organizations to embrace paradoxical tensions by reframing the conflicting poles as opportunities

for growth and adaptation (Mill et al., 2022).

Given the emerging field of AI, research around AI in startups, among others, remains limited (Oldemeyer et al., 2024), making it difficult for society and AI startups to fully understand the paradoxical tensions. Hence, it is crucial to look at how the specific paradoxes that transformative AI startups face are perceived and how they can potentially address them. By understanding the areas of tension within AI startups, insights can be gained to inform the development and deployment of socially responsible AI solutions in the future. Consequently, the central research question of this study is: "How do entrepreneurial paradoxes influence the management of transformative AI startups?" To answer this, two sub-questions will be addressed:

1. How do AI startups perceive paradoxes?
2. How do AI entrepreneurs address these paradoxes?

2. Theoretical Considerations

After taking a look at transition literature in which this work positions itself, the following section provides an introduction to AI startups, paradox theory and a brief overview of existing research on paradoxes in entrepreneurship and AI. Given that research on AI entrepreneurship is currently limited (Oldemeyer et al., 2024), this knowledge will help then to identify relevant paradoxes that can occur in AI startups.

2.1. Regime Transformation

Digitalization has significantly transformed our society in recent years, leading to a transition from one sociotechnical regime to another (Geels and Schot, 2007; Geels and Kemp, 2007). Sociotechnical regimes, as described in transition literature, are established systems that guide and stabilize the functioning of society (Geels and Schot, 2007; Nelson and Winter, 1982; Geels, 2019). Actors such as consumers, investors, firms, researchers, social movements, media and policymakers collaborate to maintain the current system of technologies, rules, institutions, and social practices, making it resistant to change unless

faced with strong external pressures or innovations (Geels and Schot, 2007; Geels, 2019). For example, disruptive technology can open up a transformation pathway, leading to adjustments by incumbent actors due to societal debates, institutional power struggles, conflicts or market negotiations (Geels and Kemp, 2007; Geels et al., 2016; Geels, 2019).

One phenomenon that challenges current industrial regimes is AI, which can be defined as "a system's ability to interpret external data correctly, to learn from such data, and to use those learnings to achieve specific goals and tasks through flexible adaptation" (Kaplan and Haenlein, 2019, p. 17). AI technology rapidly develops and spreads within society (Haefner et al., 2021) and can have a significant impact on personal lives and how firms operate (Haenlein and Kaplan, 2019). Furthermore, it is often considered as the latest general purpose technology by researchers (Vannuccini and Prytkova, 2020) and thus has the potential to trigger "systemic economy-wide transformation" (Cockburn et al., 2018, p. 119), despite that AI products are often designed for a specific, individual purpose (Kaplan and Haenlein, 2019).

Given the disruptive characteristics of AI and the high expectations placed upon it by the current regime, AI enablers often struggle to establish themselves within the current system. They further feel compelled to renegotiate their position and encounter conflicts and contradictions along the way, which can ultimately hinder the desired sociotechnical transformation.

2.2. AI Startups

An important enabler of AI are new ventures. AI startups can be defined "as a digital startup having AI as a core component of its business model" (Schulte-Althoff et al., 2021, p. 6517), therefore creating innovative digital products or services in the online world (Zhao and Collier, 2016). These technology-driven startups play a decisive role in transforming a wide range of industries (Miziolek, 2021), as they have the ability to disrupt traditional business models and processes (Kaggwa et al., 2023) with their cutting-edge AI solutions. Beyond their industry impact, AI deployment also can have a significant influence on society as a whole (Sanderson et al., 2022).

Furthermore, the AI startup scene is rapidly evolving, as more startups implement AI in their product and services (Weber et al., 2022). Those startups are in a constant interplay between technological innovation and market forces, requiring them to quickly adapt to emerging customer needs and technological advancements (Kaggwa et al., 2023). The market environment is also characterized by a duality of great opportunities and considerable hurdles (Kaggwa et al., 2023), which can significantly impact the operations of ventures. For example, one key challenge faced by AI startups is the need to navigate complex financial considerations, such as choosing the appropriate funding channels (Bonini et al., 2019; Kaggwa et al., 2023). Securing the right funding can be crucial for sustaining the business and driving continued innovation, while missteps in this area can ultimately lead to the startup's failure (Kaggwa et al., 2023). To overcome these and other challenges, such as managing technological development, market influence, and organizational growth, AI startups often rely on strategic entrepreneurial approaches such as strategic planning to navigate the complex situation and position themselves for long-term success and vitality (Kaggwa et al., 2023).

Lastly, it should be noted that many AI startups have their origins in academic research and development environments, as AI is based on science and technology (Zhai et al., 2024), thus having a knowledge-driven character.

2.3. Entrepreneurial Paradoxes and Strategies

One of the considerable hurdles that AI startups face while spreading the new technology is encountering tensions or contradictions, so-called paradoxes. The respective paradox theory was first covered by management research in the late 1970s and 1980s (Carmine and De Marchi, 2023) and has become a key theoretical lens for studying organizational phenomena (Lewis and Smith, 2014). According to Putnam et al. (2016) extensive literature review on paradoxes, the management of paradoxical situations can be divided into: 1. Either-or approaches, which involve defensive reactions and mechanisms, selection or privileging one pole, and deciding between separation or segmentation. 2. Both-and approaches, which involve embracing paradoxical thinking, vacillation or spiraling inversion, and integration/balance. 3. More-than approaches, which include reframing and tran-

scendence, connecting, creating third spaces and dialogue, and lastly reflective practice and serious play.

Within entrepreneurship, numerous paradoxes have been identified in scientific research. For example, paradoxes are known to emerge particularly in the context of social entrepreneurship, as these startups seek to reconcile their entrepreneurial practices with their social mission. One common paradox for startups is balancing the economic growth with their social mission (De Mon et al., 2022), which can also lead to an identity crisis, where organizations struggle with external perceptions that conflict with their self-identification (Weller and Ran, 2020). Furthermore, inconsistent performance metrics pose a challenge as social enterprises struggle to quantify their social impact alongside traditional financial metrics, often resulting in a trade-off between profitability and social value creation (Weller and Ran, 2020). De Mon et al. (2022) also identified key challenges such as reconciling work and family life, as well as integrating the innovation while maintaining organizational culture. Those paradoxes can be resolved with strategies such as selective coupling, compromise, and decoupling (De Mon et al., 2022).

Next, within transformative social innovations, systems reproduction, temporality, and reality construction can also arise in technological innovations as a paradox (Pel et al., 2023). The authors provide strategies for handling each paradox to "grasp, analyze and communicate about these paradoxical phenomena" (Pel et al., 2023, p. 54). For system reproduction dialectical approaches, multi-perspective analyses and critical discourse analysis can be utilized. Within the temporality paradox, translation analysis, process analysis and critical innovation research can help to resolve tensions. Lastly, for reality construction participatory action research, reconstructions of coproduction and reflexive methodology are key strategies.

Despite the paradoxes related to entrepreneurship, some paradoxes have been also identified in AI-related contexts that predominantly focus on the deployment of AI technology. One common paradox in this setting emerges from the consumers' interactions with the new technologies (Johnson et al., 2008). The authors assume that improving the functional aspects of a technology can simultaneously increase consumer anxiety and risk, which underlines the complexity of paradoxical thinking. Similarly, Chen et al. (2021) observe that technology paradoxes manifest within organizations during the adoption

phase, creating complex tensions. While these sources demonstrate the existence of such tensions, they do not provide strategies for how entrepreneurs can resolve them.

Furthermore, another paradox related to sustainability tensions is the Accuracy-Energy Paradox (Mill et al., 2022). The paradox occurs in the practice of trying to achieve accuracy for AI models while also limiting their carbon footprint. Strategies against this tension include a defensive approach, trade-off approach, or incorporating initiatives to improve the situation in the longer-term.

Moreover, in the field of AI, tension between augmentation and automation plays also a central role. Raisch and Krakowski (2021) argue against a clear distinction between augmentation and automation in management and emphasize their interdependence and the resulting paradoxical tensions. They warn that overemphasis on either augmentation or automation can negatively impact organizational performance and have societal consequences. Therefore, the authors argue that the paradox can be managed by adopting a balanced approach that combines automation and augmentation, leading to benefits for the business. Similarly, Singh et al. (2024) identified also tensions between automation and augmentation roles in healthcare services related to AI. They argue that balancing these dual perspectives poses challenges again during the adoption of technologies. Moreover, they outline several paradoxes in healthcare, including the data paradox relating to patient autonomy and data privacy, the efficiency paradox concerning the integration of AI and human expertise in advanced treatments, ethical dilemmas arising from AI-based decision-making and behavioral resistance. According to the authors, strategies to increase AI adoption in healthcare should focus on providing training and additional support for stakeholders to increase their knowledge and understanding of these technologies.

2.4. Relevant Paradoxes for Study

Considering the characteristics of AI startups and identified entrepreneurial paradoxes, three specific paradoxes arise that play a significant role for AI startups while attempting to transform the current regime: the survival paradox, the system reproduction paradox, and the temporality paradox (see Figure 1).

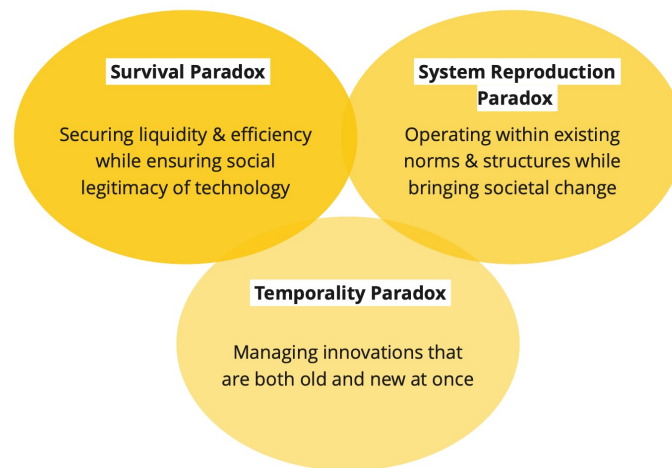


Figure 1: Relevant paradoxes for study

2.4.1. Survival Paradox

The *survival paradox* is the first critical paradox for AI startups and is extracted from key entrepreneurship literature.

To drive transformation within sociotechnical regimes and gain the attention from actors, startups must develop groundbreaking innovations (Geels and Schot, 2007, Geels et al., 2016), thus leading to financial stability for the company. However, those actors also need to approve the innovation. Similar to social startups, who often struggle to balance economic growth with their social mission (De Mon et al., 2022), AI startups struggle to balance their financial growth with the need to develop a socially accepted product.

Especially disruptive AI technologies are complex and unfamiliar to society, thus require careful development and explanation. For example, Johnson et al. (2008) assume that improving the functional aspects of a technology can simultaneously increase consumer anxiety and risk. Moreover, Raisch and Krakowski (2021) warn that an overemphasis on either augmentation or automation can negatively impact organizational performance and have societal consequences. Hence, AI startups must legitimize their innovations by society to secure financial stability. Without this approval, their survival is uncertain.

Therefore, securing liquidity and efficiency while ensuring the social legitimacy of the technology plays a critical role for AI startups.

2.4.2. System Reproduction Paradox

The second paradoxes that is relevant in the AI startups context is the *system reproduction paradox*, proposed by Pel et al. (2023).

Startups operate within a established regime with existing norms and structures (Geels and Schot, 2007; Geels, 2019), making it difficult to bring about change (Pel et al., 2023). Especially with technological innovations, social structures often remain largely unchanged, even as startups strive to introduce their innovations (Pel et al., 2023).

This phenomenon is particularly relevant for AI startups, as they are often dependent on large technology companies, investors, customers, and competitors who have an influence on their product or service. For example, while investors want to support innovation, they may insist on a safe, clear path to profitability (Kaggwa et al., 2023), limiting the transformative potential of AI startups. Furthermore, the market forces with the constant customer needs also have an influence on those startups (Kaggwa et al., 2023). Although consumers want the latest AI technologies, they are often unwilling to accept the associated social changes. As a result, startups find themselves forced to soften their goals and become less radical to fit into the current system (Pel et al., 2023).

Based on this understanding, operating within existing norms and structures while bringing societal change plays a critical role for AI startups.

2.4.3. Temporality Paradox

The final paradox that is significant for AI startups is the *temporality paradox*, where innovation is "at the same time new and old – and therewith at the same time an innovation and not an innovation" (Pel et al., 2023, pp. 46-47).

AI is a rapidly, constantly changing technology (Haefner et al., 2021), yet is considered to become a general purpose technology in the next couple of years (Trajtenberg, 2019). As AI becomes increasingly embedded in industries, society expectations shift, and startups must continuously adapt their offerings to current system requirements (Kaggwa et al., 2023). This process leads to that the application and use of the product evolve over time and across diverse social contexts, ranging from how the society uses or values a product,

the locations in which it is utilized, and the ways in which the product itself is modified by the company (Pel et al., 2023).

Here, AI startups especially experience temporal influences. As their innovation become more embedded, AI startups must continuously renegotiate their position within the market and society, while still trying to push the boundaries of their innovation. This two-sided pressure can ultimately hinder the overall transformative potential of AI.

Consequently, for AI startups is also managing innovation that is both old and new at once across social context a critical factor.

3. Methodology

3.1. Research Method

Given the nature of the research goal, it is crucial to capture social reality in a natural setting. Taking an ethnomethodology standpoint (Gubrium, 1997), this study therefore follows a qualitative research design to explore the paradoxes present in AI startups through talk and interaction. To do so, a field study is carried out, as it is suitable for comprehending natural phenomena within a real-world context and for gathering data on behaviors and interactions (Cook and Cook, 2016; Van Beek et al., 2018).

To lay the foundation of this work, the study first explores how the three paradoxes survival, system reproduction and temporality are perceived within the AI startup context in a descriptive manner. Understanding these perceptions is crucial for accurately capturing the reality of the sample in the following steps. Subsequently, an inductive process based on the grounded theory work of Strauss and Corbin, 1998, as further interpreted by Gioia et al., 2013, is employed. Through this analysis method, the phenomenon of interest can be described and relevant dynamic relationships identified (Gioia et al., 2013), as "data collection, analysis, and eventual theory stand in close relationship to one another" (Strauss and Corbin, 1998, p. 12). This approach will allow a deep exploration and analysis of the strategies and methods used by AI startups in response to the paradoxes.

3.2. Sample and Data Collection

This study utilizes a nonprobability purposive sampling method (Saunders et al., 2019), to gain insight from startups that integrate AI technologies into their products and services, thus having a direct impact on society. The selection criteria required AI startups to have completed the pre-seed phase and be at least approaching market launch, thereby ensuring sufficient exposure to paradoxes. After the sample was determined, the first contact was established via e-mail, LinkedIn profiles of founders and two contact persons from the AI startup scene. Of the 41 AI startups initially contacted, most of which are based in Germany, eight responded positively to participation requests. Key management figures of these responsive startups were then selected for the subsequent data collection process, including, for example, chief executive officers or AI team leads (see Table 1).

Participant	Role in company	Startup founded in
E1	Co-founder and managing director	2023
E2	Founder and CEO	2023
E3	Co-founder and CEO	2024
E4	Founder and managing director	2022
E5.1	Co-founder and COO	2019
E5.2	Co-founder and CTO	2019
E5.3	Co-founder and CEO	2019
E6.1	Co-founder and CEO	2020
E6.2	Co-founder and head of data science and AI	2020
E6.3	Head of data science and AI	2020
E7	Co-founder	2021
E8	Co-founder	2024

Table 1: Sample of semi-structured interviews

For data collection, the study uses a triangular approach, as more than one method results in greater confidence in the findings (Webb et al., 1966). Data was on the one side collected through a micro-ethnography approach, as it allows to focus on specific aspects of organizational culture in a shorter period (Wolcott, 1995). In addition to the micro-ethnography, qualitative semi-structured interviews lay the foundation of this study to obtain both retrospective and real-time perspectives on the phenomena (Gioia et al., 2013). Furthermore, interviews also help to clarify observations with interview questions (Bryman and Bell, 2011) and are commonly used as non-observational method

under ethnographers. Moreover, interviews offer perspectives from founders, while field observations will offer firsthand insights (Seddon et al., 2013) into organizational dynamics and decision-making processes. Overall, both approaches are suitable for capturing detailed information and understanding variable relationships (Kehm, 2015; Merchant et al., 2021), thus providing a deeper contextual understanding of entrepreneurial paradoxes within startups.

Before commencing the study, key focal areas were defined based on the research question and literature review to guide the application of methods (Moser and Korstjens, 2018). An interview guide was then created to ensure that the questions focused on the research questions, were thorough enough and did not contain any leading questions (Gioia et al., 2013), see section Appendix. Since detailed documentation during data collection is vital in ensuring the integrity and comprehensiveness of qualitative research (Mulhall, 2003; Dabić and Stojanov, 2014; Busetto et al., 2020), various methods such as field notes, audio recordings, and structured protocols (Mulhall, 2003; Dabić and Stojanov, 2014; Moser and Korstjens, 2018) were utilized to capture the relevant details.

The data collection process continued in iterative processes until saturation was reached, indicating that no new insights relevant to the research question were emerging (Tuckett, 2004; Guest et al., 2006; Moser and Korstjens, 2018).

Given the sensitive nature of the research topic, all data from the interviews and observations were anonymized to prevent identification of the participants or their companies. The interviewees were also given the option of not answering specific questions or to terminate the interview or observation at any point. Prior to the data collection, explicit consent was obtained for the recording of the interviews and the use of anonymized quotes in the present work.

In total, two observations in one startup and 12 semi-structured interviews in eight startups were performed. During the two observations, extensive field notes were taken, and afterwards anonymized. The interviews were conducted in German, lasted around 30 to 60 minutes and were audio-recorded via Microsoft Teams, transcribed, and anonymized as well.

3.3. Data Analysis

Prior to coding, all interview and observational data were transcribed and anonymized. MAXQDA software was used to streamline the coding process. The subsequent data analysis was split up in two phases to achieve the main objectives of the research questions. In the first phase, the collected data was screened to determine how the paradoxes from the literature review are perceived in AI startups. Subsequently, the results were written down descriptively to create the basis for the subsequent inductive coding.

In the second phase of the analysis, an inductive approach was performed to understand how AI startups deal with these paradoxes. For that, the study employed an iterative process using the methodology proposed by Gioia et al. (2013), based on the grounded theory work by Strauss and Corbin (1998) to analyze the qualitative data. The process began with two rounds of coding.

In the first round, the interviews and observations were open coded line by line to create zero-order codes, using expressions occurring in the gathered qualitative data. Similar expressions were then summarized in a more comprehensive first-order concept. In this way, concepts such as "reflecting product" or "obtain feedback" were identified, resulting in a total of 31 first-order concepts.

These first-order concepts were then broken down into second-order themes using axial coding. For example, a theme such as "short-term focus" occurred from the first-order concepts "generating income" and "gaining customers", as those are strategies that follow short-term goals. In total, ten second-order themes emerged.

Afterwards, the second-order themes were then condensed into overarching theoretical dimensions. For example, the aggregated dimension of "repression of paradox" occurred from the themes "path of least resistance", "short-term focus", and "cognitive dissonance", as they all do not deal with the arising paradoxes. In the end, concepts, themes and dimensions were combined into a coherent data structure and visualized.

The final step of the analysis was to formulate dynamic relationships between the second-order concepts within the data structure. This step transformed the static data structure into a dynamic inductive model that explains the identified phenomenon (Strauss and Corbin, 1998). With the grounded theory model in place, it was also possible to derive various mechanisms for dealing with paradoxes within AI startups afterwards.

4. Findings

The following reveals the findings for the research question "How do entrepreneurial paradoxes influence the management of transformative AI startups?".

The first part presents how AI startups perceive the paradoxes identified from the literature in Section 2.4. The second part outlines strategies AI startups use to manage paradoxes in general. The final part introduces a dynamic grounded theory model that explains in detail how AI startups in the study manage the emerging paradoxes they encounter.

4.1. Paradoxes in AI Startups

Based on the literature research, three paradoxes were found that can also occur in AI startups: survival, system reproduction, and temporality paradox. The subsequent findings from the data analysis show how all three paradoxes are perceived in AI startups and the contexts in which the paradoxes arise.

4.1.1. Survival Paradox in AI Startups

Securing liquidity and efficiency while ensuring social legitimacy of the technology is a critical factor for startups, according to the literature. The data from interviews and observations suggests that AI startups in the sample struggle to achieve social legitimacy of AI and maintain the liquidity and efficiency needed to continue their growth and development.

One of the primary constraints is the lack of trust in AI technology among end-customers. The study participants report that building trust is challenging, as end-consumers are often biased against AI, thus forming a central task for the startup to convince those customers from their disruptive technology. Furthermore, AI startups also highlight ongoing concerns regarding data protection and security. Specifically, customers express uncertainty about what happens to their personal data and where it is stored. As one

participants stated, *"I think there is still a question mark for everyone: 'What about the security? Where does my data actually go to?'"* (E3).

Next, according to the sample, consumers often assume their data will be sent to the United States or other foreign countries, where it may not be stored securely. Additionally, the occurrence of AI-generated hallucinations - outputs that are factually incorrect - has contributed to public skepticism. On top of that, media coverage has also raised fears about data security, leading customers to often asking about data handling practices: *"I always hear [...] 'Do you have AI in there?' and then we say yes and then the next question is 'how do you deal with hallucination?' or 'do you send it to America? What about data security?'"* (E2).

In addition, public institutions are particularly cautious with new AI technologies, wanting to avoid potential legal liabilities related to data protection. As one participant observed,

"In the public sector in particular, everyone is always afraid that they will end up with data that they should not have, because then someone will be breathing down their necks in terms of data protection" (E5.1).

Closely related to the trust component is the fear of job loss and replacement by AI technology. Customers have been observed reacting defensively, as one startup stated:

"'Oh wow that works, that is actually exactly my job that is being covered now.' Then they get defensive relatively quickly and say 'yeah ok cool, but that cannot cover everything.'" (E3).

Despite the trust issues, technical challenges also pose a threat to the legitimacy of the technology for the AI startups. Poor-quality data provided by consumers can negatively impact the product, leading customers to perceive the solution and the company itself as inferior, as one startup explained, *"If you have bad data, then you get bad results and then people think the solution is bad but the data is actually bad."* (E3).

Additionally, the pressure to bring products to market quickly, even if they are not yet 100% perfect, can result in the release of imperfect solutions that have a negative effect on the customer experience. As one participant stated,

"To get things moving, you have to do imperfect things all the time." (E5.3).

Lastly, startups report that they lack the financial resources to make their products perfect, contributing to the release of imperfect solutions. In turn, those imperfect solutions can lead to the products displaying incorrect results, which can harm the consumer in the end. As another participant noted,

"You actually need tests everywhere to see directly where things go wrong when you change something in the code. [...] we have the most important tests, but if I had the choice and if we had unlimited time and money, I would build in many more tests, simply to ensure that the code simply works, that the whole pipeline does not spit out any errors of an unexpected nature." (E5.2).

The issues outlined above ultimately lead to that AI startups must decide whether to invest time and energy in educating and reassuring customers or prioritize other aspects of their business in order to generate income and build a novel product.

4.1.2. System Reproduction Paradox in AI Startups

With the system reproduction paradox, startups must operate within existing norms and structures while simultaneously try to bring about societal change. The predefined paradox from section 2.4 is also evident in the experiences of the study sample. The system in which AI startups operate is shaped and influenced by the expectations of the customer. In addition, other competitors, established, conventional companies as well as big players in the AI field, also cause difficulties for AI startups. Moreover, the existing system ensures that investors also exert pressure on AI startups with their perceptions and claimed knowledge, thus making change a complex endeavor. In the following, the various aspects are explained in more detail.

One key aspect of the system reproduction paradox in AI startups is the mismatch between customer expectations and the innovative nature of the startups' products. This is particularly evident in situations where startups are trying to enhance existing market offerings by integrating AI components. In these cases, AI startups often face significant resistance, as customers tend to prefer maintaining the status quo and desire products

with minimal changes and complexity. Furthermore, customers tend to have unrealistic expectations when it comes to AI related products, demanding for example 100% accuracy from the beginning, which can hinder the adoption of the novel products. This can lead to immense pressure on AI startups to deliver perfect solutions, requiring them to constantly optimize and refine their offerings to meet these visions.

An additional barrier arises from the novelty of AI as a product category itself. Customers often lack the necessary technical knowledge to understand the underlying technology, making the offerings of AI startups inaccessible. This knowledge gap forces customers to invest time and effort in learning how to use the new products, which can also hinder adoption, as they are under time constraints. In order to be more accessible, startups are potentially forced to compromise on technological innovation or use their internal resources to provide training and have educational conversations with customers. As one startup stated, *"The introduction of the tool, [...] is always a tricky point because you simply have to learn something new. You know that it takes a certain amount of time and [...] people really do not have much time, so I definitely have concerns about that"* (E1). Furthermore, the lack of knowledge combined with the technical complexity can lead to customers disengaging completely, preferring to stick with the familiar processes and systems they have become accustomed to,

"Then the discussion usually becomes too technical again for people and then they click off, so they want to have this technical discussion with you, but they cannot have it with you and then it is just like 'yes, then I would rather not do anything'" (E3).

Lastly, customers' preference for individual solutions clashes with the AI startups' need to standardize certain processes in order to ensure compatibility and quality while keeping track of the limited resources. It is simply not often possible to provide customized AI-based products. This mismatch creates resistance to the adoption of mass-produced AI products offered by AI startups by the customers.

In addition to the customer expectations and technological barriers, AI startups also face competition from established technology giants, such as Google and OpenAI. Customers often struggle to differentiate between the offerings of small AI startups and larger, more

recognized players, tending to favor the latter due to their trusted brand and existing infrastructure, even if the startup's product may be more suitable for their needs. As one participant stated:

"The end customer simply does not know how to distinguish between what is a generative AI component that Microsoft is offering me vs. what we are doing"
(E1).

Moreover, the rapid pace of development by these tech giants poses a significant systematic challenge itself, as they can quickly outpace the small AI startups, as described by another participant, *"What hurts other startups a lot right now, however, is that it feels like the big players bring out a new update every four weeks, [...] and that is how they wipe out entire startups"* (E3). This critical situation can lead to AI startups letting go of certain functions or not going down certain paths that the big players have already taken in order to have a prospect in the system.

Another competitor systematic influence that AI startups face is the presence of established competitors who have not yet incorporated AI technology into their products but are familiar to customers. Customers often prefer the familiar offerings from companies they have worked with for years, as they are hesitant to embrace the unfamiliar. As a result, AI start-ups need to revise their own products and become more similar to the well-known offerings on the market.

Furthermore, since the sample included only German AI startups, it is worth noting that German culture poses another significant barrier for these AI startups. Particularly, the slow-moving processes within the German public sector compound the difficulties faced by startups developing fast-paced, AI-driven products. As one startup noted,

"There will not be any American culture, I do not think there ever will be in Germany, but yes, I think that is a bit of a paradox - we want to be modern and play at the top, but that is only possible in Germany if the big companies finance it" (E2).

The final systematic influence that AI startups face is from investors, who often have biased opinions of what a successful startup should look like. AI startups are pressured to

simplify their products and strategies to align with the mainstream expectations, which could jeopardize their innovative edge in the end. As one interviewee stated,

"They think they know how things work and then they have a lot of ideas about how things should work for us in their opinion" (E5.3).

4.1.3. Temporality Paradox in AI Startups

The temporality paradox represents a significant challenge in the management of innovation that is both old and new simultaneously across diverse social contexts. Through the interviews and observations, it is noticeable that AI startups face challenges such as the rapid pace of technological advancement, evolving societal perceptions, product development, and the constant need to adapt to new target groups and market demands. These temporal influences are explored in greater detail below.

The first aspect that is significant for AI startups regarding the temporality paradox is the constant technological shift. The technological development takes place at a rapid pace, systems and capabilities transforming in short timeframes and suddenly. On the one hand, this is pivotal, as AI technologies are becoming increasingly efficient and powerful, on the other hand, startups are also easily overrun by it, as one startup stated, *"In terms of performance, it has changed massively. [...] we did not think it would occur so quickly..."* (E3). However, these rapid technological changes lead to functions becoming obsolete within a very short timeframe. Consequently, AI startups must constantly reassess the current landscape. Furthermore, these paradigm shifts disrupt established norms, creating the need to react immediate and adapt the product to stay competitive. This situation proves highly stressful for AI startups, as they must manage multiple product variations or projects simultaneously, leading to significant resource expense, as one startup noted,

"It is actually constantly changing and there are always paradigm shifts, so you say: 'Hey, what we have been doing so far has actually changed for a certain target group, where we want to go, we might have to take a completely different approach here and there'" (E5.2).

Alongside the technological dynamics, AI startups also have to deal with the changing nature of their target group. Due to their innovative nature and constant development, as well as their growing visibility in the field, AI startups often need to address customer segments that differ from their original base over time. In this context, AI startups face the challenge of continuing to serve their existing customers to maintain their revenue streams, while also addressing the needs and preferences of new market segments, as one startup stated, *"We still have to solve the same problem, but for yet another customer group"* (E2). Another variation of this aspect is the diffusion of products across geographical borders. As the transformative technology spreads to different countries, challenges arise in scaling the offering to accommodate diverse social contexts and regulatory environments.

Furthermore, the perception of innovation in society is constantly changing. Increasing media coverage and the widespread use of AI-powered products such as ChatGPT have led to a growing awareness and acceptance of these technologies among the general public. In response, AI startups need to adapt their products and communication strategies to accommodate the different levels of understanding in society, as another startup stated, *"The perception in society is now completely different, so everyone now knows a little bit about what AI is"* (E5.1).

Lastly, over time, the products themselves become more professionalized, moving from purely technical solutions towards a more holistic, market-oriented designs. As already noted in section 4.1.2 continuous adaptation is necessary to keep pace with changing customer requirements and other trends. Here, AI startups also need to manage technology that is both old and new at once, and sometimes must discard their old ways and ideas to stay competitive, as one startup experienced,

"It will continue to change [...] we started with one tool and now we are building an entire suite, [...] everything is getting bigger and more deeply integrated [...] which is significantly different from the small widget that we somehow thought about at the beginning" (E7).

4.2. Strategies

After the study has shown that paradoxes occur in AI startups, the question remains as to how they are handled by startups and how they can potentially be resolved.

The following findings reveal three key dimensions through which AI startups navigate the paradoxes they encounter: understanding, repression, and acting.

In the understanding dimension, AI startups try to figure out the paradoxes they face, using strategic foresight to anticipate issues and engage in adaptive learning. Furthermore, they actively gather feedback and practice Integrated decision-making to address contradictions. Second, the repression dimension involves AI startups refusing to directly confront paradoxes. In this dimension they focus on short-term goals, resist change, or recognize but consciously avoid the underlying issues, leading to cognitive dissonance. In contrast, the acting dimension comprises AI startups that directly confront and attempt to resolve paradoxes. Strategies include responsible AI development, building products around customer needs, adapting to market changes, and engaging through various channels to make their solutions more accessible. Subsequently, the three dimensions are examined in detail in the following. Supporting evidence can be found in the Appendix.

4.2.1. Understanding

From the data analysis *understanding* emerges as a crucial first dimension encompassing three key second-order themes: strategic foresight, adaptive learning, and integrated decision-making. In essence, the understanding dimension implies that the AI startup must first thoroughly understand the paradox before it can respond to it. Figure 2 illustrates the corresponding data structure.

Strategic Foresight The first theme AI startups utilize to understand a paradox can be summarized as strategic foresight. This theme involves a forward-thinking approach where startups consistently think about the future, keep an eye on their end goals, and develop clear strategies and hypotheses.

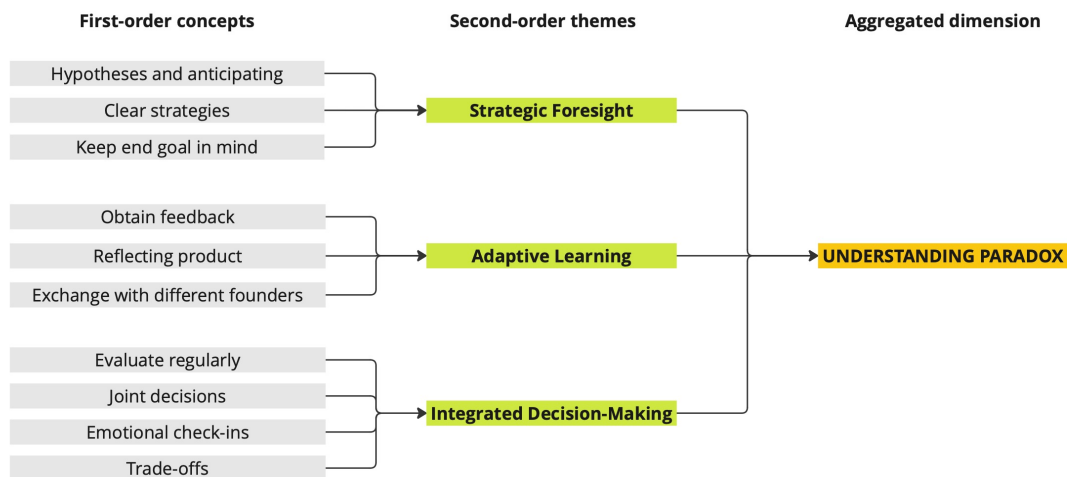


Figure 2: Understanding paradoxes data structure

A key method of strategic foresight is having a clear strategy and working with hypotheses. As one entrepreneur noted, *"We also work a lot with hypotheses"* (E3). This approach helps AI startups to think about different potential scenarios without encountering them, preparing them for various outcomes, and leading to the adaptation of their strategies. Thinking about what can happen beforehand is another important element that is closely related to the hypotheses. Anticipating can range from considering what can be done in terms of data security to the technological development of AI over the next few years to implement preventative projects before contradictions arise. As a startup explained, *"We started to precalculate a lot of indicators"* (E5.2).

Overall, many startups noted that focusing on their end goals and what they want to achieve in the long run, also helps in potential difficult situations. Some startups align their entire product road map with the target image and make decisions in advance as to whether products will be adapted or what measures are necessary to make the products accessible to customers in order to achieve the technology they are imagine. Their entire strategy is aligned to achieving this. As one startup explained,

"We have a North Star where we want to get to, where we want to have this innovation in our industry at some point. The technology does not exist yet, we do not have it yet either" (E7).

Adaptive Learning The second method that AI startups utilize to understand a paradox can be summarized as adaptive learning, which consists of collecting feedback, reflecting

on it internally, and obtaining external knowledge.

A central element of adaptive learning is to obtain feedback on the product from various stakeholders. AI startups are constantly trying to find out how the product is perceived and used and whether there are any difficulties in implementing it. This is necessary as AI is a very new topic for the interest groups and therefore faces adaptation challenges. Obtaining feedback can range from doing interviews, *"We are already trying to do a lot of interviews"* (E4), over surveys, *"We have surveys that we introduce so that they can answer the questions directly"* (E5.1), and organizing discussion rounds with (potential) customers, as another entrepreneur noted,

"This is only possible through such discovery or exploration discussions with potential customers or with existing customers, who are actually most likely to give honest feedback" (E5.1).

After obtaining relevant feedback, AI startups use the collected knowledge primarily to reflect on their product or service and think about how it can be developed further. As one startup stated,

"We have conducted many interviews and discussions with potential or ideal customers in the areas that we have recognized and then tried to understand what their pain points are in these areas in order to then develop a product that meets their needs" (E5.1).

What also supports this often iterative process is the exchange with founders of other AI startups, *"What helps a lot in my opinion is to talk to other founders, because then you have the feeling that you are less alone"* (E1). As founders of AI startups often face similar challenges, from technical hurdles to market uncertainties, they can learn from each other's experiences and provide emotional support. Furthermore, the exchange brings in different, diverse perspectives, which can help to solve contradictions in the end.

Integrated Decision-Making The last key aspect of the understanding dimension covers integrated decision-making. Here, AI startups assess their current business situation as well as the mood of the founders and make decisions or compromises based on the adaptive learning outcomes and other assessments that have taken place in advance.

The interviewed and observed AI startups often mentioned, in order to make informed decisions, they need to evaluate regularly. This comprises consistent, scheduled meetings among founders discussing the current progresses, obtained feedback or the general direction the product and company should take. As one startup founder noted,

"We always have a meeting once a week where we three founders talk together [...] about where we want to go, [...] where we want to be as a company in that period" (E5.1).

These evaluations ensure that all founders are on the same page and have all the necessary information and insights to make appropriate decisions. In addition, updating strategies based on new information is also key at these meetings, as another startup explained, *"We have a six-month strategy and then somehow adapt it every three months" (E3).*

Moreover, the startups underline that it is essential to make joint decisions. It is important for them to hear the different perspectives within the founding team in order not to overlook any of the co-founders and to maintain the team spirit. For decisions, they try to focus on areas that are frequently mentioned, as one founder reports,

"Typically we sit down and talk. We always try to focus on what problems need to be solved and problems that you hear about very often are more likely to be worth solving because there is then a greater demand and that is actually how you try to make decisions" (E5.2).

Another component in the integrated decision-making is to do emotional check-ins, i.e. meetings that do not focus on the regular business activities and core strategies. At these meetings, founders and employees talk openly about how they feel in the current situation, also regarding a possible paradox. Through this holistic approach, the startup acknowledges that emotions and personal well-being are also important and can lead to potential new solutions. As one startup stated,

"We try to have conversations from time to time that are less tactical and operational, because you kind of do that every day. Then also a bit of an emotional check: 'how do you feel right now?'" (E1).

Lastly, not all paradoxes can be addressed, or all solutions can be executed at once because of financial restrictions or time limitations. AI startups therefore must make trade-offs in their decision-making process, as one startup stated, *"We often have features that we want to implement, but then again we also have to prioritize and know what is most likely to be asked for"* (E5.1). Furthermore, startups must ensure that it is feasible to implement a project, as another founder noted,

"You have to balance that out, so things that are unrealistic to implement, we don't implement, where we know right away 'OK, that's not possible'" (E5.3).

4.2.2. Repression

The second dimension focuses on the *repression* of the paradox, including second-order themes of short-term focus, path of least resistance, and cognitive dissonance, as illustrated in the data structure in Figure 3. The repression dimension can be summarized as the tendency to avoid or suppress paradoxical tensions and contradictions, which often lead to short-sighted decisions or actions that do not consider the underlying issues.

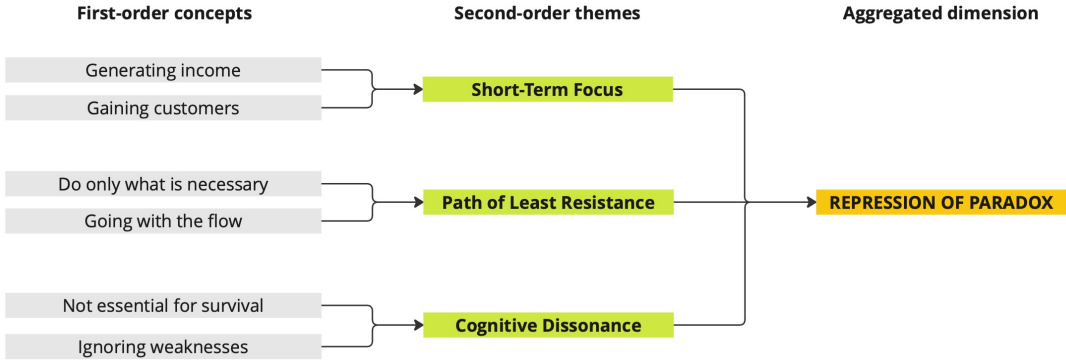


Figure 3: Repression of paradoxes data structure

Short-Term Focus A first common strategy that AI startups follow to sustain their young business is to focus on short-term goals, which leads to the suppression of the paradox that occurred.

One central focus point is to prioritize on immediate financial gains. Similar to conventional startups, AI startups also face monetary challenges, such as funding that expires

and expenses for office space. In addition, AI startups often have significant upfront costs due to the need for advanced hardware and specialized personnel to build the technology behind their product. To sustain their company, AI startups must decide in favor of income, as one startup noted, *"That is a small driver in the direction of going where the money is closest"* (E2). A further example of this approach are AI startups that only undertake new projects when they are paid for by customers, as one interviewee expressed, *"If we do a project, develop something new, then it has to be something that firstly is paid for"* (E5.3). In some cases, AI startups even engage in projects that fall outside their current portfolio, solely to keep their business alive, as another startup stated,

"We also have to pay our bills in the next few months, so we have to generate revenue now, [...] and that might have been generated from time to time with projects that we would no longer accept today" (E6.1).

Another short-term goal that leads to repression is closely related to financial need. For some interviewed and observed AI startups, growing their customer base is a high priority. This is necessary to be not only financially stable but also to attract investors to secure additional funding rounds and other paying customers in the future. As one startup stated,

"Our top priority is to win more customers and to keep the ones we have, and we play on that and say ok, if we do that now, it will help us to win or keep more customers" (E4).

Path of Least Resistance Another approach how AI startups repress a paradox is in choosing an easy and comfortable option, rather than fully confronting the paradox.

For example, due to the lack of time and resources, AI startups may choose to do the bare minimum rather than putting in the effort to make their products outstanding. As one founder described,

"He would like to make it a bit better and so on, but sometimes that is just not possible, everything just has to go a bit faster and the customer has to be satisfied. Then it is good enough. It does not have to be better" (E5.3).

Instead of dealing with the contradictions inherent in their situation, AI startups prioritize speed to market and choose to *"just do it quickly with shippen"* (E5.2) to gain customer feedback and market attention, even if it means releasing imperfect products that can increase the paradox at hand. Furthermore, in some cases it is more favorable to serve an existing customer base, as expanding the customer base requires considerable effort and expense.

Additionally, regarding technological change in the broader ecosystem, AI startups tend to 'go with the flow' and fail to recognize the paradox in this case. As one startup notes, *"I think it is good that this has changed, and it was also an exciting process"* (E4), indicating that changes are accepted as a process that they simply let happen.

Cognitive Dissonance The final theme in the repression dimension is cognitive dissonance. Despite recognizing the paradoxical situations they face, AI startups sometimes choose to avoid or deny paradoxes rather than actively addressing them. This approach is often caused by a shortage of time and resources.

As one founder noted, some paradoxes are viewed as *"Valid threat, but it is not yet existential in any way"* (E6.1), indicating a tendency to play down the significance of the emerging contradictions. Other startups show even a non-insightful attitude, *"If it were like that, then it is also the case that they see a huge market in it and then we are already somehow in the market a bit"* (E5.3). Other AI startups have a more pragmatic approach, as another interviewee explained, *"I think there is a certain pragmatism. [...] if you want one hundred percent security, then you are just trying to secure yourself and I think that does not help the success of the company either"* (E6.3). The pragmatic mindset of AI startups can also lead to their own weaknesses being overlooked or underestimated. As one founder described:

"'Hey, there is a request now, but we are just going to let it pass' and as soon as the person complains, we take care of it, if the person does not complain at all, then it cannot have been that important, but at some point you just have to understand that you simply can't do everything in a team the size of ours" (E1).

While those two approaches are practical in the short term and help to make quick progress, it also prevents AI startups from solving the underlying problems and hinder them to create a solid foundation for their own business.

4.2.3. Acting

In the final dimension that emerges from the collected data AI startups confront and attempt to resolve the paradoxes they face. *Acting* against paradoxes covers the four key areas responsible AI development, customer-centric development, product adaptation, and multi-channel engagement, which are illustrated in the data structure in Figure 4.

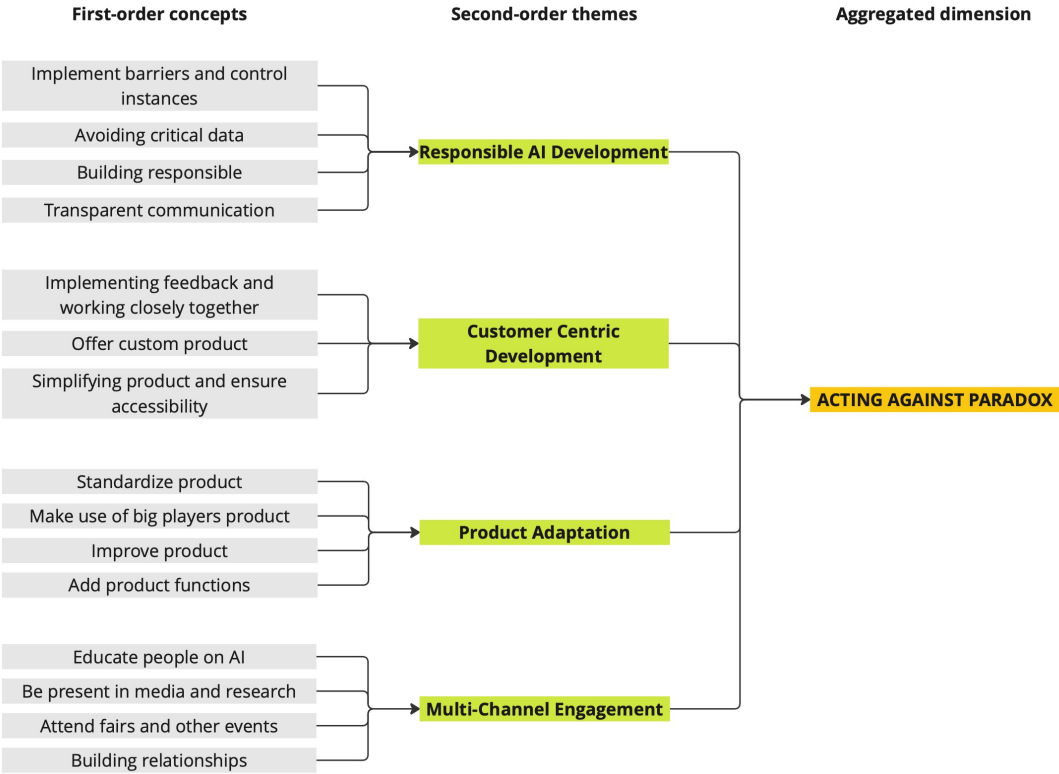


Figure 4: Acting against paradoxes data structure

Responsible AI Development The first strategy of the acting dimension deals with responsibility in relation to the new AI technology. Here, AI startups take responsible action towards the data they use and how the product itself is handled, as well as communicating clearly with their target audience.

First, the sample often highlighted the importance of *"anticipating the error case and building in barriers to a certain extent"* (E4), to resolve contradictions regarding data security. Additionally, it is common to conduct thorough testing to assess the quality of the AI technology, as one startup noted,

"We have a test [...] that we run on everything we do with AI to see 'how is the quality? [...] We have logical tests that we run, which then evaluate the quality, which means we have a kind of scoring system for the quality of the AI" (E2).

Particularly when dealing with public customers, it can be challenging to guarantee complete data security and ensure the other complex requirements the public customers often have. Consequently, one AI startup decided to *"generally do not deal with personal data at all and [...] try to avoid this problem in the first place"* (E5.1), thereby avoiding the critical data to meet the special requirements.

Another contradiction that frequently arises with AI technology that uses data is the presence of unintentional social biases in training data, which can lead to discriminatory outcomes. One strategy to address this issue is to utilize tools and work on the AI to reduce the extent of biases, as one interviewee stated,

"We just try to work internally on tooling, to analyze more people about why certain predictions are made in this way" (E6.3).

The final crucial aspect for responsible AI development is open and transparent communication with stakeholders. This includes, for example, clearly communicating the capabilities, limitations, and potential risks of AI and the associated product to customers. Furthermore, even in cases where issues arise, it is important to respond directly and transparently, as one entrepreneur noted *"We tried to calm them down somehow and took them along on the journey quite transparently"* (E7). In addition, AI startups communicate openly about upcoming updates and explain the inherent processes to build trust. Lastly, being open to feedback and providing customers with a platform or central contact person where they can communicate their concerns is also a key element.

Customer Centric Development Another key strategy employed by AI startups to actively address the paradoxes they face is to engage in customer centric product development. This approach involves building products in close cooperation with customers and implement their needs and preferences.

First, a lot of the interviewed AI startups mentioned that *"product development as such should happen a lot with potential customers, but especially in the AI area, because it's something new too, it absolutely has to happen a lot with customers"* (E3). The novelty of AI products and services requires this increased level of customer involvement to ensure that the developed solutions by the AI startup address the real problems of users and is more accepted, as another startup noted,

"we believe strongly that you can only implement such things by working very closely with the customer, so that you really create the actual product together, which also leads to people accepting it better" (E1).

The data also shows that customers are having an increasingly influential role in the creation of the product itself. As one startup noted, *"customers are also having an increasing influence on the product"* (E5.3), with some startups even going so far as to develop the product directly with their customers. As another entrepreneur stated,

"They are basically building it with us, So we are in very, very, very close contact with them and they are constantly coming to us" (E7).

In addition to working closely together with customers, AI startups recognized that making their product more accessible and user-friendly, helps to solve paradoxes as well. This often involves simplifying the product by reducing its complexity and scope of features. As one startup explained,

"We just make really bite-sized small innovations that are somehow compatible with the company structure, that do not require everything to change" (E7).

Similarly, another startup noted, *"we have to make sure that we do not throw too much complexity at the customers, so at the moment we have rather taken things out of the product again"* (E6.2), showing that this startup is even reducing the functions offered to make the product simpler for customers and reduce underlying paradoxes.

A further approach on simplification is to offer entry-level versions of the AI product with a reduced range of features, which can be used by customers as a starting point to familiarize themselves with the technology, as another interviewee stated, *"We are providing starter versions of our tools, which really have a reduced scope of services, making them easier to understand, easier to train, easier and faster to use"* (E6.1).

Lastly, AI startups also focus on offering *"very customized"* (E1) and *"very, very individual"* (E3) solutions to meet the specific needs of their customers, which is often the case when the AI must operate with a large amount of customer data. This approach extends also beyond simple end-product adjustments, some AI startups even modify the whole way how they train their AI models, as another startup noted,

"In our specific case, it's also things like AI model training that we do for customers, where models are created that are only built for this customer and can only be used by this customer." (E6.1).

Product Adaptation The next main strategy by AI startups is the adaptation of their product offerings. This theme is closely related to the customer centric development approach, but also incorporates other elements such as standardization, leveraging from established players, product improvement, and the addition of new functions.

Despite the customer centric approach that some AI startups take, others find it necessary to shift their product strategy from customized or individualized solutions to more generic offerings. As one startup noted, *"To standardize a little and then offer it to others as a more standardized product"* (E5.3). This step significantly reduces maintenance costs for the AI startup and makes it easier to scale their product to a wider customer base, as developing individual products can be highly expensive. Since building individual products is highly expensive, this step reduces maintenance costs for the AI startup a ton and helps in scaling the own product across more diverse customers.

The second approach within the product adaptation theme involves the utilization of AI technology from established big players in the AI business, such as OpenAI or Anthropic, if it is compatible with the AI startup's own offering. This reduces development time and costs, and the AI startup can also take advantage of the popularity and name

recognition of these well-known companies among customers. Furthermore, AI startups can take advantage of the ongoing improvements and updates to these platforms, as one entrepreneur stated, *"you always have to make sure that you make the best possible use of the technologies that are out there and that are all open now"* (E3). One startup even actively incorporates generative AI from big players into its product, although it is not a necessary component, to demonstrate the technical possibilities and attract a wider customer base.

Another key aspect is the constant improvement of the existing product, as one startup noted, *"we try to improve the basic model at some point and then we try to improve the individual fine tunes"* (E6.3). This can range from fixing bugs, updating the user interface, optimizing back-end processes, to enhancing performance quality. The continuous adaptation is an integral part of the daily operations, as one interviewee stated, *"Yes, we have to adapt, over and over again, which is sometimes annoying"* (E5.2), and is necessary to react fast to emerging paradoxes.

Lastly, AI startups often consider adding new features to the current product as the market is constantly evolving. This is particularly crucial when expanding into other countries, as it often requires complex adjustments. These adaptations include incorporating region-specific functions and data content or adapting the product to local regulatory requirements, as one interviewee noted,

"It is not that we only have the product content from Germany, but also the product content from the USA and Canada and the whole of Europe" (E5.1).

Multi-Channel Engagement The last strategy AI startups utilize to act is to engage through different channels to make their solutions more accessible and appealing. These strategies focus on educating stakeholders about AI, engaging in media and research, participating in industry events and maintaining strong, trustful relationships.

Given the novelty and unfamiliarity of AI technology among consumers, education represents a key strategy for AI startups. A common approach is to give informative talks to various target groups, including students, small and medium-sized enterprises and the public sector. The aim is to explain the nature of AI and its practical applications, thus

leading to more acceptance in the society. In addition, startups have "*regular calls [...] every 2 weeks*" (E4) and offer additional educational activities to improve stakeholder knowledge. As one startup stated,

"I go to the people and sit down and talk to people from the public sector, people who are also students, but also small and medium enterprises [...] and say 'okay, what do you actually think AI is'" (E3).

Next to these educational efforts, AI startups also actively engage with media and research communities to raise awareness of their products and the broader AI technology topic. This involves conducting interviews with magazines and news websites, as well as maintaining close contact with universities and researchers to contribute to AI publications. This allows AI startups to reach a wider audience and increase awareness of their product, as another interviewee noted,

"We get a lot of inquiries that simply end up with us internally because they have somehow read something about us in our paper, have somewhere seen a publication with our product" (E5.1).

Moreover, participation in trade fairs and other industry events represents another key strategy. Here, AI startups present their work, gather customer feedback, and network with a range of stakeholders, including potential customers, other startups, investors, and industry players.

Lastly, building strong, trust-based relationships is also a key strategy from the multi-channel engagement perspective to overcome barriers. This often involves leveraging existing personal networks, as one startup stated:

"Each of us has a different network that we bring with us and through that we can then approach existing acquaintances who studied with us or people we know through a corner, that often works quite well, especially with larger companies. Larger contacts in particular are usually more likely to be approached via a person from your own network" (E5.1).

In addition, building partnerships with universities, research labs and other institutions is seen as an effective way to increase the credibility of the AI startup’s technology and gain access to new customers.

4.3. Dynamic Inductive Model and Mechanisms

The findings from the interviews in section 4.2 revealed three data structures with the distinct aggregated dimensions of *understanding*, *repression* and *acting*. These dimensions, in conjunction with the second-order themes, form a dynamic inductive model that illustrates how AI startups respond to entrepreneurial paradoxes, which is visualized in Figure 5. Within the model the dimensions are interconnected with each other and the second-order themes form a chain of reactions that can occur sequentially or in parallel. Furthermore, identified AI startups characteristics from the literature review (Section 2.2) are represented in the model as well, showing the influence of the characteristics on the identified reactions. In the following the model is explained in greater detail.

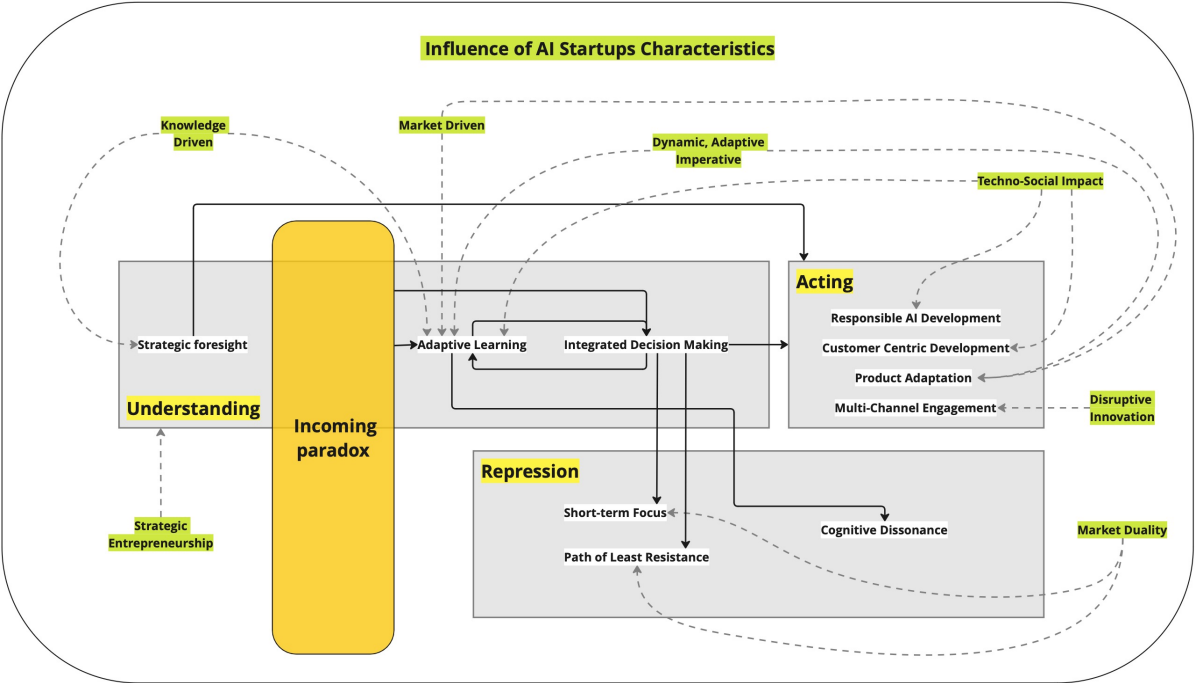


Figure 5: Dynamic inductive model

First, the qualitative study's findings show that the processes how AI startups manage the paradoxes (section 4.1) can be divided into two temporal phases: before and after the emergence of a paradox. This division is represented in Figure 5 by the incoming paradox field.

Within this division the *understanding* dimension plays a central role and is typically engaged first to address the incoming paradox, as the paradox must be comprehended before a response can be formulated. Once an AI startup navigates through the *understanding* dimension, it subsequently reacts with either an action (*acting* dimension) or shows a repressive response (*repression* dimension).

Interestingly, the findings reveal that some AI startups adopt a proactive approach inside the *understanding* dimension. Having heard of conflict points beforehand, for example that data security is critical for the target group, AI ventures try to address potential paradoxes before they even arise. Here, strategic foresight enables AI startups to avoid the paradox and directly address it with measures.

Further, when a paradox does emerge, AI startups typically undergo various processes inside the *understanding* dimension. One common way when the paradox is unknown is that the AI startups try to learn about the paradox first (adaptive learning) and then make decisions accordingly on the acquired knowledge (integrated decision-making). Often, they also decide to go through another iterative process to make a thorough decision on whether to act or suppress the paradox. However, in some cases, startups bypass the adaptive learning phase entirely, making immediate decisions. This often occurs when gathering additional information is difficult for the startup or requires a lot of time, leading rather to a *repression* of the paradox than action (short-term focus or path of least resistance). Additionally, the interviews also revealed that some AI startups engage in Adaptive Learning but do not enter the integrated decision-making phase. In such cases, the venture enters the *repression* dimension directly, experiencing a state of cognitive dissonance.

The outcome of the integrated decision-making determines the AI startup's following management actions. Either AI startups transition into the *acting* dimension, where steps such as responsible AI development, customer centric development, product adaptation and multi-channel engagement are taken to address the paradox, or the *repression* dimension, where avoidance strategies such as short-term focus or choosing the path of

least resistance are employed.

The presented dynamic inductive model can be also brought into connection with the three identified paradoxes in section 4.1. Taking a closer look at the interview and observation data, it is possible to recognize that AI startups react to the survival, system reproduction and temporality paradox with different mechanisms within the model. In addition, the different mechanisms occur with varying intensity and therefore have different relevance for the management of entrepreneurial paradoxes. The identified mechanisms are explained in further depth below.

4.3.1. Mechanisms when encountering Survival Paradox

As section 4.1.1 indicates, constraints such as data security, the target group’s openness to the new technology and restrictions on product quality contribute significantly to the product not being accepted by the target group, thus leading to liquidity and efficiency issues for the AI startups.

Based on the interviews, it is apparent that AI startups address the survival paradox in different ways (see Figure 6), depending on the specific challenge they are facing.

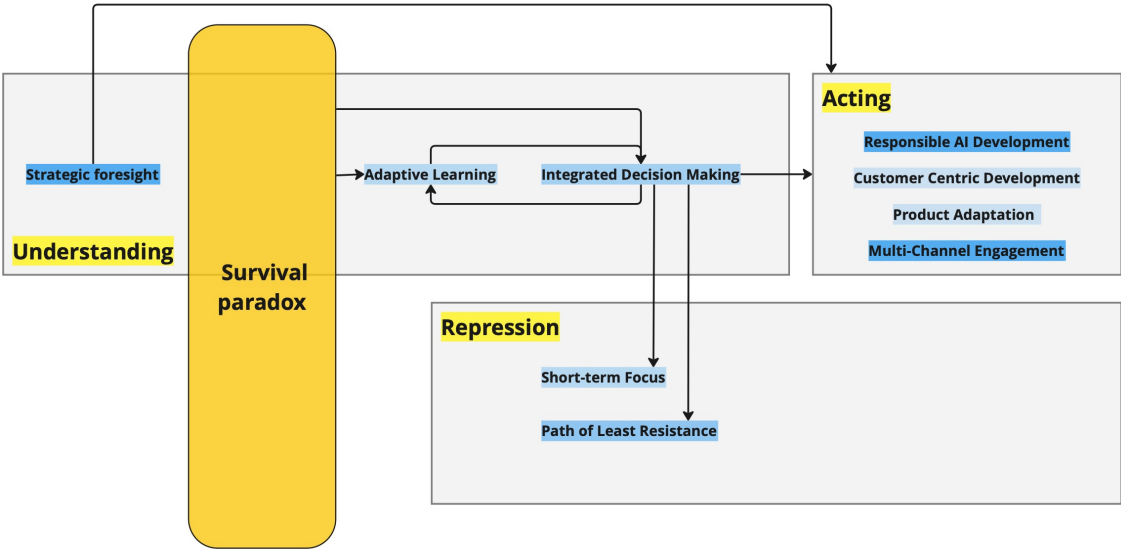


Figure 6: Survival paradox mechanisms

Regarding the first challenge of data security, AI startups take a proactive approach within the dynamic model. They view data security as an essential component of their business,

which is reflected in their implementation of data security measures as part of their overall strategy. Furthermore, they actively delve into strategic foresighted planning, considering how to communicate with their target audience about data security before the paradox even arises. Accordingly, AI startups engage in responsible AI development by implementing for example security barriers to counter potential paradoxes. Additionally, they offer educational activities and have pre-prepared responses ready for their target group when data security questions arise. The underlying mechanism within the model at play here is *strategic foresight to responsible AI development* and *multi-channel engagement*. This mechanism allows AI startup to avoid encountering the paradox directly.

Second, the AI technology is viewed with skepticism by the target group, leading to an reduced openness to the new technology. Concerns such as the fear of job loss or the ongoing media coverage about data being sent to the USA trigger the paradox here.

In this situation, AI startups are already facing the paradox, typically trying to understand the triggering point first. Therefore, they gather more information from the target group and reflect on their own product. Afterwards AI startups either enter the action or repression dimension, depending on how they decide in the integrated decision-making process.

As with the data security perspective, AI startups often decide in this case to engage in educational measures to gain a wider range of users. However, some AI startups also choose to ignore the concerns by the target group, as it is not possible to win over all individuals for the AI technology. Instead, the strategy of the path of least resistance is adopted, focusing on those individuals who are already open to the technology and are maybe already users. The mechanism in this case can follow two paths: *paradox to adaptive learning to integrated decision-making to multi-channel engagement* or *path of least resistance*.

Lastly, AI startups struggle with the quality of the product they are building, as they encounter a pressure to bring the product to the market quickly and code issues occur on a regular basis, having an impact on the customers and thus on the trust the customer have in the company.

Therefore, when AI startups face the paradox, they often decide in the integrated decision-making phase to release their products quickly, even if they are still flawed, or ignore the

customer feedback to generate income. In this case, the short-term focus on generating revenue takes precedence over product quality, to the disadvantage of customers. In other cases, it is not even technically feasible to implement certain features yet because of a lack of resources, leading to the adoption of the path of least resistance approach. However, in some instances, the AI startups attempt to gather more information about the concerns and subsequently adapt the product to ensure a higher quality. The mechanisms at play here are *paradox* to (*adaptive learning*) to *integrated decision-making* to *repression* (*short-term focus* or *path of least resistance*) or *action* (*product adaptation* or *customer centric development*).

4.3.2. Mechanisms when encountering System Reproduction Paradox

In the second paradox, AI startups must navigate the existing system, operating within the current norms and structures. However, the system is often not yet ready to fully accommodate AI technologies. From section 4.1.2 identified factors such as customer expectations and perceptions, competitor and market dynamics, and investor requirements can significantly impact the operations of an AI startup, leading to a paradoxical situation which they cannot plan for in advance. Figure 7 illustrates the common mechanisms used when encountering the system reproduction paradox that are further explained in the following.

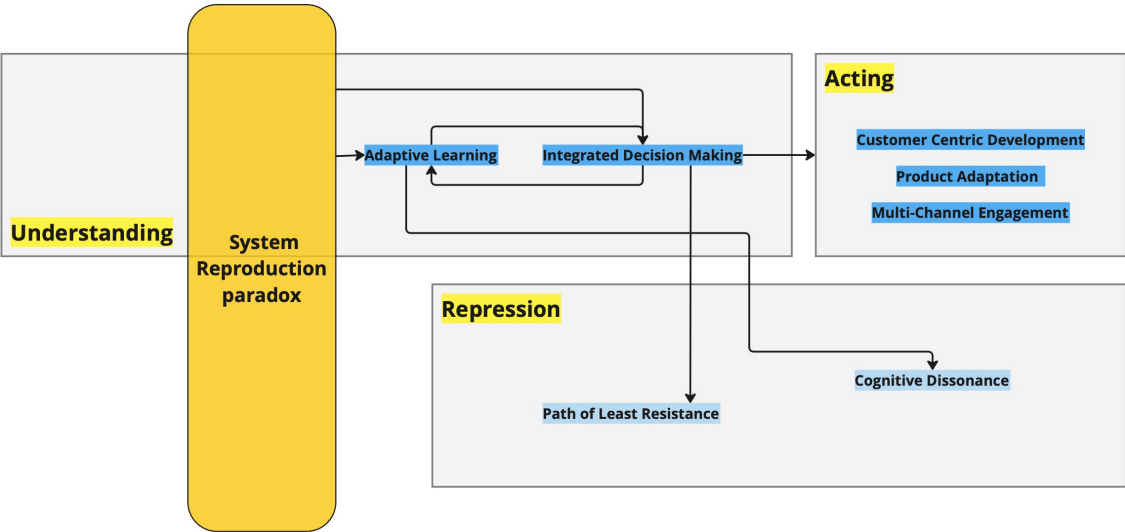


Figure 7: System reproduction paradox mechanisms

A common strategy employed by AI startups to address the system reproduction paradox is to first analyze the problem at hand. This involves collecting constant feedback, researching for better solutions, and engaging in exchanges with other startup founders. The insights gathered from this process then inform the decision-making and subsequent actions taken by the AI startup.

One such action is the development of products in close collaboration with customers, or even jointly with them. Additionally, AI startups often adapt their products to align with market demands and investor requirements to remain competitive. Another strategy is to actively engage with various channels, such as attending industry events, maintaining a presence in the media and research landscape, and building stronger relationships within the system to overcome the barriers posed by the paradox.

In some cases, the paradox is not properly recognized, leading the AI startup to simply continue its operations without addressing the underlying issue, taking the path of least resistance. Conversely, organizations sometimes acknowledge the paradox but fail to take further action, leading to the cognitive dissonance state.

The mechanisms observed for navigating the system reproduction paradox can be summarized as a progression from paradox recognition to *adaptive learning*, *integrated decision-making*, and finally *action* (*multi-channel engagement*, *product adaptation*, or *customer-centric development*). Alternatively, AI startups sometimes use *repressive* mechanisms, such as *cognitive dissonance* or the *path of least resistance*, when the paradox is not adequately addressed.

4.3.3. Mechanisms when encountering Temporality Paradox

Section 4.1.3 showed that AI startups operate in a dynamic environment characterized by rapid technological development, societal influences and the need for new customer bases, partly across different countries, to stay competitive. This situation creates a requirement for continuous adaptation of the innovation, while also running their daily business. Therefore, AI startups must manage innovations that are both old and new simultaneously.

In general, AI startups often abandon their old ways of operating and embrace new

approaches to stay competitive in the market. The ventures also sometimes maintain an older product to generate income, while also developing a new product to keep up with the rapid changes. However, some startups expressed during the interviews a sense of sadness in having to change their product, although this is necessary for their survival.

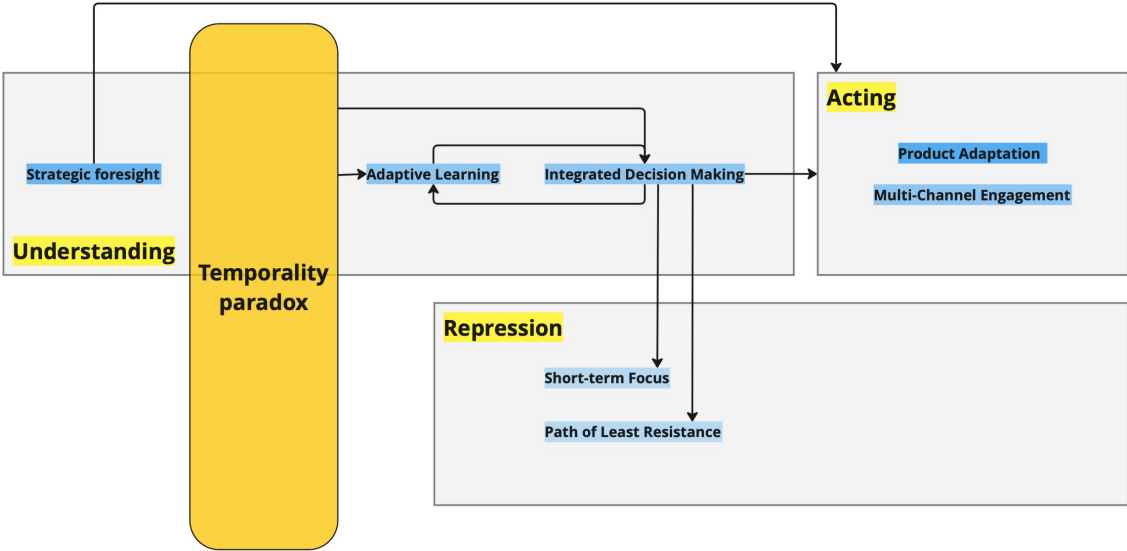


Figure 8: Temporality paradox mechanisms

To address the temporality paradox, startups employ two primary strategies (see Figure 8). The first is to plan for product changes from the beginning, developing a clear roadmap for continuous adaptation to ensure their product remains relevant. Decisions are made with the end goal in mind, rather than reactively.

When the paradox is already present, the second strategy involves gathering extensive feedback to inform integrated decision-making. This allows the AI startups to adapt their product in response to new technological developments and societal influences. For geographical expansion, startups typically research the target market and customer preferences beforehand, then make decisions and act through networking and product adaptation according to the needs of the new market. However, the need to sustain the own businesses also influences the AI startups decisions here. For some startups it is necessary to focus on revenue-generating activities, even if they are contradictory to the need for rapid product adaptation. Another repression mechanism is that founders simply “go with the flow”, continue operations as before and let themselves be surprised by what happens and how their product works under the new circumstances.

Overall, the mechanisms at play here include either *strategic foresight* directly to *product adaptation*, or encountering the paradox to *adaptive learning, integrated decision-making*, and then to *action (multi-channel engagement or product adaptation)* or *repression (short-term focus or the path of least resistance)*.

5. Discussion

The findings of this study are align with transition literature, showing AI startups as change agent challenging existing societal structures with their disruptive innovations (Geels and Schot, 2007; Geels, 2019), thus having the opportunity to transform the established system. However, this study also reveals that the transformative potential of AI is often complicated by paradoxes that arise during societal debates, institutional power struggles, or market negotiations within the existing system (Geels et al., 2016). The three identified paradoxes survival, system reproduction and temporality that AI startups encounter illustrate the resistance by the actors of the industrial regime to change. To achieve the desired sociotechnical transition, AI startups adopt strategies to manage contradictions. The subsequent emerging grounded theory model (see Figure 5) shows the dynamics between the identified strategies and uncovers mechanisms that AI startups use when they encounter paradoxes. Those mechanism further enrich current literature on AI entrepreneurship and paradox theory.

5.1. Contribution to AI Entrepreneurship

The findings from the interviews and observations in this study show similarities, but also expand upon the existing literature on paradoxes and strategies in entrepreneurship.

Regarding the survival paradox, existing literature in the field of social entrepreneurship has shown that startups experience tensions between a social component and economic growth (De Mon et al., 2022). This study extends this understanding to AI entrepreneurship, as tensions between social legitimacy and economic growth are also relevant for those startups. Furthermore, as previous work by Johnson et al. (2008) pointed out, technical innovations often lead to an increase in anxiety among consumers. This study confirms

this finding and provides more nuance on how this anxiety manifests. Specifically, the lack of trust and anxiety towards new AI technologies emerged in the form of concerns about data protection, security, the fear of data being transferred to other countries, and restrictions on product quality in this study. Furthermore, the AI related tension between augmentation and automation described by Raisch and Krakowski (2021) is also reflected in this study in the form of fear of job losses.

While social entrepreneurs face those tension by using selective coupling strategy, followed by compromising and decoupling (De Mon et al., 2022), this is not the case for the interviewed and observed AI entrepreneurs. AI startups may sometimes use compromising strategies during the integrated decision-making process when facing skepticism from target groups or struggling with product quality, but this alone is insufficient to resolve the paradoxes they face. Instead, this research provides a more holistic understanding of the step-by-step mechanisms through which AI startups react to the survival paradox.

Similar patterns emerge regarding the system reproduction and temporality paradoxes. Previous work has demonstrated these paradoxes in the context of transformative social innovation systems (Pel et al., 2023). This study extends the understanding of these paradoxes to AI startups, as both were also present in the examined cases.

While Pel et al. (2023) research highlights investigation strategies such as dialectical approaches, multi-perspective analyses, and critical discourse analysis for addressing system reproduction paradoxes, and translation analysis, process analysis, and critical innovation research for the temporality paradox, the AI startups in this study did not actively employ these analytical approaches. Instead, the startups adopted a more pragmatic approach to dealing with paradoxes, likely due to the demands of their daily business operations, the need to respond quickly to market changes, and the evolving nature of their business models. Consequently, this work contributes an empirical perspective by providing mechanisms in a dynamic inductive model for addressing entrepreneurial paradoxes in the real world setting, thereby expanding the horizons of research in this domain.

5.2. Contribution to Paradox Theory

This research also adds interesting insight to paradox theory in general. First, the various strategies for managing paradoxical situations highlighted by Putnam et al. (2016) can be found within the model. Traditional *either-or* approaches are evident in the model's repression dimension. *Defensive reactions* such as regression (Lewis, 2000) in form of short-term focus and repressing (Lewis, 2000) in form of cognitive dissonance appear within the model. In addition, selection in form of choosing the comfortable pole of path of least resistance is present. Furthermore, *both-and* approaches also appear in the model. *Paradoxical thinking* can be found within the understanding dimension through the adaptive learning and integrated decision-making strategies. The action dimensions with its four strategies is primarily driven by *integration and balance*. Lastly, while less prominent, *more-than* approaches also occur within the model. Here, *connecting, creating third spaces and dialogue* is especially seen in AI startups that adopt the multi-channel engagement strategy by educating people on AI.

It is important to note that this study not only examined the individual strategies, but also explored the underlying mechanisms AI startups take to manage paradoxes. Since the individual strategies within the model are interconnected and occur in parallel or cycles, this raises interesting questions about their feasibility in organizations. For instance, can an *both-and* approach truly be combined with an *either-or* approach, as observed in mechanisms that first aim to understand the paradox before moving into the repression dimension? Furthermore, what happens when organizations simultaneously pursue acting against the paradox and the repression of the paradox? This could manifest for example in an organization holding off from implementing change in order to focus on short-term goals while simultaneously engaging in educational activities with stakeholders.

A further contribution is that the grounded theory model offers a new perspective on the temporal dynamics around paradoxes in organizations. The model distinguishes between the periods before and after the occurrence of a paradox. The interviews revealed that some contradictions are already known to AI startups before they actually manifest themselves within the organization. Realizing that they will unavoidably encounter a paradoxical situation in the future, they take a proactive approach and plan ahead how to deal with the threat. Through implementation of active strategies, AI startups are

able to prevent the paradox from occurring in the first place. This raises the question of whether it can still be a “paradox” if the organizations have not yet experienced the contradictory situation, since Smith and Lewis (2011) definition states that paradoxes persists over time.

5.3. Managerial Implications

In addition to the theoretical contributions, this work also offers practical implications for managers of AI startups.

First, the study provides an overview of the various paradoxes and constraints that can arise within AI startups. By recognizing these hurdles and understanding their origins, AI entrepreneurs can engage in active reflection on how the paradoxes emerge within their own organizations. This can enable them to adjust their strategies accordingly, anticipating the potential challenges and being better equipped to navigate them.

Next, the work provides numerous strategies and mechanisms that AI startups can directly adopt to address the emerging paradoxes. The knowledge gained from this study, can help AI startups to find fast a fitting strategy for contradiction they encounter. Furthermore, this work can be also a starting point for managers to engage in self-reflection on their own reactions and mechanisms when dealing with paradoxes. For example, the work provides an overview of also repressive strategies and mechanism, that often lead to not solving the paradox. With this knowledge, AI startups can adapt their responses to a more proactive approach.

5.4. Limitations and Future Research

The study comes with limitations, despite given scientific diligence. First, the present study focused exclusively on startups from Germany, which might limit the transferability of the results. The specific economic, political and cultural context in Germany may have an influence on the characteristics of the AI startup founders and the paradoxes they face. For instance, the various public funding programs such as EXIST or the Berlin Startup Scholarship, which many startups receive in Germany at the beginning, can have

an impact on the strategies. As AI startups are financially secure in this case, they could choose riskier strategies, which startups from less supported countries would avoid. To enhance the applicability of the results, future research should consider a broader range of AI startups in Europe and globally.

Furthermore, the possible subjectivity of this study should not be overlooked, despite the academic rigor Gioia et al. (2013) highlight when using their methodology. The semi-structured interview questions, labels, and coding processes were created by a human researcher, which may introduce biases and subjectivity in the data collection and analysis. Consequently, future research is recommended to validate the findings of this study.

Moreover, the three key paradoxes examined in this study are not a complete list of contradictions and points of conflict faced by AI startups. Other paradoxes, such as the identified accuracy-energy paradox of Mill et al. (2022) could also be relevant and lead to the emergence of additional strategies and dynamics. Therefore, an extension of the examined paradoxes in future studies could contribute to a more comprehensive understanding of how AI startups navigate complex challenges.

In addition, the grounded theory model presented may not yet be complete. AI and AI startups are a new phenomenon, characterized by rapid technological advances, changes in the regulatory environment and changing market requirements. These changes may lead to the emergence of new strategies and dynamics that are not currently captured in the model. Accordingly, the study invites future researchers to continuously refine and expand the model.

Finally, this study offers additional opportunities for future research. The analytical strategies proposed by Pel et al. (2023) for addressing the system reproduction and temporality paradoxes may be valuable for enhancing the "understanding" dimension. Exploring the practical application of these strategies could potentially enable AI startups to make more informed decisions about whether to pursue certain courses of action or repression. Furthermore, taking a closer look at how the different approaches and mechanisms can be combined in organizations and interact with each other could further enhance the understanding of paradoxes. Moreover, further research is needed to determine whether a

situation can be considered a true paradox if an organization employs proactive strategies to prevent contradictions from occurring in the first place.

6. Conclusion

The present qualitative study sheds light on how entrepreneurial paradoxes are perceived and addressed by AI startups. Utilizing the Gioia methodology, three key paradoxes were observed: *survival*, *system reproduction*, and *temporality*. The findings illustrate that AI startups perceive these paradoxes in various ways, such as restrictions on product quality, data security, and target group openness, leading to liquidity and efficiency issues. Furthermore, customer expectations, cultural barriers, and investor biases, forcing AI startups to compromise their innovative vision. Lastly, AI startups must constantly adapt to rapid technological advancements, evolving customer needs, and changing societal perceptions. The resulting grounded theory model reveals how AI startups address these paradoxes. The *understanding* dimension plays a central role, as AI startups must first comprehend paradoxes before formulating a response. They then typically choose to either take *action* or, less commonly, *repress* the paradox. The specific mechanisms used to address each paradox vary. For the survival paradox, AI startups often engage in strategic planning before a paradox arises, leading to taking action with responsible AI development and educating their target audience. For the system reproduction paradox, AI startups learn and discuss in iterative processes first, resulting in mainly taking action in form of engaging with their stakeholders, adapting the product, or building it together with customers. For the temporality paradox it is also common to plan ahead or trying to understand it first, leading to mainly product adaptation.

Overall, this study provides novel insights into the paradoxes faced by AI startups and the strategies they employ to navigate these challenges. The findings also extend the understanding of sociotechnical transitions in the context of AI. However, further research is needed to expand the generalizability of the findings and explore additional paradoxes and strategies that may emerge as the AI startup landscape continues to evolve.

Appendix

Interview Guideline

In the following, the questions for the semi-structured interviews are provided.

Introduction to startup

- Can you give an overview of the startup?
- How did you come up with the idea?
- What are your goals?
- What is your role within the startup?
- Can you describe the daily processes in your startup?

Asking about what is good/bad

- What is going well in the startup at the moment?
- What are your biggest successes?
- What are the current hurdles/challenges?
- Follow-up questions, for example:
 - How did you get into this situation?
 - How did you achieve XYZ?
 - How do you deal with XYZ?
 - You just mentioned XYZ, can you elaborate on that?

System reproduction paradox

- What influence do potential customers/your target group have on your company/product?
- What influence do the big players like Google or OpenAi have on you?

- What influence do investors have on you?
- What influence do competitors have on you?
- Do you cooperate with public/governmental organizations? Do they support you in bringing the different groups together?
- At what moments do you adjust your product?
- If your product is not accepted by the customer, what do you do?
- What impact do existing norms and structures within society have on you?

Survival paradox

- How is your product accepted by consumers?
- Do you have problems with consumers accepting your product/service? What are you doing to make it more acceptable?
- Have you ever had to restrict social acceptance in order to stay solvent?
- How do you generate income?
- What do you do about data privacy concerns?
- How do you make decisions about whether to include a feature that is relevant/important to end customers or leave it out?
- What influences the decision for or against a function of your product?
- Are financial constraints imposed on you?
- What role does money play in the development of your product?

Temporality paradox

- Has your product/service changed over time? Why? What led to this?
- Has the use/function of the product changed? Why did it change? How did this happen?

- Do users influence your product/service?
- Did you change your product/service because of users?
- Are you working on two or more products at the same time within your startup?
- AI is currently a total hype topic, everyone is trying out ChatGPT etc.? What impact does that have on you?
- AI models are currently becoming faster, can process much more and are more flexible, how does this affect your product and company?

Other

- How do you deal with tensions within the startup?
- How do you deal with the different tasks, how do you prioritize them and why?
- How do you avoid conflicts, how do you deal with conflicts
- How do you organize employees and resources?
- What is your strategic alignment?
- If you have different perspectives within the team, how do you make decisions?

Quotes Semi-Structured Interviews

Strategies - Understanding

Participant	Quote	First-Order Concept
E3	"We also work a lot with hypotheses"	Hypotheses and anticipating
E3	"We don't have to, we've built it so that certain things simply happen faster."	Hypotheses and anticipating
E5.2	"We started to precalculate a lot of indicators"	Hypotheses and anticipating
E5.1	"We always have a meeting once a week where we three founders talk together and it's exactly about such discussions on 'where do we want to go?', [...] 'where do we want to be as a company in this period?'"	Clear strategies
E1	"So it has evolved from tactical to strategic planning"	Clear strategies
E6.2	"We have of course planning"	Clear strategies
E7	"To quickly say 'hey, now we'll try XYZ and if that doesn't work, then there'll be a plan C and D and E'"	Clear strategies
E3	"We are relatively clear through the target image about what we want to achieve in the long term."	Keep end goal in mind
E6.1	"It has a lot to do with prioritization and also with the ability to deal with customers or potential customers. If you are now thinking about the new business, to say no, really."	Keep end goal in mind

Participant	Quote	First-Order Concept
E5.3	"If we do a project, develop something new, then it has to be something that firstly is paid for and secondly somehow brings us closer to the direction [...] that we want to take. So we already have a vision"	Keep end goal in mind
E7	"We have a North Star where we want to get to, where we want to have this innovation in our industry at some point. The technology does not exist yet, we do not have it yet either."	Keep end goal in mind
E4	"We are already trying to do a lot of interviews"	Obtain feedback
E4	"We actually want to collect all the feedback as much as possible."	Obtain feedback
E5.1	"We have surveys that we introduce so that they can answer the questions directly"	Obtain feedback
E5.1	"This is only possible through such discovery or exploration discussions with potential customers or with existing customers, who are actually most likely to give honest feedback"	Obtain feedback
E4	"If we want to have complex processes, then you have to bring in a consultant"	Reflecting product
E5.1	"We have conducted many interviews and discussions with potential or ideal customers in the areas that we have recognized and then tried to understand what their pain points are in these areas in order to then develop a product that meets their needs"	Reflecting product
E1	"What helps a lot in my opinion is to talk to other founders, because then you have the feeling that you are less alone"	Exchange with different founders

Participant	Quote	First-Order Concept
E5.1	"We always have a meeting once a week where we three founders talk together [...] about where we want to go, [...] where we want to be as a company in that period"	Evaluate regularly
E3	"We have a six-month strategy and then somehow adapt it every three months"	Evaluate regularly
E7	"We have a retro once a week where we talk about what's going badly, so we have a very, very, very structured process"	Evaluate regularly
E5.2	"Typically we sit down and talk. We always try to focus on what problems need to be solved and problems that you hear about very often are more likely to be worth solving because there is then a greater demand and that is actually how you try to make decisions"	Joint decisions
E5.2	"We discuss that"	Joint decisions
E1	"We try to have conversations from time to time that are less tactical and operational, because you kind of do that every day. Then also a bit of an emotional check: 'how do you feel right now?'"	Emotional check-ins
E5.1	"We often have features that we want to implement, but then again we also have to prioritize and know what is most likely to be asked for"	Trade-offs
E5.3	"You have to balance that out, so things that are unrealistic to implement, we don't implement, where we know right away 'OK, that's not possible'"	Trade-offs

Participant	Quote	First-Order Concept
E3	"Then we evaluate how much work that would be, what kind of ROI we would have from it and what kind of market it would open up for us and then we look at how it fits in terms of resources"	Trade-offs
E2	"Where is the compromise in between and that has been enough until now"	Trade-offs

Strategies - Repression

Participant	Quote	First-Order Concept
E5.3	"If we do a project, develop something new, then it has to be something that is paid for"	Generating income
E2	"That is a small driver in the direction of going where the money is closest"	Generating income
E6.1	"We also have to pay our bills in the next few months, so we have to generate revenue now, [...] and that might have been generated from time to time with projects that we would no longer accept today"	Generating income
E4	"Our top priority is to win more customers and to keep the ones we have, and we play on that and say ok, if we do this now, it will help us to win or keep more customers"	Gaining customers
E5.3	"He would like to make it a bit better and so on, but sometimes that is just not possible, everything just has to go a bit faster and the customer has to be satisfied. Then it is good enough. It does not have to be better"	Do only what is necessary
E5.2	"Just do it quickly with shippen"	Do only what is necessary
E4	"I can't describe it in words, but it was almost like an avalanche."	Going with the flow
E4	"I think it's good that this has changed, t was also an exciting process"	Going with the flow
E5.1	"It's simply amazing how quickly you have progressed in your own development, even in the background"	Going with the flow

Participant	Quote	First-Order Concept
E5.2	"We are now dependent on it, but it does have a big influence, because the better their models become, the better our models will be in the end"	Going with the flow
E1	"What is difficult is to sometimes just completely deprioritize and say, hey, there's a request now, but we will just let that slide and as soon as the person complains, we'll take care of it, if the person does not complain at all, then it can't have been that important, but at some point you just have to understand that you simply cannot do everything in a team the size of ours"	Not essential for survival
E6.1	"Valid threat, but it is not yet existential in any way"	Not essential for survival
E5.3	"If it were like that, then it is also the case that they see a huge market in it and then we are already somehow in the market a bit"	Not essential for survival
E6.3	"I think there is a certain pragmatism. [...] if you want one hundred percent security, then you are just trying to secure yourself and I think that does not help the success of the company either."	Ignoring weaknesses
E3	"Which problems we do first, that's more gut feeling"	Ignoring weaknesses
E4	"It's going to happen one way or another, whether we're there or not, it's just going to happen"	Ignoring weaknesses

Participant	Quote	First-Order Concept
E1	"Hey, there is a request now, but we are just going to let it pass' and as soon as the person complains, we take care of it, if the person does not complain at all, then it cannot have been that important, but at some point you just have to understand that you simply can't do everything in a team the size of our"	Ignoring weaknesses

Strategies - Acting

Participant	Quote	First-Order Concept
E4	"Anticipating the error case and building in barriers to a certain extent"	Implementing barriers and control instances
E2	"We have a test [...] that we run on everything we do with AI to see 'how is the quality? [...] We have logical tests that we run, which then evaluate the quality, which means we have a kind of scoring system for the quality of the AI."	Implementing barriers and control instances
E5.1	"Generally do not deal with personal data at all and [...] try to avoid this problem in the first place"	Avoiding critical data
E8	"We have structured it in such a way that we don't actually have any data, or at least that we don't have access to it ourselves as a company."	Avoiding critical data
E6.3	"We just try to work internally on tooling, to analyze more people about why certain predictions are made in this way"	Building responsible
E6.3	"We just want to make the updates at least more transparent so that they are not announced on the one hand and on the other hand that one can see the results in the historical results"	Transparent communication
E7	"We tried to calm them down somehow and took them along on the journey quite transparently"	Transparent communication
E6.3	"Make this transparent and perhaps also give customers a certain amount of choice"	Transparent communication
E8	"Our entire product is designed to be as transparent as possible"	Transparent communication

Participant	Quote	First-Order Concept
E3	"We talk to customers and if somehow a customer wants to build something with us, then we do it"	Implementing feedback and working closely together
E3	"Product development as such should happen a lot with potential customers, but especially in the AI area, because it's something new too, it absolutely has to happen a lot with customers"	Implementing feedback and working closely together
E1	"We believe strongly that you can only implement such things by working very closely with the customer, so that you really create the actual product together, which also leads to people accepting it better"	Implementing feedback and working closely together
E5.2	"Again and again you hear what people have, and then you start, you build something and then you keep iterating until you get closer and closer to [...] what many people would like"	Implementing feedback and working closely together
E5.3	"Customers are also having an increasing influence on the product"	Implementing feedback and working closely together
E7	"They are basically building it with us, So we are in very, very, very close contact with them and they are constantly coming to us"	Implementing feedback and working closely together
E1	"Very customized"	Offer custom product
E3	"Very, very individual"	Offer custom product
E6.3	"In our specific case, it's also things like AI model training that we do for customers, where models are created that are only built for this customer and can only be used by this customer."	Offer custom product

Participant	Quote	First-Order Concept
E3	"You get this booster to 80% relatively quickly, ok cool, we actually have a proof of concept, but then to really build a functional product that customers can use and understand how to use and which then always works and always works the same way, that's where the AI keeps finding new ways to reach the goal"	Simplifying product and ensure accessibility
E6.2	"We have to make sure that we do not throw too much complexity at the customers, so at the moment we have rather taken things out of the product again"	Simplifying product and ensure accessibility
E7	"We just make really bite-sized small innovations that are somehow compatible with the company structure, that do not require everything to change"	Simplifying product and ensure accessibility
E7	"Then comes the next product, which is a step further, so that's exactly how we go about it, that's what we call our Trojan horses"	Simplifying product and ensure accessibility
E3	" We've built it in such a way that certain things simply happen faster, so no, we don't have to do much more."	Standardize product
E5.3	"To standardize a little and then offer it to others as a more standardized product"	Standardize product
E6.1	"We are providing starter versions of our tools, which really have a reduced scope of services, making them easier to understand, easier to train, easier and faster to use"	Standardize product
E3	"You always have to make sure that you make the best possible use of the technologies that are out there and that are all open now"	Make use of big players product

Participant	Quote	First-Order Concept
E5.1	"The big players have now developed models that are super exciting for us, that can also make our own product better"	Make use of big players product
E6.1	"We ourselves also generally try to incorporate generative AI functionalities into our product to a certain extent, either by using an interface to an open AI, for example, or by using an open source generative AI approach ourselves [...] in order to demonstrate the advantages and technical possibilities"	Make use of big players product
E3	"A lot of fine-tuning"	Improve product
E5.2	"Yes, we have to adapt, over and over again, which is sometimes annoying"	Improve product
E6.3	"We try to improve the basic model at some point and then we try to improve the individual fine tunes"	Improve product
E5.1	"It's not that we only have the product content from Germany, but also the product content from the USA and Canada and the whole of Europe, that was also the case now, so that we can then win customers in the countries"	Add product functions
E5.3	"That you can go one step further with us"	Add product functions
E4	"Regular calls [...] every 2 weeks"	Educate people on AI
E3	"I go to the people and sit down and talk to people from the public sector, people who are also students, but also small and medium enterprises [...] and say 'okay, what do you actually think AI is'"	Educate people on AI
E8	"We have also thought about offering workshops ourselves"	Educate people on AI

Participant	Quote	First-Order Concept
E5.1	"We get a lot of inquiries that simply end up with us internally because they have somehow read something about us in our paper, have somewhere seen a publication with our product"	Be present in media and research
E5.2	"We are still very strongly networked with research and also give a relatively large number of [...] lectures at various universities, at public institutions, at some events and that's where you get to know each other"	Be present in media and research
E5.1	"Go to trade fairs and have a stand there"	Attend fairs and other events
E2	"So I go to events and try to get to know people"	Attend fairs and other events
E2	"You really have to spend a lot of time getting to know people and then at some point you have to network well enough to get customers"	Building relationships
E5.1	"We also contact companies"	Building relationships
E1	"If you have an investor who says hey, I know the [...] industry really well, for example, I can make you 30 intros, then it simply makes sense from an economic point of view to say ok, cool, we have someone who can make really warm intros"	Building relationships
E5.1	"Each of us has a different network that we bring with us and through that we can then approach existing acquaintances who studied with us or people we know through a corner, that often works quite well, especially with larger companies. Larger contacts in particular are usually more likely to be approached via a person from your own network"	Building relationships

Participant	Quote	First-Order Concept
E5.1	"We acquired a large university as a customer in our network, for example, and we use that as a launch pad to get to other customers from there"	Building relationships

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