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Digital Gazelles: Challenges of Digital Startups during Phases of High Growth

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Full research paper

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Abstract

To investigate the challenges that high-growth digital startups ("digital gazelles") face, we conducted an exploratory study of this under-researched class of enterprises at the intersection between information systems and entrepreneurship research ("digital entrepreneurship") and propose a digital gazelle definition. We base our findings on an interview study with high-ranking representatives of 14 digital gazelles of different company ages and from different countries and industries. By following a grounded theory approach, we identified nine key challenges across the three areas of management, organization structure, and technology/systems. Building on this, we aim to better capture the strong link between the management and the digital technology use of startups in the digital age. Digital gazelles' leaders can draw on our results to prepare their organizations for further growth.

Keywords: digital entrepreneurship, digital gazelles, digital technologies, high growth, challenges

1 Introduction

Emerging and established digital technologies occupy a prominent position in information systems (IS) research and their intersection with the entrepreneurship discipline—recently coined as digital entrepreneurship. In this context, digital technologies demonstrate enormous potential to innovate, disrupt, and transform entire business areas (Von Briel et al. 2021; Nambisan et al. 2019; Sahut et al. 2021). Understood as key drivers of organizational transformation (Bailey et al. 2022; Bharadwaj et al. 2013; Yoo et al. 2012), digital technologies can significantly support rapid business growth through innovation (Huang et al. 2017) and their strategic use can help small firms survive in a competitive environment (Chan et al. 2020).

However, the actual impacts of digital technologies, especially on rapidly growing organizations—called "gazelles" in the literature (Acs and Mueller 2008; Birch and Medoff 1994; Henrekson and Johansson 2010)—are largely unexplored. To study high-growth digital organizations ("digital gazelles"), we draw on this concept and seek to extend it to better capture the specifics of these companies. Here, we focus on digital gazelles as startups and small businesses in the range of 10 to 100 employees during their phases of high growth. In this size range, we expect major growth-related organizational and technological changes and related challenges. Digital gazelles, in our understanding, are "grown or born digital" (Tumbas et al. 2015) and rely heavily on digital technologies—such as cloud, blockchain, digital platforms, artificial intelligence (AI), and the Internet of Things (IoT)—as core enablers and components of their business or operating models. Consequently, we expect digital gazelles to face different challenges compared to "regular" (non-digital) gazelles. In our study, we therefore aim to understand digital gazelles' specific challenges during rapid growth, with a special focus on how digital technologies support organizational agility and enable rapid business growth at different stages of development. Thus, we address the following research question:

What are the challenges digital gazelles face during phases of high growth?

Our findings contribute to the digital entrepreneurship literature in two ways. First, we make a terminological contribution by introducing and defining the concept of digital gazelles. Second, we identify the specific challenges digital gazelles face during phases of high growth. An improved understanding of the managerial, organizational structure-related, and technology- and systems-related challenges may help founders and managers of digital gazelles better cope with increasing complexity during phases of rapid growth.

2 Theoretical and Conceptual Foundations

2.1 A Socio-Technical Systems Perspective on Entrepreneurial Growth

From a socio-technical perspective, organizations are inherently intertwined with technologies (Leavitt 1965). As multivariate systems, they consist of "four interacting and aligned components—task, structure, actor, and technology" (Lyytinen and Newman 2008, p. 594). Here, the social system represents, among others, the relationships between people and authority structures, whereas the technical system deals with processes, tasks, and technologies. These systems are independent of each other, but interact correlatively; their output is the result of the joint interactions of both (Bostrom and Heinen 1977). Thus, social and technological interactions are recursive, as "users shape the technology structure that shapes their use" (Orlikowski 2000, p. 407), and are to be considered in an environmental context (Lyytinen and Newman 2008). In this context, the strategic alignment of information technology (IT) with business needs is not to be understood as an event but as "a process of continual adaptation and change" (Henderson and Venkatraman 1993, p. 473). Since digital technologies (e.g., a cloud-based, scalable digital infrastructure to sustain organizational agility along with the collection, analysis, and evaluation of business data to support (strategic) decision-making) can be understood as enablers of business growth, a closer look at the individual growth phases of startups and small businesses thus requires a strong consideration of digital technologies. This leads to the need for a holistic view of social and technical aspects and their synergistic relationships in small digital organizations during phases of rapid growth.

In 1994, Birch and Medoff coined the term "gazelle" for high-growth firms that contribute substantially to the net job growth in the economy. These gazelles can be found in all industries, such as health care, textiles, and even cookie-making, with "high tech" making up only 2.5% of such companies, as gazelles are "predominantly appliers of technology, not creators of it" (Birch and Medoff 1994, p. 164). While most of the gazelles start very small—with 1 to 19 employees—when they enter phases of rapid growth, some start with an employment size of more than 100 employees (Birch and Medoff 1994). One year

later, Birch et al. (1995) operationalized the term "gazelle" as "a business establishment which has achieved a minimum of 20% sales growth each year over the interval, starting from a base-year revenue of at least US$100,000." This is more in line with a recent Organization for Economic Co-operation and Development (OECD) definition of high growth, which measures high growth (>20% per annum over a three-year period) by the number of employees or by turnover (OECD 2008).

However, the definitions of high-growth companies and gazelles are inconsistent in the literature, as high growth "is multidimensional in nature [and] can be achieved in a variety of ways" (Delmar et al. 2003, p. 37). Other authors call small high-growth firms "flyers" (Gallagher and Miller 1991), refer to gazelles as a subset of high-growth companies that are up to five years old (OECD 2008), or distinguish between gazelles and high-impact firms (Acs et al. 2008). For the latter, with an average age of 25 years, expanding employment is combined with rising revenue (Acs et al. 2008). This includes a definition of gazelles as rapidly growing firms with 20–499 employees in the year of entering phases of high growth, which separates them from small, slow-growing firms with less than 20 employees (mice) and large firms with more than 500 employees (elephants) (Acs and Mueller 2008). Moreover, different growth indicators (e.g., increase in the number of employees or growth in sales, or as x percent of the fastest-growing firms in the country) are proposed to measure gazelles. Alternately, it is debated whether there should be a size or an age limit for gazelles (Henrekson and Johansson 2010). In summary, shared characteristics in these definitions are a growth indicator, such as employees or sales growth, usually expressed as a percentage per annum, and a coherent growth period that is usually between 3 and 5 years. A threshold of 10 employees is recommended to identify the beginning of a growth period (OECD 2008).

Finally, as is widely accepted, organizations undergo different stages of evolution and revolution when aging and growing (Greiner 1998). Birch and Medoff (1994) noted that gazelles in 1993 on average consisted of 61 employees. Considering this, and given our research focus on organizations with 10 to 100 employees, most gazelles fit into small business growth models (e.g., Churchill and Lewis, 1983; Scott and Bruce, 1987; Steinmetz, 1969). These generally include aspects of (top) management style, organizational structure, and (formal) systems. In these stages of development, a plethora of socio-technical challenges needs to be addressed "as people, planning, and systems gradually increase" (Churchill and Lewis 1983, p. 10).

2.2 The Digital Gazelle

To transfer the concept of gazelles to the digital age and to better distinguish between digital and non-digital challenges during phases of high growth, we first need to determine what makes an enterprise "digital," as its understanding and expression varies widely in the IS literature (e.g., Baiyere et al. 2023; Rodriguez and Piccoli 2018). To this end, digital technologies, which occupy a prominent position in the process of entrepreneurial growth (Lehmann and Rosenkranz 2018; Nambisan 2017; Steininger 2019; Tumbas et al. 2018), must be taken into account to understand what makes an enterprise digital. Viewed as "combinations of information, computing, communications, and connectivity technologies" (Bharadwaj et al. 2013, p. 471), digital technologies can fundamentally transform and scale business models (Tumbas et al. 2015), significantly enhance operations and processes, and "shape the business infrastructure and influence new organizational logic and patterns of coordination within and across" (Bharadwaj et al. 2013, p. 480). In terms of organizational logic, digital technologies enable "new forms of collaboration and coordination, such as non-hierarchical, boss-less, or agile organizations" (Bailey et al. 2022, p. 2). Here, elements in a heterarchical (i.e., non-hierarchical) organizational structure are potentially equal and not ranked in contrast to hierarchical organizational structures where these tend to be subordinate and ranked (Crumley 1979). In this context, adopting agile practices can support firms in increasing flexibility and speed (Gerster et al. 2018; Horlach et al. 2020). However, strict adherence to agile practices and methods, for example, can also have adverse effects (e.g., on innovation activities or the development of products), as these may function as a "control imperative," and a sense of collective ownership can lead specialists to become generalists (Annosi et al. 2022). In addition, digital technologies support enterprises in sustaining agility by establishing technology-enabled processes, evaluating product performance and monitoring changes, engaging with external communities, or combining internal and external resources to develop services or products (Chan et al. 2020). In terms of innovation, organizations may also develop ambidexterity at different levels (e.g., firm or business unit), which is positively associated with firm survival (O'Reilly III and Tushman 2013). Here, "organizational ambidexterity refers to the ability of an organization to both explore and exploit—to compete in mature technologies and markets where efficiency, control, and incremental improvement are prized and to also compete in new technologies and markets where flexibility, autonomy, and experimentation are needed" (O'Reilly III and Tushman 2013, p. 2). Hence, digital technologies are crucial for the design of business models that can be considered digital if "digital technologies trigger

fundamental changes in the way business is carried out and revenues are generated" (Veit et al. 2014, p. 48). In line with this, another crucial factor is reflected by the challenge of building a digital infrastructure, defined as "digital technology tools and systems (e.g., cloud computing, data analytics, online communities, social media [...]) that offer communication, collaboration, and/or computing capabilities to support innovation and entrepreneurship" (Nambisan 2017, p. 1032), while enabling a greater reliance on data-driven (algorithmic) decisions (Alaimo and Kallinikos 2022; Vial 2019).

Building on the aforementioned IS and entrepreneurship literature and paying close attention to Steininger's (2019, p. 377) model of typical co-occurrences of IT use in entrepreneurial business models, and, in particular, the two pillars of infrastructure and product ("a company's bundle of products and services") of entrepreneurial business models (Osterwalder et al. 2005, p. 18), we propose to distinguish gazelles from digital gazelles in terms of the degree of an integrated digital infrastructure (process-digital) and offered products and/or services (product- or service-digital). This contrasts digital gazelles as high-growth organizations from other slow- and moderate-growing digital and non-digital organizations (Figure 1).

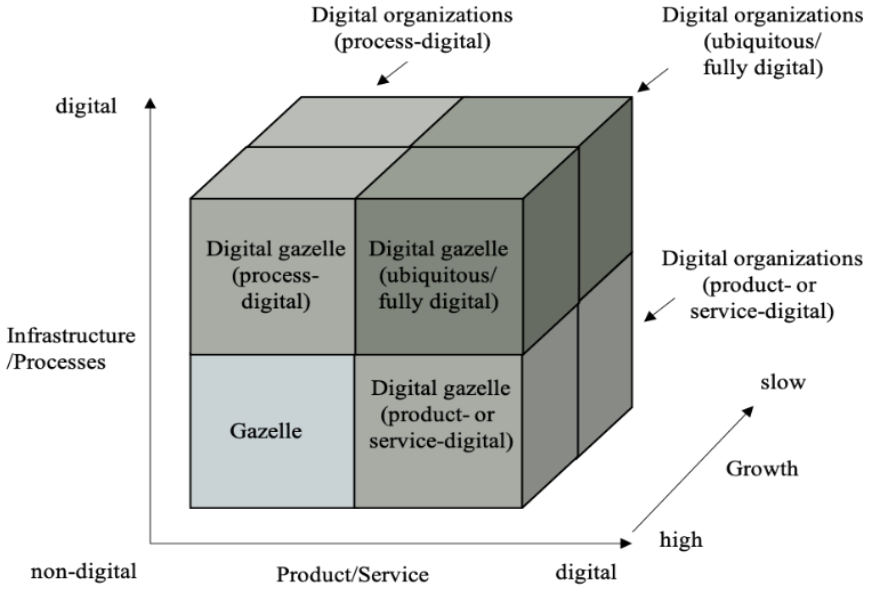

Figure 1. Classification of Digital Gazelles

Following this, we define digital gazelles as "all enterprises primarily offering digital products and/or services and/or relying on an integrated digital infrastructure, with an average annualized employee and/or sales-growth greater than 20% per annum, over a three-year period starting from 10 employees or US$100,000." Note that our definition deliberately allows digital gazelles to be active in traditional industries and excludes a limit on company age and size despite focusing on startups and small businesses in this study.

3 Research Methodology

We conducted a qualitative exploratory study to improve the understanding of the digital and non-digital challenges of digital gazelles at the intersection between IS and entrepreneurship. Using grounded theory (Strauss and Corbin 1998), we sought to identify and categorize these challenges, giving special attention to the impact of digital technologies on the three areas of management, organizational structure, and technology/systems. This approach was particularly useful as "grounded theory can also be used for developing non-theory (conceptual ordering or elaborate description)" (Jones and Noble 2007, p. 93). In doing so, we drew on a cross-sectional sample of 14 digital entrepreneurial organizations. To achieve a certain level of heterogeneity, we sought small, digital, rapidly growing organizations from different countries with an employee or sales growth rate of more than 20% per annum over several years. These were primarily in a size range between 10 and 100 employees, as we expected major organizational and technological changes there (e.g., in professionalizing (digital) leadership, introducing new organizational and agile structures, or building an integrated digital infrastructure). All companies exhibited a high level of familiarity in dealing with digital technologies (e.g., cloud solutions).

Following this, by drawing on the concept of Tumbas et al. (2015), we differentiated between "born digital" and "grown digital" organizations, as we expected different technological prerequisites when digital gazelles enter stages of high growth. While born digital organizations are by nature agile and are already embedded in digital technologies and infrastructures when they enter stages of growth, grown digital companies have to develop an integrated digital infrastructure over time due to their partially paper-based processes (Tumbas et al. 2015). Moreover, we distinguished between software-centric and hardware-centric business models, as we anticipated differences in organizational structure (e.g., in terms of agility) and technology use (e.g., in terms of data-driven decision-making). In addition, by referring to the "born global phenomenon" (Oviatt and McDougall 1995), we differentiated between "grown global" and "born global" startups. As digital technologies (e.g., platforms) enable early-stage startups' international endeavors (Nambisan et al. 2018), these seize the opportunities of globalization in early or later growth phases compared to locally or country-wide operating startups.

Supplemented by secondary data (e.g., websites and press reports, financial and funding statements, social media posts), we conducted semi-structured interviews with one suitable representative from each company (Table 1). This supported "to obtain both retrospective and real-time accounts by those people experiencing the phenomenon of theoretical interest" (Gioia et al. 2013, p. 19). The interviewees consisted of the (co-)founders or chief executive officers (CEOs) of the companies, or long-term employees with a strategic focus from the C-suite (e.g., the chief operating officer (COO) or the chief finance officer (CFO)). While all companies at least partly used cloud solutions to operate their businesses, the companies differed in the maturity of their digital infrastructure and in their use of digital technologies for their business model. For example, company M had a high degree of digitalization in all areas; its business model was primarily based on offering digital certificates and learning units. For platform and product development and processing, blockchain technology as well as digital technologies, such as virtual reality (avatars) and gamification, were used. With its fully integrated digital infrastructure, including collaboration tools and cloud solutions, the company was capable of operating 100% remotely and relied on data-driven decisions. In contrast, company A's business model mainly focused on online services, such as website development and search engine optimization, while the company also offered offline consulting services and was comparatively less integrated in its infrastructure, as some processes were still paper-based and not all applications were fully integrated in a cloud environment. Although the company relied heavily on social media, its digital technology usage and depth were more limited compared to company M.

#	Founding year	Employees (2021)	Country	Interviewee	Length (min)	G/B	SW/ HW	g/b	Industry
A	2009	150	GER	CEO	63	G	SW	-	Marketing
B	2015	36	GER	CEO	73	B	SW	g	eCommerce
C	2014	59	GER	Co-founder	41	B	SW	g	Advertising
D	2015	85/35*	GER	CFO	70	G	HW	g	Electronics
E	2015	98	GER	Co-founder	61	B	SW	b	Fashion
F	2015	198	GER	COO	51	B	SW	b	Marketing
G	2014	58	NZ	CEO	54	B	SW	b	Marketing
H	2018	22	NZ	CEO	53	B	SW	b	Software
I	2007	87	NZ	CEO	54	G	SW	g	Market research
J	2017	65	NZ	CEO	53	B	SW	b	Accounting
K	2014	50	NZ	Co-founder	62	B	HW	g	Automotive
L	2008	25	NZ	CEO	55	G	SW	g	Payroll
M	2018	40	FRA	CEO	55	B	SW	b	Education
N	2019	40	EST	Co-founder	60	B	SW	b	Last mile delivery

= Company; * = Highest number of employees vs. end of 2021; GER = Germany; NZ = New Zealand; FRA = France; EST = Estonia; G/B = grown/born digital; SW/HW = software-/hardware-centric; g/b = grown/born global; - = operates only regionally or country-wide

Table 1. Sample of Digital Gazelles from Germany and New Zealand

The research process included several cycles of iterative data collection and analysis. Through a previous three-year research project with company A, we were able to gather initial evidence on growth-related

challenges for digital gazelles (e.g., sustaining their organizational agility) and their technology use. Building on initial insights and reviewing the literature on gazelles and the growth phases of startups and small businesses, this was the starting point for the development of the interview guideline for the first semi-structured interview with the CEO of company A. This guideline was then adapted for the interviews that followed.

All interviews were transcribed and analyzed using the qualitative data analysis tool MAXQDA by following the grounded theory steps of open, axial, and selective coding (Strauss and Corbin 1998). In this process, we identified initial concepts, abstracted these by developing categories (themes), and related them to each other. As we wanted to open up the data to all potentials and possibilities within them, we started with open coding the impingements of growth, related challenges, and characteristics of digital gazelles. The data gathered and analyzed from company A served as the baseline for coding the subsequent interviews. Building on our initial concepts and associated tentative categories, we applied axial and selective coding to first develop and relate our categories (e.g., technological or managerial challenges) to each other. Then we integrated and refined them to finally reveal a set of nine overarching key challenges digital gazelles face during phases of high growth. By aligning them with selected dimensions of small business growth models, the aggregate dimensions were classified into managerial, organizational structure-related, and technology- and systems-related challenges. In this process, to make the data structure visible, we used the methodology of Gioia et al. (2013) (Figure 2).

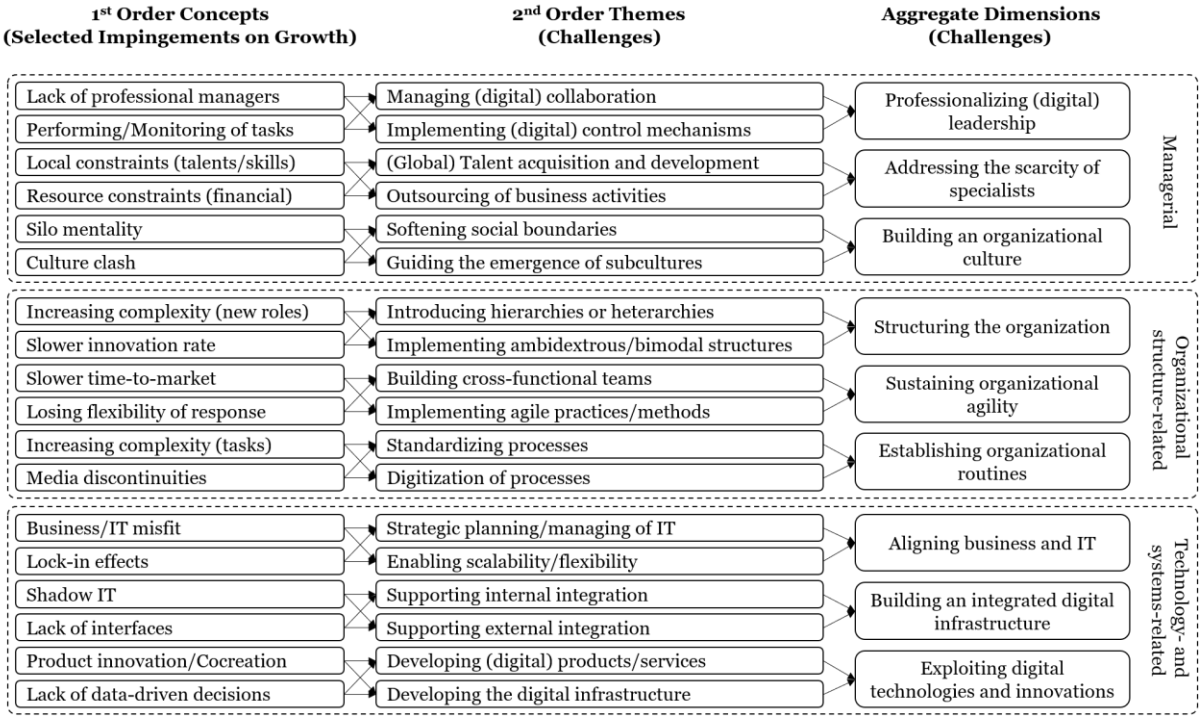

Figure 2. Challenges of Digital Gazelles during Rapid Growth

4 Findings

In the following sub-sections, we present our findings by elaborating on the managerial, organizational structure-related, and technology- and systems-related challenges that digital gazelles face during phases of rapid growth (Figure 2).

4.1 Managerial Challenges

In our study, we observed three managerial key challenges of digital gazelles (M-I to M-III), deepened by associated sub-challenges (e.g., M-Ia).

First, the high growth of digital gazelles has led to challenges in terms of *professionalizing (digital) leadership* (M-I) in a short time. Given their propensity to have their employees work mostly remotely (with the exception, of course, of physical activities, such as rental car maintenance in the case of company K), digital gazelles needed to orchestrate digital collaboration (M-Ia) and find the right (digital) tools and control mechanisms (M-Ib) to support this. For example, companies F and J

introduced the objectives and key results (OKR) framework to support leadership from a distance. This was accompanied by traditional challenges, as evident in company I, which faced a leadership crisis at 20 employees, as it needed strong leadership but could not afford professional managers. Moreover, differences in the preference for digital working were noticeable: while some companies, such as companies A and D, emphasized the advantages of a presence culture, other companies, such as company B, switched from a company of presence to a fully remote company because of local constraints, while company N dispensed with a physical office from the beginning. This highlights the need to integrate online and offline leadership and to support it with targeted measures, reward systems, and control mechanisms.

Second, alongside the traditional challenge startups face in finding and retaining human talent, most digital gazelles depended heavily on acquiring business and IT talents to develop and sell their software and hardware products and services due to their high degree of digitalization. To *address the scarcity of (business and IT) specialists* (M-II), digital gazelles increasingly leveraged global recruitment and remote working (M-IIa). For example, this was of particular interest to company E for which people from 25 nations worked, as its rapid growth would not have been possible in this form due to local constraints in Germany and its subsidiary in the Netherlands. Moreover, some of the gazelles, such as companies A or D, developed their own "talent development programs," or so-called "academies," to support the development of business and IT know-how. Furthermore, some of the digital gazelles outsourced some of their business activities (M-IIb) to address the lack of human resources or to achieve cost advantages. This was evident, for example, in company G, which outsourced its Tier 1 support to the Philippines and parts of its software development to Sri Lanka.

Third, *building an organizational culture* (M-III) that supported efficient communication and collaboration was essential for most of the digital gazelles. In this context, the founder's role and professional background were not only crucial for choosing and implementing new systems but also for shaping the organization during the founding period and softening social boundaries (M-IIIa) between teams and employees as organizational complexity increased due to more roles and functions in later stages. This had a lasting impact on the organization and its culture and can be related to the concept of imprinting (Marquis and Tilcsik 2013). Accordingly, the majority of digital gazelles placed a high value on building a strong organizational culture (e.g., through the function of people/culture managers) in the early phases. In this context, most digital gazelles placed less emphasis on hierarchies and, despite the possibility of working remotely to a significant extent, regularly organized joint activities and events to strengthen the corporate culture. For example, company E rented a large chalet in Austria for 6 weeks to promote creativity, innovations, and team cohesiveness, where all employees were invited to work from there and to get to know each other as they were able to work almost 100% remotely. In addition, the organizational growth of company F was accompanied by increasing cultural challenges, as the "sworn family" began to develop subcultures (M-IIIb). Thus, the corporate culture becoming more heterogeneous was a major challenge for company F and harmed organizational performance and agility when new managers hired employees who better represented their own personal values but did not fully identify with the corporate identity.

In summary, globalization efforts and digital collaboration presented digital gazelles with the challenge of professionalizing leadership in both online and offline realms, which required the implementation of control mechanisms in the early phases of growth, particularly when introducing a middle management layer. While talent acquisition spanned all phases of growth, companies A or D, for example, did not begin to develop explicit "talent development programs" until late stages, although skills development played a significant role in earlier stages as well. This was also evident in cultural topics. Most digital gazelles placed high value on team-building activities that support (informal) communication and collaboration early on but were, in later stages, confronted with growth-accompanying challenges as subcultures emerged, which significantly hampered organizational agility and performance.

4.2 Challenges Related to the Organizational Structure

Moreover, we identified three key challenges of digital gazelles related to the organizational structure (O-I to O-III), deepened by associated sub-challenges (e.g., O-Ia).

First, the challenge of *structuring the organization* emerged (O-I). Due to a rapidly increasing number of employees and, thus, organizational complexity, digital gazelles needed to introduce hierarchies or heterarchies in a short time (O-Ia). In this context, new demands on communication, collaboration, and leadership arose as responsibilities changed and new functions and roles emerged. Furthermore, in some cases, the evolving of ambidextrous structures was evident (O-Ib). On the one hand, several digital gazelles (e.g., company F or N) increasingly relied on ambidextrous structures to support product

innovations in the sense of the separation between exploitation and exploration when the companies had achieved more mature organizational structures compared to their early stages of growth. On the other hand, bimodal IT structures were rudimentary and only introduced in a few cases due to size (as shown in company E, where three employees were responsible for IT infrastructure issues and the majority of IT was divided into product and innovation teams).

Second, *sustaining (the initial) organizational agility* (O-II) as a startup while complexity increased due to growing organizational structures was crucial for the ability of digital gazelles to stay competitive. In line with the challenge of introducing new (heterarchical) organizational structures, most digital gazelles increasingly promoted the cross-functionality of teams (O-IIa), as was evident, for example, in company I or H. Moreover, many of the gazelles relied at least partially on agile practices and methods (e.g., Scrum, Kanban, daily meetings, and burndown charts for sprints) tailored to their business needs. In this context, implementing agile practices and methods (O-IIb) supported digital, borderless, and asynchronous collaboration while maneuvering through turbulences of fast-paced internal and external changes. Working, among others, with the agile business operations decision-making framework, the CEO of company N promoted the need to implement agile practices, tailored to the department's needs. In this context, weekly sprint planning was understood as a general orientation, which came along with the task of synchronizing the individual teams. In the case of company J, almost the entire company worked in the same sprint cycle with regular standups each morning, on the one hand and without the pressure of having to deliver on fixed weekly deadlines on the other. Thus, the company did not strictly adhere to agile methods, but rather internalized a holistic agile philosophy, adapted to the respective needs of the individual departments.

Third, digital gazelles faced the challenge of *establishing organizational routines* (O-III). In this context, they needed to find a balance between formal rules and case-by-case decisions that matched the growing organizational complexity (e.g., through new employees, processes, and structures and, thus, avoiding over-organization or "bureaucratization"). On the one hand, standardized processes (O-IIIa) promoted organizational agility through the more efficient distribution and processing of tasks, but on the other hand, they posed the risk of slowing them down through "bureaucratization." During this continuous rebalancing, companies needed to (re-) position themselves within the continuum between mutual adjustment and standardization while picking up the chances of digitizing processes (O-IIIb) to overcome media discontinuities and to support efficiency and integration.

In summary, with growing organizational complexity, several challenges of structuring the organization arose. While, in some cases, implementing ambidextrous structures supported digital gazelles in sustaining their agility and innovation rate, this development was primarily observed in later stages due to their size. In some cases, organizational growth also led to the development of cross-functional teams and included the implementation of agile practices and methods. This also aligns with the growing need for standardizing and digitizing processes in the early stages of growth to avoid long-term costs due to high integration efforts.

4.3 Challenges Related to Technologies and Systems

Finally, three technology- and systems-related key challenges of digital gazelles were identified (T-I to T-III), deepened by associated sub-challenges (e.g., T-Ia).

First, to ensure scalability and flexibility in the face of high growth and to avoid long-term costs due to a loss of organizational agility and non-integrated software solutions, digital gazelles needed to plan IT strategically to *align IT with business needs* (T-I). This was particularly evident in grown digital gazelles, although it also occurred in born digital gazelles with their comparatively higher proportion of software as a service (SaaS) and cloud solutions from the beginning. For example, with its fragmented IT landscape, lack of interfaces, partially paper-based processes, and increasing complexity in communication and collaboration due to a rising number of cross-departmental customer projects, company A faced the threat of losing organizational agility and significant financial losses due to processual inefficiency over the next few years. In this context, planning and consolidating the IT infrastructure (T-Ia) at a size of approximately 100 employees became a strategic decision for company A, which led to the introduction of a cloud-based enterprise resource planning (ERP) system as a part of the development of a digitalization strategy. Additionally, since digital gazelles must ensure the scalability, flexibility, and integration of their digital architecture (T-Ib) to support rapid growth, short-sighted planning of the digital infrastructure significantly inhibited organizational agility in some cases and led to high long-term costs through the high integration efforts of processes, software, and interfaces.

Second, *building an integrated digital infrastructure* (T-II) was a major challenge particularly for grown digital gazelles, as internal communication and collaboration became more complex and the interaction (as well as integration efforts) with customers, suppliers, and partners increased over time. Since systems and software integration was crucial for many internal (T-IIa) and external business processes (T-IIb), their strategic planning was often led by the C-level (e.g., evident in company A) and supported by external service providers or by internal, IT-savvy employees or enterprise architects, especially in the early growth phases.

Third, *exploiting digital technologies and innovations* (T-III) was crucial for developing (digital) products, services, and the digital infrastructure. While, in some cases, digital technologies and software solutions were assigned a primarily supporting role, in most cases, their high relevance for developing (digital) products, services (T-IIIa), and the digital infrastructure (T-IIIb) became clear. For example, cloud technology was used extensively in all cases. Its significance for the integration of processes and systems could also be associated with the use of AI for data analysis and decision-making. Moreover, while company M used blockchain technology to enable global cryptocurrency payments, other companies used remote technologies to take advantage of globalization opportunities (e.g., outsourcing business activities).

In summary, major differences between born digital gazelles, with their higher proportion of digital processes and cloud solutions from the beginning, and grown digital gazelles in terms of business–IT alignment challenges were evident. While born digital gazelles in the early stages of rapid growth already had a digital infrastructure that generally supported scaling and integration efforts, the integration of heterogeneous IT systems and the path to the cloud presented grown digital gazelles with greater challenges, particularly in later stages. Since digital technologies were important enablers of growth (e.g., supporting collaboration or creating opportunities for enhancing the business model), their adoption reached all phases, from inception to maturing resources.

5 Discussion and Conclusion

Through our study, we contribute to the relatively young body of digital entrepreneurship literature by 1) introducing and defining the concept of digital gazelles and 2) developing a better understanding of their challenges during phases of high growth.

First, based on the extant literature on high-growth enterprises ("gazelles") and digital technologies with their enormous potential to innovate, disrupt, and transform entire business areas, we make a terminological contribution to the research vocabulary by introducing and defining the concept of digital gazelles. These can be distinguished from "regular" gazelles by their relatively higher degree of an integrated digital infrastructure and digital products and/or services. Moreover, in light of the recent discourse on digital x (Baiyere et al. 2023; Rodriguez and Piccoli 2018), our findings also provide theoretical fuel for questioning whether a company should be considered digital or not. For example, company M stood out with its 100% digital products and services, its intensive use of digital technologies such as blockchain and virtual reality, and its integrated cloud infrastructure that enabled data-driven-decision making and allowed completely remote operations when needed. This contrasts with, for example, company K, which was also entirely in the cloud and developed its own software but had a high proportion of offline activities in the area of car sharing.

Second, we identify nine overarching key challenges of high-growth digital organizations ("digital gazelles") in the early phases of growth, focusing on the three areas of management, organization structure, and technology/systems. Next to the challenges that regular gazelles face—such as finding and retaining human talent, accessing financial capital to accelerate growth, and exploring new business opportunities with scarce resources (Chan et al. 2020; Davila et al. 2003)—digital gazelles, also need to manage digital collaboration, adapt their internal processes and organizational structure, rethink their technology adoption and use, and scale their digital infrastructure at pace to prevent from a loss of organizational agility. Here, for example, major differences in the development of the digital infrastructure and organizational structure between born and grown digital gazelles emerged.

From a practical perspective, our findings enable the founders and managers of digital gazelles to better anticipate current and future challenges to better prepare their organizations for the next phases of rapid growth. For example, one such challenge comprises carefully planning and developing the digital infrastructure with respect to its scalability as the organization grows, its level of integration to enable data-driven decisions (e.g., for the placement of marketing campaigns), and digital tool selection to prevent a growth-related loss of organizational agility.

Of course, our study also has limitations. While our sample includes digital gazelles in several countries and industries, we based our analysis on a single voice per company. Moreover, despite our attempts to carefully scope the companies in our sample based on a precise definition, we still found that a number of "gray areas" remained. Notably, there was sometimes a challenge in drawing a clear boundary between digital and non-digital gazelles (e.g., when there was a high reliance on physical activities or products to provide digitally enabled services). In addition, it remains debatable to what extent digital gazelles can provide their products or services without a digital infrastructure, and exceptions (such as franchises) should be given greater consideration. There were further scoping challenges with respect to fluctuating growth figures over time, with growth figures that were at the very limit of or even beyond our boundaries (e.g., exceeding 100 employees in the latter growth phases (companies A and F), or with strong disconnects between the extent of sales and employee growth figures (company L)), leaving it unclear whether a particular phase was one of low or high growth. While all these "gray areas" constitute threats to the validity of our findings, we are confident that there is no outlier in our sample that would go against the spirit, if not the letter, of a digital gazelle.

Future research could focus on the impact of digital technologies on the rapid growth of startups (e.g., sustaining organizational agility). Moreover, as digital technologies can be understood as key drivers of organizational transformation, our findings further lead to the conclusion that most dimensions of established small business growth models, such as that of Churchill and Lewis (1983), are still useful but need to be refined with respect to management, organizational structure, and technology/systems to accommodate technological advancement. Finally, our findings can also be used as input for future theorizing on digital gazelles (e.g., exploring socio-technical tensions during phases of rapid growth).

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