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From digitalized start-up to scale-up: Opening the black box of scaling in digitalized firms towards a scaling process framework

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ABSTRACT

While there is some recent empirical research on scale-ups, how digitalized start-ups transition to scale-up remains largely unexplored. Our research furthers our understanding of digitalized scale-ups and their growth process by examining *how digitalized start-ups transform during scaling*. We focus on internal workings of digitalized scale-ups and the transformation therein distinct from the firms' start-up phase. Drawing on firm growth literature, we use a qualitative methodology consisting of in-depth, semi-structured interviews with digitalized scale-up founders, finding commonality in their scaling process. We find scaling in digitalized firms is a complex mix of related internal activities, priorities, and trade-offs in pursuit of scaling process goals. Four priorities, goals, and related tensions relevant to their scaling process emerge from our analysis. We also find balancing tensions to optimize trade-offs require dynamic capabilities during scaling in digitalized firms. We conclude that although their growth patterns may be heterogeneous, digitalized scale-ups have commonality in their scaling process. The study furthers our understanding of the *firm growth process* and nascent literature specific to *scaling digitalized firms*, contributing towards a *scaling process framework for digitalized scale-ups*. We uncover opportunities to further develop theory, sharpening it with greater operative insight based on today's digitalized scale-ups.

1. Introduction

Digital technologies are increasingly observable in rapidly growing firms (Nambisan, 2017). They facilitate innovation opportunities and act as enablers (Aldrich, 2014; Appio et al., 2021; Nambisan, 2017). They are central to the notion of cost-advantages and scale economies, enabling firms to grow without significant increase in operational costs (Ardolino et al., 2018; Mithani, 2023; Nambisan, 2017; Reuber et al., 2021; Shankar and Clausen, 2020). Digital technologies have also enabled the emergence of digital innovation and new digital business models (Chauhan et al., 2022) often associated with rapid replication, early internationalization and infinite scalability (Piaskowska et al., 2021). However, these digitalized firms also face the opposing tension of managing the early pressures of growth, if scaling in increasingly compressed time (Furr, 2011; Nicholls-Nixon, 2005; Phillips, 2019).

Scale-ups are firms at the *intermediate stage* of firm life, who grow both *rapidly* and *efficiently*, prioritizing the attainment of *economies of scale* (Coad and Srhoj, 2020; Monteiro, 2019; Piaskowska et al., 2021). Their pursuit of scale economies combined with other defining characteristics (high growth and intermediate stage of firm life) distinguishes them fundamentally from other firms such as start-ups, high-growth firms, or gazelles[1]. Despite this, the terms are often used synonymously and broadly in literature and by policy makers with other forementioned firms, signaling scale-ups and scaling is often confused with growing and high-growth (Cardenete and García-Tapial, 2018; Duruflé et al., 2017).

Firm growth as a phenomenon has been substantially theorized about and studied extensively, yet scholars have been critical of the overall conclusiveness and the slow progress of theory development (Coad, 2007; Dahlqvist et al., 2000; Davidsson and Wiklund, 2017; Macpherson and Holt, 2007; McKelvie and Wiklund, 2010; Shepherd and Wiklund, 2009; Weinzimmer et al., 1998). Most empirical efforts have been directed towards growth as an outcome, where firm-level research has failed to consistently explain growth differences between firms across studies (Coad, 2007; Shepherd and Wiklund, 2009;

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[1] Birch (1979) first coined the term 'gazelles' as small, young firms who were responsible for a disproportionately large share of new net jobs. The OECD (2007) later defined gazelles as young, high growth firms <5 years in age.

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Weinzimmer et al., 1998). Adding to the fragmentation, previous research efforts concerning firm growth focused on a multitude of different growth and firm definitions (Coad, 2009; Dahlqvist et al., 2000; Shepherd and Wiklund, 2009), and scale-ups as a distinct unit of observation, until recently, have not been in focus (Coviello, 2019; Piaskowska et al., 2021).

The implications of the inconclusive determinants and discussion on growth as an outcome has led scholars to recommend future research first address the question of 'how' firms grow before attempting to solve for 'how much' (Amadi-Echendu and Mngadi, 2015; McKelvie and Wiklund, 2010). In this stream of research, the 'growth' is not considered a single outcome but rather a 'black box' process in which research "[…] attempts to get to the internal nature of growth, specifically what goes on inside the firm while it is growing" (McKelvie and Wiklund, 2010, p. 217). We address these research gaps by exploring the *scaling transformation process* of today's digitalized scale-ups through our research question: *How do digitalized start-ups transform during scaling*?

The purpose of this research is to examine the internal workings of digitalized scale-ups and the transformation that took place therein *distinct from the preceding start-up phase* (Coviello, 2021; Cowan, 2022; McKelvie and Wiklund, 2010). In doing so, we focus less on the variables that determine growth or the outcomes of growth, outwardly visible in reports or public information, as prior research has covered (i.e., revenue growth, staff growth, funding, M&A activity, market capitalization etc.). We rather focus on the less visible but at their core, crucial alterations happening *inside the firm* during scaling.

Both firm age, innovation type, and industry context is relevant to explaining differences in growth between firms (Delmar et al., 2003; Linton and Walsh, 2003). However, digital technologies have increasingly blurred the boundaries between industries, products, markets and technologies (Appio et al., 2021; Autio and Lumme, 1998). Therefore, to truly understand scaling in today's digitalized firms, we take a less homogenous approach versus previous empirical research by focusing on (i) young scale-ups, who are early in their scaling process with (ii) business models that make extensive use of digital technologies to create and deliver value to customers (i.e., digital business models). Henceforth, we describe our examined firms as *digitalized scale-ups*.

Relevant to today's digitalized, innovative scale-ups are growth process theories considerate of fast-changing environments. The dynamic capabilities stream of growth process theory argues internal resource accumulation is insufficient, potentially unsuitable, in highly innovative, technology-driven business environments. What matters more is corporate agility and dynamic capabilities to anticipate and respond to fast-changes in technologies and markets (Atzmon et al., 2022; Helfat, 2007; Prahalad and Hamel, 1990; Teece, 2007). Within this theoretical context, digitalized firms, with their ease of iteration and human capital 'light' business models, find themselves well-suited to navigate and excel in this dynamic landscape.

We rely on a qualitative research approach recommended by scholars for our research purpose as it delivers in-depth insights on internal firm activities, largely unavailable to researchers through quantitative methods (McKelvie and Wiklund, 2010). We conducted in-depth, semi-structured interviews with 14 founders, representing the key decisions makers in their respective digitalized scale-ups and further validated and complement this data through additional information sources (e.g., Crunchbase, industry websites). This was followed by an inductive analytical approach to identify themes and aggregate dimensions (Gioia et al., 2012) important to our research question.

We find scaling in digitalized firms is a complex mix of related internal activities, priorities, and trade-offs, in pursuit of scaling process goals. Our findings highlight that although their growth patterns may be heterogeneous, digitalized scale-ups have commonality in their scaling process. Four new priorities and firm goals relevant to the scaling process emerge from the analysis. At the start of scaling, firms initially (1) *build capacity ahead of growth*, thereby increasing the size and autonomy of the organization. Second, firms (2) *introduce synchronistic technology and organizational process innovation* to deliver and support many more customers and, by extension, sales growth. Third, during scaling digitalized firms not only prioritize but rigorously pursue (3) *economies of scale*, making more data-led decisions leading to improvements in unit costs and returns on capital invested. We identify an early focus among digitalized scale-ups on *planning for scale* and efficient growth (versus linear 'high-growth' or sales growth at same cost and margin), even prior to scaling commencement. Furthermore, we identified a fourth dimension specific to the (4) *individual founder's transformation to CEO*. Due to the rapid growth and compressed pressure of time, scale-up founders are required to learn and adapt their roles quickly as the firm transforms. It follows founders' individual learning agility and general human capital (skills, experience, and knowledge) are influential from early scaling. Finally, we observe four tensions which present significant challenges to founders during scaling. These tensions require intermittent balancing as founders and management navigate the trade-offs between them. They are also dynamic in that their nature changes between initial transformation from start-up to scale-up, and subsequent stages of scaling.

Our contributions to firm growth and entrepreneurship theory are three-fold. We answer calls for research into the process of firm growth and scaling, which helps to open the black box of start-up to scale-up transformation and deepen our understanding of a digitalized scale-up 'DNA' as distinct from their start-up phase. Second, we categorize rare insights on the internal workings, priorities, and dominant activities of young, digitalized scale-ups and depict our findings graphically towards a *scaling process framework for digitalized scale-ups*. Third, we uncover opportunities to further progress theory on growth process, updating it for advancements in technology, data, resources accessible to today's digitalized scale-ups. As well as addressing critiques of vagueness with 'lived' scale-up founder and operative insights. For founders and management of digitalized scale-ups, we provide a framework to help them to navigate the transformation from start-up to scale-up more confidently and identify new capabilities they may require when transforming from start-up founder to scale-up CEO.

2. Literature & research context

2.1. Firm growth

Previous research on firm growth has been extensive, but there is criticism regarding the overall conclusiveness of empirical research and the progress of theory development (Coad, 2007; Davidsson and Wiklund, 2017; Macpherson and Holt, 2007; McKelvie and Wiklund, 2010). Scholars are somewhat overwhelmed by the fragmentation in research and further underwhelmed by the subsequent progress with respect to theory development, given the sizable body of literature (Delmar et al., 2003; McKelvie and Wiklund, 2010). Generally speaking, most empirical efforts have been directed towards modelling determinants of growth (where growth is the outcome) and such research has failed to consistently explain differences in growth between firms and across studies, leading to critique of inconclusiveness (Coad, 2007; Shepherd and Wiklund, 2009; Weinzimmer et al., 1998).

2.2. A heterogeneous view of growth process

The issues surrounding firm growth research are of particular concern when identifying growth patterns in *new or young firms*. New firms are proposed to be even more difficult to sort, group, and categorize as they tend to experience more erratic and unpredictable growth patterns than more mature and larger firms (Coad et al., 2016; Schneck et al., 2021). When observing growth patterns in new firms over time, differences in growth metrics within an individual firm, period on period, are far greater than differences between firms (Coad et al., 2016; Gibrat, 1931; Schneck et al., 2021).

As such, there is a growing view among growth scholars that there is

no 'one best way' for all new firms to successfully grow. Rather firm growth patterns are related to inherent characteristics such as *firm age, size, industry, type of innovation, and market dynamics*. (Linton and Walsh, 2003; Penrose, 1959; Stinchcombe, 2000). *Innovation*, including technological and market innovation has also been proven to influence firm performance (Autio and Lumme, 1998; Miller, 2001; Singh et al., 2022; Yu et al., 2012; Zeng et al., 2023), particularly discontinuous innovation (i.e., where the technology, product or market is new, or perceived new by customers) (Wu and Wang, 2006). For example, Linton and Walsh (2003) examine firms in manufacturing and materials-based innovation, where the relationship between product and process innovation is different to digitalized firms typically. They observe the interaction between market dynamics and firm market engagement strategies as influential to commercialization success. Further case studies support the notion of multiple pathways, showing different practices may provide "possible paths to scale, even for firms lacking technological capabilities to deliver discontinuous innovation" (Wu and Wang, 2006, p. 1017). To add to this complexity, since the proliferation of digital technologies, innovation is also viewed more broadly to include business models and markets, where business value creation is no longer primarily the domain of engineers, scientists, or R&D departments (Miller, 2001).

We conclude two important points: (1) 'high growth' in firms can be achieved in a variety of ways and (2) the characteristics and circumstances of the firm (i.e., age, size, industry, governance structure, business model, innovation type) provide an important context for explaining differences in growth patterns.

2.3. Growth process theory and digitalized firms

Growth process literature is often grounded in the Resource Based View (RBV) of firm growth and closely linked to Penrose's (1959) theory, the foundation of much of today's management literature (McKelvie and Wiklund, 2010). However, RBV has been criticized as outdated in today's digitalized economies, where fast and agile are preferred to big and well resourced. More contemporary theories that account for this notion focus less on asset accumulation and internal resource management and more on building competencies and capabilities able to withstand changes to the firm's circumstances. Jansen et al. (2023) recognizes scaling as a dynamic capability where responsiveness, flexibility, and agility are required to reassemble resources to withstand fast-changes in business and environment (Helfat, 2007; Prahalad and Hamel, 1990; Teece, 2007). Unlike ordinary, operational capabilities, firms with dynamic capabilities are more able to rapidly sense and shape new opportunities to win short-term gains and competitive positions, while also building long-term strategic assets (Teece, 2007). Accordingly, it is dynamic capabilities, not resource accumulation (e.g. agile learning, rebuilding strategic assets) that stimulate ongoing scaling in firms operating in today's fast changing environment (Jansen et al., 2023; Teece, 2007). Digitalized firms, with their low barriers to iteration, and human capital light business models, are well placed within this theory context, to adapt and perform.

However, critiques of new dynamic capabilities theory view it as difficult to operationalize, too vague and lacking empirical support (Loureiro et al., 2021; Zeng et al., 2023). While efforts have been made directionally to move from theory to practice (Gomes-Casseres, 2020; Groen et al., 2008; Shepherd and Patzelt, 2022), our understanding of how digitalized firms transform from start-up to scale-up and experience scaling, is incomplete. (Jensen and Clausen, 2017; Nambisan, 2017; Piaskowska et al., 2021).

Processual research on digitalized firm growth has been constrained, possibly due to limited access by researchers to internal firm workings. However, there is a strong case for more contemporary narratives, grounded in *lived* operative experience, and reflective of how new digitalized start-ups transform as they scale over time (Jansen et al., 2023; McKelvie and Wiklund, 2010; Zeng et al., 2023). Further, how this manifests in changes to the firm's competencies and capabilities, such as organizational learning agility, people, innovation, operational processes, technology, data, and other new capability development, is integral to theory (Strehle et al., 2010).

2.4. Digitalized scale-ups and scaling

Scale-ups are firms at intermediate stage of life, who grow both rapidly *and* efficiently in that they pursue strategies aimed at the attainment of economies of scale (Piaskowska et al., 2021). *Scale-up* is a common term used by practitioners to refer to the period after start-up in a new firm's life when growth rates are at their peak, i.e., double- or triple-digit growth rates (Coviello, 2019). Growth puts pressure on the internal workings of the firm and management. Scaling is associated with the challenge of how to synchronize *internal organizing* with *growth* (Eisenmann and Wagonfeld, 2012). The rapid growth associated with scaling produces more dramatic changes in the size and scope of a young firm's activities. As such, entrepreneurs at times cannot manage the pressure and implications of managing such growth within the compressed time (Nicholls-Nixon, 2005).

Scale-ups' growth differs from other firms at mid-stage of life in that it benefits more from the notion of *economies of scale,* whereby each additional output (i.e., required to serve a new customer or earn new revenue) comes at a decreasing unit of cost or input (Monteiro, 2019). As such scaling is described as a complex, time-limited process of exponential growth, increasing returns to scale (Bohan et al., 2024). The focus on scale economics potentially influences the internal transformation and different decisions in scale-ups' growth paths (Bohan et al., 2024; Piaskowska et al., 2021). For example, prioritizing capital infrastructure and employees, rather than producing a large inventory (Coad and Srhoj, 2020).

Scale-ups have often been referred to interchangeably with *high-growth firms* (Coviello, 2019). High-growth firm definitions, including young high-growth firms known as gazelles, (OECD, 2007) are generally operationalized via a single measurement of growth in sales or employees. At least 20% or more per annum, over three consecutive years, with a firm size control of at least ten employees at the start of the measured period is common (Duruflé et al., 2017). Scale-ups are different to high-growth firms (Bohan et al., 2024; Palmié et al., 2023), which can be firms at any stage of life experiencing 'high-growth episodes' (Schneck et al., 2021). High-growth firms may include older small to medium sized enterprises (Chetty and Campbell-Hunt, 2003) and large companies alike (Vermeulen and Barkema, 2002).

Scale-ups are also different to start-ups (Gilbert et al., 2006) by virtue of their stage and how efficiently they grow. Where all firms large and small, young, and old, can go through periods of 'high growth', not all firms are on a path to scaling. Therefore, the terms high-growth firms, gazelles, or start-ups, while related, cannot be seen as interchangeable with scale-ups. In addition, given the conclusions presented regarding growth pathways (Delmar et al., 2003), scholars agree scale-ups warrant a distinctive examination (Bohan et al., 2024; Jansen et al., 2023; Coviello, 2019; Piaskowska et al., 2021; Shepherd and Patzelt, 2022).

Scaling may differ regarding the scope of activities being expanded, replicated, and synchronized and the product-market combination (Palmié et al., 2023). Following the forementioned heterogeneous view of firm growth paths (Delmar et al., 2013; Penrose, 1959), defining scale-ups and high-growth firms interchangeably and relying on a singular relative growth metric to identify scale-ups for research can be considered flawed. For example, we find the proportion of firms fitting the high-growth firm definition in Europe in any given year at between 10 and 12% (Eurostat, 2022), when in fact scale-ups according to the three constructs of life stage, growth rate and efficiency or scale economics are expected to represent only a small single digit percent subset of all new firms founded (Deutsch, 2017; Harnish, 2014).

The lack of alignment in research and management literature on the *very definition of scale-ups* leads to further divergent views (also among

practitioners) of *when* precisely a start-up can be considered a scale-up. Further, when the job of scaling actually commences is in question. Piaskowska et al. (2021) attempt to deconstruct scale-up growth patterns by examining growth-enabling activities of a rare, extreme subset of firms, known as unicorns.[2] Quantitatively examining activity considered essential for high growth, including business model, financing, innovation, acquisition, and digitalization activity, they identify four new *scale-up modes*. Piaskowska et al. (2021) observe that with today's digital technologies and digitalized business models, some of the previous theorized limits to firm growth are 'pushed-out', such as abilities to leverage digital technologies to acquire many customers in a relatively short time.

Digital technologies, noticeably digital artifacts, digital platforms, and digital infrastructure are increasingly observable in rapidly growing firms (Nambisan, 2017). They facilitate innovation opportunities, often forming part of the entrepreneurial idea and affect how firms and industries compete and organize for innovation (Appio et al., 2021). Digital innovation relies extensively on digital technologies "as the recombination of digital components in a layered, modular architecture to create new value-in-use to users or potential users of a service" (Huang et al., 2017, p. 302).

They also support entrepreneurial processes, serving as a growth enabler, i.e., cloud infrastructure, AI, internet of things, data architecture, smart devices (Aldrich, 2014; Nambisan, 2017). Digital technologies have enabled new business models (Chauhan et al., 2022; Miller, 2001), which create and deliver value to customers and capture value through *extensive use of digital artifacts* i.e., encoded information, interactive, editable, reprogrammable, open and/or distributed artifacts (Wirtz, 2019). As such, digital innovation and digital business models are "both a process and an outcome of digital technologies" (Huang et al., 2017, p. 302).

Digitalized firms are often viewed as a sub-set of high-tech firms (Cavallo et al., 2019). More open digital technology environments enable more sharing of data, information, resources, and knowledge (Guo et al., 2020), expanding access to strategic assets outside the firm and accelerating new capability building. Digitalization is also associated with replication and internationalization, enabling firms to increase customers and scale operations more easily, without similar or significant increases in operational costs (Ardolino et al., 2018; Mithani, 2023; Nambisan, 2017; Reuber et al., 2021; Shankar and Clausen, 2020). Scaling may differ regarding the scope of activities being expanded, replicated, and synchronized and the product-market combination. In the case of digitalized start-ups, hyper-focus on one product and/or market niche (i.e., specialization) is a successful scaling and internationalization strategy of many digitalized firms (Jansen et al., 2023).

However, young, digitalized scale-ups also face the opposing tension of managing the pressures of new levels of scale afforded through digitalization. This is fueled by a 'winner takes all' mentality and first to scale ambition (Hoffman and Yeh, 2018) as well as scaling under increasingly compressed time (Nicholls-Nixon, 2005). Many also face the issue of pre-mature scaling (Furr, 2011), as Phillips (2019, p.125) comments: "Today's tech unicorns seek to scale prematurely, in order to chase a possibly illusory first-move advantage."

To overcome such research gaps and measurement challenges, Coviello (2021) recognizes the need to look beyond numbers to the *internal workings of the firm* and posits there is an important stage before scaling, when the firm learns how to transform itself to become a scale-up. If growth can be achieved in several different ways, within different contexts (Appio et al., 2021; Delmar et al., 2003), then scaling may also be a temporary, rather than enduring period for many firms, with unicorns perhaps being outlier exceptions. Further research specific to *scaling transformation* from today's digitalized start-up to digitalized scale-up may help inform our yet incomplete understanding of the scaling phenomenon in these firms.

3. Methods

We use a qualitative research approach as the appropriate methodological fit (Eisenhardt, 1989) to approach the scaling process in a fine-grained manner by soliciting information from relevant business elites (Ma et al., 2021). This approach enabled us to clarify key characteristics of the scaling process and address the how-question (Eisenhardt, 1989) we are asking: *How do digitalized start-ups transform during scaling?*

Given the heterogeneous view of growth, an industry context is important to understanding the growth process (Delmar et al., 2013; Penrose, 1959). We therefore focus on scale-ups with digitalized business models, examining their internal workings to understand how *digitalized* start-ups transform during scaling. We build on firm growth theories (Teece, 2007; Wernerfelt, 1984) and a research agenda focusing on the *scaling process* through a qualitative narrative (McKelvie and Wiklund, 2010; Piaskowska et al., 2021). To collect and analyze our data we follow the rigorous inductive method described by Gioia et al. (2012).

3.1. Research design

Following a purposive approach (Miles and Huberman, 1994), we were searching for companies with digitalized business models, having sufficient scaling experience. We set theoretical sampling conditions (Yin, 2009) through an extensive literature review combined with industry experience. The companies we are focusing on are successful representatives of the scale-up phenomenon and therefore suitable to be included in our study (Flick, 2018; Patton, 2015). The focus was always on talking to a scale-up's founder who was with the company during the start-up stage as well as scaling process, so as to talk to the temporal nature of their transformation (McKelvie and Wiklund, 2010). For soliciting information from business elites like these, qualitative is the only effective approach (Ma et al., 2021) having shown its validity in research publications although small sample sizes should be expected (e.g., Brewis et al., 2023).

We defined scale-ups according to a three-pronged definition and looked to identify potential scale-ups for our sample based on the characteristics of being (1) at the *intermediate stage* of firm life, (2) who had grown *rapidly* over multiple years, and (3) were on a path of *scalable growth* (Coad and Srhoj, 2020; Monteiro, 2019; Piaskowska et al., 2021) as to distinguish clearly from high-growth firms (Chetty and Campbell-Hunt, 2003; Vermeulen and Barkema, 2002). We focused on firms with extensive use of digital technologies in value creation and delivery, as digital technologies are associated with scalability (Cassetta et al., 2020). After creating an extensive list of over 90 potential scale-ups with digital business models, we started to reach out to potential interviewees, targeting the founders. The digitalized scale-ups in the sample were accessed via the three authors' personal networks, and through third-party investors or other networks such as venture capitalist firms and accelerators, as well as via German and American universities. Snowballing was also used in some cases (Patton, 2015).

We ended up with 25 elite interviewees (Ma et al., 2021) willing to share their insights with us and we conducted 25 unique semi-structured interviews between February and November 2021. We structured the interviews into five major sections. After asking general information about the company, we started with general transition factors. In the next section, we intended the interviewee to share some insights about changes in the founder's role. We followed by focusing on the firm-level changes required to shift the organization to an exploitation mode associated with scaling. We finished off understanding sources of new knowledge and know-how during scaling and finalized with founder

[2] They limit the sample to 278 companies with unicorn or near-unicorn ($500 million market cap valuation) status, VC funded to Series A, <10 years old and with digitally driven business models.

recommendations to other founders. During this phase we prepared the data collection, conducted, and transcribed the interviews as well as collected secondary data. We applied the three principles set forth by Yin (2009) using multiple sources of evidence, creation of a suitable database, and the maintenance of the chain of evidence helping us with case development and mitigating validity issues (Denzin and Lincoln, 2018).

After purposefully conducting the interviews and coding, we had to exclude 11 interviews. These interviews had to be excluded as the firms – although initially identified to be a potential digitalized scale-up – did not meet our definition and strict suitability requirements for a scale-up and therefore were not able to address the research question appropriately (Flick, 2018; Patton, 2015). While the interviewees in those cases very much believed they had commenced scaling, the information they were providing did not underpin this claim (e.g., they had too few customers or staff or years of scaling, were not technology driven, or were not on a path to scalable growth yet), further supporting the different notions in understanding of what constitutes a scale-up, extending beyond literature to practice. Finally, our sample consists of 14 successful digitalized scale-up entrepreneurs. Table A.1 provides an overview.

3.2. Data collection

To ensure we were interviewing founders with actual scaling experience, we started all semi-structured interviews to ask the participating entrepreneurs to tell us about their history, their current business and role, size of business, year of foundation, and when they believe that scaling had commenced. These introductory parts gave us insights into the individual's background, motivation, and human capital as well as the firm's genesis, purpose, and business model thereby already painting a picture of their movement from start-up to scale-up. We then introduced our research and its aim and backgrounds of the authors, establishing credibility with the interviewees (Patton, 2015). We continued by laying out a definition of scale-ups and validated directly whether the founder finds their firm within this definition. This gave us the opportunity to check whether an interviewee's definition of scale-up was concurrent with ours and if not, how the understanding differs in practice.

The interviews were conducted in great depth with the duration ranging between 45 min and 90 min. The focus of the interviews was on the changes to the internal workings of the firm and founder's role that took place at the commencement of scaling and during the scaling process as it progressed. We acknowledge that individual perceptions of the past with our interviewees can be imperfect. However, as going through the process of successfully scaling a business has significant emotional value attached to it, there is a high likelihood that entrepreneurs will have a strong memory of it as they were personally engaged (Morgan, 1983). Throughout the interviews this assumption was confirmed, as the entrepreneurs who had experienced sufficient scaling were generally highly self-reflective and had sharper responses from a detailed memory of their decisions and the process of scaling. In some instances, the interviewee referenced documents and other information to confirm detailed facts such as dates, growth rates or employee counts.

We employed triangulation to minimize the bias possibly arising from the founders imperfect recollection of the events and to validate their responses from the interviews (Yin, 2009). We conducted online research to validate information about the company characteristics, size, timeline, and growth trajectory to help validate the scale-up criteria. An important source was the database Crunchbase, one of the most referenced, comprehensive databases on start-up and scale-up companies worldwide (Crunchbase Inc., 2022).

3.3. Data analysis

We built our analysis on the method described by Gioia et al. (2012) which has demonstrated its validity in numerous high-quality publications in recent years (e.g., Brewis et al., 2023; Shankar and Clausen, 2020; van Weele et al., 2017). We employed a highly iterative process in this research characteristic of a qualitative approach (Eisenhardt, 1989; Miles and Huberman, 1994), going back and forth between the data and our emerging theoretical framework. After identifying initial concepts, we related them to higher level categories and constantly revalidated them with new data (Charmaz, 2006).

Following an inductive approach (Corbin and Strauss, 2015), we started the analysis without certain expectations of potential themes and their interrelationships. While being cautious about not interpreting too much into the data, we gave them room to speak for themselves (Suddaby, 2006). In a first step, all interview transcripts were divided up among the researchers to analyze them independently of each other, determine common themes across respondents, and assigning them to certain text passages in an open coding approach (Strauss and Corbin, 1990). In a second step, each transcript was reviewed by another researcher again independently to repeat this approach. In this process a plethora of first-order themes quickly started to emerge. We refrained from sorting at this point leading to over 100 themes per researcher and a sense of necessary confusion (Gioia, 2004). After that each interview's themes and assigned text passages were discussed in the corresponding pairs of researchers clarifying the themes and building a census list for each interview. Comparable to other studies, the initial agreement was high on average within the pairs (O'Neil and Ucbasaran, 2016). Finally, these results were shared among all researchers and structured. Diverging outcomes were discussed until consensus was reached. This process led to a list of 59 first-order themes that emerged from the interviews. As our research progressed, we started to discuss the emerged themes and began clustering according to themes' similarities or differences (axial coding) (Strauss and Corbin, 1990). We were also looking for interrelationships among the themes as well as their fit to theory and previous research. This iterative process continued until we summarized all first-order themes and second-order themes reaching theoretical saturation (Glaser and Strauss, 2010). This led us to ten second-order themes under three firm-level overarching aggregate dimensions. Fig. A.1 provides an overview.

4. Findings

To focus our findings on the scaling process, we present our emerging themes from the interviews below in narrative form, making use of power quotes within text as examples (Gioia et al., 2012; Pratt, 2008).[3] Overall, we found that irrespective of distinguishing firm factors or characteristics outlined in Table A.1 among our sample, such as geography, industry, digital business model offering, funding sources, customers, or growth mode, there emerged several themes and aggregate dimensions with respect to internal activities and priorities relevant to scaling among interviewees. Note, within our sample of digitalized scale-ups, all were classified as presenting with *discontinuous innovation*, either technologically (new product or tech meets existing market needs) or commercially discontinuous (existing tech applied to meet new market needs) or both (new tech and/or products to meet new needs) (Wu and Wang, 2006).

Our findings' narrative is structured in accordance with the aggregate dimensions deduced from our process and includes a description of the first and second order themes (Fig. A.1), which speak to the firm's priorities and dominant activities during scaling. In addition, we have included narrative on key goals, challenges, or trade-offs faced by the firm and/or founders during the scaling process falling out of the analysis. For conciseness and clarity, we have represented our findings diagrammatically in Fig. 1 so that the reader may follow the narrative

[3] Further illustrative quotes are available on request as proof points of each first level theme (e.g., Xian et al., 2021; Zellmer-Bruhn et al., 2021).

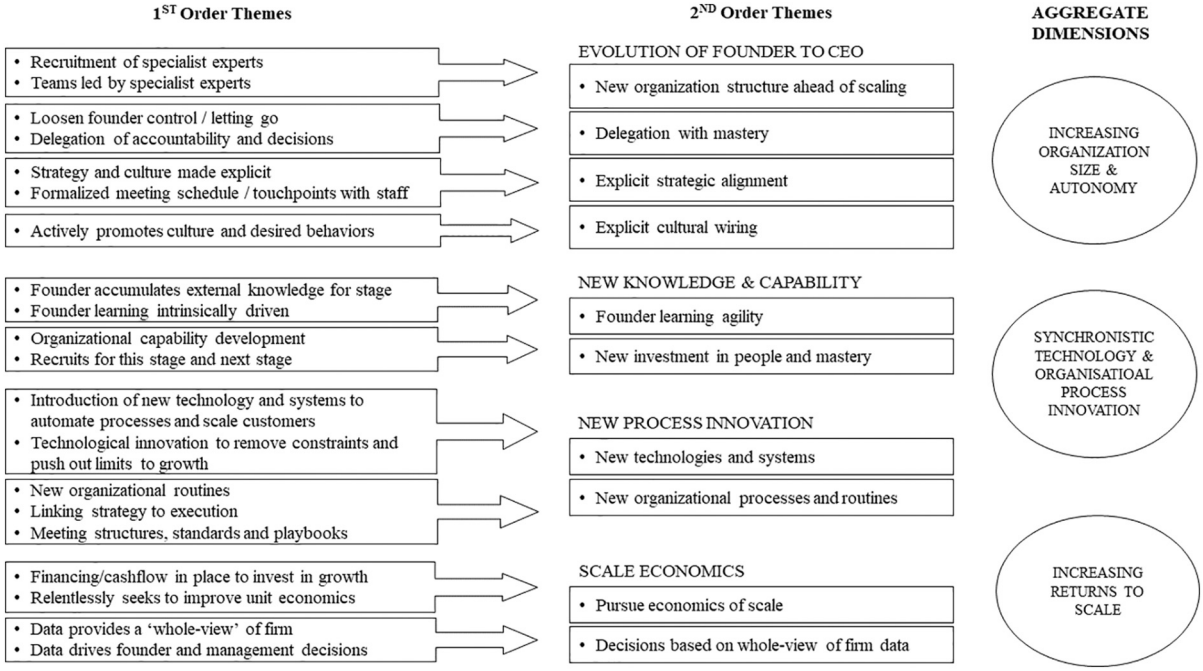

Fig. 1. Scaling process priorities, dominant activities, goals and trade-offs in digitalized firms during scaling.

more easily. Where we found opportunities to transfer our qualitative findings, we have highlighted several implicit propositions for future research and testing (Clark et al., 2010; Gioia et al., 2012).

4.1. Build capacity

We found at the start of scaling, one of the first priorities, if not the first for digitalized scale-ups, is to *build organizational capacity*. Capacity in a production context is the maximum output a firm can sustain and represents a limit to growth (Coelli et al., 2002). Start-ups are often resource constrained and therefore often characterized as operating 'lean', a term used to describe the process of early start-up exploration where few resources are operating at maximum capacity (Ries, 2011). Scale-ups are distinct from start-ups as the focus is on capacity boosting for the exploitation of the viable business model at scale (Piaskowska et al., 2021; Reuber et al., 2021; Zhao et al., 2020). In an organizational context, capacity is broadly speaking used interchangeably with building capabilities.

Much has been theorized and written about the type of capabilities including managerial or professional 'talent' required for firms to be successful in today's fast-changing economy (Demirkan and Spohrer, 2015; Ninan et al., 2022). For example, T-shaped professionals is a visual metaphor introduced by David Guest (1991), which refers to two types of competencies for professional talent. First, in-depth knowledge and expertise (vertical 'l') in a specific discipline or domain area coupled with broad knowledge and expertise (horizontal 'T') essential to operating, managing, and innovating across disciplines and organizations. Whereas emerging Pi-shaped skills (after the Greek-letter π) refers to three types of competencies, two deep vertical skills plus the broader capabilities (Hayajneh et al., 2022).

As the pace of change has increased, and change is now less a defined process with start and end point, and more of a continual and dynamic process, the management of change has also shifted. This shift means organizations need managers and leaders, particularly in innovative, digitalized firms, with both types of capabilities to succeed. For example, technology payments professionals may have deep technical knowledge or skills specific to payment technologies in the financial industry coupled with an ability to communicate with non-technology teams within the finance and banking ecosystem and value chain, understand customers and partnership relationships, and be flexible and adaptable to competitors and new business models. Whereas H- or Pi-shaped skills (after the Greek-letter) refers to three types of competencies, two in-depth plus the broader capabilities.

4.1.1. Specialist leaders and new organizational structure

In our sample, this initial organizational capacity building is in the form of new capabilities brought in through the recruitment of *specialized leaders*, usually at the management layer. Reporting to the founders, this is accompanied by a *new organizational structure* i.e., additional organizational layer of management and new teams or business units. This new structure was straightforward and for the most part functionally driven (e.g., sales, marketing, people, and finance). *Capacity building* in the form of hiring functional or specialist leaders and new structure is commenced at the *start of scaling*, in anticipation of future growth.

> *"We **hired people**… I hired a CFO, CMO and all **different roles** in HR and finance that would… let's say, that are way better than I am in all different areas of the company for sure. We did that. I started that process pretty early on."*
>
> *[Interview 8-021]*

In addition to new functional skills, we found hiring decisions prioritized *capabilities relevant to stage*, referring to the firm's current and next phase of growth goals, often described in terms of revenue, or size of organization. *"I realised the people we had for ARR of $2 mill were the **wrong people** for ARR $10 mill. Likewise, people **experienced** in running businesses at $10-50 mill level **expected a different level of structure and resources**." [Interview 3-009]*

*"… this has always been a challenge. To find the **right people for this stage**… a person who might be better even like for the **next stage,** but they could still do the one before …I mean you run a company differently below 50 people, about 50 to like 100 or so."*

[Interview 6-008]

Indicating that in terms of capabilities, digitalized scale-ups are not only looking for broad and in-depth knowledge and experience by function (T-shaped), but also by stage, potentially more akin to Pi-shaped professionals.

4.1.2. Explicit strategy and culture

As scale-ups build capacity at the start of scaling, founders expressed a necessary internal change to communication activities and alignment of *strategy and culture*. Organizational culture refers to the entirety of values, presumptions, and beliefs defining the manner in which a firm is conducting business (Barney, 1986). In the context of growing businesses, Atzmon et al. (2022) emphasize that the creation of a unifying culture which also stimulates collaborations within the firm and with other firms is crucial. Often, the creation of a new organizational identity seems mandatory (Schou, 2023).

As the organization became *more layered* at the start of scaling, founders had *less direct contact* with staff. They found that, although strategy may be clear in the mind of the founder or even the next management layer working close with the founder, strategy became diluted or less clear to the entire organization. As a result, founders commenced communicating *strategy more explicitly* to the entire organization.

*"…this was really hard learning for us as well because our employees told us 'We don't have a **vision.** We don't have a **strategy**.' We say 'Hey, come on. This is a **vision;** this is already a really cool approach."*

[Interview 11-026]

Interviewees stated that more formalized, repetitive, explicit communication was required by founders to align strategy compared with the start-up phase. We observed this is an important *priority* at the start of scaling and often a painful lesson and *new capability* for the founder to learn.

Culture was a challenge emphasized by several interviewees in our sample, and particularly in focus for firms with hybrid growth modes (i.e., M&A) or hybrid human and digital services business models (see Table A.1). Organizational culture is considered a source of competitive advantage and organizational effectiveness (Chan et al., 2004). Digital organization culture has been correlated to value generation from digitalization and firm performance (Martínez-Caro et al., 2020). As one scale-up founder reflected on the acquisition of a bigger, but non-digitalized firm (i.e., hybrid growth strategy).

*"You know, the **cultural alignment**, the Cadence of **how fast you work**, the work ethic. All of those were **major issues** and was the **biggest challenge**, right? But actually, I would say the **cultural and mindset issues** were even larger than **the technical infrastructure** issues."*

[Interview 9-008]

We propose the scaling process in digitalized firms commences in many cases with capacity building. At the start of scaling, digitalized firms shift from lean organizations working at maximum capacity to investing in new capabilities and creating some resource slack, to seize new opportunities. We also found increasing organizational structure put pressure on the firm's culture, particularly its ability to act entrepreneurially. We propose that the context of growth mode (i.e., organic vs. M&A), innovation type and digital business model offering are potentially moderating factors influencing the intensity of the structure-culture tension during scaling. Successfully balancing this tension and managing trade-offs between structure and culture are a new stage-related challenge for founders during scaling.

4.1.3. Delegation and loosening founder control

Capacity building inevitably led to the founders facing their *first individual-level transformation* priority of relinquishing decisions (*loosening control)*, compared to previous stage when "*there were a lot less decisions*" and founders inevitable "*made more of them*" [Interview 11]. We observed *founder learning* as one of the aggregate dimensions important to start-up to scale-up transformation. Specifically, learning to delegate, or make room, for the specialist leaders to take on tasks that had previously been the founder's own is a particularly challenging transition-stage activity for most founders, according to them.

*"And for me it was **hard**. Sometimes it's probably **still hard** as well, and it's **hard to delegate**, of course. When you've done all stuff by yourself, you have some kind of expertise in this field."*

[Interview 11-016]

Founders theoretically know and acknowledge as the organization grows and specializes, that they need to *delegate accountability* and *decisions*, providing greater organizational *autonomy*. However, at the start of scaling they are still learning to trust or rely on the skills and capabilities of the specialist leaders they have hired. We observed, in line with previous research (Strehle et al., 2010; Van Lancker et al., 2023) a revision of the founder's formal and informal role is necessary to make room for specialists, particularly with respect to formal decision-making. While it is a transformation-stage goal of the founders to shift to more *autonomous organization* and collaborative management, by the most part, this occurs at a slower pace than the new organizational structure itself. Until at some point founders can "*flip the switch and enable others to do that*" [*Interview 6*], shifting to a more collaborative management style and increasing organizational autonomy. Van Lancker et al. (2023) find founder role changes may be the consequences of different factors including role-crafting on behalf of the new specialist leaders as they may take on more of an informal 'surrogate founder' role. Either way, *delegation* is not a given when it comes to capacity and capability building and it comes with *founder learning*.

4.2. Synchronistic technology and organizational process innovation

While all digitalized scale-ups in our sample identified initially as discontinuous product innovation (see Table A.1), we found the firm's innovation widened during scaling to include more continuous, process innovation.

Process innovation includes technological innovation and non-technological innovation directed at improving production-oriented output such as cost-reductions, productivity, and output quality (Hervas-Oliver et al., 2014). As firms grow, benefits or outcomes from investing in innovation grows, particularly in the case of process innovation (Cohen and Klepper, 1996).

4.2.1. New technologies and systems

Introduction of *new technologies and systems* during scaling was predominantly motivated by two goals. First, the removal of constraints that limit or have the potential to limit the firm's growth. While constraints come in different forms, continuous process innovation efforts in traditional manufacturing recognizes "processes as interdependent chains of activities", whereby "the strength of a chain is not determined by the sum of its parts but by the weakest link" (Dalton, 2009, p. 52). During scaling, even digitalized scale-ups expressed resource and capabilities constraints to rapidly increase customers, or rather sell, deliver, and support many more customers simultaneously than had been possible during the start-up stage. As one founder explained regarding customer scaling:

"All bets went out the window mid-March, none of our forecasting made any sense anymore, […] In those seven weeks we were showing that we were going to be able to hit and sustain that and then Covid happened and

that jumped up to 17% month on month growth, and then 20, and then 14, and then 23."

[Interview 5-006]

We observed the type of new technologies and innovation introduced by digitalized firms during early scaling was likely to be continuous, or rather 'new to firm' (i.e., new to their customers or employees), not new to the market or world at large (discontinuous) (Garcia and Calantone, 2002). For example, "*going from [sic],* ***custom man-made email*** *forwarded reports to* ***real-time dashboards and reports*** *that the clients can log in at any point and see the results of their campaign in real time. So, taking the things that took a lot of manual effort and labor and automating them as much as we can.*" *[Interview 9-027]*

The second motivation to invest in continuous process innovation is to streamline, standardize and *automate processes* that require manual or human effort. Much of this streamlining job initially is about replication – automation of recurring tasks relating to sales, onboarding and support of customers formerly requiring manual effort. New capabilities in the form of new to firm products and digital technologies enable scale-ups in our sample to deliver their own innovative products and output with incrementally less constraints and unit costs associated with human effort. Examples of technologies mentioned were CRM software, marketing automation, analytics dashboards, automated product testing etc.

"Starting from ***setting up Salesforce*** *in the proper way, but then, doing* ***account-based marketing****, and defining strategies and campaigns, and helping people to execute these campaigns and* ***streamlining the processes*** *way more."*

[Interview 2-014]

The goal of new process innovation in scaling firms is directly related to building and reassembling new capabilities to enable and keep pace with growth. This includes the capacity to supply many more customers (and by extension, increasing sales and returns to scale). In addition, scale-ups seek process innovation to improve unit costs and efficiency gains (economies of scale) from adding each incremental customer or unit of sales revenue. It is therefore also linked to the pursuit of exponentially increasing returns to scale.

The key challenge of this priority is that scale-ups are still pursuing new opportunities and operating with resource constraints. As such, are often forced to make trade-off decisions when *allocating resources between future growth* (such as discontinuous innovation or market expansion activities), which tend to be longer-term, and *future efficiency* (such as process innovation and operational activities), which tend to be more short-term (Hervas-Oliver et al., 2014). Therefore, we propose our second scaling tension of balancing the *allocation of resources between short-term wins and long-term capabilities and strategic assets that lead to growth.*

4.2.2. New organizational processes

The primary focus of introducing new organizational processes synchronistically with tech-enabled process innovation is to cascade organizational goals, priorities, and know-how to individual staff to translate company strategy and plans into execution and firm performance. During scaling, if organizational processes including frameworks, routines or systems are not already in place to manage and *link organizational and individual* priorities and performance, they are introduced during this stage. Wan et al. (2023) found that incongruence between the CEO and the top management team regarding growth, was a potential limit to performance during scaling, which a focus on goal-setting procedures could help overcome. As this founder also observed during scaling:

"But then the real challenge arose, no one knew ***how to get there****, right? So, we were telling like a super nice story: that's where you're going to go. […]. So, how can we ever* ***get there****?"*

[Interview 7-007]

Founders also commented that collaboration and communication become more cross functional during scaling, as their newly structured units or teams are increasingly required to work in cross-functional ways around company goals.

"We introduced a lot of ***meeting formats*** *and* ***collaborative formats*** *like squads. So, people from* ***different teams*** *working on a topic are on a step and the customer journey rather than in the departments and connected to the* ***OKRs****."*

[Interview 8-015]

Another example of organizational processes or routines characteristic of scale-ups is the *systemization of knowledge sharing*, which we observe beginning in a smaller number of interviews. In this regard, they begin to put in place processes supportive of building dynamic capabilities specific to more structured internal know-how and knowledge sharing (Teece, 2007).

Scaling is often thought about as *"more the phase when you basically operationalize and systemize the growth of the things that you figured out*" [Interview 2]. As new specialist leadership is hired, 'role-crafting' commences and aspects of founder formal decision-making and informal activities are replaced (Van Lancker et al., 2023), it follows sharing knowledge with new staff and teams, cascading what has been 'figured out' (learned know-how), would be important during scaling.

One example of knowledge sharing referred to by our sample of interviewees is in the form of handbooks, sometimes called *playbooks*. (e.g., "*We built* ***playbooks*** *for each function*" [Interview 3], "*we have a sort of* ***sales handbook*** *of things that worked*" [Interview 2].) The playbooks referred to by scale-up founders are usually digitalized handbooks or documents contained in centrally accessible locations such as on collaboration platforms (e.g., Microsoft teams, Slack, Confluence). Accessible to the firm's staff, they aim to document and systemize internal firm knowledge regarding processes or activities such as sales, marketing, customer onboarding, new product releases, or launching new geographical markets. Playbooks are a tool used by digitalized scale-ups to share know-how "figured out" earlier on in the firm's life, across the organization, to replicate success. They are therefore an example of an operative tool used by digitalized scale-ups important to firm learning agility and developing dynamic capabilities.

While *organizational processes* such as frameworks, routines and systems are prevalent and important to other firms, they are critical to start-up transformation as they enable founders to maintain some connection and indirect level of control of the firm's goals and priorities at team levels. Maintaining this connection is influential to their learning to delegate and loosening of formal and direct control for operational decision-making. By extension, organizational processes are important to the founder's balancing trade-offs between loosening control or delegation and staying connected.

"And it's easy, it's ***easy to lose connection****, right. What I'm saying is* ***delegation is a very thin line****, delegating important things to also new managers that you hire is [sic]* ***extremely tricky*** *because you want to give independence and you don't want to micromanage, but you also want to* ***stay aligned with managers*** *and* ***know what happens*** *in your company."*

[Interview 8-019]

Firms which introduce continuous technological and organizational process innovation simultaneously are likely to have a positive influence on production-oriented performance (Hervas-Oliver et al., 2014). New organizational processes are important scaling activities, which directly and indirectly influence learning capabilities, and performance at all levels– organization, team, and individual. New routines indirectly help founders feel comfortable with increasing autonomy, as they *let go* of some decisions and activities within their role. For example, introducing new meeting cadence or collaboration tools, (e.g., quarterly, monthly planning meetings, software such as Microsoft Teams or Slack),

systemize knowledge sharing (e.g., playbooks, wikis, analytics) and processes to set and cascade organizational goals to individual performance (e.g., planning and performance processes).

We propose that such organizational processes or routines are related to organizational autonomy in that they help founders *balance tension and associated trade-offs between loosening control and delegation* with *staying connected* to the operations of the business without needing to be accountable for 100% of the decisions.

4.3. Pursue scale economics

Scaling in digitalized scale-ups is different to start-ups, high-growth, or other firms in that scaling is characterized by the pursuit of economies of scale (Piaskowska et al., 2021). Whereas any and all firms may experience *episodes of high growth* in customers, sales or employees and linear returns to scale, scale-ups are characterized by their pursuit of increasing or *exponential* returns to scale (Monteiro, 2019; Piaskowska et al., 2021). Per definition in scale-ups, the management of economies of scale are such that for each new unit of revenue or customer or output, digitalized scale-ups aim to deliver these at a decreasing unit of cost and effort (Monteiro, 2019; Piaskowska et al., 2021). We found just as in capacity building, *planning for scalability begins early*, in most cases during the start-up stage. We observed the view, "business model is the key to scale" and "requires early planning" [Interview 6], a response from the interviewees when reflecting on their scaling limitations:

> *"So, we need to just fine tune the **business model** a little bit better. We need to go like much more into the specialty finance space. And we need to just **get much more tech driven** in what we are building, to just **deliver the service** to our customers."*
>
> *[Interview 6]*

This commences with not only ambition for growth among founders, but a *purposeful intention* for *scalable firm growth* (or a *scalability mindset)*, and a focus on proving an efficient business model. We observed an early focus on figuring out the potential scalability in the business and subsequent signals of realizing an *efficient business model*, prior to the start of scaling, gave founders in our sample confidence to take more risk and invest more capital. Founders stated that once their business was able to demonstrate potential for positive or improving returns on a *per unit* basis, this was an early economic signal of an efficient, potentially scalable business model.

> *"So, once we've seen that, the **customer acquisition cost** that we had on those was exceeded quite significantly by **the lifetime value** of what we then generate out of those customers. That was basically the point where we said 'okay, now it makes sense to put in more money'."*
>
> *[Interview 6-007]*

Those scale-ups who were externally financed, put financial capital in place first ahead of building capacity. One founder sourced growth funds through a mix of external capital and the acquisition of a more traditional, cash flow positive business (i.e., hybrid growth mode). Another from an initial public offering, listing the business on a stock exchange and raising capital from the public.

> *"I think it was probably the **funding** round, a **series A funding**… And that was a big step up compared to other funding's like seed and pre-seed we had before. And that was definitely a step up where we started investing in bigger office, team, and substantially increased also our **growth** budgets. [Interview 8-001]*

Irrespective of source of funds, founders were mindful of external environmental factors such as demand and market maturity (e.g., the readiness of customers to adopt new technology, competition) versus availability of cash flow or external capital to fund such growth. As one internally financed founder explains:

> *"We didn't feel comfortable that bringing an **investor** on board and having more **money** at the time, back in, you know 2015-2016 when we hit cash flow positive and maintain that we didn't feel the market, was quite ready for it. By the time we got to 2018-2019, we thought the market was ready for that aggressive **growth**."*
>
> *[Interview 11-004]*

During scaling, it is not enough to simply validate a business model through repeatedly selling to customers (Deutsch, 2017), and generate linear returns. What is differential among digitalized scale-ups is the focus to build capabilities in such a way as to deliver a business model with future potential of exponential increasing returns to scale.

We propose, an early focus on scalability (i.e., such as an intention to pursue a sizable, scalable business, a focus on unit economics) coupled with the realization of a level of efficiency in the business model (such as through declining average costs, or improving unit economics, or margin) is influential to initial capacity building. Such focus and realization encourage founders to take additional risks and address financial constraints through funding, which may act as limits to growth.

4.3.1. Data sufficiency and data-led decisions

Founders of digitalized scale-ups in our sample had a proclivity towards *data-led decisions* and collecting *sufficient data* to measure success and performance of their activities and subsequent improvements. This usually begins early with collecting data relevant to customer usage or satisfaction, such as Net Promoter Scores,[4] repeat usage, or other quality and performance measures. As one founder illustrates:

> *"One thing we started doing and collecting early on, and that's what our organization is driven by is **NPS** or **customer satisfaction** and quality assurance in general. So, we are very precise in **tracking customer satisfaction** and NPS. In every single step we are collecting 15 scores along the customer journey continuously and looking at them."*
>
> *[Interview 8-014]*

With sufficient, *whole-view of the firm data capabilities*, scale-up founders feel more confident making *fast, agile decisions*, regarding new resource allocations and investments of time and capital to deliver potential impact on firm performance. For example, increasing or reducing marketing spend to be more effective or adjusting pricing to increase net margin, despite the risk of losing some customers.

> *"And then it was easy for us to **adjust** it on a monthly basis. This was probably one big advantage for us for a long time, and it's still a big advantage, a **data-driven-go-to-market-approach**."*
>
> *[Interview 11-023]*

We observed having 'sufficient' data also meant investing in data quality and analytics to inform decisions and help solve problems constraining growth.

> *"… so that's something we invested in having, **good data analytics** and, [sic] we have data scientists on the team and so that that's certainly helped us solve the problem or at least better understand it."*
>
> *[Interview 12-007]*

During scaling, the pressure to make fast decisions which directly or indirectly affect inputs (for example price, customer demand, unit costs, operations) may be perceived to be riskier than at start-up stage due to the potential impact on performance at scale (i.e., on customer satisfaction, margin, cash flow, and returns to capital), in the larger firm. Through sufficient data, founders also provided examples of how they were now able to manage the trade-off between fast decision-making and potentially negative impacts on firm performance.

[4] Net Promoter Score or NPS measures how likely a customer is to refer your product or service to another person. It is considered one of the leading indicators of customer satisfaction and referral.

4.4. Founder learning: evolution of founder to CEO

Founders may need new knowledge relevant to scaling and their new priorities, activities, and resourcing decisions. They need to learn quickly and under compressed time in digitalized firms, hence *learning agility* is an important capability for digitalized scale-up founders. Learning agility refers to "the willingness and ability to learn from experiences and then apply those lessons to perform successfully in new and challenging roles" (De Meuse, 2019, p.25) or conditions (Lombardo and Eichinger, 2000). It has been linked to having a 'growth mindset' (Dweck, 2006) and correlated with both leadership performance and leadership potential (De Meuse, 2019; Lombardo and Eichinger, 2000).

We found that *founder learning agility* continues during scaling, however founders are more likely to seek *new knowledge externally,* such as from the experiences of other founders, operators, and experts. Where founders were turned 'inward' during their lean, start-up years, focused on their customers and product experimentation, founders *turn outward to find sources of new knowledge* relevant to the scaling process. Several founders interviewed mentioned turning to third-party experts, such as a management or leadership coach, or other founders with prior scaling process experience.

> *"I talked a lot to others, with **other founders**, like [A. S.] and all those people."*
>
> *[Interview 11-001]*

Founders indicated they benefitted in this respect from others with scaling experience, such as through peer mentoring, recruiting a more experienced co-founder or appointing founders with prior scaling experience to their board.

> *"I tried also like **external mentors** and what not and this helped me extend but not entirely like internally. What will help? My **other co-founder** who joined a little later and that was interesting because he had **scaling experience** before."*
>
> *[Interview 6-007]*

While many scale-up founders indicate they acquire new knowledge from reading or attending events and conferences, they comment less is known, and published regarding scaling processes and methods. Formal founder learning may have been provided during the start-up phase from ecosystem developers (i.e., accelerators, incubators, or other programs) but are aimed at start-up founders specifically.

We observe from our findings that founder and firm learning agility, as a dynamic capability, is highly related during scaling. Broadly speaking, the evolution from founder to CEO over a *compressed time span* is a unique, common characteristic of digitalized scale-ups. Founder learning agility, including founder's openness to seek external sources of knowledge relevant to scaling-stage management and activities, and motivation for *learning* with regards to their changing role, is important to both the founder's and firm's transformation process.

5. Discussion

5.1. Towards a scaling process framework

To organize our findings regarding the process of scaling in digitalized firms, we compiled Fig. 1 as a graphical representation of our findings (Bansal and Corley, 2011). Our intention is simply to summarize our findings collected from our interviewees, and encourage other researchers to progress theory, working towards a *scaling process framework* for digitalized scale-ups (Gioia et al., 2012).

Based on the research, we organize and categorize the internal workings and activities of our digitalized firms during the transformation process and from the start of scaling into (i) scaling goals, (ii) scaling priorities, and (iii) dominant activities associated with each priority. We also observe the emergence of new priorities and dominant activities may result in (iv) trade-offs and tensions that founders seek to balance during the scaling process.

In summary, *three primary firm goals* are observed to be in focus during scaling being *increasing organizational size*, *increasing customers,* and *increasing (exponential) returns to capital*. An individual-level goal relevant to the *founder's transformation* to CEO makes the fourth scaling goal. Each goal is associated with a *key priority,* emphasized during scaling compared with the founder's previous start-up period. These scaling priorities are categorized as (i) build capacity, (ii) synchronistic technology and organizational process innovation and (iii) pursuit of scale economics. A fourth individual-level priority is (iv) *founder learning*, which is different to earlier learning in that founders seek stage-relevant knowledge from more external sources. At a more granular level, we observe *dominant activities* within each priority, explained in our findings.

5.2. Managing tensions and balancing trade-offs

Four tensions present a challenge for founders during scaling. How founders balance these tensions and what outcomes they trade-off are still predominantly a black box, seemingly relying on judgement and management skill. Founders informed us that these tensions required frequent balancing and intermittent management related to the rapid changes taking place during the scaling process. As one founder reflects:

> *"I think of the **balance**. I mean, you always have to try to **keep things balanced**. As soon as you **start changing significant things**, you risk losing [sic] the balance, which you shouldn't do if you move fast. So, I think **that's where the complexity** lies - all within the fact that you have to do it while you are running at full **speed**."*
>
> *[Interview 13-008]*

The first of these tensions are balancing between *structure and culture* or *"how to balance between structure and repeatability versus moving fast and being entrepreneurial and doing things in a quick and dirty way."* [Interview 9-025] Another balance relating to *resource allocation between short-term wins* vs. *long-term growth outcomes* (e.g., prioritizing between product and process innovation effort, long-term capability building and short-term operational wins). For example, when referring to allocating development resources to improving platform capacity, founders noted *"they would have sacrificed growth in the business for a year completely … in order to get it done in a year and get it fully done."* [Interview 5-023]

Perhaps the most prolific tension observed within our sample is the tension between *delegation* of more decisions to specialist leadership and founders' needs to *stay connected* to the firm operations and decisions (i.e., having appropriate level of oversight and control when and where needed). Therefore, during scaling, they actively prioritize technologies, systems, data sufficiency, and organizational routines enabling them to manage this tension. As interviewee 9 exemplifies:

> *"Being able to train the more junior guys, to escalate things at the right time and make sure the leadership was aware of those things before things went south and make sure there was a certain level of quality."*

We understand from our interviewees, balancing tensions and managing trade-offs during scaling require dynamic capabilities in that they are likely to change over the time and the process of scaling. They are not mutually exclusive, but rather a question of gradients requiring intermittent tightening and loosening. Thereby the balance is managed to optimize trade-offs including how to remain responsive and entrepreneurial (i.e., agile, take risks, be innovative etc..) with increasing complexity, structure, and size, associated with scaling organization. Also, how to allocate resources and redesign their own role and effort best to maximize growth. Scaling process tensions may also be relational to the firm's digital business model and growth path including growth mode. For example, we observed that firms in our sample offering a complimentary digital service with human services in their digital business model [interviewees 9 and 13] particularly emphasized the

tension between structure and culture during our interviews, when compared with more human capital 'light' business model offerings such as digital services or digital products.

We conclude that while there is heterogeneity in their firm characteristics and growth patterns, digitalized scale-ups have commonality in their scaling process. The challenges associated with synchronistically managing growth and internal organizing warrants deeper empirical research, and such research can focus on the scaling tensions we identified through our research, and others. For example, how management of scaling tensions relates to dynamic capabilities building (like knowledge management, organizational processes, managerial structures), and firm performance or ongoing scaling success, as well as the moderating influence of digital business model and growth mode on scaling tensions.

5.3. Growth process theory and scaling digitalized firms

We find that many of the underlying firm growth processes theories remained relevant in our research today (Penrose, 1960, 1959; Teece et al., 1997). Firms require new resources, including stage-relevant managerial capabilities, technological capabilities, superior organizational processes and systems, and organizational structures to scale. Today's digitalized firms are operating in fast-changing, dynamic environments. Building a sustained competitive advantage from accumulating resources (funding, technical and managerial talent, IP, assets) alone is insufficient. Particularly given the affordability and openness of existing technologies and competitor's capabilities for imitation. Accordingly, with the fast pace of technology, change and affordability of digital technologies, building capabilities in organizational learning agility and responsiveness, may be as relevant as acquiring resources like data, technologies, technical and managerial talent. Even patents etc. may be insufficient to long-term performance where discontinuous digital innovation is involved (Teece, 2007).

Scaling process management itself can be considered a dynamic capability. The firm's capability to reconfigure the organization through the transition from start-up to scale-up, including through multiple stages of scaling, in congruence with changes to their business (e.g., size of organization, sales growth, product expansions) and environment (e.g., international markets, new competition, regulation) requires the firm to rebuild capabilities at the start of scaling. We therefore view the start of scaling as an opportune moment in time for digitalized start-ups to commence development of new scaling capabilities explained in our Scaling Process Framework. For example, to build initial capacity, digitalized start-ups learn new processes for hiring, organizing and managing new specialist leaders. According to our findings, ideally these are Pi-shaped professionals who have (1) deep functional expertise, (2) broad management skills, (3) relevant to the current and next stage of scaling. This likely involves reconfiguration of existing structure, routines, and resources, including the role of the founder, and may be followed by subsequent structural and organization process reconfigurations through different stages of scaling.

Scaling process management requires acquisition and application of new knowledge and capabilities. Learning agility is therefore relevant to scaling as knowledge and capabilities required to manage scaling change over subsequent stages of scaling. In the case of digitalized scale-ups, external knowledge is initially acquired as firms build capacity and recruit specialists. Knowledge relevant to the scaling process is also important. In scale-ups, founders without scaling experience may become a 'limit to growth' unless they have access to other leaders or experts with stage-relevant knowledge specific to the scaling process. Therefore, learning and access to such knowledge is arguably as important to the firm's transformation from start-up to scale-up for the founder/CEO, who is primarily responsible for the firm's growth strategy.

Addressing and balancing tensions during scaling is a new capability founders and wider management must learn during early scaling. While the process of how digitalized start-ups transform during scaling can be explained and understood relatively straight-forwardly from our findings and framework, the complexity comes from managing tensions and minimizing trade-offs associated with the scaling process. For example, how to balance the tensions between agile or responsive decision-making and becoming more data-driven and considerate of the wider impact of decisions on the whole firm is difficult. Or when and how to allocate resources between short-term wins and long-term growth strategies and capabilities building represents a hard choice to make. Finally, while firms need new capabilities and learning at the start of scaling, founders also need rapid learning agility to balance tensions between letting go parts of their founder role to new specialist leaders they hire, and yet remain connected to the firm. Understanding the nature of scaling tensions (e.g. relationships, how dynamic they are, in what order they should be addressed) and how founders and management successfully achieve congruence during a high-pressure period of rapid and efficient growth, to optimize outcomes and minimize trade-offs, is a potential area for future research.

A few areas within RBV theory we found that warrant deeper research relate to the view that new, small firms are largely capital constrained. However, with their efficient business models and high-growth, it is questionable whether today's digitalized, capital efficient scale-ups are *as constrained* by resources – human or financial – as in the time of Penrose's observations (i.e., increasing size of financial capital markets and funding options available to start-ups and young scale-ups has grown substantially). As has the emergence of technology-driven and more human-capital 'light' business models with high market valuations, which in turn enables them to attract funds to invest in growth. The relationship between access to funding and growth is well researched as positive (Duruflé et al., 2017). Yet many well-funded firms still fail to grow and scale.

Business model efficiency also plays an integral role in the scaling process. One view we have put forth is that future scale-ups intentionally pursue efficient business models capable of delivering scale economics and increasing per unit returns. The notion of scaling therefore commences earlier than most researchers may have previously considered. Where efficient business models have been realized early, this acts to overcome pre-conceived limits to growth including reducing uncertainty, risk, access to financial resources, or reducing the reliance on more managerial talent to help manage and overcome such risk (Gomes-Casseres, 2020). During scaling, process innovation in the form of technology, more sophisticated data analytics and new ways of thinking about resources driven by the pursuit of scale economics (e.g., network effects, virality) are enabling firms to grow much more cost-effectively, and in a relatively short span of time than during Penrose's research. Further research into how establishing early efficiency in business models of young firms, influences scaling and growth outcomes, particularly relevant to differences in human capital intensity of the firm (e.g., employees per unit of sales or margin) may help explain why some firms grow rapidly from the outset and continue scaling while in other firms, growth slows, despite early periods of high growth.

Successful scale-ups appear to strike a balance between entrepreneurship and efficiency that delivers higher than average industry growth over-time. How this balance evolves from early to later stages of scaling is unclear however, it is plausible that some scale-ups continue to act both efficiently and entrepreneurially (i.e., agile, flexible, innovative, competitive etc.) for long periods, even decades, remaining as scale-ups even after becoming large, mature firms with high market valuations (think today's Apple or Amazon). For example, how do such large, digitalized scale-ups continue to organize and balance their innovation priorities, allocating resources between product, technology, market innovation and process innovation simultaneously? How do the scaling process actors (goals, priorities, dominant activities, trade-offs) in scale-ups evolve over time and subsequent stages of scaling (e.g., internationalization or horizontal market expansion)? And how do some larger, older digitalized scale-ups assemble and reassemble capabilities

in response to their changing environment, competitive position, and growth, to remain agile, overcome constraints and continue to scale?

6. Discussion

6.1. Theoretical contributions

Our contribution to firm growth theory development is three-fold. First, we answer calls for research into scaling and the *process of firm growth*. Second, we offer rare insights on the internal workings, priorities, and activities innovative, digitalized firms and their founders prioritize during scaling, generalized to theory, and put towards a proposed *scaling process framework for digitalized scale-ups* on which other researchers can build. Third, we examine firm growth process theory relevant to today's fast-changing environments and innovative, digitalized firms, upon which we offer directions for further research to deepen our understanding of the growth process and scaling among digitalized scale-ups.

Scaling is broadly misunderstood and largely under-researched among scholars. Following inconclusiveness of findings on deterministic models of firm growth, and general misunderstandings regarding scale-ups, start-ups, and high-growth firms, we answer calls for research into scaling (Coviello, 2021; Cowan, 2022; Palmié et al., 2023; Shepherd and Patzelt, 2022) and the scaling *growth process* (Jansen et al., 2023; McKelvie and Wiklund, 2010; Piaskowska et al., 2021). Our findings led us to *open the 'black-box' of the scaling process* in digitalized firms and generate new operative insights which improve our understanding of digitalized scale-up DNA. Our findings lead to our view that the scaling process in digitalized firms is in fact a *complex mix of direct and indirect relationships* between *scaling goals, internal priorities, dominant activities*, and the *challenges of balancing tensions and trade-offs in pursuit of both high and efficient growth*. We encourage further examination and empirical research on these different factors and scaling process tensions to better understand their nature and relationships and their influence on future scaling paths and performance as part of a future research agenda. We consider our findings in terms of firm growth theories, offering several observations and potential avenues for future research on scaling within the context of today's digitalized scale-ups.

6.2. Practical contributions

Scaling is an important topic among practitioners and contributions from our study are predominantly directed towards founders and operators of digitalized scale-ups and start-ups seeking to scale. We hope that our scientifically based findings and progress *towards a scaling process framework* for digitalized scale-ups provides a more structured way for digitalized start-ups to approach scale-up transformation. Arranging priorities, allocating resources and adopting new capabilities at the start of scaling. To successfully navigate the scaling process, founders should seek new, external sources of knowledge and know-how that are scaling-stage relevant and seek to transform themselves alongside their firms, despite being faced with seemingly insurmountable odds.

6.3. Limitations & further research

There are several limitations with our study. Our study is only specific to digitalized scale-ups, all of whom we identified as deploying digitalized business models and discontinuous product innovation. We do not claim our findings or framework would be suitable for all start-ups and scale-ups, including other types of technology-based start-ups, particularly hardware or materials science technologies such as found in clean tech, climate tech, med tech or advanced manufacturing. Or firms with other business models, where digital technology is predominantly a growth enabler, not an outcome or substantial part of the product or service offering (e.g., retail, wholesale). However, we encourage similar in-depth research among other technology-based business models (e.g., clean tech, climate tech or med tech) for comparison. We do not claim that our operative findings regarding the internal workings and activities of the firm or on the complexity of managing scaling process tensions during scaling is exhaustive, however we have aimed to identify, sort, and categorize the dominant themes and aggregate dimensions, narrate on the different relationships, and variables we found in our sample as a springboard for fellow researchers engaged in this area. Further qualitative and empirical research would help validate and understand for example, the nature of the tensions or founder learning agility on speed of scale-up transformation or firm performance, validating our findings, proving directness, and mitigating factors between these variables and their relationships.

The scale-ups in our sample are young, and their ultimate growth path and success is yet unknown. Because all the founders interviewed came from scale-ups, we cannot say with certainty that all our findings are unique only to digitalized scale-ups as compared to other mid-stage or mature firms experiencing high-growth periods. However, we can say that our findings help us to further our understanding of the scaling process in digitalized firms and identify new dynamic capabilities relevant to transformation from digitalized start-up to scale-up.

7. Conclusion

Scaling in digitalized firms is a complex mix of related *internal activities, priorities*, and *trade-offs* synchronistically managed in pursuit of both high *and* efficient growth. Three firm-level priorities and goals and four related tensions relevant to the scaling process emerge from our analysis, which we aggregate *towards a scaling process framework for digitalized scale-ups*. While a fourth priority relevant to the founder's transformation to CEO also emerges. We conclude that although digitalized firms and growth patterns may be heterogeneous, *digitalized scale-ups have commonality in their scaling process*. We propose future scaling research focus on founder learning agility and scaling process tensions as management learn to balance and optimize trade-offs and outcomes relative to subsequent stages of scaling.

CRediT authorship contribution statement

Claire Mula: Conceptualization, Data curation, Formal analysis, Visualization, Writing – original draft, Writing – review & editing. **Nora Zybura:** Conceptualization, Data curation, Formal analysis, Supervision, Validation, Writing – original draft, Writing – review & editing. **Thomas Hipp:** Conceptualization, Data curation, Formal analysis, Methodology, Visualization, Writing – original draft, Writing – review & editing.

Data availability

The authors do not have permission to share data.

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Appendix A

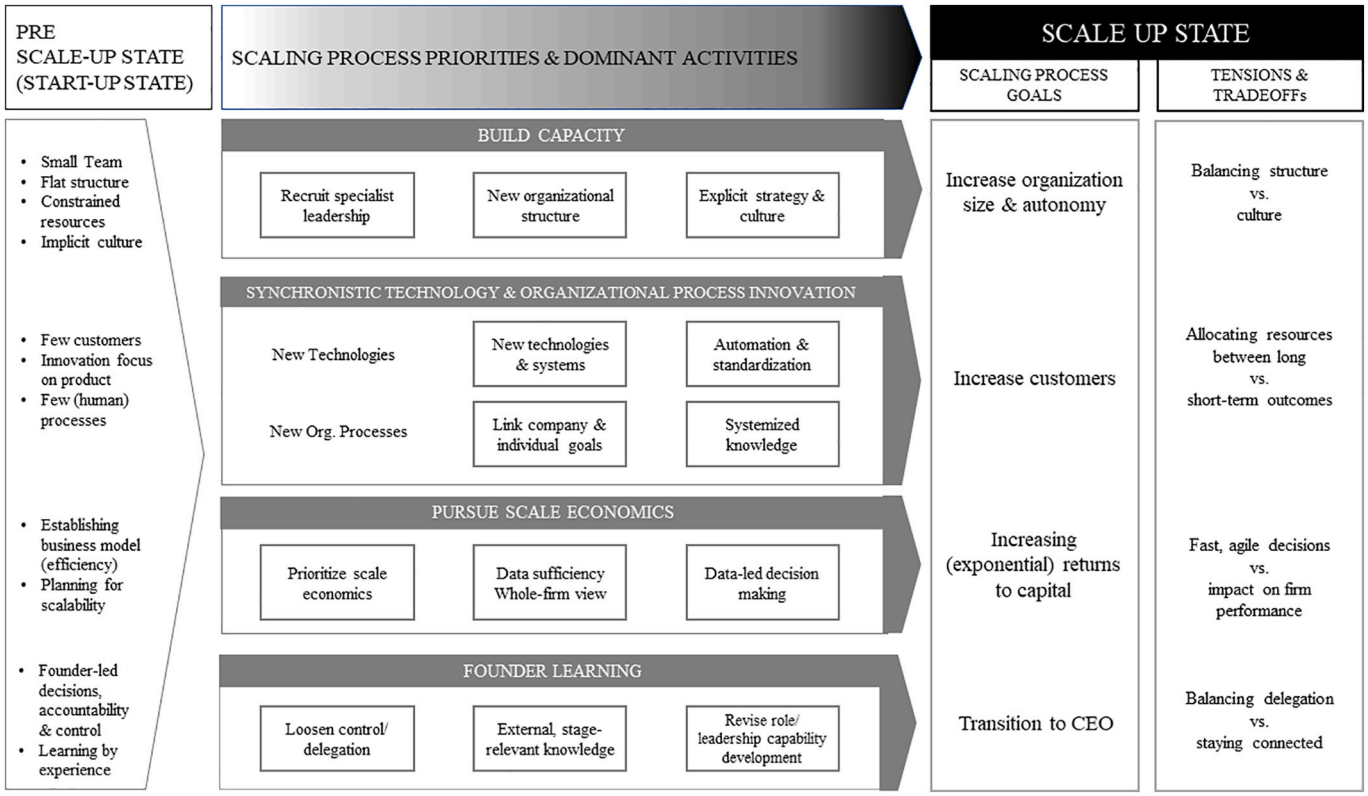

Fig. A.1. Data structure.

Table A.1
Detailed information on interviewees and companies.

Interview code	Interviewee role	Headquarters	Industry	Industry classification[8]	Customers	Employee size	No. of founders	Company Status	Financing estimate – USD million	Foundation year	Firm age	First year of scaling	Age at start of scaling	Years of scaling
1	Founder/ CEO	Australia	Finance	522,291	Business	400	4	Active	$40	2013	9	2016	4	5
2	Founder/ CEO	Germany	Retail	541,810	Consumers & Business	175	3	Active -Acquired[3]	$31	2011	11	2014	4	7
3	Founder/ CEO	United Kingdom	Advertising	541,613	Business	135	1	Active	$23	2012	10	2016	5	5
4	Founder/ CTO	Malaysia	Finance	522,320	Consumers & Business	160	4	Active-Acquired[1]	$0.375	2018	4	2020	3	1
5	Founder/ CEO	Australia	Technology	518,210	Business	27[2]	2	Active	$3.7	2011	11	2015	5	6
6	Founder/ MD	Germany	Logistics	541,614	Business	180	2	Active	$31	2015	7	2017	3	5
7	Founder/ CEO	Germany	Finance	522,320	Business	120	2	Active	$43[6]	2017	5	2019	3	2
8	Founder/ CEO	Germany	Insurance	524,210	Consumers	120	3	Active	$53	2015	7	2019	5	2
9	Founder/ CEO	Singapore	Advertising	541,613	Business	140	3	Closed	$5	2008	14	2014	7	7
10	Founder/ CVO	Germany	Media	516,210	Business	100[7]	2	Active	$4.75	2012	10	2019	7	3
11	Founder/ CEO	Germany	Accounting	541,219	Business	200	2	Active	$78	2013	9	2017	5	4
12	Founder/ CEO	Australia	Sharing economy	812,930	Consumers	25	1	Active	$3.7	2015	7	2017	3	4
13	Founder/ MD	Germany	Professional services & Technology	511,210	Business	251–500	3	Active -Acquired[3]	$3.5[3]	2006	10[4]	2013	8	2
14	CEO	Malaysia	Real Estate	237,210	Consumer & Business	300	3	Active-Acquired[5]	$100	2007	15	2010	4	11

(*continued on next page*)

Table A.1 (*continued*)

Interview code	Interviewee role	Headquarters	Industry	Industry classification[8]	Customers	Employee size	No. of founders	Company Status	Financing estimate – USD million	Foundation year	Firm age	First year of scaling	Age at start of scaling	Years of scaling

All data is as at time of interview sourced from the interviewee and verified with external sources including Crunchbase, firm's own websites, and press articles. Financing rounded to protect confidentiality.

[1] Company was acquired after the interview Q4, 2021 and continues as a wholly owned subsidiary. [2] Staff size at time of acquisition [3] Company was acquired in year 10 and remains an active subsidiary. [4] Excludes series B funding from sale of professional services part of business in 2013. [5] Company was acquired twice in its history. [6] Additional funding has been raised post the interview. [7] Includes full-time equivalent consultants and staff. [8] Following the 2022 North American Industry Classification System (NAICS).

Interview code	Interviewee role	Innovation type[1]	Growth mode[2]	Digital business model offering[3]
1	Founder/CEO	Tech discontinuous	Organic	Digital services
2	Founder/CEO	Tech discontinuous	Organic	Digital services
3	Founder/CEO	Tech & commercially discontinuous	Organic	Digital services
4	Founder/CTO	Tech & commercially discontinuous	Organic	Digital services
5	Founder/CEO	Commercially discontinuous	Organic	Digital services
6	Founder/MD	Tech discontinuous	Organic	Digital services
7	Founder/CEO	Tech & commercially discontinuous	Organic	Digital services
8	Founder/CEO	Commercially discontinuous	Organic	Digital services
9	Founder/CEO	Tech discontinuous	Hybrid	Human & Digital services
10	Founder/CVO	Tech & commercially discontinuous	Organic	Digital product
11	Founder/CEO	Commercially discontinuous	Organic	Digital services
12	Founder/CEO	Commercially discontinuous	Organic	Digital services
13	Founder/MD	Tech & commercially discontinuous	Organic	Human & Digital services
14	CEO	Tech discontinuous	Acquisition	Digital services

[1] Innovation type based on Wu and Wang (2006) Integrative framework for discontinuous paths and authors interpretation: Researcher categorization by Commercially discontinuous means existing tech used to meet new customer needs; Tech discontinuous means new tech and products meets existing customer needs; Tech & Commercially discontinuous new tech chosen to meet new customers' needs. [2] Researchers categorization based on McKelvie and Wiklund (2010) and interview. [3] Following the classification of Bock and Wiener (2017).

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