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Business model scalability attributes of internet-based startups – an analysis of German unicorns

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Abstract

In the recent years, start-ups in Europe and especially in Germany witnessed a tremendous growth. Expansions into new target markets happened within weeks, often outside the domestic DACH region and even into the furthest continents. This was all possible due to an increasing number of foreign investments, predominantly from US venture capital firms such as Peter Thiels Founders Fund or Sequoia Capital. For the first time, German companies received hundreds of millions of euros in one funding round, such as the fintech Trade Republic in their series C, which raised over 800 million euros in 2021. Ultimately, this enabled even faster growth and brought forward multiple, so called, unicorns. But to become a startup with a €1 billion plus valuation, many boxes need to be ticked. But one factor positions itself to be particularly important to investors – scalability. This work focuses on which strategies and patterns exist to scale a company's operations stemming from its business model, ideally increasing output when resources are added. After having identified those, a closer look will be taken onto which of those patterns can actually be found in German unicorns, ideally providing further support for those scalability strategies.

Considering the current economic environment, impaired by a 3 year-long pandemic and a war in Europe ultimately propelling raising interest rates, it becomes apparent that exponential growth of start-ups may not be the first choice. Still, this work aims to contribute to the scientific exploration of those scalability strategies in the context of German start-ups and can further support as a tool for founders to identify and explore ways of growing their business.

It is safe to say, that next to scalability stemming from the conceptualisation of a firm's business model, there are multiple other factors influencing exponential growth. Might it be the execution of said business model motivated by the entrepreneurs' characteristics and strategy, or the industry and general market conditions the startup is situated in – influencing factors of scalability are multi-faceted.

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Abbreviation

API	Application programming interface
B2C	Business-to-consumer
D2C	Direct-to-consumer
BM	Business model
CAC	Customer acquisition cost
HR	Human resource/relations
SaaS	Software-as-a-service
SME	Small and medium-sized enterprises
TAM	Total addressable market
VC	Venture capital
WSM	Weighted scoring model
AWS	Amazon Web Services
VP	Value proposition
B2B	Business-to-business

1 Introduction

It is widely agreed that business models which enable a faster and more resource-friendly expansion are crucial for the success of a new venture (Capelo, et al., 2021; Freeman & Engel, 2007; Stampfl, et al., 2013; Zhang, et al., 2015). Not only allows scalability for a greater impact of the offered product or service, but moreover is a critical indicator for investors when it comes to the potential of a firm, often mirrored in its valuation (Malyy, et al., 2021; Hallowell, 2001).

In recent years, scalability and hyper-growth have dominated the funding climate for internet-based startups. In order to attract investment and succeed in the highly competitive internet industry, startups have been expected to demonstrate the potential for rapid growth and the ability to scale their operations quickly (deutsche startups, 2023). Distribution at scale was the principle of the past decade.

This led to startups being expected to rapidly expand their user base, even if it means operating at a loss in the short term. Examples include the German dark store delivery service *Gorillas* and companies like *wework* or *TIER mobility*.

Propelled by the aftermath of the years-long covid-19 crisis, paired with the serious impact of the Russian-Ukrainian conflict, inflation is now on an record high again. As this is ultimately influencing the expansion possibilities of startups, signs of a shifting funding climate become more and more apparent. As the cost of capital rises, investors become increasingly selective in their investment decisions, which can lead to a reduction in potential valuations for startups seeking funding.

The German startup monitor (Deutscher Startup Monitor) 2022, a report issued by *PWC* and the German ministry for startups, acknowledges the crisis' impact on the German ecosystem. They argue, that coinciding with the changing interest rate environment and the decline in the company valuation of many listed tech companies, the positive investment trend has been dampened in the past year. Especially the later financing rounds which often decide for the unicorn status of a firm, are impacted the most (Deutscher Startup Monitor, 2022).

According to the 2022 *European Unicorn & Soonicorn Report* published by i5i, an international tech merger and acquisition firm, investor, and venture builder, a European unicorn is defined as follows:

"a tech company with a valuation of at least $1 billion USD that is still predominantly privately owned. Its valuation was either achieved in an equity financing round or, in the case of a company that has not raised any equity funding to date, has been calculated based on financial performance indicators and multiples and/or is based on the evaluation of investors or potential buyers." (Huebl, et al., 2022, p. 4).

This trend can also be seen in the fluctuation of contestants for the German unicorn list, which is issued by CB Insights (cbinsights, 2023) and updated on a constant base. Companies like *Gorillas* or *Raisin* have recently lost their unicorn status due to down rounds on their initial valuation.

In light of those uncertain times, it becomes even more interesting to take a closer look at those German unicorns, analyzing which aspects made them climb upwards a valuation of $1 billion.

Startup success is a complex phenomenon that is influenced by a multitude of factors. A study conducted by three Madrid-based researchers identifies the startups underlying business idea, the CEOs decision making as well as the firms business model as the most relevant aspects (Sevilla-Bernardo, et al., 2022). According to their argumentation, a geographical perspective reveals that the business model of a venture, along with its business idea, holds the topmost importance in Europe when it comes to success factors. Zott et al. (2011) further argue that the business model has emerged as a novel unit of analysis that differs from the product, firm, industry, or network. Subsequently, this enables a comprehensive understanding of how companies conduct their operations (Zott, et al., 2011)

Hence, the following question arises: which attributes of a business model concept create scalability and subsequently the venture success?

In order to address this question, it is necessary to establish a clear definition of what the term "business model" means within the context of the discussion. Despite the rise of literature on business models, there is a lack of consensus among scholars regarding its precise definition (Zott, et al., 2011). Alexander Osterwalder, a pioneer in business model theory, differentiates between business model terminology and ontology. Broadly speaking, he defines a business model as

“a conceptual tool containing a set of objects, concepts and their relationships with the objective to express the business logic of a specific firm.”

(Osterwalder, et al., 2005, p. 3)

He further indicates that the interpretations and characteristics of business models may vary depending on their industry and origin (Osterwalder, et al., 2005).

As previously stated, the ability to scale is a critical factor in the success of a venture. Along with other considerations, the inclusion of scalability characteristics in the business model design can assist companies in achieving greater heights by obtaining increased funding and expanding their customer base (Stampfl, et al., 2013).

Alongside a company's strategy, which encompasses the business model, there exist other crucial factors that drive the growth of ventures. According to Gilbert et al. (2006) the characteristics of the entrepreneur, available resources, industry landscape, and organizational structure and systems all significantly influence this growth. However, the focus of this investigation primarily revolves around the design and conceptualization of business models, specifically emphasizing their connection to innovation and the founders' prior experience.

Although scalability as such can contribute to venture success in many different ways, it is closely linked to a company's potential for growth, often measured by its ability to leverage economies of scale (Rappa, 2004). This becomes particularly important, when considering Osterwalder’s industry differentiation regarding the design of business models. Internet-based companies, such as Dropbox or Facebook (Meta), are capable of growing and scaling at a rapid pace due to their ability to innovate their business model more easily (Amit & Zott, 2001; Rappa, 2004; Bouwman & MacInnes, 2006).

Scholars have identified three key reasons for this phenomenon: firstly, the cost of communication and interaction has been significantly reduced with the emergence of new technologies. Then, those novel ways of interaction create new forms of “innovation transaction” and “exchange mechanisms” among various parties (Amit & Zott, 2001). Lastly, the high pace of transformation within the information technology business environment leads to the emergence of fresh organizational structures, as numerous iterations of the own business model become both routine and essential (Mendelson, 2000).

After having established this, it becomes increasingly apparent why this study focuses on internet-based startups, as they are responsible for the majority of disruptive business model innovations, which are inherently associated with rapid growth and high scalability (Markides, 2008).

In order to even better analyse scalability patterns, this study not only focuses on younger, internet-based companies, but further chooses to take a closer look at unicorn companies within the German market. In a business or finance context, a unicorn is classified “as a startup whose value is considered to be over $1 billion” (Cambridge Dictionary, 2023). They therefore have a proven track record of growth and the probability of them having incorporated some form of scalability pattern is comparably high. Furthermore, a greater amount of information is accessible on those firms, as they have already established a presence within the market.

Having clarified that, the overall aim of this study is to investigate the applicability of scalability patterns in business model conceptualization to unicorn companies. Specifically, the study will examine the prevalence of these patterns among German unicorn companies and identify any additional patterns that may not be included in the current literature on business model scalability.

Finally, this research is expected to serve as a navigational aid for founders and investors, enabling them to analyse and execute scalable venture growth effectively.

After an extensive screening of the relevant literature on business model scalability and its definition, a comprehensive scalability scorecard is developed, which enables a clear analysis of the selected target group of German unicorns. To further isolate the relevance of scalability on startup success, the founders entrepreneurial background is also taken into consideration, as suggested by literature (Gilbert, et al., 2006). Although there are many influencing factors, it was agreed on focusing on three major aspects: the founders' past management, industry, and founding experience.

To the best of my knowledge, this is the first study that unifies different scalability attributes into a comprehensive scoring model, allowing for a greater comparison of companies. By differentiating between different scalability drivers, a company’s business model can be holistically analysed, allowing a better quality of analysis. Although many scalability patterns are derived from practical examples and expert

interviews, none of the existing works hold a clear industry and geographical focus, allowing for better clustering of results.

After providing overview of the theoretical background, and the therefrom derived tool of analysis, the scorecard results of the 17[1] analyzed unicorn companies are presented and discussed. Included in the discussion are the theoretical and practical contributions of this work, as well as limitations and implications for future research.

Ultimately, this paper closes with a reflective conclusion.

[1] German unicorn companies with an internet-based business model

2 Theoretical background

In this chapter, the fundamentals of exponential startup growth will be explored, with a particular focus on internet-based firms. Furthermore, the concept of scalability as the main driver of new venture growth will be discussed, along with its interplay with business model design.

Followed by an introduction of several business model scalability patterns and an explorative model of business model scalability, the various elements that contribute to scalability will be elaborated on. Furthermore, this chapter will examine the background of the entrepreneur, with a particular focus on how it relates to a firm's growth potential and pace.

The chapter closes with the business model scalability scorecard, a tool developed out of the relevant literature that allows to identify and evaluate the level of scalability of business models. This scorecard is then used in the analysis part of this thesis, to examine underlying scalability drivers in German unicorn startups.

Overall, this part of the thesis provides a comprehensive theoretical foundation for understanding the importance of scalability in internet-based startups and derives a practical tool for identifying and assessing the scalability of a business model concept.

2.1 Business model conceptualization

To explore the topic of company growth and examine the frameworks enabling rapid scalability, it is essential to closely examine a company’s underlying business model and its configurations. In the earlier sections, a basic definition of a business model was already presented. Here, Osterwalder describes a business model as an “conceptual tool (…) expressing the business logic of a specific firm” (Osterwalder, et al., 2005, p. 3). The objective is to further enhance the understanding of the concept of business modeling by diving deeper into its typology and exploring the different features that hold the potential for scalability. This exploration aims to improve comprehension of how businesses can achieve significant growth and expansion.

In their paper *A Business Model Innovation Typology*, Taran et al. (2015) state that scholars are uncertain about the meaning of the term "business model" and its components. They also reference Mintzberg’s (1978) argument that the elements of a

business model are subject on the alignment between organizational structure and various factors, such as the environment, strategy, technology, and size. The dynamic interaction between an organization and its direct or indirect environment, which ultimately influences its course of action, is commonly referred to as a contingency model (Honig, 2004). The contingency model heavily draws upon Piaget's theory of equilibrium (1950), which highlights that equilibrium is a dynamic process in which individuals continuously and gradually integrate new knowledge and utilize it with growing levels of sophistication and complexity (Honig, 2004).

A contingency model that Taran et al. (2015) mention, is the well-known 7S model by McKinsey. The framework contains the elements strategy, structure, systems, shared values, skills, style, and staff which can be seen as a constellation of interrelated factors that influence an organization's ability to change (McKinsey, 2008).

By applying the concept of the contingency model, which recognizes that a firm's business model is influenced not only by its current business practices but also by a set of interrelated factors that evolve over time, Taran et al. (2015) introduce seven building blocks for a business model. These components can be seen below in Table 1. The authors use these components in their research to identify and analyse business model innovation, which occurs when any modification takes place within the building blocks of a business model. They further argue that certain changes can be more radical and/or complex than others, and some changes may appear unusual or distant. For instance, when a firm completely pivots away from its initial profit formula (Taran, et al., 2015).

For this specific reason, these building blocks were selected to better explain the underlying notion of business models, as they were developed to reveal change and innovation. Furthermore, these building blocks simplify the process of attributing growth and scalability characteristics to specific aspects of the business model, helping to understand the correlation between certain actions and their overall impact on the business.

The next chapter will delve deeper into the concept of exponential startup growth, concluding in an exploration of the various scalability attributes derived from the literature. These attributes form the basis for the sample analysis and will be directly linked back to the building blocks outlined in Table 1.

Building block	Description
Value proposition	A company's offering of products and services
Target customers	Customer segments company aims to serve
Customer relations	Actual interactions established with these customer segments
Value chain architecture	Involving both the primary and support activities needed for a company to develop, produce and deliver its offerings
Core competences	Those capabilities that are difficult to imitate by competitors, and are critical to a company for achieving competitive advantage, e.g., unique technology, IPR, know-how, culture, market exclusivity (e.g. Porter, 1985)
Partner network	Partners who engage in different kinds of cooperation with a company, with the goal of achieving economies of scale, reduction of risks (e.g., joint venture) or tapping into new knowledge or resources (Osterwalder & Pigneur, 2010)
Profit formula	Including revenue model, cost structure, margin model, and resource velocity (e.g., Johnson et al., 2008)

Table 1: The business model building blocks (Taran et al., 2015)

2.2 Fundamentals of exponential startup growth and scalability

As mentioned in the Introduction, scalability and venture growth are closely intertwined. When taking a look at what forms of growth a company can follow to become more successful, exponential or scalable growth is often brought up. In their paper "The Concept of Business Model Scalability", Lund & Nielsen (2018) describe the relationship of scalability and company growth in the context of business. They state, that scalability implies that the fundamental business model of a firm has the capacity to generate economic expansion for the organization. When considering the economic expansion potential for internet-based startups, it becomes even more apparent that rapid growth is direclty linked to the underlying business model design.

Because of their newness and relatively flat organizational structures, entrepreneurial firms possess a certain agility that allows them to quickly adjust their business models in response to evolving external as well as competitive conditions (Stampfl, et al., 2013; Christopher & Towill, 2001; Boden, 2004). The ability to adapt and remain closely attuned to the market is not a one-time occurrence. According to a study by Harvard Business School, a startup typically modifies its fundamental business model more than four times before reaching profitability (Johnson, et al., 2008). This is possible, as in the realm of e-business, companies can often experiment with their business models

at a relatively low cost (Stampfl, et al., 2013). This operational flexibility together with low-cost growth as a important driver of scalability was also idenfied by Bondi (2000).

After having identified the special characteristics of startup growth in e-businesses, it is important to take a closer look at the typical startup development journey.

Adapted by Picken (2017), Figure 1 provides a summarized overview of the different stages. The author states that the process of entrepreneurial innovation can be divided into four distinct stages: *startup, transition, scaling,* and *exit*. The challenges encountered by the founding team serve as defining factors for each stage gate. The figure illustrates that the boundaries between the neighboring stages are indistinct and often interrelated.

The first stage, *startup***,** is defined by exploring and validating the businese's underlying concept. This includes the market opportunity, mirroring the target market, its size and timing, the product or service offering and its value proposition, as well as the business model. The founding team also needs to create a viable go-to-market strategy that ensures the dependable delivery of the product or service to the intended customers while generating profits (Picken, 2017). The author further claims, that in that phase, firms are usually more narrow in focus, have limited time and resources commitment, but also face a only moderate economic risks. Additionally, their organizational structure rather informal, loosely defined, and flexible.

In the second stage called *transition*, the foundation for accelerated growth is laid out. The transition stage commences when the startup first starts to gain traction in the market. This phase is a crucial link which especially lets the management of a former informal and loosely structured startup evolve into a structured and disciplined company ready for rapid growth. At this point, particularly with the support of professional investors such as venture capital firms, the founding team may be partially replaced or supplemented with experienced growth managers who possess the relevant skills and expertise to take the company to the next level.

This knowhow around growing and managing a growing company's' operations becomes essential in the following *scaling* phase, where the entrepreneurs need to collect resources (qualified workforce, funding, infrastructure) and utilize processes

and partnerships to expand the business while operating within the framework of the validated business concept. The clear objective in this phase is to secure market share and establish a prominent position allowing to reach the critical mass needed to withstand competition. Picken identifies a crucial step, which also partially explains why more mature companies were chosen to be analyzed in the paper:

“Scaling requires a very different kind of organization.”

(Picken, 2017, p. 2)

He states that as the company expands, the “fluid” and “flexible” atmosphere of the startup structure prevents progress. The often-informal methods of communication and decision-making are no longer effective. A certain need for in-depth expertise replaces generalists with experts, often recruited from industry players. They assist the implementation of procedures and policies for better planning. Hofer and Charan (1984) also portrayed this shift towards a more professionalized approach in their research on *Transition to Professional Management*.

Eventually, as a natural outcome of becoming a dominant player in the market and in order to provide a return on investment to stakeholders, the focus is shifted towards an *exit.* The accumulated value of the venture is realized and returned through means such as an IPO, private sale, merger, or acquisition. This also presents an opportunity for the founders to receive compensation for their high-risk efforts.

Picken (2017) clearly differentiates the transistion phase as the most relevant part of a startups journey. During the transition into the scaling phase, management experience and competence become crucial (Wasserman, 2003), and the lack of these qualities is a common reason for failure (Gorman & Sahlman, 1989; Drucker, 1985). As a result, this paper recognizes the founders' professional and entrepreneurial background as a significant factor in achieving scalability.

Now that the typical growth path of a startup has been established, keeping in mind that internet-based companies go through these stages even more quickly, it is necessary to delve further into the concept of scalability. Scalability refers to a

particular form of business growth in which net output increases positively in relation to input. This concept will be explained in more detail in the next chapter.

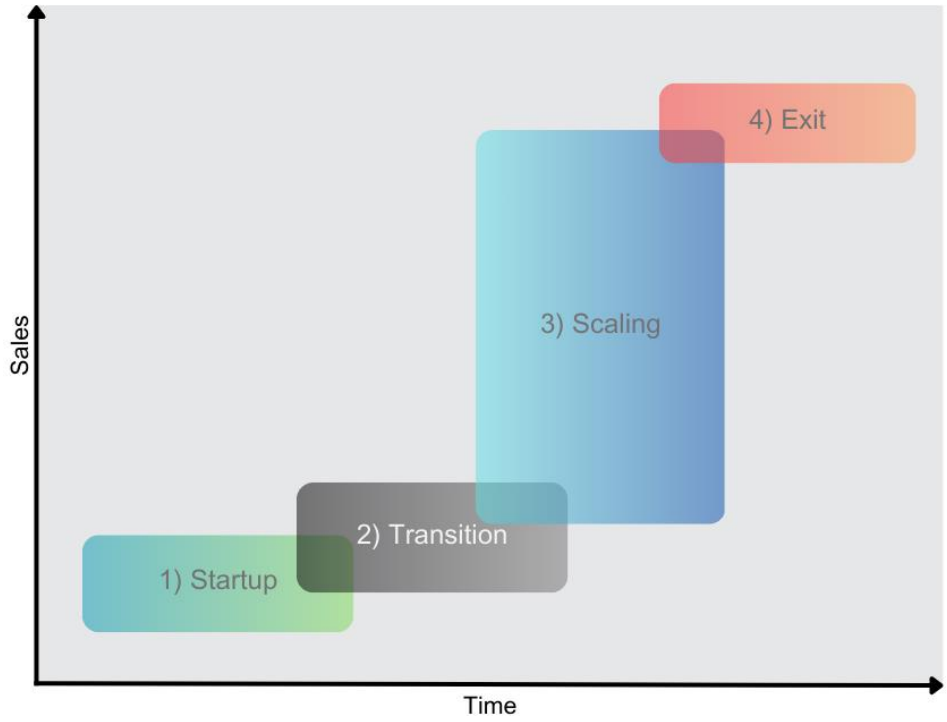

Figure 1: Four stages in the life cycle of an entrepreneurial firm (Picken, 2017)

2.2.1 The concept of scalability

As a concept originated in information technology infrastructure, scalability is defined as the “ability of a system, network, or process to handle a growing amount of work in a capable manner or its ability to be enlarged to accommodate that growth” (Bondi, 2000). Lund & Nielsen (2018) establish a connection between the scalability of a system and the scalability of a business model. They argue that a business that is scalable, like an IT-system, can increase its overall output when additional resources are provided. In this comparison, the underlying business model concept functions similar to the systems infrastructure. A stable framework creates durability and ensures high performance when capacity is enlarged. Consequently, scalability can be utilized as a mean to assess the business potential of a company.

In their paper "*an explorative model of business model scalability*, Stampfl, et al. (2013) develop a clear definition of scalability in relation to business models. Derived by a publication of Hallowell (2001), the authors define business model scalability "as a business model's ability to increase revenues faster than the corresponding cost base."

Aligned with this concept is the idea of scale and scope from economics. Here, economies of scale imply, that a decrease in production costs occur as a result of manufacturing and selling goods in large quantities. Economies of scope on the other hand, refer to the cost savings achieved through the sharing of resources, processes, and skills in the production of a wider range of products (Cambridge Dictionary, 2023).

Drawing on that, Lund & Nielsen (2018) introduce the notion of returns to scale into the context of business model scalability. According to them, business models can encompass attributes which have declining, constant or increasing returns to scale. They further add the dimension of linear and exponential qualities, ultimately influencing the level of scalability.

This differentiation illustrates the importance of understanding that scalability can take several forms. The authors further demonstrate this dynamic by an example: If a company anticipates a 10% increase in returns by increasing its capital deployment by 10%, it would be experiencing constant returns to scale. However, if the same company hires 10% more employees to attain a net-positive result of only 5%, it is encountering declining returns to scale.

The definition by Stampfl et al. indicates that increased returns to scale are evident when the output grows exponentially with every unit of input. This phenomenon is referred to as the "sweet spot" by Lund and Nielsen.

Next to the economic side of business model scalability, there are further aspects that are subject to exponential growth potential. Zhang et al. (2015) define scalability in business model design adding the notion of value creation, often summarized in the businesses' value proposition. According to the authors, business model scalability "is the extent to which a business model design may achieve its desired value creation and capture targets when user/customer numbers increase and their needs change, without adding proportionate extra resources" (Zhang, et al., 2015, p. 243). On closer inspection, the recurring theme of flexibility and agility as predecessors to scalability becomes evident.

Regardless of which elements of the business model are analyzed, they can all be classified based on their returns to scale. To achieve genuine scalability, a business model must hold potential for increasing returns to scale (Lund & Nielsen, 2018).

The objective of this paper is to provide a precise indication of scalability, and thus it concentrates on a specific set of attributes that can be measured in returns to scale.

The following chapters will explore and explain the relevant scalability attributes and their origins, as identified in the literature screening. These attributes are presented in Appendix 2 for reference. The table highlights the wide range of backgrounds of scalability drivers inherent in firms' business models, with a particular focus on the scholars who have made significant contributions to our current understanding.

2.2.1.1 Scalability in terms of return to scale

Lund & Nielsen (2018) further present a model to enhance comprehension of returns to scale in the context of business model design. The model depicts the contrast between increasing and decreasing returns to scale and highlights the impact of linear and accelerating (exponential) business model attributes. This provides guidance to founders on how to approach the different types of returns to scale strategically. Consequently, the model serves as a useful tool for strategic navigation.

The model is depicted in Figure 2. As mentioned earlier, to attain genuine scalability, businesses aim to integrate business model attributes that generate exponentially increasing returns to scale. This is referred to as the "sweet spot." The graph compares the impact of linear and exponential attributes, which ultimately determines the optimal strategy for a company to pursue. If a firm struggles to achieve increased returns to scale without a significant rise in inputs, it should focus on creating synergies within its current business model.

Decreasing returns to scale, for example competing sales channels, pose a significant risk for companies. In such cases, the authors recommend a sensible sell-out or an immediate exit from the market, depending on the level of investment already made.

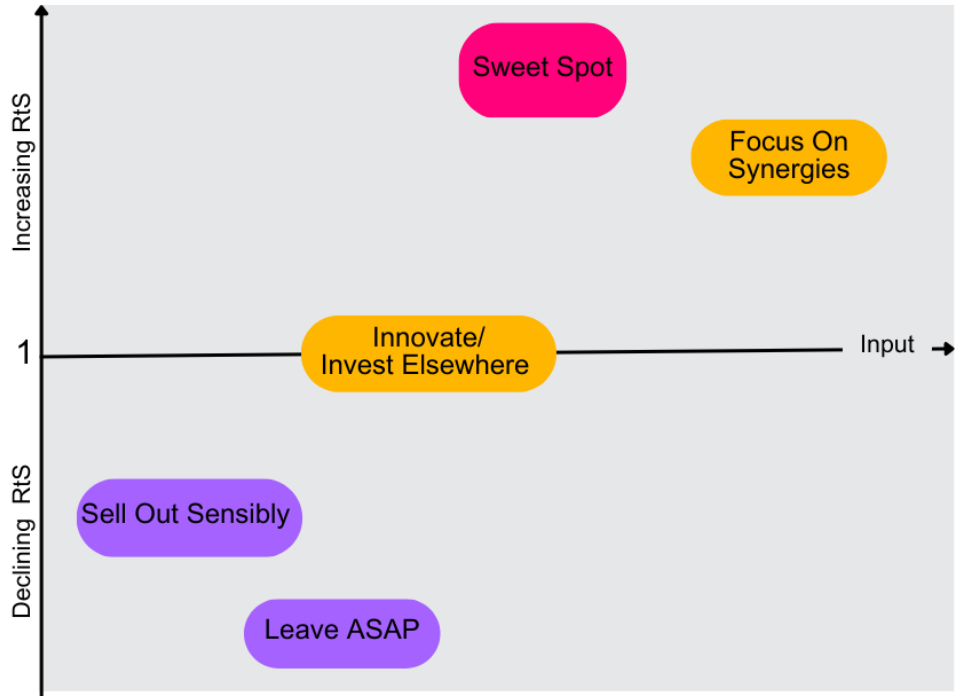

Figure 2: Hitting the scalability sweet spot (Lund & Nielsen, 2018)

Lund & Nielsen's model concentrates exclusively on the interaction of returns to scale with applied resources as a metric for scalability. In contrast, Stampfl et al. (2013) expand on this by introducing the concept of market potential and management expertise as "moderating factors." These two factors have a direct impact on how venture growth unfolds and help firms position themselves better as part of their business model realization. Thus, Figure 3 depicts an adjusted model that merges both approaches to create a multidimensional perspective, which can enhance strategic navigation.

The market potential is described by the authors as the current market volume or segment that a start-up is targeting, as well as the maximum possible size that the market could reach within a defined time frame. In this context, the term “TAM” (total addressable market) is frequently used. The TAM refers to the potential revenue a company could generate if it were to capture 100% of the market share without facing any competition. Often expressed as a dollar amount, it helps founders and investors to understand the potential scale of a business (Agarwal, 2022). Thus, a business functioning in a market that is expected to expand and has an increasing customer base allows for even more rapid scalability of the business model.

The second major moderating factor, the management or founding teams experience, can be seen as the cornerstone of most young businesses. Many scholars have identified the prior management (Groenewegen & de Langen, 2012), founding (Hsu, 2004), and industry experience (Birley & Stockley, 2017) as a crucial driver of successful company growth (Eisenhardt & Schoonhoven, 1990; Ensley, et al., 2002). The clear significance of the subject is precisely why the professional background of the founders has been incorporated into the scalability scorecard employed for analyzing scalability trends in German unicorn startups.

A leading example provided by Stampfl et al. (2013) highlights the influential role of market and management in shaping the potential outcomes of business model scalability, using Rocket Internet as a prime case study from Germany. During the early 2010s, Rocket Internet gained recognition for its remarkable ability to replicate successful e-business models. Instead of creating entirely new models, the company looked outside their home market to identify scalable business models and started deploying them in different markets across Europe and Asia. By leveraging their expertise in execution and implementation, Rocket Internet excelled in managing the process of building new ventures. This led to the firm building and selling ventures for hundreds of millions of dollars to companies like eBay, which they had copied the initial model from.

Lastly, the age of a company is introduced as a third moderating factor in the provided Figure 3. While it may be challenging to draw a direct correlation between the age of a venture and scalability, a certain level of maturity allows better self-development and supports better decision making for optimized growth. Additionally, with time, the market potential can be further expanded. Furthermore, considering that innovation requires a significant number of resources, older firms are more likely to reach the "sweet spot" of success, which is why unicorn companies were selected for the sample.

However, the observation period was set between zero and five years, as this represents the typical startup age range (deutsche startups, 2023). Furthermore, research indicates that a steep growth curve cannot be maintained endlessly, and with more time in the market, growth becomes less explosive (Churchill & Lewis, 1983; Freeman & Engel, 2007).

Taking all factors into account, the model serves a dual purpose: it enables the exploration of startups current positions and the necessary steps for improved scalability, while also providing investors with a more accurate assessment of a potential investment target. Still, it is important to acknowledge that this model represents a highly simplified depiction of reality.

In order to provide a better understanding of the model's dynamics, a few illustrative scenarios will be presented below:

For companies experiencing declining returns to scale, coupled with limited market potential and management experience, it is advisable to exit the market immediately to prevent further resource depletion. This situation often arises when inexperienced founders quickly enter a market without conducting thorough research. In such cases, growth can only be stimulated by iterating the business model to achieve linear returns to scale, a process that inevitably requires time.

The optimal trajectory for a startup involves entering a market with significant growth potential and a certain level of management experience, either from previous employment or prior founding experience. If the underlying business model generates linear returns to scale, the company can attain the sweet spot of success by innovating their product and service offerings, contributing to the development of the market, and internalizing additional management expertise through hiring experienced professionals. By doing so, after some time in the market, exponential returns to scale can be achieved, allowing the company to reach its full potential.

There are well-known examples of early-stage companies operating in highly promising markets with exceptional teams. Frequently, these companies find themselves in a position where they need to iterate or even entirely pivot their business model due to its initial configuration resulting in diminishing returns to scale, consequently burning through investors' funds. This recurring narrative underscores the critical importance of experimentation in identifying the attributes that contribute to business model scalability, ultimately paving the way for venture success.

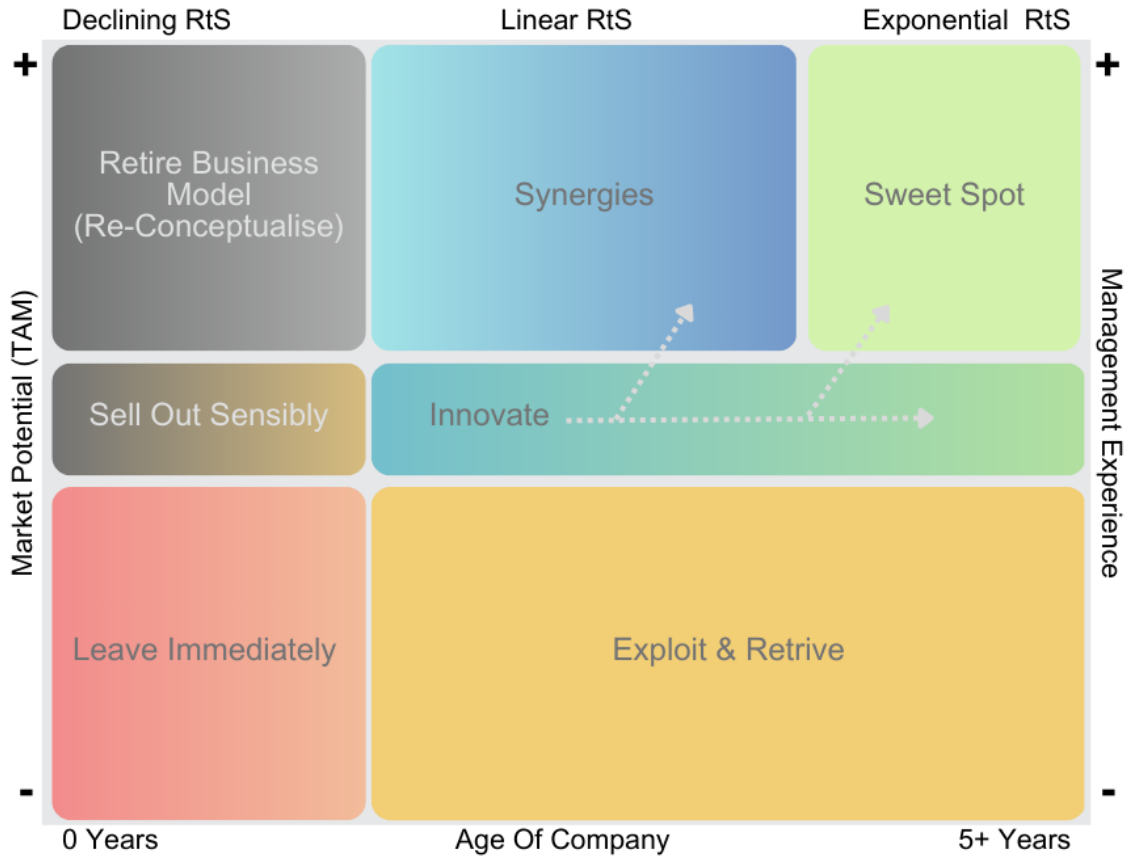

Figure 3: The scalability matrix (inspired by Lund & Nielsen, 2018 & Stampfl et al., 2013)

2.2.1.2 Business model scalability patterns

After elaborating on company growth and its phases, particularly in internet-based startups, and clarifying the relation of scalability within the business model conceptualization and realization, one might question if there exist standardized patterns of business model scalability.

Lund and Nielsen conducted a study on scalability examining over 90 Scandinavian businesses over a span of five years. Their research focused on the innovation of 10 network-based business models. Additionally, they enriched their findings by incorporating the experiences of renowned companies such as Google, Apple, and Groupon. Throughout their investigation, they identified five distinct patterns through which companies can attain scalability (Lund & Nielsen, 2018; Nielsen & Lund, 2017). These patterns can be seen in Table 2 below. They function as the basis of analysis for the underlying target sample of this work, the current 17 (December 2022) German unicorn companies with an internet-based business model. The authors further

enhance these patterns by overlaying business model configurations with scalability characteristics onto the existing structures, resulting in improved relevance to the underlying attributes of the business model. In this regard, Lund & Nielsen (2018) build upon a set of business model configurations initially developed in collaboration with Taran et al. (2016).

Number	Scalability pattern	Description	Corresponding BM configuration	Example
1	Scalability achieved through new distribution channels	The creation of mutually reinforcing distribution channels results in the generation of value for each customer segment involved	**Enriching the value proposition:** virtual communities, (e-) shops, (e-) mall **Removing capacity constraints:** Channel maximization, integrator, disintermediation, customer focused, trade show	A seafood wholesaler added a new channel for private consumers of fresh fish, enabling selling higher quality fish to restaurants at a lower price (mutually reinforcing channels)
2	Scalability through release from traditional capacity constraints	Companies remove themselves from otherwise typical capacity constraints of that type of business	**Enriching the value proposition:** virtual communities, (e-) shops, (e-) mall **Removing capacity constraints:** Channel maximization, integrator, disintermediation, customer focused, trade show **Creating platform-based value:** Free for advertising, integrated, adaptive, collaboration platforms, VC service provider/coordinator, brokerage,	A private bank prioritizes customer relationship activities by outsourcing the infrastructure and product innovation activities
3	Scalability through the outsourcing of investments	Partners enrich the value proposition without hurting profits		The App Store by Apple serves as a platform where software developers create content and pay for its presentation

			infomediary, multi-sided platforms	
4	Scalability through the leveraging of partners working for free	Stakeholders take multiple roles and create value for one another	**Creating platform-based value:** Free for advertising, integrated, adaptive, collaboration platforms, VC service provider/coordinator, brokerage, infomediary, multi-sided platforms **Changing the role of stakeholders:** Round up buyers & Content creator	Tupperware leverages its loyal customers as brand ambassadors to extend their marketing initiatives and reach into new customer segments
5	Scalability through the implementation of platform models	The business model becomes a platform that attracts new partners, including competitors		In 2022, Google made almost 80% of their revenue from selling advertising space, leveraging their multi-sided platform

Table 2: The five business model scalability patterns (adapted by Lund & Nielsen, 2018)

These configurations refer to specific structures or activities that are commonly observed in many companies, thereby enhancing the reliability of the later following analysis part. Their objective is to foster a deeper comprehension of how to generalize the five patterns of scalability and offer a potential framework for further exploration. This work specifically aims to accomplish that.

When taking a closer look at the configurations, it becomes apparent that they in part belong to the building blocks of business models discussed in chapter 2.1. This is also identified by Lund & Nielsen (2018), explaining, that the business model configurations discussed tend to revolve around the building blocks associated with partner networks, value chain architecture, profit formula, and are interconnected with the value proposition.

In the course of this paper, the five patterns play an important role for business model scalability, as they offer a comprehensive perspective of the entire business, irrespective of the type or variety of the product or service offering.

When considering the implementation of these patterns, a distinct emphasis on collaboration becomes evident. Aligning and leveraging the competencies and motivations of stakeholders within the firm's immediate ecosystem proves to be crucial.

This fosters the establishment of trust and loyalty among partners, serving as the foundation for long-term success. The authors recommend analyzing one's own business model by actively seeking opportunities where collaboration can enhance the value offered to customers.

While Lund & Nielsen's scalability patterns primarily concentrate on the internal aspects of the business model, including its connection to the value proposition and partnerships with stakeholders, Stampfl et al. (2013) shift their focus towards the external environment and the influential factors affecting the scalability of the business model. The subsequent chapter will explore their approach and discuss why combining both perspectives lead to a more comprehensive analysis of what drives business model scalability.

2.2.1.3 Predecessors for business model scalability

In their *explorative model of business model scalability* for internet-based companies, Stampfl et al. (2013) clearly differentiate between the business models conceptualization and its realization as main influencing factors for scalability. This separation of design and execution is widely recognized in relevant literature (Mitchell & Coles, 2004; Pateli & Giaglis, 2004; Teece, 2007), and especially Osterwalder et al. (2005) outlines the importance of poorly designed business models still being able to succeed due to strong management and implementation skills, whereas robust business model can be mismanaged and result in failure.

In the realm of internet-based businesses, where constant experimentation with new business model concepts is frequent (Johnson, et al., 2008), the conceptualization and realization phases cannot be strictly separated chronologically. Consequently, a scalable business model design represents growth potential that ultimately needs to be realized during the business model implementation phase (George & Bock, 2011). Therefore, the processes of business model (re-) design and implementation are more parallel in nature rather than strictly sequential (Sosna, et al., 2010).

This is also the rationale behind including market and management as realization factors in the scalability matrix (Figure 3). By considering all these factors together, a holistic overview of a firm's current position and its potential to transition from one quadrant to another is obtained. In addition, the subsequent scalability scorecard

encompasses not only the scalability patterns and their predecessors, but also the past experience of the management (founding) team, as such experience ultimately increases the likelihood of successfully realizing scalable business concepts. The entire explorative model of business model scalability can be seen in Appendix 1.

Given the scope of this project, a more specific focus is placed on the left side of the model, which involves examining the predecessors for scalability as part of the business model conceptualization. The remaining elements of the model, including the consequences of business model scalability such as investor attractiveness and company growth, as well as the moderators between variables, specifically market and management, will be addressed later in the course of this work.

Following the logic of Chrisman et al. (1988), the authors recognize five distinct factors that contribute to business model scalability: technology, cost and revenue structure, adaptability to various legal regimes, network effects, and user orientation (Stampfl, et al., 2013). These factors are presented in Table 3, which not only includes a brief description but also offers real-world examples illustrating how these predecessors manifest in intent-based companies.

In addition to conducting an extensive literature analysis, Stampfl et al. (2013) employed semi-structured expert interviews to gather data. A total of 12 interviews were conducted, involving two distinct groups of experts: entrepreneurs and investors. This approach enabled the development of a more refined level of abstraction known as the "antecedents" to business model scalability. These antecedents, or predecessors, enable to effectively categorizing the actual scalability attributes across various areas of the business model.

While certain predecessors in internet-based ventures are self-explanatory and logically contribute to scalability, others exhibit a more intricate relationship. Like a double-edged sword, certain factors can lead to outcomes contrary to the intended goal.

One prominent example which the authors also outline, is the adaptability to different legal regimes. While a legally versatile product or service that complies with all legal and governmental standards forms the foundation for a highly scalable business, it also necessitates the consideration of various local adaptations. This is particularly relevant during the process of internationalization and can pose challenges to

scalability, as substantial resources are often required to address any modifications needed to enter a new market.

Another scenario involves the scalability factor of network effects. When these effects are negatively influenced, they can accelerate the rate at which users abandon a social network or similar platform. With each user cancellation, the loss of users increases exponentially. In general, existing research confirms a positive correlation between the size of internet communities and business model scalability. This is attributed to larger communities facilitating a higher volume of transactions, leading to increased margins and transaction-based revenues for the platform operator (Rothaermel & Sugiyama, 2001; Zhang, et al., 2015).

The research conducted by Stampfl et al. (2013) reveals another key finding: software-as-a-service business models (SaaS) demonstrate immense scalability potential. In fact, SaaS models, such as those utilized by Salesforce and Dropbox, offer several key advantages, including the fact that they do not have to deliver physical goods, which is a typical capacity constraint that companies encounter when experiencing rapid expansion. This becomes especially interesting in the context of the following analysis, as a majority of the current German unicorn companies operate on a SaaS business model.

The predecessors for business model scalability form the supporting drivers in this papers analysis, allowing for a more precise depiction of a firm’s infrastructure and value drivers. The study's utilization of qualitative interviews with entrepreneurs and investors engaged in internet start-ups, combined with a comprehensive synthesis of existing literature, makes it ideally suited for the purpose of this thesis. Leveraging the authors' findings holds tremendous potential for obtaining the research goals of this paper.

However, it is acknowledged that due to the nature of the analyzed target companies being young and privately held, obtaining the information required for an accurate assessment of individual scalability factors might be challenging.

Scalability factors	Predecessors	Description	Example
Technology	Automation of processes	Reduce dependence on human resources by automating processes	Salesforce.com uses self-service technology for the entire process of registering new customers
	Scalability of technical infrastructure	Techniques to enhance a system's capacity to accommodate a larger number of users without drop in performance	Phonedeck's technological infrastructure crashed after their server capacity was not able to cope with an overload of enquires
Cost and revenue structure	Ratio of fixed costs to revenue	Fix cost rise unproportionally to revenue	Groupon's extensive sales force has resulted in challenges related to scaling their operations effectively
Adaptability to different legal regimes		Scalability can be significantly hindered by varying legal restrictions	Spotify having problems related to different intellectual property rights systems in different countries
Network effects (customer focused)	Going viral	Use of viral marketing techniques to reach critical mass and foster positive network externalities	Groupon motivating users to invite friends and recommend desirable deals to their peers
	Reaching a critical mass	Point at which the growth of a business reaches a level where it becomes self-perpetuating and gains momentum	An online newspaper must reach a critical mass of subscriptions for advertising and transaction commissions to be a viable revenue source
User orientation	Value proposition is focused on problem solving	Business model addresses a pressing problem which is eventually solved by the service or product offered	Picnic's online grocery delivery service addresses the challenge of lack of time by eliminating the need of their

			users to physically visit a store
	Simplicity of product/service	Business models built around easy to understand products/services are more likely to scale	N26's neo-bank service appeals to users through its user-friendly interface and intuitive design
	Previous user knowledge	Building on existing skills within the target group and therefore not requiring users to develop new knowledge	Tier Mobility utilizes similar processes and interfaces as other e-scooter/bike providers, facilitating fast customer onboarding

Table 3: Antecedents to business model scalability in BM conceptualization (Stampfl, et al., 2013)

2.2.1.4 The founders' experience

„The team is the basis for scalability“ - Interview partner 11

(Stampfl, et al., 2013, p. 241)

In their research on the aspects of new venture growth, Gilbert et al. (2006) explore various factors and circumstances that contribute to the enhancement of venture growth, using sales growth as a metric. They specifically emphasized the significance of entrepreneurs' characteristics as a primary catalyst for venture growth. The researchers further subdivided these characteristics into distinct sub-factors: personality traits were found to exert a somewhat indirect influence (Baum & Locke, 2004), whereas attributes such as educational background, previous experience in related industries, and prior entrepreneurial or start-up experiences were found to have well-established direct effects on the sales and employment growth of new firms. They reason that the founders' experiences hold significant importance as they equip them with competencies that shape decision-making towards improved and optimized growth. It is presumed that an entrepreneur with relevant experience is more likely to make superior decisions compared to one who lacks similar experience (Gilbert, et al., 2006).

Supporting the significance of founders' characteristics and background, Santisteban & Mauricio (2017) emphasize the experience of founders at previous startups and their management expertise as crucial components among the 21 critical success factors for information technology startups. These factors are categorized into three groups: organizational, individual, and external, and are examined in relation to the four stages of startup development (seed, early, growth, and expansion) to determine their impact on startup success. The "individual" aspect of these success factors encompasses not only the said experience but also other relevant aspects of the founders' personal backgrounds, such as academic capital, technological and business skills, as well as age and gender.

In order to pinpoint the particular factors within the founding team that contribute to their ability to integrate scalable growth into a firm's business model and effectively execute this growth, this paper primarily concentrates on the founders' previous experience. Specifically, the study places emphasis on the founders' prior management, founding and industry experience.

Groenewegen & de Langen (2012) highlight that the literature frequently examines the entrepreneurial *management experience*, noting that numerous successful startups have been led by CEOs with prior company management experience. Furthermore, management experience enables entrepreneurs to effectively allocate resources (van Gelderen, et al., 2005), navigate employee dynamics, and particularly handle conflict in a positive way (Chatterji, 2009), ultimately contributing to venture of success. When startup founders possess previous management experience, the likelihood of them being replaced by a more seasoned executive diminishes (Wasserman, 2003). This is primarily due to investors seeking stability and someone who can effectively navigate the challenges of a turbulent growth phase (Picken, 2017). Investors recognize the value of founders with management experience, as they bring a track record of getting the job done and possess the necessary skills to steer the startup towards success.

Serial entrepreneurs, individuals with previously *founding experience*, demonstrate a higher likelihood of succeeding with their new ventures (Gompers , et al., 2010). Their past experience equips them with valuable insights on how to exponentially grow a firm and implement operational best practices that can be transferred to their current endeavors. Moreover, their track record increases their access to human capital, allowing them to assemble high-quality teams and attract talented individuals who are eager to work with successful founders. Additionally, serial entrepreneurs often possess a well-established network of contacts within the startup ecosystem, including other founders and venture capital firms, which provides them with enhanced opportunities for collaboration and funding (Shaw & Sørensen, 2019). This combination of expertise, resources, and networks significantly boosts the probability of success for serial entrepreneurs in their entrepreneurial pursuits.

The prior *industry experience* and knowledge of founders exert a substantial influence on the team's ability to demonstrate effective entrepreneurial behavior and venture growth (Li & Dutta, 2018). Such expertise enables founders to conduct more accurate evaluations of the business environment, including factors like customers, suppliers, competitors, and technology. By possessing deep insights into the industry, founders are better equipped to understand the dynamics and interactions within the market, allowing for more informed decision-making. This industry-specific knowledge also facilitates superior strategic issue processing, as founders can identify and address key challenges and opportunities with greater precision (Jackson, 1992). Ultimately,

the founders' prior industry expertise enhances their ability to navigate the business landscape and make informed choices that contribute to the success of their venture (Birley & Stockley, 2017).

In conclusion, the experience of entrepreneurs, specifically their prior management, founding, and industry-specific expertise, plays a crucial role in measuring the potential for scalability in startups. When taking a step back and looking at Stampfl et al. (2013) model of business model scalability, the founding team's experience serves as a critical factor in the realization of the business model. By including these three experience factors, a better overview of how well the business plan can be executed with the current team can be provided. The founding team's experience serves as a binding piece between the business model's potential and its actual ability to be leveraged. Thus, analyzing the experience of entrepreneurs offers valuable insights into the potential for scalability and the likelihood of success in startup ventures.

2.3 Operationalizing theory: the business model scalability scorecard

To facilitate a comprehensive analysis of business model scalability, an business model scalability scorecard was developed, taking into account the scalability patterns introduced by Lund & Nielsen (2018) in chapter 2.2.1.2 and the antecedents to business model scalability outlined by Stampfl et al. (2013) (see Table 3). This scorecard also integrates the past experience of founders, enabling a holistic evaluation of the target group. By considering both, the structural aspects of business model scalability and the personal attributes of the founders, the enhanced scorecard provides a more comprehensive assessment framework for evaluating the potential scalability of a business model. The scorecard can be seen in Appendix 3.

In the analysis section of this thesis, the scalability scorecard will be employed to evaluate a total of 17 German unicorn companies that operate on an internet-based business model. The objective is to identify the presence of suggested scalability attributes based on theory and assess the extent to which these patterns are present in comparison to other companies. As depicted in Appendix 3, the scorecard components are categorized into the five scalability patterns, the scalability predecessors, and the founders' experience. The five scalability patterns are closely aligned with the initial conceptualization of the business model and are also linked to the business model contributions proposed by Taran et al. (2016). On the other hand, the antecedents of scalability, as well as the founders' experience primarily focus on the external environment of the business model and its execution, providing additional support and insights.

Upon examining the score, it becomes evident that the scalability patterns hold a weighting of 1.5 and the founders experience a weighting of 1, whereas the scalability predecessors carry a weighting of 0.5, indicating a relatively lower level of significance. This distinction is primarily attributed to the focus of this thesis, which concentrates on studying scalability attributes within business model configurations. While the antecedents of business model scalability are considered relevant, they are not as closely aligned with scalability in terms of the conceptualization of the business model. Moreover, given the larger number of scalability predecessors, a same weighting would be diluting the overall score.

In addition to the weighting, each element in the scorecard can be assigned a value ranging from 0 to 2. The assigned value reflects the level of relevance for scalability in relation to the respective attribute. A value of 0 indicates no relevance, a value of 1 indicates medium relevance, and a value of 2 signifies high relevance in terms of scalability. As depicted in the table, the expression of relevance for a scalability attribute varies depending on the subject at hand. The scores for the entrepreneurial past experience attributes are represented using a binary variable. A value of 0 indicates no experience, while a value of 1 signifies some level of experience.

Take, for instance, the predecessor scalability driver "previous user knowledge," which is evaluated based on a scoring system of 0, meaning non-existent (new to the market), 1 equaling limited user knowledge, or 2 meaning the firm can draw back on existing user knowledge for their product or service (second mover). So, if a firm's business model is centered around a product or service that is already familiar to its customer base, it would receive a score of 2. For example, when Disney Plus, the streaming provider of Disney, was launched at the end of 2019, it benefited from existing user knowledge. This is because established streaming platforms like Amazon Prime or Netflix had been operating for several years. Many new Disney Plus users already had subscriptions to other platforms and were familiar with the concept of streaming services when they signed up for Disney Plus. Ultimately, this allows for faster growth.

On the flip side, when examining the pattern "scalability through the leveraging of partners working for free," a different scoring range is required. The objective is to meter the extent to which a firm's business model incentivizes stakeholders to assume multiple roles and generate value for one another. This can manifest in various forms, making it more challenging to assign scores. The leveraging of partners can occur in areas such as marketing, fulfillment, recruiting, and more. In internet-based startups, marketing often represents a prominent area where this scalability pattern can be observed.

A score of 0 is given when stakeholders lack incentives to utilize their networks. If customers are motivated through loyalty programs or referrals, indicating the potential for constant returns to scale and modest growth of the customer base, a score of 1 can be assigned. On the other hand, if stakeholders act as product or brand ambassadors, creating content and promoting products beyond their immediate circles of friends and family, it signifies increasing returns to scale, warranting a score of 2.

A prime example of achieving a maximum score of 2 in this specific area would be the German deal platform mydealz.de. Functioning similar to Groupon, this platform enables community members to post and access various deals, including discount codes for products, price drops, car leasing deals, and forums for rating and discussing different products or services. By utilizing affiliate links, the platform generates revenue through each user click. Meanwhile, users actively promote deals on the platform and share them with friends and family purely driven by the desire to save money. This exemplifies the leveraging of partners working for free, as both the platform and its users mutually benefit from the sharing and promotion of deals.

Upon closer examination of the various levels of detail within the scalability scorecard elements, it becomes evident that a clear score cannot be assigned without a certain degree of qualitative estimation. Compounding this challenge is the inevitable presence of information asymmetry, particularly prevalent in private companies, especially in the German context. However, leveraging the weighted scorecard enables the generation of a comprehensive overview of the current state of scalability to a satisfactory extent. This, in turn, empowers founders and investors to make more informed decisions by drawing insights from real-life examples.

Further elaboration on the systematic construction of the scorecard and the rationale behind its utilization in this study will be provided in the methodology chapter. This will offer a more comprehensive understanding of the analysis approach and establish the validity of this form of analysis for the present case.

2.4 Aim of the thesis and research questions

Having explored the theoretical foundation of business model scalability and its operationalization, it is now essential to provide context and outline the framework and objectives of this work. The primary objective of this study is to examine the relevance of scalability patterns in the conceptualization of business models, with a specific focus on unicorn companies. The rationale behind selecting unicorn companies as the target group is that they have already demonstrated exceptional growth and successful expansion, making them a rich source for analyzing scalability attributes.

By specifically focusing on German unicorn companies, this research aims to isolate and analyze any macroeconomic dynamics that could potentially impact scalability

characteristics. By narrowing down the scope to a specific country, it becomes possible to account for factors such as general economic conditions, policy frameworks, and market characteristics that may influence the applicability and effectiveness of scalability strategies.

The German startup scene holds immense significance in the global startup ecosystem, particularly in terms of the number of unicorns and the amount of funding it has received. Germany has emerged as a key player, witnessing a remarkable rise in both unicorns and "soonicorns" – startups that are on the verge of reaching a valuation of $1 billion (Huebl, et al., 2022). This steady growth and the substantial investments pouring into the country emphasize Germany's robust position and valuable contributions to the global entrepreneurial landscape.

The significance of this work lies in its contribution to the scientific exploration of scalability strategies within the German start-up ecosystem. By shedding light on the applicability and frequency of scalability attributes among unicorn companies, this research seeks to enhance our understanding of effective growth strategies. Moreover, it aspires to provide a valuable tool for founders and investors, equipping them with the necessary insights to analyze and execute scalable venture growth more effectively. In summary, this thesis aims to address the following research questions:

1: *To what extent do the scalability attributes found in existing theory and consolidated in the scalability scorecard apply to internet-based German unicorn companies?*

2: *Which attributes are most commonly present among these companies, and are there any additional attributes that have not been documented in the current literature?*

Through a thorough investigation of these questions, this study aims to advance both academic knowledge and practical understanding in the field of business model scalability.

3 Methodology

In the methodology section of this thesis, a closer examination will be conducted on the kind and condition of the underlying sample and its data, explaining the rationale behind the narrower focus on German, internet-based startups with a valuation of over $1 billion. Furthermore, the selected tool of presentation, the balanced scorecard, will be put into perspective, clarifying why this method of analyzing and presenting data creates better comparability and facilitates result discussions.

3.1 Data and sample

As mentioned previously, the German startup ecosystem holds significant importance on a global scale, particularly in terms of the number of unicorns it has produced and the amount of funding it has attracted. Germany has emerged as a key player, experiencing a remarkable increase in relevance within the global startup community. Notably, several prominent international investors, including Sequoia Capital (US), Accel (US), and EQT Partners (SE), have invested hundreds of millions of dollars in the German market.

In terms of scalability, Germany stands out with four out of the five fastest-growing unicorns in Europe. Companies such as Gorillas and Razor Group have achieved a valuation of $1 billion in less than two years since their inception (Huebl, et al., 2022).

For this thesis, unicorn companies were selected as they offer several advantages for in-depth analysis. Firstly, they have been operating in the market for a longer period, which provides a larger amount of historical data and information to study. Moreover, their success has garnered significant attention from the press, resulting in extensive media coverage and a higher availability of information about their strategies, challenges, and growth patterns in comparison to more early-stage firms.

Furthermore, unicorn companies often have founders and management teams with extensive experience in scaling fast-growing startups. This accumulated knowledge and expertise can offer valuable insights into the strategies and tactics employed during their growth journeys. By examining these companies, researchers can uncover best practices, identify successful scaling strategies, and gain a deeper understanding of the factors that contribute to their continued growth.

It is worth noting that the majority of German unicorns have not yet reached their peak. This implies that their focus remains on expansion and further scaling, making them highly relevant for studying growth strategies for this research.

Due to the emphasis placed on German unicorns that operate on an internet-based business model, known for their significant scalability potential according to Stampfl et al. (2013), the original list of 29 companies has been reduced to 17. The excluded 12 companies either function as manufacturing companies (Otto Bock HealthCare, Volocopter, Agile Robots, Enpal and InFarm), serve as holding companies that internally manage multiple smaller firms (NuCom Group, Razor, SellerX and Berlin Brands Group), or are purely focused on e-commerce (Flink, Gorillas and Grover). The decision to reduce the list was primarily aimed at enhancing comparability among the companies and their scalability characteristics. It is important to avoid any disproportionate representation of certain attributes that could arise from the selected industry and underlying business model of the observed target group. This was done to ensure a fair and accurate assessment of the companies' potential for scalability.

Despite the existence of inconsistencies among various sources that collect data on unicorn companies, CB Insights is widely considered a reliable and valid source for obtaining startup insights. CB Insights data is widely recognized for its significance and has served as the foundation for numerous academic articles. Moreover, it holds great relevance for Fortune 500 companies and renowned investors within the startup ecosystem (Lougen, 2017). Therefore, in this research, the continuously updated "$1B+ Market Map" (CB Insights, 2023) provided by CB Insights was utilized to compile a comprehensive list of all the current German unicorns. This approach ensures a reliable and up-to-date representation of the German unicorn landscape for the purposes of this study.

The valuations of the startups included in the list are determined either by considering the most recent publicly disclosed equity financing round or, in the absence of any equity funding raised thus far, by utilizing financial performance indicators, multiples, and evaluations provided by investors or potential buyers. The data utilized for the analysis conducted in this thesis is current as of December 2022.

Due to the private nature of German unicorn companies, which are not obligated to disclose detailed financial information, a diverse range of internet sources were utilized. It is important to note that a majority of German unicorns prefer not to disclose company data, making it challenging to access comprehensive information about their financial performance and operations.

To mitigate the risk of data not accurately representing the current operations, strategy, and business model of the German unicorn companies, I exclusively relied on sources directly provided by the firms themselves, their founders, c-level executives, or trusted partners. No third-party information was utilized in evaluating scalability variables. While this approach may lack scientific rigor, it is the most feasible option considering the private nature of these companies and their relatively recent entry into the market. By relying on direct sources, I aim to ensure the highest possible accuracy and reliability in the data used for analysis.

Still, the qualitative research approach of this thesis aims to uncover the figurative sense of findings and explore their interrelationships (Schmid & Oesterle, 2009). According to Yilmaz (2013), qualitative research is characterized by its inductive and naturalistic approach, relying heavily on the interpretative abilities of the researcher when analyzing data and findings. The sensitivity to context and the axiological assumptions of the researcher, which refer to the values and norms that influence data interpretation, can impact research outcomes and their positioning within the broader context (Schmid & Oesterle, 2009).

In comparison to quantitative research approaches, qualitative methods often result in more descriptive and comprehensive recommendations for dealing with similar phenomena, rather than explaining or falsifying a theory. As a result, the researcher is able to generate application-oriented recommendations for practical implementation (Wrona, 2006). The qualitative approach adopted in this thesis allows for a deeper exploration of the subject matter, providing valuable insights and actionable recommendations for addressing the identified phenomena.

Similar methods were utilized by different scholars in the past, arguing an expert status when analyzing qualitative data (Turner, et al., 2021; Campbell & Göritz , 2014; Taylor, et al., 2016).

To gather data on the entrepreneurial background and past experience of the founders, the primary source utilized was the professional social network LinkedIn. Although the use of LinkedIn in entrepreneurial studies has been relatively infrequent in recent years (Banerji & Reimer, 2019), there is growing recognition of its attractiveness as a source for human capital information. LinkedIn offers publicly available and comprehensive data, surpassing that of other platforms (Ge, et al., 2016; Kreiss & Jasinski, 2016; Pisano, et al., 2017). In cases where data was unavailable on LinkedIn, alternative sources such as Xing, a professional social networking site focusing on the German-speaking market, were searched to supplement the missing information.

3.2 The balanced scorecard

The weighted scoring model (WSM), a multi-criteria decision analysis method, integrates quantitative and qualitative measures to aid operational decision-making, enabling consideration of multiple factors. Specific scoring criteria can be selected based on well-defined objectives and metrics. This technique involves assigning weights to each criterion based on their relative importance, with the most significant criterion receiving the highest weight (Ouchra & Belangour, 2021; Griffith & Headley, 2010). This methodology was chosen for analyzing the qualitative data on scalability aspects in the target group's business models. By assigning weights to each scalability criterion, a final score can be calculated. The resulting scores provide better means of comparing scalability attributes within the business model of a company, as well as between different unicorns.

To ensure consistent quality across different scoring elements and minimize decision maker bias, specific rules were followed during the design of the WSM.

As mentioned earlier, the selection of criteria was based on the research conducted by Lund & Nielsen (2018), as well as the scalability factors identified by Stampfl et al. (2013) in the business model design of internet-based companies. The criteria were carefully chosen to address the research question and purpose, ensuring a comprehensive analysis without overlooking any essential evaluation factors. Each criterion was critically assessed for its true relevance before inclusion in the list. To manage data collection and processing requirements, it was ensured to exclude factors of relatively minor importance in the decision-making process. Measurability is

a key aspect of each criterion, requiring the availability of a measurement scheme to evaluate the extent to which it was fulfilled. In situations where measurement schemes are not readily available, an "artificial" measure was constructed. While this may seem unconventional, it adds an interpretive dimension to the use of weighted scoring models in analyzing startup company data. However, it is crucial to exercise caution and ensure that the proposed measure is reliable, accurate, and meaningful in assessing the desired performance criterion. Lastly, efforts were made to minimize criteria overlap. This was done to prevent double counting or excessive weighting of the impact of a particular factor, ensuring that one criterion did not include or encompass another (Moore & Baker, 1969).

After identifying the criteria, it is important to assign weights that reflect the relative importance of each criterion. This step in the development of the scoring model requires extracting personal or group utilities from the decision maker. The expertise of the decision maker plays a vital role, as they should possess profound insights into the analyzed environment to exercise better judgment. It is crucial to ensure that both the score range and the assigned weights have comparable intervals, as this enables cross-analysis (Moore & Baker, 1969).

Ultimately, this approach provides the decision maker with the flexibility to consider both qualitative and quantitative factors allowing for a more holistic analysis.

4 Presentation of findings

Following a thorough analysis of the 17 German unicorn companies that operate on an internet-based business model, the findings have been presented in Table 4. The table provides an overview of each firm's overall scalability score, as well as individual scores for the five scalability patterns, scalability predecessors, and founders' experience. On average, the total scalability score reaches 20.5 out of 27 points, indicating that the average German unicorn company resides within the top quartile in terms of scalability. Furthermore, it provides evidence that the scalability attributes found in the literature are indeed present in over 75% of the selected sample.

Upon examining the scalability attributes individually, it becomes evident which aspects contribute the most to the average scalability score. This insight highlights the specific areas within the business model and its execution that are responsible for achieving superior scalability. According to Lund & Nielsen’s (2018) suggested five scalability patterns, they achieve an average score of 12.9 out of 15 points. This indicates a strong alignment of these patterns with the target group, highlighting their relevance in achieving scalability. However, when considering the scalability predecessors derived from Stampfl et al. (2013) explorative model of business model scalability, an average score of 5.9 out of 12 is observed. This shows a lower level of concordance, with only approximately 50% presence of these predecessors in the average German unicorn startup. Lastly, the founders' experience, encompassing management, founding, and industry experience, averages a score of 1.7 out of 3 points.

Upon closer examination of the internet-based companies with the highest scalability scores, it becomes evident that firms with a business-to-consumer (B2C) approach exhibit significant potential in their business models. One such example is FlixMobility, which achieves the highest score of 25 out of 27 possible points, reaching the maximum score of 15 in the five scalability patterns category. Similarly, the travel booking platform Omio also excels in the scalability pattern section, scoring 15 out of 15 points, resulting in a total score of 23.5 out of 27. It is interesting to note that both FlixMobility and Omio operate in the travel and transportation industry, providing a platform-based solution for their customers.

Next to them, Trade Republic and wefox are notable companies with high scalability scores. Trade Republic, a financial technology company providing trading solutions to private customers, and wefox, an insurance technology company serving end-customers and businesses, both achieve a comparably high total scalability score of 23 out of 27 points. These companies demonstrate a strong potential for scalability in their respective business models.

In contrast to its high valuation of $13 billion, Celonis, a B2B software company specializing in process mining and process excellence, received a comparatively low scalability score of 18. Similarly, Personio, a human resource software company with a valuation of $8.5 billion, obtained the lowest score among the 17 firms, with a total of 14 out of 27 possible points. Upon closer examination, it becomes evident that both companies score below the average in terms of scalability patterns. This is primarily attributed to the fact that neither firm operates a platform-based business model and solely focuses on B2B operations. Due to their absence of a platform-based business model, both Celonis and Personio lack the advantage of a complex network of partners that typically assist with capacity constraints, product or service innovation, and synergistic cross-promotion. This further contributes to their lower scalability scores compared to other companies in the analysis.

It is worth noting that among all the scalability attributes, the founders' experiences are the only ones that scored zero in multiple firms. Companies such as Celonis, Personio, and GetYourGuide are still managed by their founders, who lack prior experience in management, founding a company, or the specific industry in which they currently operate in. This highlights the unique situation where these companies are led by founders who may not have a background in the necessary areas for scalability, therefore leading to a lower scalability score, but still reaching some of the highest valuations in the unicorn space.

For more detailed information on the specific companies and their corresponding scalability attribute scores, please refer to the scorecards provided in the appendix. These scorecards offer in-depth insights into the individual companies' performance across various scalability attributes.

Unicorn intel				Scalability score			
Company	Valuation ($B)	Industry	Target group	Scalability patterns	Scalability predecessor	Founders experience	Total score
Celonis	$13.00	Data management & analytics	B2B	10.5/15	7.5/12	0/3	18/27
N26	$9.23	Fintech	B2C	13.5/15	6/12	3/3	22.5/27
Personio	$8.50	Internet software & services	B2B	9/15	5/12	0/3	14/27
Trade Republic	$5.36	Fintech	B2C	15/15	6/12	2/3	23/27
wefox	$4.50	Fintech	B2C/B2B	15/15	6/12	2/3	23/27
Contentful	$3.00	Internet software & services	B2B	12/15	5.5/12	3/3	20.5/27
FlixMobility	$3.00	Auto & transportation	B2C	15/15	9/12	1/3	25/27
Forto	$2.10	Supply chain, logistics, & delivery	B2B	12/15	6.5/12	2/3	20.5/27
Tier	$2.00	Travel	B2C/B2B	9/15	6/12	3/3	18/27
solarisBank	$1.65	Fintech	B2B	15/15	4.5/12	2/3	21.5/27
Scalable Capital	$1.40	Fintech	B2C	13.5/15	6.5/12	2/3	22/27
Choco	$1.20	E-commerce & direct-to-consumer	B2B	13.5/15	4.5/12	2/3	20/27
GetYourGuide	$1.10	Travel	B2C/B2B	15/15	6/12	0/3	21/27
Sennder	$1.10	Supply chain, logistics, & delivery	B2B	12/15	4.5/12	2/3	18.5/27
Staffbase	$1.10	Internet software & services	B2B	13.5/15	5/12	3/3	21.5/27
Omio	$1.00	Travel	B2C	15/15	7,5/12	1/3	23.5/27

Taxfix	$1.00	Fintech	B2C	10.5/15	5/12	1/3	16.5/27
			Average score	12.9/15	5.9/12	1.7/3	20.5/27

Table 4: Scalability score of German unicorn companies

4.1 Frequency distribution of scalability attributes

In order to address the aspect of the research question that deals with the occurrence frequency of the mentioned scalability attributes within the sample, a comprehensive heat map has been created, displayed in Table 5. This visual representation illustrates both the absolute and relative frequency of the scalability attributes categorized into the five scalability patterns, the scalability predecessors, and the founders' experience.

The heat map assesses the occurrence frequency of the scalability patterns and predecessors on a scale of 0, indicating their absence, 1, if partial present, and 2, representing full presence. The categorization and scoring of individual scalability attributes differ significantly, as outlined in the corresponding chapters dedicated to each attribute group. This variation arises due to the nuanced nature of these attributes and the requirement for a thorough analysis of a company's business model before being able to assign a certain score. Detailed information regarding the specific scoring intervals and the rationale behind each score can be found in the score cards provided in the appendix of this work.

It should be noted that the founders' experience is evaluated differently, with a score of 1 assigned if prior experience exists in any of the three fields (management, founding, or industry experience), and a score of 0 given if no prior experience is present.

Starting with the five scalability patterns, the patterns of creation of new distribution channels, release from traditional capacity constraints, and outsourcing of investments to partners emerge as particularly noteworthy. These patterns demonstrate a high degree of prevalence within the sample. Notably, the creation of new distribution channels pattern is observed in 94% of the firms, while both the release from traditional capacity constraints and outsourcing of investments to partners patterns exhibit a relative frequency of 82%. It is worth mentioning that none of the firms in the sample completely lack these three patterns. Among German internet-based unicorns, it is

evident that patterns four and five are less commonly observed. The scalability pattern involving the leveraging of partners working for free is found to be fully present in only 47% of the sample companies, while it is partially present (score of 1) in 53% of the cases. This particular pattern is closely linked to the scalability predecessors associated with a firm's capacity to generate network effects. The ability to create viral effects through the firm's brand, product, or service, as well as rapidly achieving critical mass, plays a crucial role in leveraging partners to promote and cross-sell a service without charge. As seen in Table 5, both scalability predecessor falling under network effects are comparably less frequent.

Lastly, it is worth noting that the pattern related to the implementation of platform-business model features was fully present in 12 out of 17 firms, accounting for a 72% occurrence rate. However, it is interesting to observe that three companies, namely Celonis, Personio, and TIER, do not operate on a platform-based business model. In this assessment, all three companies received a score of 0. Remarkably, Celonis holds the distinction of being Germany's most valuable unicorn with a valuation of $13 billion, while Personio boasts a valuation of $8.5 billion.

Shifting the focus to the scalability predecessors, a different perspective emerges. As mentioned in the preceding chapter, the predecessor category holds the lowest average score of 5.9 out of 12. This implies that, on average, the unicorn companies in the sample achieve less than 50% of the maximum score in this category.

Nevertheless, certain scalability predecessors are disproportionately prevalent within the sample, particularly those related to technology and user orientation. A significant majority of the analyzed firms demonstrate a high degree of process automation (71%) and possess a high scalability of technical infrastructures (94%). In the latter case, 16 out of 17 companies exhibit highly stable server and cloud infrastructures, primarily relying on platforms such as Amazon Web Services (AWS) or Microsoft Azure. This ensures that even transcontinental expansions are manageable and feasible. It is important to highlight that both attributes, process automation and scalability of technical infrastructures, are present to some degree in all 17 companies, with no scores of 0 recorded.

Turning to the scalability predecessor related to user orientation, a substantial 88% (15 firms) place significant emphasis on a simple product and/or service design, as well as

the associated processes. This user-oriented approach proves to be the second most prevalent scalability predecessor, indicating a clear strategy among these firms. Moving on to the scalability predecessor related to a firm's underlying value proposition, it is notable that 71% of the unicorn companies received a perfect score of 2 out of 2, while 29% received a score of 1 out of 2. In this assessment, the focus was placed on evaluating how central a firm's value proposition is to problem-solving, taking into account both the magnitude of the problem in terms of total attainable market size in dollars and number of customers. The results highlight an over-proportioned emphasis on problem-solving from these firms. When considering previous user knowledge as a scalability predecessor, the scores are almost evenly divided between full presence (2 points) and partial presence (1 point). Within the sample, certain firms introduced unique solutions that were not previously available, resulting in a slower adoption rate. However, the majority of firms (88%) were able to leverage existing user knowledge to some extent, facilitating faster scalability.

As previously discussed in the section on scalability patterns, the scalability predecessors associated with creating network effects are influenced by a firm's implementation of a platform-based business model (feature), as well as their ability to leverage partners, such as brand ambassadors, who work for free. Consequently, these interrelationships are also reflected in the frequency of occurrence concerning the ability to reach a critical mass quickly and the viral effects of the firm itself or its products or services.

Within the sampled firms, it is evident that 41% show no viral effects whatsoever, indicating challenges when it comes to organic growth. Additionally, 35% of the firms appear to experience a slow rate of customer acquisition, indicating a longer time required to reach a critical mass.

The scalability predecessor related to a firm's cost and revenue structure is the only attribute that is notably absent in the majority of the sample. Specifically, 65% of the firms have higher fixed costs compared to their net revenue. While detailed financial data is challenging to obtain for private companies like in our sample, founders often acknowledge that profitability has not been achieved yet. This is primarily attributed to the high growth and expansion efforts of the firms, resulting in the cost of staff (salaries) exceeding the revenue generated. Furthermore, as highlighted by the originator of the scalability predecessors' concept, this specific attribute can be viewed as a double-

edged sword. It suggests that scalability is often achieved by prioritizing growth over immediate profitability (Stampfl, et al., 2013). However, it is noteworthy that in the context of this research, firms with high valuations tend to demonstrate profitability, which supports the perspective presented here.

The frequency results also reveal that none of the firms are encountering significant challenges regarding the adaptability of their products to different legal regimes. Among the seven firms that exhibit limited adaptability (score of 1 out of 2), their requirements typically involve obtaining licenses or permits to operate in new markets. However, these challenges are often mitigated by forming partnerships with crucial local players, as seen with the example of solarisBank collaborating with JP Morgan Chase in the US to offer they white-label banking solutions.

In conclusion, when considering the frequency of occurrence of different founders' experiences, it becomes evident that a higher proportion of firms, particularly their founders, do not meet the criteria compared to the other scalability attributes. Regarding prior management experience, 76% of the firms' founders have worked in a management position. In terms of founding other startups before, 53% of the current founders have done so, while 47% have not. Furthermore, when examining prior industry experience, a majority of 59% have not worked in the industry they currently operate in.

To provide further clarification on these comparatively more drastic scores, it is important to note that in the sample, a positive score is assigned only if one or more of the currently managing founders possess relevant experiences. This consideration works in favor of a positive score. Furthermore, it is important to note that when considering industry and management experience, only full-time employment is taken into account.

In the forthcoming chapter, a more comprehensive understanding of the scoring process based on the presence of scalability patterns, predecessors, and founders' experience will be provided. This will be illustrated through the explanation of two specific examples selected from the sample, offering insights into the assessment methodology and highlighting the factors influencing the assigned scores.

Scalability attributes			Frequency of score					
			Score 0	%	Score 1	%	Score 2	%
Scalability patterns	Scalability achieved through new distribution channels		0	0%	1	6%	16	94%
	** through release from traditional capacity constraints		0	0%	3	18%	14	82%
	** through the outsourcing of investments		0	0%	3	18%	14	82%
	** through the leveraging of partners working for free		0	0%	9	53%	8	47%
	** through the implementation of platform models		3	18%	2	12%	12	71%
Scalability predecessor	Technology	Automation of processes	0	0%	5	29%	12	71%
		Scalability of technical infrastructure	0	0%	1	6%	16	94%
	Cost and revenue structure	Ratio of fixed costs to revenue	11	65%	3	18%	3	18%
	Adaptability to different legal regimes		0	0%	7	41%	10	59%
	Network effects	Reaching a critical mass	6	35%	7	41%	4	24%
		Going viral	7	41%	6	35%	4	24%
	User orientation	VP is focused on problem solving	0	0%	5	29%	12	71%
		Simplicity of product/ service	0	0%	2	12%	15	88%
		Previous user knowledge	2	12%	7	41%	8	47%
Founders experience	Management Experience		4	24%	13	76%		
	Founding Experience		8	47%	9	53%		
	Industry Experience		10	59%	7	41%		

Table 5: Frequency heat map of the scalability attributes

4.2 High scalability score companies: example of FlixMobility

To better understand the analysis process of the business models of respective companies and the subsequent assignment of scores, two examples are examined. Beginning with FlixMobility, which serves as a superb illustration of how scalability is effectively integrated into a company's business model. FlixMobility, founded in 2011 and headquartered in Munich, operates as a transportation platform that offers long-distance bus, train, and carpooling services. Operating under renowned brands like FlixBus, FlixTrain, and FlixCar, the company connects passengers with affordable and convenient travel options, boasting an extensive network of routes and destinations across Europe, North America, and other regions. Appendix 4 shows FlixMobility's business model canvas, providing further insights into their business operations.

As mentioned earlier, FlixMobility has achieved the highest overall score for scalability among the entire sample, reaching an impressive 25 out of 27 possible points. In Table 6, the detailed breakdown of scores based on the five scalability patterns, predecessors, and founders' experience is presented. For more detailed information and specific sources of intel, please refer to the attached Excel list included in this thesis.

4.2.1 FlixMobility: scalability patterns

Notably, when examining the five scalability patterns, which hold significant importance with a weight of 1.5, it becomes evident that FlixMobility's business model thoroughly incorporates each pattern.

Starting with the first pattern, achieving *scalability through the utilization of new distribution channels*. FlixMobility implements a multi-channel distribution strategy, capitalizing on both online and offline channels, while also establishing partnerships with third-party portals. This approach guarantees that all channels synergistically reinforce their sales efforts, thereby expanding their customer base. As a crucial link connecting transportation companies, other booking platforms, and end-customers, FlixMobility maintains a strong level of control over the essential resources and capabilities crucial for value creation. By strategically managing the different stages in the value-adding process, like payment and electronic ticket management, FlixMobility effectively safeguards its ability to scale.

The second pattern, *scalability through release from traditional capacity constraints*, is exemplified in FlixMobility's distinctive approach of not owning the majority of transportation vehicles they facilitate. This strategic positioning allows them to avoid the usual capacity limitations. Instead, FlixMobility engages in subcontracting with, for example, bus operators on specific routes as required, granting them the flexibility necessary to cater to customer demand effectively. By adopting this approach, FlixMobility can adapt its resources and operations dynamically, ensuring optimal utilization and responsiveness to fluctuating market conditions such as seasonal demand peaks.

Moving on to the third pattern, *scalability achieved through the outsourcing of investments* to partners or third parties, FlixMobility successfully meets this criterion through its innovative approach of not owning physical assets like buses or trains. By adopting this strategy, FlixMobility can leverage the resources and investments of their transportation partners. Collaborating with these partners enables FlixMobility to capitalize on their continual advancements in equipment and transportation capabilities. Additionally, by providing access to the FlixMobility API (application programming interface) for other booking platforms, both parties can enhance their value propositions. This mutually beneficial integration amplifies the reach and impact of FlixMobility's services, fostering a network effect that drives scalability and value creation.

The following pattern aligns with the previous one, as it involves leveraging stakeholders to enhance a company's value proposition. However, *scalability through the leveraging of partners working for free* primarily focuses on the brand mix of a firm and the perceived reputation it holds among end-customers. In the case of FlixMobility, this pattern can be observed through their comprehensive affiliate program, encompassing dynamic and static ads, as well as their refer-a-friend initiative for users. Furthermore, the pervasive design and overall brand experience of freedom associated with FlixMobility encourages customers to actively post and share about the brand, effectively transforming them into indirect brand ambassadors. This organic advocacy and user-generated content contribute significantly to FlixMobility's scalability and bolster their brand recognition and reputation.

Lastly, the *implementation of platform model features* is prominently observed in FlixMobility's business strategy. Not only does FlixMobility operate on a multi-sided

platform business model, but they also leverage various other business model configurations associated with this scalability pattern. As a collaboration platform, FlixMobility offers a toolkit that facilitates seamless interaction and cooperation among different parties involved. Additionally, by connecting transportation operators that traditionally sold tickets through their own channels, FlixMobility acts as a value chain service provider and coordinator. This is achieved by bringing together transportation operators and passengers, streamlining the booking process, and providing a unified platform for travel. Through their platform model approach, FlixMobility enhances scalability by creating a robust ecosystem that optimizes the overall travel experience for all stakeholders involved.

Having explored all five scalability patterns, which serve as vital indicators for enhanced growth potential, it becomes evident why FlixMobility has achieved such a high score. By effectively incorporating and leveraging these patterns within their business model, FlixMobility has positioned itself as a prime example of a company with significant scalability and growth prospects.

4.2.2 FlixMobility: scalability predecessors

Shifting focus to the scalability predecessors, a similar narrative emerges. In this regard, FlixMobility once again gains a maximum score, signifying the presence of all scalability predecessors found in literature within the company's business model.

When considering the *technology-related predecessors*, it becomes evident that FlixMobility excels in both areas. Firstly, FlixMobility operates on automated processes, ensuring a seamless and efficient travel experience for customers. The entire booking process, including payment and reservation management, is fully automated through their web- and mobile application. This automation streamlines operations, reduces manual intervention, and enhances overall scalability. Secondly, FlixMobility provides transportation partners with digital capabilities that significantly contribute to scalability due to their self-service nature. These partners can easily add routes, manage payouts, and facilitate communication through FlixMobility's platform. Like 94% of the other companies in the sample, FlixMobility benefits from a fully scalable server capacity. The company achieves this scalability by leveraging the Azure Cloud platform, provided by Microsoft, to fulfill all its operational requirements.

This robust and flexible IT infrastructure plays a crucial role in supporting FlixMobility's services, including the provision of free WIFI on their buses and trains.

When analyzing the *costs and revenue structure*, FlixMobility stands out with its favorable ratio of fixed costs to revenue. Unlike some other companies examined in this sample, FlixMobility has showcased a positive financial performance for the year 2022, as highlighted by CFO Christoph Debus.

FlixMobility demonstrates *complete adaptability to different legal regimes*, as its service offering does not pose any legal concerns. The company has strategically structured its operations to comply with relevant laws and regulations, ensuring a seamless and compliant travel experience for its customers. Additionally, FlixMobility's collaboration with local transportation companies helps them navigate legal dependencies that may arise during the travel period.

When considering the predecessor related to building *network effects*, which is closely intertwined with the last two scalability patterns, the Flix group's marketing and brand strategy come to the forefront. FlixMobility, with its low-cost and no-frills transportation offering, has successfully achieved a rapid *critical mass* overall. However, attaining profitability and ensuring full seat occupancy on less frequently traveled routes can pose more significant challenges, requiring continued efforts to achieve sustainable operations. As mentioned earlier, FlixMobility has established a strong brand awareness through its distinctive design and extensive presence on high-frequency routes. With a target audience comprising young, digitally savvy individuals, there exists a high potential for *viral effects*. This potential amplifies the reach and impact of FlixMobility's brand and services, further bolstering its network effect. By capturing the attention and loyalty of its target audience, FlixMobility fosters a sense of community and encourages word-of-mouth referrals and online sharing.

Concluding with the last three scalability predecessors centered around *user orientation*, FlixMobility's commitment to a strong customer focus becomes apparent. FlixMobility's *value proposition* revolves around delivering affordable, comfortable, and sustainable transportation options to bridge the gap in public transport connections between European and US-American metropolitan areas. By providing these services at competitive prices, FlixMobility strives to make travel more accessible and convenient for passengers. Additionally, FlixMobility emphasizes a *user-friendly and*

intuitive software design, available through their app and web application. The platform caters to the needs of both travelers and transportation suppliers, enabling smooth interactions and enhancing the overall user experience. By prioritizing usability and convenience, FlixMobility strengthens its customer-centric approach and fosters long-term engagement with its user base. Lastly, FlixMobility leverages the *existing user knowledge* and familiarity with established travel booking platforms in their target market, such as bahn.de in Germany. By tapping into users' existing preferences and habits, FlixMobility can seamlessly integrate with these platforms and tap into a wider customer base.

4.2.3 FlixMobility: founders experience

Concluding with the final scalability attributes on the scorecard, the *founders' experience* is addressed, which reveals the sole weakness in FlixMobility's overall scalability potential. While the founders possess prior *management experience*, it is notable that they lack any *founding* or specific *industry experience*. However, it is worth acknowledging that the managing founders, despite this gap, bring valuable qualities to the table when it comes to planning and executing scalability strategies. For instance, André Schwämmlein's extensive background as a consultant at Boston Consulting Group for over five years equips him with strategic planning and general business understanding. Similarly, Daniel Krauss's prior role as a technical account manager at Microsoft enhances his technical expertise and understanding of software systems.

Scalability score card of FlixMobility					
Scalability attributes			Score	Weight	Weighted score
Scalability patterns	Scalability achieved through new distribution channels		2	1.5	3/3
	** through release from traditional capacity constraints		2		3/3
	** through the outsourcing of investments		2		3/3
	** through the leveraging of partners working for free		2		3/3
	** through the implementation of platform models		2		3/3
Scalability predecessor	Technology	Automation of processes	2	0.5	1/1
		Scalability of technical infrastructure	2		1/1
	Cost and revenue structure	Ratio of fixed costs to revenue	2		1/1
	Adaptability to different legal regimes		2		1/1
	Network effects	Reaching a critical mass	2		1/1
		Going viral	2		1/1
	User orientation	VP is focused on problem solving	2		1/1
		Simplicity of product/ service	2		1/1
		Previous user knowledge	2		1/1
Founders experience	Management Experience		1	1	1/1
	Founding Experience		0		0/1
	Industry Experience		0		0/1
				Total weighted score	25/27

Table 6: Scalability score card of FlixMobility

4.3 Low scalability score companies: example of Personio

After examining a comprehensive analysis of a best practice sample company that achieved a high scalability score, and understanding the criteria for score assignment, let us now shift the focus to an example of a unicorn company with a comparatively low, yet still relevant score.

Established in 2015 in Munich by Hanno Renner, Arseniy Vershinin, Ignaz Forstmeier, and Roman Schumacher, Personio has emerged as a significant player in the market, boasting a valuation of $8.5 billion and ranking as the third most valuable unicorn in Germany[2]. Personio operates as a human resources (HR) software platform that aims to streamline and automate various HR processes. The platform offers a range of tools and features, including employee data management, recruitment assistance, onboarding support, time and attendance tracking, payroll management, and HR reporting. By providing these comprehensive solutions, Personio enables businesses to effectively handle their HR tasks and optimize workforce management. While Personio's B2B focus allows for tailored solutions and a deep understanding of the specific needs of this market segment, it restricts the company's ability to rapidly penetrate new markets and diversify its customer base. The niche-oriented approach implies that Personio's potential for exponential growth may be hindered, as it remains heavily reliant on the limited target market of small and medium-sized businesses in the German-speaking region. This phenomenon is also reflected in Personio's overall scalability score, as illustrated in Table 7. With a score of 14 out of 27, Personio falls at the lower end of the spectrum compared to the other sample companies. For more detailed information and specific sources of intel, please refer to the attached Excel list included in this thesis.

[2] As of December 2022

4.3.1 Personio: scalability patterns

When examining the five scalability patterns, a notable contrast emerges compared to the previously discussed company, FlixMobility. While *scalability achieved through new distribution channels* is fully present in the analysis of Personio, other patterns are not as prominent.

Personio primarily offers its services through the online channel, with inbound leads accounting for 50% of their customer acquisition. They utilize designated sales teams to work on the sales funnel, ensuring efficient conversion of leads. Moreover, Personio actively participates in fairs and congresses to target and acquire larger accounts, which aligns with the e-commerce self-service and phone-based sales force pattern. This approach is driven by Personio's focus on serving small and medium-sized enterprises (SMEs), requiring a combination of direct sales efforts and targeted marketing strategies to cater to their specific needs. In addition to direct sales and marketing efforts, Personio embraces partnership programs that enable agencies and other third parties to resell or utilize their software as an extension. This collaborative approach further expands Personio's reach and allows them to tap into new customer segments through the network and expertise of their partners.

Regarding the second pattern*, scalability through release from traditional capacity constraints*, Personio does encounter certain limitations. These constraints can manifest in various forms, such as the client segment, intermediaries, or the company's infrastructure. Personio has a dedicated and proficient tech team that continuously works on implementing and adapting features on a monthly basis. However, they have identified a bottleneck in the onboarding process, particularly in the reliance on account managers. To overcome this constraint, Personio has taken steps to outsource certain aspects of the onboarding process to implementation partners. The specifics of this collaboration and the extent to which they rely on these partners are not explicitly disclosed. By leveraging the assistance of implementation partners, Personio aims to alleviate the capacity constraints related to onboarding and enhance scalability.

As mentioned earlier, *scalability through release from traditional capacity constraints* and the *outsourcing of investments* are closely interconnected. The latter focuses on how Personio's partners contribute to enriching the value proposition without compromising profits. This is often achieved through a strong network that fosters

innovation. Personio has demonstrated this aspect through its proactive promotion of product innovation and co-collaboration within its partnership program. Through the program, Personio incentivizes its partners to actively engage in product innovation and development. These partners create extensions that integrate with Personio's software via APIs, enabling them to generate revenue. To ensure widespread adoption of these extensions, partners must continuously innovate and keep their offerings up to date. This fosters a mutually beneficial relationship where both Personio and its partners thrive by driving innovation and delivering valuable solutions to their customers.

Turning to the pattern of *scalability through the leveraging of partners working for free*, which centers on leveraging the end-customer, Personio exhibits a somewhat limited implementation of this strategy. While the company utilizes various partnership programs to leverage the networks of stakeholders for potential new client acquisition (such as referral, implementation, and product partnerships), their efforts currently do not extend beyond a simple referral program. Personio's referral program allows existing customers or partners to refer new clients to the platform. However, they have not fully harnessed the potential for partners to actively contribute to their growth without direct compensation. This represents a missed opportunity to leverage partners' networks and expertise to expand their customer base more extensively.

Lastly, it is noteworthy that Personio does not operate on a fully platform-based business model, distinguishing it from many other firms. While Personio does engage in matching partners and users to facilitate synergies, no other collaborative business model features were detected during the analysis. Additionally, it is important to highlight that Personio does not generate significant revenue through these collaborative efforts.

4.3.2 Personio: scalability predecessors

When examining the scalability predecessors, the underlying reasons for Personio's comparatively low overall score become apparent. Beginning with the technology-based attributes, Personio's business-to-business (B2B) software-as-a-service (SaaS) product offering, combined with its wide range of software extensions, necessitates extensive sales support and client onboarding. Consequently, *process automation* is only partially present, contributing to a score of 0.5 out of 1 in this category. Similar to many other sample firms, Personio benefits from a highly *scalable technical infrastructure*. In their case, they collaborate with Amazon Web Services Europe (AWS), which provides robust and scalable cloud computing services.

In line with Personio's requirement for a larger sales force and customer onboarding team to effectively operationalize their clients, this need for human resources is also reflected in their *cost-to-revenue structure*. Despite generating a revenue of €50.7 million in 2021, the company incurs personnel costs exceeding €101 million, resulting in an unfavorable *fixed costs-to-revenue ratio*. The high personnel costs indicate that a significant portion of Personio's expenses is allocated towards maintaining and expanding their workforce. While this investment in human resources is essential for supporting their growth and providing the necessary services to clients, it creates a higher fixed cost burden. However, one potential avenue for relieving this burden and improving scalability is by focusing on process automation.

Throughout the analysis of Personio, it became evident that the company exhibits a high level of *adaptability to different legal regimes*. Given that Personio deals with sensitive employee data, such as payroll information, social security numbers, and bank details, adherence to stringent data protection regulations, particularly the *General Data Protection Regulation* (GDPR), is of utmost importance. Personio's ability to meet the rigorous requirements of GDPR showcases their commitment to safeguarding user data and maintaining compliance with privacy regulations. Moreover, the company benefits from operating within the German legal framework, which is often regarded as a worldwide benchmark for data protection.

When considering the potential *network effects* inherent in Personio's business model, the pace at which a *critical mass* is reached can be evaluated with a score of 1 out of 2. It is important to note that in the case of a business-to-business (B2B) software-as-a-service (SaaS) product like Personio, achieving a critical mass can take a longer time compared to consumer-oriented platforms. Decision-makers in businesses often require more convincing and may have longer evaluation and adoption cycles. However, Personio has positioned itself to cater to a broader range of customers by offering its services to companies as small as 10 employees. By targeting small and

medium-sized enterprises (SMEs), Personio expands its potential customer base and increases the likelihood of reaching a critical mass over time.

Regarding potential *viral effects*, no evidence of such effects could be detected within Personio's business model. Due to the firm’s business client focus, they do not offer a product or service that lends itself to viral adoption or organic spread among end-users. Personio's focus lies in providing internal process optimization solutions for businesses, particularly in the realm of human resources management. Their product/service primarily serves the purpose of streamlining HR processes within organizations, with limited direct contact or visibility to end-customers.

In conclusion, when evaluating the extent to which scalability predecessors occur at Personio in the realm of *user orientation*, a mixed performance is observed. While the company's *value proposition* is clearly focused on addressing a significant problem faced by small and medium-sized enterprises (SMEs) with their innovative solution, there are certain limitations in terms of *simplicity* and *existing user knowledge*. Personio's value proposition lies in providing an HR software solution tailored specifically to the needs of SMEs, filling a gap in the market that had not been adequately addressed before. However, the simplicity of the solution and existing user knowledge are relatively limited. This implies that customers may require additional education and effective onboarding to fully understand and utilize the capabilities of the platform.

While Personio received a relatively low scalability score, a significant portion of this difference can be attributed to the company's deliberate choice of target group and their operational model, which does not revolve around a platform-based approach. Additionally, being a newcomer to the market with their comprehensive solution, Personio faces challenges related to customer adaptability and a lengthened onboarding process, which may impede rapid expansion. However, it is important to note that Personio possesses a strong lock-in effect due to the presence of high switching costs for customers who consider leaving.

4.3.3 Personio: founders experience

As indicated in Table 7, none of the four founders of Personio possessed prior management, founding, or industry experience before establishing the company. In an interview[3], the current CEO and co-founder, Hanno Renner, acknowledged that they founded the company right out of university, recognizing a niche in the German small and medium size enterprise market. Despite their lack of experience, the founders actively hired and learned from seasoned managers, bridging the gap and acquiring valuable expertise along the way. Interestingly, the frequency table (Table 5) also demonstrates that many highly successful unicorns have founders with limited experience.

However, it is important to note that experience can play a crucial role, particularly when it comes to securing investor confidence. Having prior experience can instill trust and credibility, making it easier to convince investors to support the venture. Nevertheless, the founders of Personio have demonstrated their ability to navigate the challenges and achieve significant growth despite their initial lack of experience, highlighting the importance of learning, adaptability, and leveraging external expertise to compensate for any gaps in knowledge.

[3] https://omr.podigee.io/463-neue-episode

Scalability score card of **Personio**					
Scalability attributes			Score	Weight	Weighted score
Scalability patterns	Scalability achieved through new distribution channels		2	1.5	3/3
	** through release from traditional capacity constraints		1		1.5/3
	** through the outsourcing of investments		2		3/3
	** through the leveraging of partners working for free		1		1.5/3
	** through the implementation of platform models		0		0/3
Scalability predecessor	Technology	Automation of processes	1	0.5	0.5/1
		Scalability of technical infrastructure	2		1/1
	Cost and revenue structure	Ratio of fixed costs to revenue	0		0/1
	Adaptability to different legal regimes		2		1/1
	Network effects	Reaching a critical mass	1		0.5/1
		Going viral	0		0/1
	User orientation	VP is focused on problem solving	2		1/1
		Simplicity of product/ service	1		0.5/1
		Previous user knowledge	2		0.5/1
Founders experience	Management Experience		0	1	0/1
	Founding Experience		0		0/1
	Industry Experience		0		0/1
				Total weighted score	14/27

Table 7: Scalability score card of Personio

4.4 The scalability score in relation to company valuation

Continuing the narrative of company success derived from well-managed and executed growth efforts, it is reasonable to assume that a high scalability score is associated with a higher company valuation. To substantiate this hypothesis, a scatterplot has been created to visualize the relationship between a firm's valuation and its assigned scalability score. Figure 4 illustrates this scatterplot, with the x-axis representing the scalability score ranging from 12 to 27 (the maximum score). Notably, Personio obtained the lowest score of 14, while FlixMobility achieved the highest recorded score of 25. The y-axis represents the corresponding company valuations, ranging from $800 million to $14 billion. Among these metrics, Celonis holds the highest valuation of $13 billion, while Staffbase, Omio, and Taxfix exhibit the lowest valuation, each valued at $1 billion.

As denoted by the legend situated in the upper right corner, the scatterplot distinguishes between different types of companies based on their target customer segment. Red dots represent firms exclusively catering to business customers (B2B), while purple dots correspond to companies focusing solely on private customers (B2C). Green dots indicate companies that target both business and private customers, encompassing a mixed customer base.

Upon initial observation, it is apparent that the majority of German internet-based unicorns listed have not yet surpassed a valuation of $3 billion. Out of the 17 companies, 12 fall into this.

A significant insight derived from this scatterplot is that two of the three highest-valued companies, namely Celonis with a valuation of $13 billion and Personio with a valuation of $8.5 billion, also possess lower scalability scores (18 and 14, respectively). There are numerous factors that can contribute to this phenomenon. However, it can be confidently stated that valuations close to or exceeding the $10 billion mark, often referred to as "decacorns," are influenced more by investment management motivations rather than purely by scalability potential.

Nevertheless, the issue of determining the valuation at which the highest level of scalability occurs remains. Although this question cannot be definitively answered with the existing available data, some indications can be derived. The plot reveals a cluster of data points between a scalability score of 20 and 24, with a common valuation cap

at $3 billion. This clustering can be partially attributed to the relatively younger age of these firms, implying that not enough investors have yet fully recognized their scalability potential through subsequent funding rounds.

Another potential reason for the clustering could be the saturation point within the market. As companies reach a certain level of scalability and market penetration, the potential for further exponential growth may become limited. This could result in valuations stabilizing around a certain threshold, even if the companies demonstrate strong scalability attributes. This observation particularly applies to companies that have been in the market for a longer duration and exhibit significant potential for scalability. Additionally, external market factors, competition, or investor preferences also influence the valuation levels and contribute to the observed pattern in the scatterplot.

An additional insight collected from the scatterplot relates to the distinction between B2B and B2C companies. While the sample group includes a nearly equal number of both types (8 B2B and 9 B2C), it is notable that companies incorporating B2C features into their business model tend to achieve higher scores on the scalability scale compared to their B2B counterparts. Interestingly, all firms with a scalability score of 22 or higher either operate a B2C business model or adopt a hybrid approach, as exemplified by wefox.

In addition to examining the distribution between B2B and B2C firms, another crucial factor to consider is the industry in which these unicorn companies operate in. Notably, among the companies scoring 22 points or above on the scalability scale, three of them—N26, Trade Republic, and Scalable Capital—are in the financial technology industry, which is one of the most well-funded sectors in Germany (deutsche startups, 2023). The public transportation industry, represented by Omio and FlixMobility, claims the highest scalability scores. An outlier is wefox, a firm in the insurance technology industry with a valuation of $4.5 billion and a scalability score of 23.

It becomes evident that these three industries—financial technology, public transportation, and insurance technology—showcase better scalability potential. This can be attributed to factors such as their direct-to-consumer (D2C) approach, the size of the industry in terms of the client base, and the ability of these companies' value propositions to address critical pain points for their customers. Additionally, it is worth

noting that all of these companies operate on a platform-based business model, further contributing to their scalability and success.

In light of these considerations, it becomes evident that perspective is crucial when evaluating scalability. While a scalability score of 14 (Personio) may initially appear relatively low, it signifies that over half of the scalability attributes, depending on their assigned weight, are present within the company. Consequently, most of the business model scalability attributes can be found across all German unicorn companies.

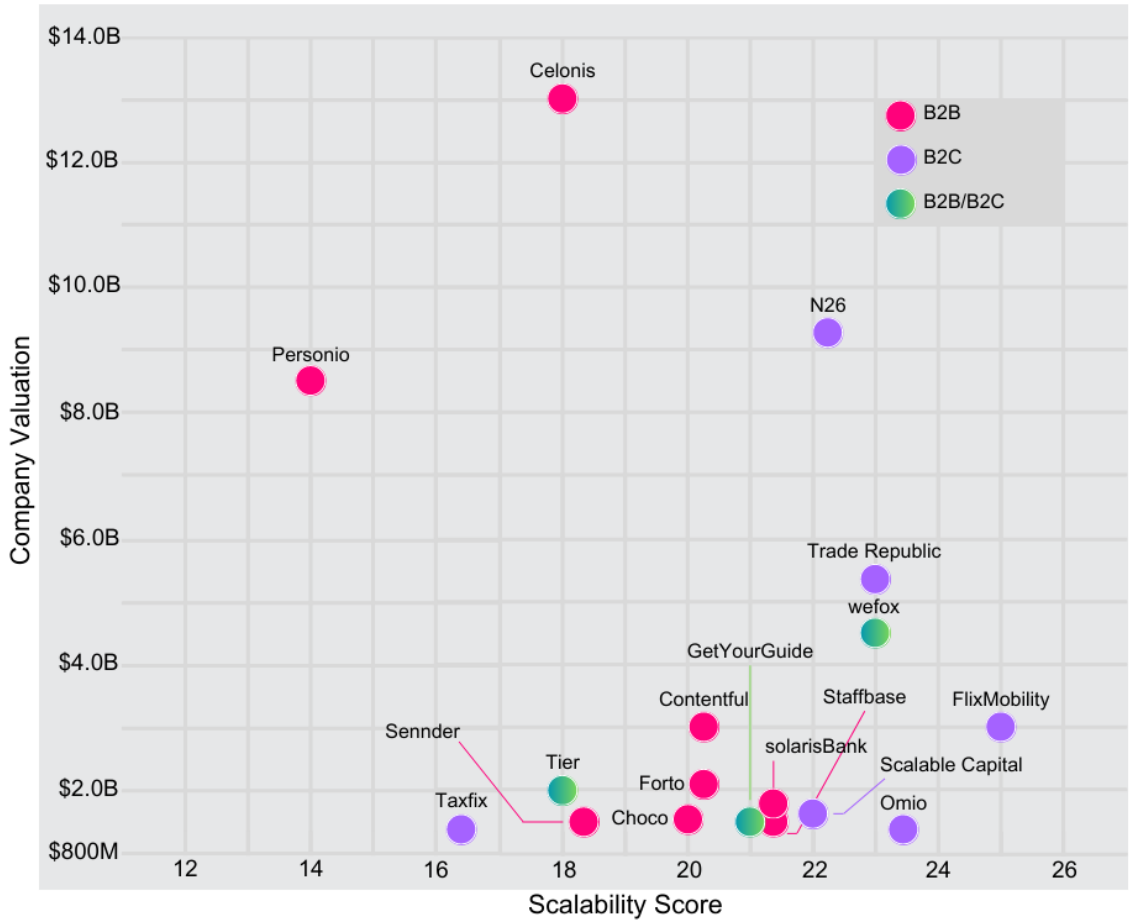

Figure 4: German unicorn scatterplot: scalability in relation to valuation

5 Discussion

The discussion chapter of this thesis is dedicated to exploring the findings and implications of the research conducted on business model scalability attributes. The overall aim of this work was to identify and analyze these attributes in existing theory and subsequently develop a systematic approach to comprehensively assess and analyze their presence within a company's business model.

To achieve this aim, the various scalability attributes identified in the theoretical part of this thesis were operationalized and integrated into the business model scorecard. This scorecard was then applied to analyze a selected target group of German, internet-based companies with a valuation exceeding $1 billion. The results obtained from this analysis were presented in relation to the research questions posed in this study, providing a clear answer to those questions.

The discussion in this chapter will not only present the key findings of the analysis but also contextualize them in terms of their contributions to theory and industry. The implications of these findings will be highlighted, shedding light on the understanding of business model scalability and its application in real-world contexts. Moreover, this chapter will critically examine the limitations of the research and discuss potential future implications, aiming to inspire further exploration and deeper understanding of business model scalability among scholars and practitioners alike.

In response to the first research question regarding the *applicability of scalability attributes* to the analyzed target group, the results indicate a clear and positive trend. The majority of scalability attributes, categorized into scalability patterns, predecessors, and the founders' experience, were observed within the target group. Furthermore, the average overall scalability score of 20.5 out of 27 underscores the relevance and currency of these attributes within the theoretical framework.

The analysis of the underlying firms also revealed another interesting insight. In instances where an attribute was not present, often it was not due to its lack of relevance, but rather it was recognized by the founders themselves as an area for improvement.

Moreover, certain attributes such as scalability predecessors related to the cost and revenue structure of a firm, as well as network effects, were already identified in theory

as “double-edged swords”. This implies that they can have both positive and negative effects on scalability. Therefore, an under-representativeness of these attributes within the target group may actually indicate a higher degree of scalability potential.

Overall, the analysis of the target group confirms the validity and applicability of the identified scalability attributes. The findings highlight the importance of these attributes in driving scalability and provide valuable insights into areas of focus and improvement for companies seeking to enhance their scalability potential.

Addressing the second research question regarding *the frequency to which scalability attributes* are present within the sample, the results provide significant insights. The frequency heat map presented in Table 5 demonstrates that certain scalability attributes are more commonly observed than others. Notably, the scalability patterns developed by Lund & Nielsen (2018) exhibit a high occurrence, indicating that, for example, the implementation of a multi-distributional sales strategy, which can be managed with increasing returns to scale, contributes to scalability. Similarly, firms that operate within a robust partnership network and leverage platform features demonstrate enhanced scalability through the possibility of outsourcing investments, thus innovation.

Furthermore, the analysis reveals that German unicorn firms commonly possess scalable technical infrastructure and employ simple and user-friendly software solutions. These attributes appear to be consistently present across the sample.

When examining the founders' experience, the findings indicate that while prior experience can be advantageous, there are also instances where firms achieve high scalability scores and valuations without founders possessing prior experience in management, entrepreneurship, or related industries. However, it is important to note that the sample group may have certain unique characteristics, potentially influencing this phenomenon.

Lastly, the analysis of the firms revealed several *new scalability attributes* that deserve attention. Interestingly, the categories of attributes that showed lower frequency and apparent relevance unveiled new attributes that counterbalance the negative impact of existing ones. For instance, firms operating outside of a platform-based business model (scalability pattern 5) exhibit a high *lock-in effect*, resulting in elevated switching costs for customers who consider migrating to a competitor. Consequently, these firms

also demonstrated a greater *potential for upselling* their plans or other products once a customer is onboarded. This phenomenon is closely tied to the different strategies implemented by firms focused on B2B or B2C markets, highlighting an important differentiation to consider when assessing scalability potential.

Another notable new scalability attribute identified relates to the financial aspect of the business model. The cost and revenue structure, specifically the ratio of fixed costs to net revenue, emerged as the least frequent scalability attribute observed in the analysis (65% of firms had higher fixed costs than revenue). In many cases, this was due to disproportionately high labor costs incurred to actually enhance scalability. As a result, a new scalability attribute emerged to provide a more precise measurement of the cost and revenue structure: *customer acquisition costs* (CAC). The shorter the time required to recoup the costs associated with acquiring a customer, the higher the scalability potential. In investment theory, the customer acquisition cost (CAC) metric is widely employed by venture capitalists to evaluate the strength of a firm's offering and its ability to effectively manage costs. This metric has gained increased importance, particularly in the current economic climate, where businesses face greater challenges and uncertainties.

These newly discovered scalability attributes add depth to the understanding of scalability factors and contribute to a more comprehensive assessment of a firm's growth potential. By incorporating these attributes into the analysis, a richer and more nuanced evaluation of scalability can be achieved.

5.1 Contribution to theory

Scalability in relation to venture success

The contribution of this thesis to existing theory encompasses several key aspects. Firstly, it confirms the association between scalability and venture success, aligning with the assertions made by numerous scholars (Capelo, et al., 2021; Freeman & Engel, 2007; Stampfl, et al., 2013; Zhang, et al., 2015). The analysis of German unicorn firms, which have achieved remarkable success in their respective fields, reveals the substantial presence of the scalability attributes within their business model conceptualization and execution. This finding underscores the significance of scalability in driving entrepreneurial accomplishments. Another dimension that

intersects with scalability and venture success is the relationship between scalability and the overall company valuation. As extensively discussed in chapter 4.4, a direct correlation between the assigned scalability score and the company valuation was not observed in this study. However, it is hypothesized that companies with stronger scalability attributes ultimately command higher valuations. It is important to acknowledge that numerous other factors contribute to company valuations, such as the age of the firm, prevailing economic conditions, and investor appetite, also considering the availability of funding.

Methodology

Secondly, this thesis goes beyond theoretical exploration by contextualizing the suggested scalability attributes within a practical framework. The development of a comprehensive tool for assessing and comparing scalability attributes allowed for a more systematic analysis and the gathering of empirical evidence on each attribute. The application of a weighted scoring method not only facilitated the operationalization of the theory but also provided a quantifiable measure to evaluate the relevance and frequency of occurrence of these attributes. This methodological approach not only strengthens the validity of the findings but also enables the adaptation and application of this tool in different contexts, fostering further research and exploration in the field of scalability analysis. Thus, this research pioneers the unification of various scalability attributes that have been previously studied in isolation.

Validity of existing literature

As its main contribution, this research validates the relevance and frequency of scalability attributes in a firm's business model. By examining scalability patterns introduced by Lund & Nielsen (2018), scalability predecessors introduced by Stampfl et al. (2013), and founders' experience as stated by Gilbert et al. (2006), Gompers et al. (2010) and Li & Dutta (2018), this thesis demonstrates that these attributes hold validity and occur predominantly at a high frequency in the business models of successful German unicorn firms. Moreover, the analysis revealed that the scalability patterns in particular, play a crucial role in determining a firm's overall business model scalability. Conversely, the analysis reveals that scalability attributes related to the founders' prior experience have shown less significance than suggested in existing literature. However, it is important to note that the findings could be influenced by the

relatively small and isolated sample used in this thesis. It is plausible that other unknown factors may have contributed to the observed outcomes. Nevertheless, it is reasonable to speculate that further examination of founders without prior experience may unveil additional scalability attributes that mitigate the need for specific management, founding, or industry expertise.

The selection of a specific target group comprising German, internet-based unicorn companies offers a unique opportunity to test and validate scalability attributes across diverse industries, business model configurations, and geographical regions. This comprehensive analysis not only enhances our understanding of scalability but also provides insights into market dynamics, including investor motivations and general economic developments.

Additional scalability attributes

The pursuit of the second research question, which aimed to identify additional scalability attributes within the sample group analysis, has proven to be highly valuable for the existing literature. As expected, certain scalability patterns and predecessors were found to be less frequently observed. However, this research also revealed the emergence of additional attributes that effectively balance out the missing aspects of scalability. These new findings contribute to enriching the existing understanding of scalability in business model conceptualization, offering researchers the opportunity to generate more comprehensive and accurate results in future studies. This discovery expands the knowledge base and enhances the overall understanding of scalability attributes in the context of business models. The newly identified and adapted scalability attributes are presented in Table 8, showcasing the additional patterns related to *customer acquisition costs*, *lock-in effect*, and *potential for upselling*.

The analysis of German unicorn startups has revealed that firms operating without a platform-based business model, such as Personio and Celonis, capitalize on *lock-in effects* created by high switching costs and are able to easily upsell additional services (Amit & Zott, 2001). These new patterns align with business model configurations identified by Osterwalder & Pigneur (2010) and exhibit significant scalability potential. Additionally, a new scalability attribute related to *customer acquisition costs* was identified, with many firms in the sample recovering these costs within the first year of customer usage, particularly in the B2B SaaS sector. This attribute emphasizes the

importance of the customer lifetime value, which ideally exceeds the initial acquisition costs and is recouped as quickly as possible.

These newly discovered scalability attributes represent only a fraction of the potential attributes that exist, suggesting a vast landscape for further research and exploration in the field of business model scalability.

Additional scalability attributes			Clarification	Corresp. BM configurations
Scalability patterns	Scalability through actively leveraging lock-in effects		A lock-in effect occurs when a customer is highly dependent on a company, making it difficult and costly to switch to an alternative. In B2B, this can be achieved through deep integration of the provider into the customer's processes	Bait and hook (Osterwalder & Pigneur, 2010) Freemium (Osterwalder & Pigneur, 2010) (Amit & Zott, 2001)
	Scalability through upselling products and services		Leveraging upselling as a sales technique to encourage customers to purchase higher-priced items, upgrades, or additional add-ons to increase revenue (driven by a lock-in effect)	Bait and hook (Osterwalder & Pigneur, 2010) Freemium (Osterwalder & Pigneur, 2010)
Scalability predecessor	Cost and revenue structure	Ratio of fixed costs to revenue	Scalability is achieved when fixed costs do not exceed net revenue, resulting in a positive operational result	Configurations linked to cost management (Stampfl, et al., 2013)
		Recoup time of customer acquisition costs (CAC)	Scalability is achieved when customer acquisition costs are recovered within a short time frame or with a small number of new customers	Configurations linked to cost management (Buttle & Ang, 2006)

Table 8: Additional scalability attributes

5.2 Contribution to industry

For many employees, founders, and investors, the process of identifying, developing, and enhancing highly promising markets, products, and companies often relies on chance or even luck. While some general plans, best practices, and success patterns may exist for smaller challenges, there is a lack of comprehensive knowledge and strategies to improve overall operations. This study recognizes the significance of the business model concept in creating value and acknowledges that its execution directly influences the outcome. Although numerous factors impact scalability and the success of a venture, this work has developed, tested, and presented a comprehensive list of selected attributes within the context of German internet-based companies. By assessing these scalability attributes, a scalability scorecard has been created, which not only puts theory into practice but also offers real-world applicability. Consequently, this scorecard enables startup *founders*, both aspiring and established, to evaluate the scalability of their business models and iterate accordingly. Through the utilization of real-life examples and the identification of best practices, this study also assists entrepreneurs in comprehending and implementing scalability attributes in their own endeavours.

On the flip side, *investors*, particularly those investing in early-stage startups, often have limited information to base their investment decisions on. Evaluating the firm's business model concept and assessing the capabilities of the founders tasked with executing the plan are crucial in this scenario. Investors often rely on their past experience and instincts, as conducting a thorough due diligence is challenging. However, by gathering established scalability attributes from literature and transforming them into a scorecard, investors can use this to improve their analysis of firms and make comparisons between them. This scorecard can also be utilized to assess companies within their existing portfolio and benchmark them against best practice examples, enabling them to extract valuable insights for their own investments. Ultimately, this work contributes to enhancing the decision-making process and facilitating a more comprehensive evaluation of potential investments.

Lund & Nielsen (2018), the authors who introduced the five scalability patterns based on returns to scale, not only provided a conceptual framework but also presented a "roadmap for achieving business model scalability." This roadmap serves as an operational checklist for founders and other stakeholders who are interested in

innovating and restructuring their businesses. Building on their work and incorporating their insights, the business model scalability matrix was developed (Figure 3). This framework enables the assessment of sample companies, as depicted in Figure 5, and highlights the necessary direction to move closer to the scalability sweet spot.

Using Personio, the HR management software company, as an example, it is evident that the firm lacks management experience and has a limited market potential. To overcome these challenges and move towards a sweet spot characterized by exponential returns to scale, the company needs to innovate its business model. When examining Personio's scalability scorecard, it becomes clear that the company is hindered by traditional capacity constraints. Currently, they have to individually onboard each client, which is a time-consuming process, especially considering that their typical small and medium-sized enterprise (SME) client has multiple unorganized processes that must be integrated into Personio's platform. However, by outsourcing the onboarding process to a strategic partner, Personio could redirect their focus towards product development and customer relationships. This strategic move would enable them to expand their potential market reach, tapping into the benefits of exponential returns to scale.

By utilizing this matrix, companies can identify their current position and determine the specific actions required to enhance their scalability.

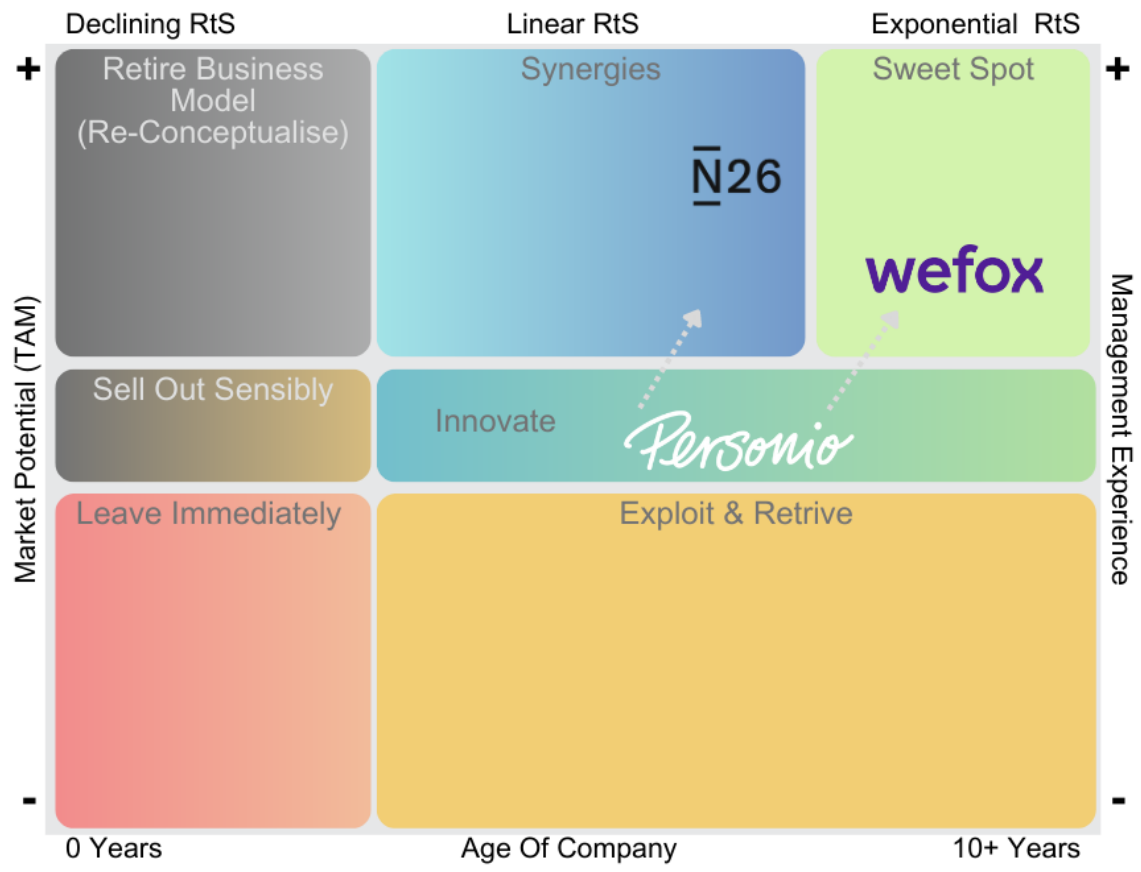

Figure 5: Operationalized scalability matrix

5.3 Limitations and future implications

Data collection

Upon reflection on the contributions of this study, several limitations become apparent. The first limitation pertains to the data collection process. By focusing on a narrow target group consisting of German internet-based companies with valuations exceeding $1 billion, only 17 firms remained for analysis. Consequently, there is an increased risk of clustering and biased results. A more robust and representative analysis of scalability attributes could have been achieved by expanding the target group to include European Union and UK firms with valuations of $500 million and above. However, conducting such an extensive analysis would have required more time, which is constrained by the nature of this being a master's thesis. Additionally, due to the analysis of privately-held companies, certain information, particularly internal strategies and detailed financial data, was more difficult to obtain. As a result,

reliance on publicly available information was necessary, which occasionally lacked depth and reliability.

Methodology

The data collection approach employed in this study also had a direct impact on the methodology utilized. While quantitative aspects are present, the analysis and evaluation of various scalability attributes were predominantly conducted qualitatively, relying heavily on the researcher's interpretive skills. Although this approach was taken, potential negative effects could have been mitigated by involving a second and third examiner to reduce the likelihood of biases and misinterpretations. Moreover, to achieve a higher level of result representativeness, it would have been necessary to conduct multiple discussions and interviews with the analysed companies. Obtaining deeper insights through these interactions would have been helpful. Particularly, assessing the scalability patterns, considering decreasing, linear, or increasing returns to scale, is challenging for external observers. Therefore, engaging in more extensive conversations in form of interviews to gain insider perspectives could have improved the accuracy and understanding of these patterns and their interplay in the sample groups' operations. It is worth noting that attempts were made to engage with decision makers in the sampled companies, but these efforts were met with significant resistance. Several company representatives cited ongoing financing rounds as the primary reason for their reluctance to provide extensive insights, emphasizing that they are being highly selective about what they disclose.

Literature

As mentioned in the results section of this study, the scalability attributes found in the literature tend to favor B2C (business-to-consumer) and direct-to-consumer business models. These models typically incorporate platform-based features and benefit from better brand awareness, enabling them to achieve network effects more rapidly. Moreover, B2C unicorns often receive more attention and have a higher level of public awareness, leading to a greater availability of general information. While this imbalance was acknowledged and addressed, it is recommended to expand the list of scalability patterns to include potential factors specific to B2B (business-to-business) business models. By focusing on identifying scalability attributes relevant to B2B

models, a more comprehensive understanding of scalability across different business types can be achieved.

Future implications

In addition to considering additional scalability attributes within a firm's business model concept, a deeper analysis of scalability can be conducted by examining the execution of the business model. While this aspect was partially explored in this study through the evaluation of founder experience, operational and strategic execution encompasses much more. This analysis could be further enhanced by identifying additional attributes of scalability related to human capital, including factors such as education, training, and general personality traits. Furthermore, as mentioned earlier, analyzing the scalability of business models in relation to their target orientation (B2B or B2C) could serve as the basis for a statistical analysis, with the firm's valuation serving as a controlling variable. By incorporating these elements, a more comprehensive understanding of scalability and its various dimensions can be achieved. Lastly, it is important to mention that the validity and frequency of various scalability attributes could be further confirmed and improved by examining a different sample group, such as startups in North America. Companies in these regions tend to have more public exposure, allowing for a better flow of information. Ultimately, this would enhance the validity of the results.

6 Conclusion

Scalability has long been regarded as the key to success and a precursor to securing significant funding for startups over the past decade. However, the global funding climate, particularly in Germany, is undergoing a change. The occurrence of multiple flat or even down rounds indicates a fundamental shift in how investors assess potential investments. Extensive research has revealed that while scalability is influenced by various factors such as markets, competition, and the economic environment, the business model's design remains the most promising lever for early-stage startups to achieve success through scaling.

In light of these findings, the objective of this thesis was to provide a clear understanding of what scalability means in the context of a business model. This involved examining the theoretical attributes associated with scalability and testing them against a selection of real-life companies to determine their applicability and degree of impact. By employing a weighted scoring model and operationalizing various scalability attributes within a comparison tool, a combination of qualitative and quantitative research approaches could be employed to address the underlying research questions.

A benchmarking analysis was conducted on 17 scalability attributes, categorized into scalability patterns, predecessors, and founders' experience, using a sample of 17 German internet-based unicorn companies. The analysis revealed that all the attributes were indeed present, with many of them displaying a strong influence. Upon examining the frequently observed scalability attributes within the target sample, it was found that a multi-distribution channel strategy, a robust partnership network fostering innovation and cross-promotion, and a user-friendly product were identified as the strongest drivers of scalability.

In addition, three new attributes emerged from areas that exhibited relatively lower frequency compared to other scalability attributes. These new attributes include scalability achieved through actively leveraging lock-in effects, upselling products and services, and lowering customer acquisition costs. These findings not only validate the theoretically identified scalability attributes but also provide real-life examples of how they are effectively implemented to achieve success.

The utilization of a qualitative research approach, which draws upon the expertise of the researcher and a relatively isolated sample group comprising German internet-based unicorn companies, may constrain the generalizability of the findings. Nevertheless, this approach offers valuable new insights into the assumptions made in theory, utilizing one of the most thriving startup ecosystems worldwide. Moreover, this research not only provides real-life applications of theory but also identifies additional scalability attributes that enrich the existing literature in this field.

Considering this, additional research is needed to conduct a more in-depth exploration of individual scalability attributes. Ideally, such research would involve collaboration with teams from each target company. This collaborative approach would not only help identify additional patterns but also facilitate the development of processes to enhance scalability and move closer to the "sweet spot" leveraging increasing returns to scale.

Ultimately, this thesis sought to bridge the gap between theoretical scalability attributes and their practical implications for real-life startups. By aligning theoretical concepts with empirical evidence, the research provides a foundation for future discussions and endeavours in the startup ecosystem, fostering a better understanding of the factors that drive successful scaling and informing strategic decision-making processes.

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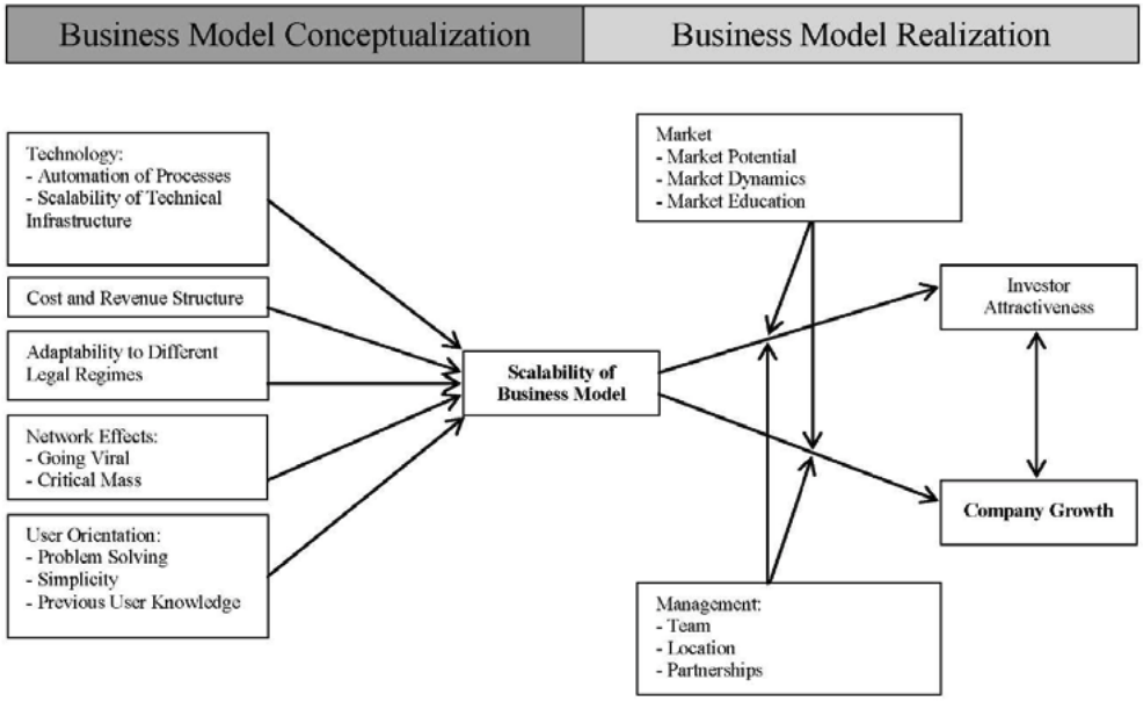
Appendix



Appendix 1: Explorative model of business model scalability (Stampfl, et al., 2013)

Appendix

Scalability attributes		Study	Data source	Research Focus
Scalability patterns	Scalability achieved through new distribution channels	(Lund & Nielsen, 2018) (Nielsen & Lund, 2017)	Longitudinal action research project from 2007 to 2013 focusing on the innovation of 10 network-based business models from over 92 firms	Support participants in the process of developing innovative network-based global business models
		(Zott & Amit, 2013)	Structured literature review	Analysis of theoretical and empirical advancements in business model research to find areas of improvement
		(Linder & Cantrell, 200)	Institute research focused on the 1000 largest US-firms (1994-1998)	Business model concepts, analysis and innovation
	** through release from traditional capacity constraints	(Lund & Nielsen, 2018), (Nielsen & Lund, 2017)**		
		(Taran, et al., 2015)	Structured literature review using an analytical induction method of data analysis	Systematically develop a comprehensive list of various business model process configurations
	** through the outsourcing of investments	(Lund & Nielsen, 2018), (Nielsen & Lund, 2017)**		
		(Taran, et al., 2016)	Structured literature review	Create a comprehensive and structured toolbox of available BM configurations
	** through the leveraging of partners working for free	(Lund & Nielsen, 2018) (Nielsen & Lund, 2017)**		
		(Taran, et al., 2015)	Structured literature review using an analytical induction method of data analysis	Systematically develop a comprehensive list of various business model process configurations

	** through the implementation of platform models		(Lund & Nielsen, 2018) (Nielsen & Lund, 2017)**		
			(Osterwalder & Pigneur, 2010)	Collaboration work of 470 experts from 45 countries	Business model design and innovation
			(Timmers, 1988)	Analysis of commercial Internet businesses and experimental work in European R&D programs	Business model configurations for electronic markets
Scalability predecessor	Technology	Automation of processes	(Stampfl, et al., 2013)	Structured literature review using a qualitative analysis method + expert interviews	Creation of an explorative model of business model scalability for internet-based firms
		Scalability of technical infrastructure	(Stampfl, et al., 2013)**		
			(Bochmann & Wong , 2003)	Data analysis together with IBM Centre for Advanced Studies	Scalability analysis of web-based electronic commerce system
	Cost and revenue structure	Ratio of fixed costs to revenue	(Stampfl, et al., 2013)**		
			(Patel, et al., 2011)	Survey	Testing the non-linear relationship between bootstrapping and venture growth
	Adaptability to different legal regimes		(Stampfl, et al., 2013)**		
			(Beck, et al., 2005)	Firm-level survey using database covering 54 countries	Investigate the effect of financial, legal, and corruption problems on firms' growth rates
	Network effects (Shapiro & Varian, 2008)	Reaching a critical mass	(Stampfl, et al., 2013)**		
			(Markus, 1987)	Structured literature review with empirical testing of hypothesizes	Explaining the phenomenon of critical mass for the diffusion of interactive media for startup innovation
		Going viral	(Stampfl, et al., 2013)**		

			(Ferguson , 2008)	Analysis of real-life campaigns from well-known companies + commentary from marketers	Study examples of emerging marketing trends and determine their measurability in terms of return on investment
	User orientation (Gambardella & Mcgahan, 2010)	VP is focused on problem solving	(Stampfl, et al., 2013)**		
		Simplicity of product/ service			
		Previous user knowledge	(Schreier & Prügl, 2008)	Analysis on three studies on extreme sports communities	Exploring the antecedents and consequences of consumers' lead userness for product innovation
Founders experience	Management Experience		(Groenewegen & de Langen, 2012)	Correlation analyses based on 75 survey respondents	Isolate the key success factors of startups implementing radical innovation
	Founding Experience		(Gompers , et al., 2010)	Analysis of Dow Jones' Venture Source database for firms that have obtained venture capital financing	Impact of performance persistence in entrepreneurship
	Industry Experience		(Li & Dutta, 2018)	Longitudinal data set of 1214 nascent entrepreneurs in the USA	Examine the role of founding team experience (industry and venturing) in new venture creation

Appendix 2: Selected articles on business model scalability attributes

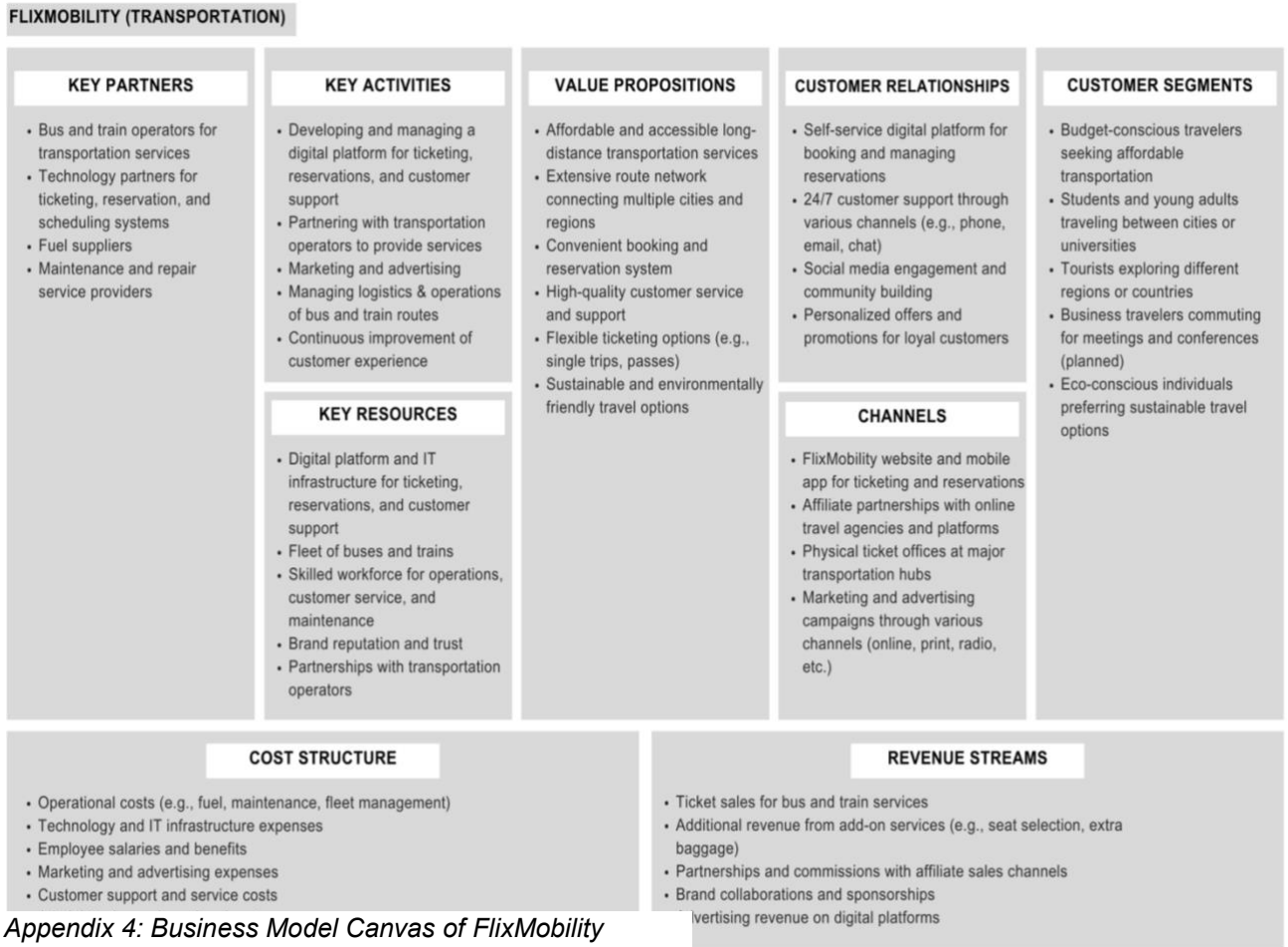
Appendix

#	Scalability attribute	Clarification	Statement	Range	Weight
Scalability patterns					
1	Scalability achieved through new distribution channels	Only if additional channels create increasing RtS	One major sales/distribution channel with supporting channels	0	1.5
			Multi-channel distribution strategy for different markets	1	
			Multiple sales /distribution channels creating synergies	2	
2	Scalability through release from traditional capacity constraints	Capacity constraints include client segment, intermediaries, company infrastructure	Bound to capacity constraints	0	1.5
			Partially independent value creation relying on key partners	1	
			D2C approach controlling the value creation process	2	
3	Scalability through the outsourcing of investments	Partners enrich the value proposition without hurting profits	No synergy potential with strategic partners on product/service development	0	1.5
			Partner network only supports marketing/sale of product/service	1	
			Strong partner network helping with innovation	2	
4	Scalability through the leveraging of partners working for free	Stakeholders take multiple roles and create value for one another	Stakeholders are not incentivized to leverage their network	0	1.5
			Customers are motivated by loyalty programs/referrals	1	
			Stakeholders function as product (brand) ambassadors (content creators, advertisers etc.)	2	
5	Scalability through the implementation of platform models	The business model becomes a platform that	The company has no platform-based business model features	0	1.5

		attracts new partners, including competitors	The company has a platform-based business model	1	
			The company has a platform-based, multi-sided business model	2	
Scalability predecessors					
6	Automation of processes	Reduce dependence on human resources by automating processes	Not automated at all	0	0.5
			Partially automated	1	
			Fully automated	2	
7	Scalability of technical infrastructure	Techniques to enhance a system's capacity to accommodate a larger number of users without drop in performance	Limited server capacity	0	0.5
			Partial server capacity	1	
			Fully scalable server capacity	2	
8	Ratio of fixed costs to revenue	Fix cost rise unproportionally to revenue	Fixed costs > net sales	0	0.5
			Fixed costs = net sales	1	
			Fixed costs < net sales	2	
9	Adaptability to different legal regimes	Scalability can be significantly hindered by varying legal restrictions	Not adaptable	0	0.5
			Partially adaptable	1	
			Highly adaptable	2	
10	Critical mass	Point at which the growth of a business reaches a level where it becomes self-perpetuating and gains momentum	Critical mass reached slow	0	0.5
			** reached normal	1	
			** reached fast	2	
11	Going viral	Use of viral marketing techniques to reach critical mass and foster positive network externalities	P/S not viral	0	0.5
			P/S semi viral	1	
			P/S highly viral	2	
12	Value proposition is focused on problem solving	Business model addresses a pressing problem which is eventually solved by the service or product offered	Slightly	0	0.5
			Indifferent	1	
			Highly focused	2	
13	Simplicity of product/service (user focused)	Business models built around easy to understand products/services are more likely to scale	Complicated	0	0.5
			Rather simple	2	
			Simple	1	

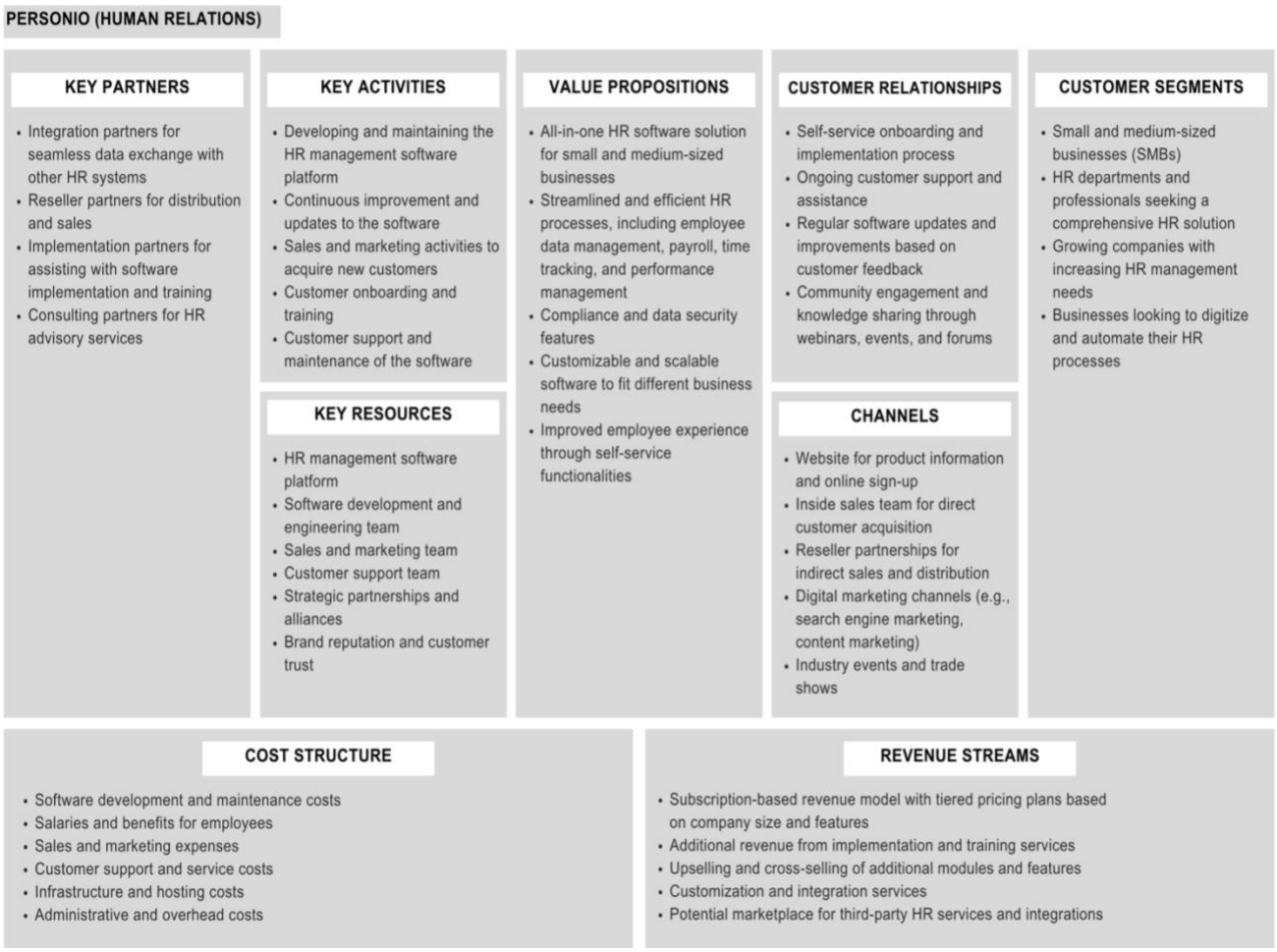
14	Previous user knowledge	Building on existing skills within the target group and therefore not requiring users to develop new knowledge	Not existing (new to market)	0	0.5
			Limited	1	
			Existing (second mover)	2	
Founders experience					
15	Management experience	Prior management experience in an established firm	No experience	0	1
			Experience	1	
16	Founding experience	Founder is a serial entrepreneur	No experience	0	1
			Experience	1	
17	Industry experience	Prior product or strategy experiences in same/similar industry	No experience	0	1
			Experience	1	

Appendix 3: The business model scalability scorecard (based on Lund & Nielsen, 2018 & Stampfl et al., 2013)



Appendix 4: Business Model Canvas of FlixMobility

Appendix



Appendix 5: Business Model Canvas of Personio

An Excel file is attached, which includes a global unicorn list, the German unicorn sample, and all 17 scalability score cards of the corresponding companies.	The file was uploaded to *Digital Exam* or is ready for download under following link.

Appendix 6: Excel file attachment

Statutory declaration

I, Nils Schröter, confirm that this master **thesis** (150,935 characters including spaces) is solely my own work and that it has not been previously submitted for assessment as a whole or in part, nor published.

All material which is quoted is accurately indicated as such, and I have acknowledged all sources employed fully and accurately.

Hamburg, 04.06.2023 

Place, date (Signature)

Further declaration

I agree with a plagiarism check of this thesis and know that the agreement of both experts is necessary for a publication.

Furthermore, I am completely aware that failure to comply with these requirements is a breach of rules and will result in resubmission, loss of marks, failure and/or disciplinary action.

Hamburg, 04.06.2023 

Place, date (Signature)