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Clarifying the scaling concept: A review, definition, and measure of scaling performance and an elaborate agenda for future research

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ABSTRACT

Scaling has recently found its way into the academic discourse. However, the term has been used inconsistently and mixed up with other terms such as growth. To overcome these impediments to knowledge accumulation, we review the literature, identifying four broad applications of the scaling concept: market scaling, volume scaling, financial scaling, and organizational scaling. Building on their commonalities and setting scaling apart from growth, we develop an inclusive definition of scaling: Scaling describes an *increase in the size of a focal subject that is accompanied by a larger-than-proportional increase in the performance resulting from the said subject*. We further propose a set of measures that makes it possible to compare the scaling performance of organizations and track their scaling performance over time. Based on our insights as well as a list of "hot topics" in the management literature, we conclude by identifying promising areas for further research.

1. Introduction

The prosperity of many IT companies has been attributed to their ability to grow their business at impressive rates and relatively low cost, colloquially called their "ability to scale" in the Silicon Valley community (Carr, 2004; Hoffman & Yeh, 2018; Jorgenson, 2001). Inspired by the success stories of Silicon Valley firms, the notion of "scaling" was soon adopted throughout the business world, and subsequently found its way into the political discourse (Coutu, 2014) and the academic literature (Autio et al., 2021; Shepherd & Patzelt, 2020). Recently, scholars noted that the diversity of contexts in which the "scaling" terminology is now applied and the lack of a rigorous definition have led to significant inconsistencies in its usage (Autio et al., 2021; Coviello, 2019). These inconsistencies are not limited to informal conversations but also permeate academic research. Existing studies implicitly or explicitly define scaling very differently. For instance, some publications equate scaling with (high) growth and use the terms interchangeably (e.g., DeSantola & Gulati, 2017; OECD, 2007), while others question the usefulness of doing so (Autio et al., 2021). Moreover, studies refer to very different subjects that are being scaled, such as an organization's size (e.g., Coad et al., 2017), geographic reach (e.g., Ambos & Tatarinov, 2022), or capabilities (e.g., O'Reilly & Binns, 2019). Currently, the diverse perspectives exist in parallel for the most part, with many studies not even acknowledging the existence of alternative views. Although research activity around scaling has sharply increased over the last few years (e.g., Autio et al., 2021), such discrepancies impede the emergence of a cumulative body of knowledge. If they remain unaddressed, academics' growing devotion to scaling will not adequately develop their ability to provide organizational leaders, political decision makers, and other stakeholders with theory- and evidence-based insights into scaling.

To overcome this fragmentation and its detrimental effects on our understanding, we review and synthesize prior scaling research published in 74 leading journals in 7 sub-disciplines of business research, namely: (1) general management; (2) strategy; (3) entrepreneurship and small business management; (4) operations and technology management; (5) organization studies; (6) innovation; (7) international business and area studies. Our review identifies four distinct types of scaling:

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financial scaling; market scaling; organizational scaling; and volume scaling. Synthesizing prior usage, we develop an inclusive definition of scaling. Concretely, we define scaling as an *increase in the size of a focal subject that is accompanied by a larger-than-proportional increase in the performance resulting from the said subject*, with "subject" referring to what is being scaled (e.g., number of products sold, number of customers, or number of markets served). This definition establishes a clear difference between growth and scaling: Growth refers to the increase of a focal indicator in isolation, while scaling refers to growth that is associated with certain performance improvements. In addition to defining scaling, we propose several measures that allow scholars and practitioners to compare an organization's scaling performance to the scaling performance of other organizations or to its own scaling performance across time. Finally, we identify promising areas for future inquiry.

Our article makes three important contributions to the management literature and beyond: First, we pinpoint the specificities and nuances of the scaling concept, allowing scholars to separate scaling from related notions and to distinguish between various types of scaling. Second, we develop a number of scaling-related measures that permit a comparison of scaling performance across organizations and/or time. Third, we propose a research agenda on scaling, taking recent trends in the management field into account. Linking scaling to "hot topics" should add to the relevance of subsequent studies. Ultimately, these contributions support the emergence of a coherent, cumulative body of knowledge and will enable scholars to generate a greater number of less ambiguous recommendations to management practice and politics.

2. A systematic review of the scaling literature

To resolve the confusion surrounding the scaling concept, we conducted a systematic review of the management literature to understand how scholars have used the scaling terminology so far. Journal identification for this systematic literature review was based on three main ideas. First, we limited the literature review to non-invited, peer-reviewed journals to ensure validated insights (Keupp et al., 2012; Palmié et al., 2023). Second, as the horizons for the empirical and theoretical work within a domain are typically set by the leading journals in the field (Furrer et al., 2008), we only considered journals rated at level 3 or above in the 2021 Academic Journal Guide (AJG) of the Chartered Association of Business Schools (ABS), commonly referred to as the "ABS list". Third, we selected journals from sub-disciplines of business research in which scaling is an essential concept and whose combination is suitable to provide broad insights. We considered journals in the following seven sub-disciplines according to the ABS: (1) General Management; (2) Strategy; (3) Entrepreneurship and Small Business Management; (4) Operations and Technology Management; (5) Organization Studies; (6) Innovation; (7) International Business and Area Studies. This procedure resulted in the identification of 74 journals of interest (see Table 1).

Thereafter, we used a three-stage selection process to identify relevant articles from these 74 journals (cf. Fig. 1). First, consistent with prior approaches used to identify relevant articles (Rashman et al., 2009; Thorpe et al., 2005; Tranfield et al., 2003), we performed keyword searches. Specifically, we filtered the Web of Science database for the preselected journals and searched for words related to scaling (scalability, scaling, scalable, economies of scale/s, scaleup/s, scale-up/s, upscale/s, up-scale/s, upscaled) in the topic and/or the author-supplied keywords. Overall, we identified 172 articles as potentially suitable. Second, we went through each of these articles and excluded it from the subsequent analysis if it used the "scaling" terminology in a sense unrelated to our purpose (e.g., to refer to statistical techniques of multi-dimensional scaling) or if it did not specify its understanding of "scaling". Excluding these articles left us with a set of 91 relevant articles (cf. Table 2; they are listed in the appendix). Notably, the 91 articles are unevenly distributed across the seven analyzed sub-disciplines, ranging

Table 1
Overview of the 74 focal journals (ABS AJG: 3 and up).

Category	Journals
Entrepreneurship and Small Business Management	Entrepreneurship and Regional Development
	Entrepreneurship Theory and Practice
	Family Business Review
	International Journal of Entrepreneurial Behaviour and Research
	International Small Business Journal
	Journal of Business Venturing
	Journal of Small Business Management
	Small Business Economics
	Strategic Entrepreneurship Journal
General Management	Academy of Management Annals
	Academy of Management Discoveries
	Academy of Management Journal
	Academy of Management Perspectives
	Academy of Management Review
	Administrative Science Quarterly
	British Journal of Management
	Business and Society
	Business Ethics Quarterly
	California Management Review
	European Management Review
	Gender and Society
	Gender, Work and Organization
	Harvard Business Review
	International Journal of Management Reviews
	Journal of Business Ethics
	Journal of Business Research
	Journal of Management
	Journal of Management Inquiry
	Journal of Management Studies
	MIT Sloan Management Review
Innovation	Industry and Innovation
	Journal of Product Innovation Management
	Journal of Technology Transfer
	R&D Management
	Research Policy
	Technological Forecasting and Social Change
	Technovation
International Business and Area Studies	African Affairs
	Asia Pacific Journal of Management
	International Business Review
	Journal of Common Market Studies
	Journal of International Business Studies
	Journal of International Management
	Journal of World Business
	Management and Organization Review
	Management International Review
Operations and Technology Management	Computers in Industry
	IEEE Transactions on Engineering Management
	International Journal of Operations and Production Management
	International Journal of Production Economics
	International Journal of Production Research
	Journal of Business Logistics
	Journal of Operations Management
	Journal of Purchasing and Supply Management
	Journal of Supply Chain Management
	Manufacturing and Service Operations Management
	Production and Operations Management
	Production Planning and Control
	Supply Chain Management
Organization Studies	Group and Organization Management
	Human Relations
	Leadership Quarterly
	Organization
	Organization and Environment
	Organization Science
	Organization Studies
	Organizational Dynamics

(*continued on next page*)

Table 1 (*continued*)

Category	Journals
Strategy	Organizational Research Methods Research in Organizational Behavior Research in the Sociology of Organizations Global Strategy Journal Long Range Planning Strategic Management Journal Strategic Organization

from four publications in *International Business and Area Studies* to 29 publications in *General Management* (cf. Table 3). Third, we analyzed the articles and their understanding of scaling in greater detail. Sixty-six of the ninety-one articles directly described their understanding of "scaling" (by providing an explicit definition), whereas the remaining twenty-five articles conveyed their understanding implicitly (it could be derived from the text).

2.1. Thematic clustering of scaling depictions

We subsequently took the 91 implicit and explicit depictions of scaling from all 7 sub-disciplines and clustered them inductively in a multi-step process. This process, which is portrayed in Fig. 2, indicates that existing depictions represent four main types of scaling: (1) *financial scaling*, (2) *market scaling*, (3) *organizational scaling*, and (4) *volume scaling*. Twenty-seven of these ninety-one depictions (30 %) emphasize elements from more than one of these categories, whereas sixty-four depictions (70 %) predominately focus on elements from one of these four types. To enhance readability, we call the latter "pure depictions" and the former "mixed depictions". Table 4 provides exemplary definitions for each scaling category as well as for its corresponding subcategories.

Looking at the content of the sixty-four pure scaling depictions, *financial scaling* is the most common scaling category with twenty-three occurrences (36 %). It generally concerns economies of scale, "situations in which businesses are able to decrease the average unit cost by increasing total output" (Baumers et al., 2016, p. 199). In seventeen of the twenty-three articles, economies of scale are explicitly mentioned, whereas six articles implicitly refer to economies of scale. Moreover, eleven articles delineate underlying mechanisms on how to achieve economies of scale, while twelve cases do not.

The second most common scaling category revolves around *market scaling* (16 of 64 depictions; 25 %), which comprises geographic scaling (5 articles) and customer scaling (11 articles). While geographic scaling consists of regional (1 case), national (3 cases), and international (1 case) scaling, customer scaling focuses on scaling customer segments (9 cases) or customer experiences (2 cases). *Organizational scaling* is as common as market scaling, being covered by 16 articles (25 % of the sample) as well. Organizational scaling comprises the scaling of activities or processes (7 articles) as well as the scaling of resources (9 articles). Resources, in turn, can be further categorized into capabilities or knowledge (6 cases) as well as headcount (3 cases). Finally, *volume scaling* is the least common main category, being covered 9 times in the literature review (14 % of the 64 depictions). This scaling type is concerned with increases in unit output.

2.2. Evolution of scaling research across time

An analysis of the ninety-one articles in our sample reveals that the evolution of scaling research in the management field progressed in three phases of development (cf. Table 5).

2.2.1. Phase 1: Infancy (1974–2003)

The article by Teitel (1974), "*Economies of scale and size of plant: the evidence and the implications for the developing countries*", is the oldest entry in our sample. Research on scaling in the journals of interest took off slowly, with a gap of 18 years between Teitel (1974) and the second oldest entry in our sample, McGrath and Hoole (1992). In the following eleven years, scaling topics were published more regularly but still at a low level, with a relevant article appearing every other year or so, for a total of six articles in the period 1994 to 2003. In its three decades of infancy, scaling research focused heavily on financial scaling – 75 % of the "pure scaling depictions" published in this era belong to this type of scaling.

2.2.2. Phase 2: Childhood (2004–2013)

The following decade saw the continuation of a slow but steady appearance of new scaling studies. Apart from 2005 and 2008, one or

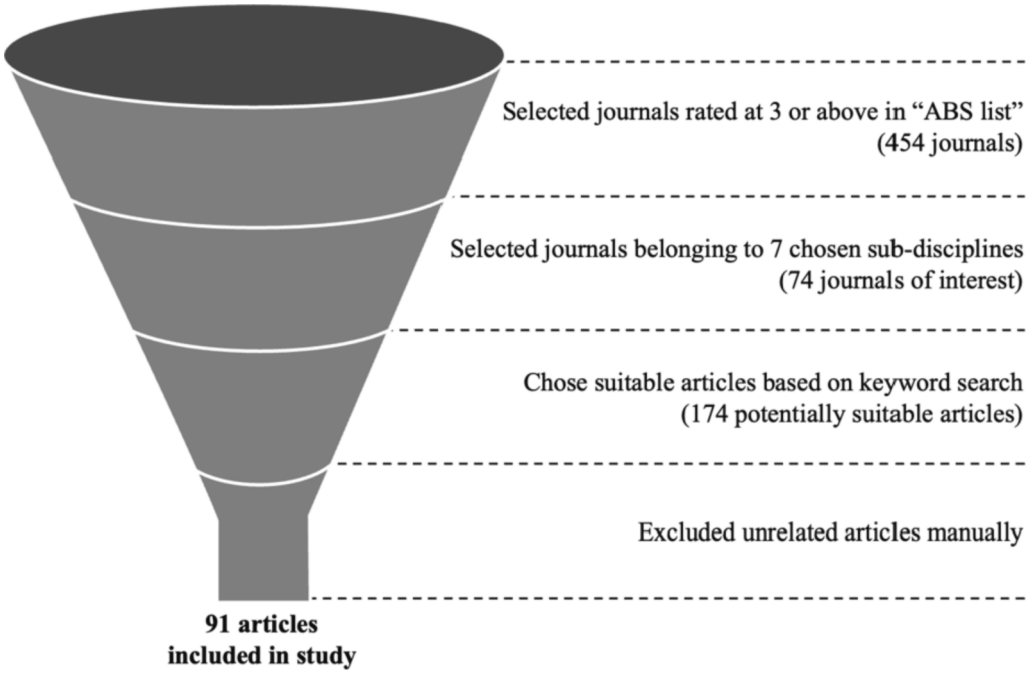


Fig. 1. Process used to identify relevant articles.

Table 2
Number of articles by journal source and year.

Journal	1974	1992	1994	1995	1997	2001	2003	2004	2006	2007	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	**Total**
AMA																			1						1
AMJ										1															1
AMP																			1						1
ASQ																					1				1
BJM																				2					2
BS																					1			1	2
CMR											1				1		2		1	1	2		1		9
ERD												2										1			3
ETP																						2	1		3
HBR		1																							1
HR																			1						1
ITEM								1								1				1		1	2		6
IJPE					2		1												1	1					5
IJPR																			1			1			2
ISBJ													1			1									2
JBE											1							2							3
JBR															1			1					2		4
JBV																		1							1
JCMS	1																								1
JIBS																						1	1		2
JMS																						1		1	2
JOM																					1				1
JPIM																					1				1
JSBM																						1			1
JSCM																					1				1
JTT														1											1
LQ																1									1
LRP																							1		1
MIR																1									1
MSMR						1														1					2
O								1	1													1			3
OE																		1				1			2
OS																		1				1			2
RDM																		1							1
RP										1															1
SBE																			1		1				2
SEJ																					1				1
SMJ			1	1																		1	1		4
TFSC																1	1	2	2		2	1	2		11
T																		1							1
Total	1	1	1	1	2	1	1	2	1	2	2	2	1	1	2	5	3	10	9	6	11	13	11	2	91

Note to Table 1:
AMA = Academy of Management Annals; AMJ = Academy of Management Journal; AMP = Academy of Management Perspectives; ASQ = Administrative Science Quarterly; BJM = British Journal of Management; BS = Business and Society; CMR = California Management Review; ERD = Entrepreneurship and Regional Development; ETP = Entrepreneurship Theory and Practice; HBR = Harvard Business Review; HR = Human Relations; ITEM = IEEE Transactions on Engineering Management; IJPE = International Journal of Production Economics; IJPR = International Journal of Production Research; ISBJ = International Small Business Journal; JBE = Journal of Business Ethics; JBR = Journal of Business Research; JBV = Journal of Business Venturing; JCMS = Journal of Common Market Studies; JIBS = Journal of International Business Studies; JMS = Journal of Management Studies; JOM = Journal of Operations Management; JPIM = Journal of Product Innovation Management; JSBM = Journal of Small Business Management; JSCM = Journal of Supply Chain Management; JTT = Journal of Technology Transfer; LQ = Leadership Quarterly; LRP = Long Range Planning; MIR = Management International Review; MSMR = MIT Sloan Management Review; O = Organization; OE = Organization and Environment; OS = Organization Science; RDM = R and D Management; RP = Research Policy; SBE = Small Business Economics; SEJ = Strategic Entrepreneurship Journal; SMJ = Strategic Management Journal; TFSC = Technological Forecasting and Social Change; T = Technovation.

Table 3
Number of scaling depictions across sub-disciplines of the management field.

Sub-Discipline	Number
Entrepreneurship and Small Business Management	13
General Management, Ethics, Gender, and Social Responsibility	29
Innovation	16
International Business and Area Studies	4
Operations and Technology Management	15
Organization Studies	9
Strategy	5
Grand Total	91

two articles were published every year in the period 2004 to 2013. However, compared to the first phase of its development, the focus of scaling research shifted notably. While financial scaling dominated previously, only one article released in the second period dealt with this type of scaling. Rather, 63 % of the articles dealt with organizational scaling, while the remaining 25 % revolved around volume scaling.

2.2.3. Phase 3: Adolescence (since 2014)

The third and last phase to date in the development of scaling research started in 2014 and is still continuing. This period witnessed a growth in scaling research from five new studies in 2014 to stable double-digit figures in the last few years. It also saw a return of financial scaling as the most commonly studied scaling category (16 new studies), but this focus was closely followed by market scaling (15 new studies). However, all four types of scaling received considerable attention in this period. In fact, while 70 % of the studies on financial scaling were released since 2014, these percentages amount to 63 % for organizational scaling, 78 % for volume scaling, and even 94 % for market scaling. Consequently, all four categories of scaling can be considered quite well established now.

3. Toward an inclusive definition of scaling

Several noteworthy insights emerge from the systematic literature review and clustering. First, some of the "pure depictions" run the risk of using scaling as a synonym for growth. Depictions of "volume scaling", "market scaling", and "resource scaling" seem particularly susceptible to this risk. Using scaling and growth interchangeably, however, foregoes the opportunity of establishing scaling as a distinct concept. Moreover, equating scaling with growth "misses the basic premise of scaling. That is, to identify and leverage economies of scale. If a firm can do this, it has the potential to grow revenues faster than costs… and this is what it means to scale up an organization. Scaling is not just about high growth" (Coviello, 2019, p. 5). These arguments suggest that scaling be defined in a way that is different from growth.

Second, a significant share of articles in our sample refer to more than one of the four main types of scaling. Thirty percent of the publications provide a "mixed depiction" of scaling, prominently featuring at least two of the categories. Additionally, even some articles with a (relatively) pure depiction of scaling and, hence, a strong emphasis on a single type of scaling still touch upon a second type. Such a preference for combining categories could reflect scholarly attempts to distinguish scaling from a conventional growth metric.

Third, elements of the four main scaling types can be combined in a way that meets "the basic premise of scaling" mentioned by Coviello (2019, p. 5) above. For instance, increases in resources (input) that are accompanied by (proportionally larger) increases in volume or markets served (output) imply that returns grow faster than costs. Similarly, organizational scaling ("spreading excellence within an organization as it grows"; Shepherd and Patzelt, 2020, p. 1) implies that the organization can use its excellent knowledge and skills more extensively than before, thus raising the average quality of the knowledge and skills used in the organization. Consequently, the organization can use resources (input) more efficiently and/or effectively than before.

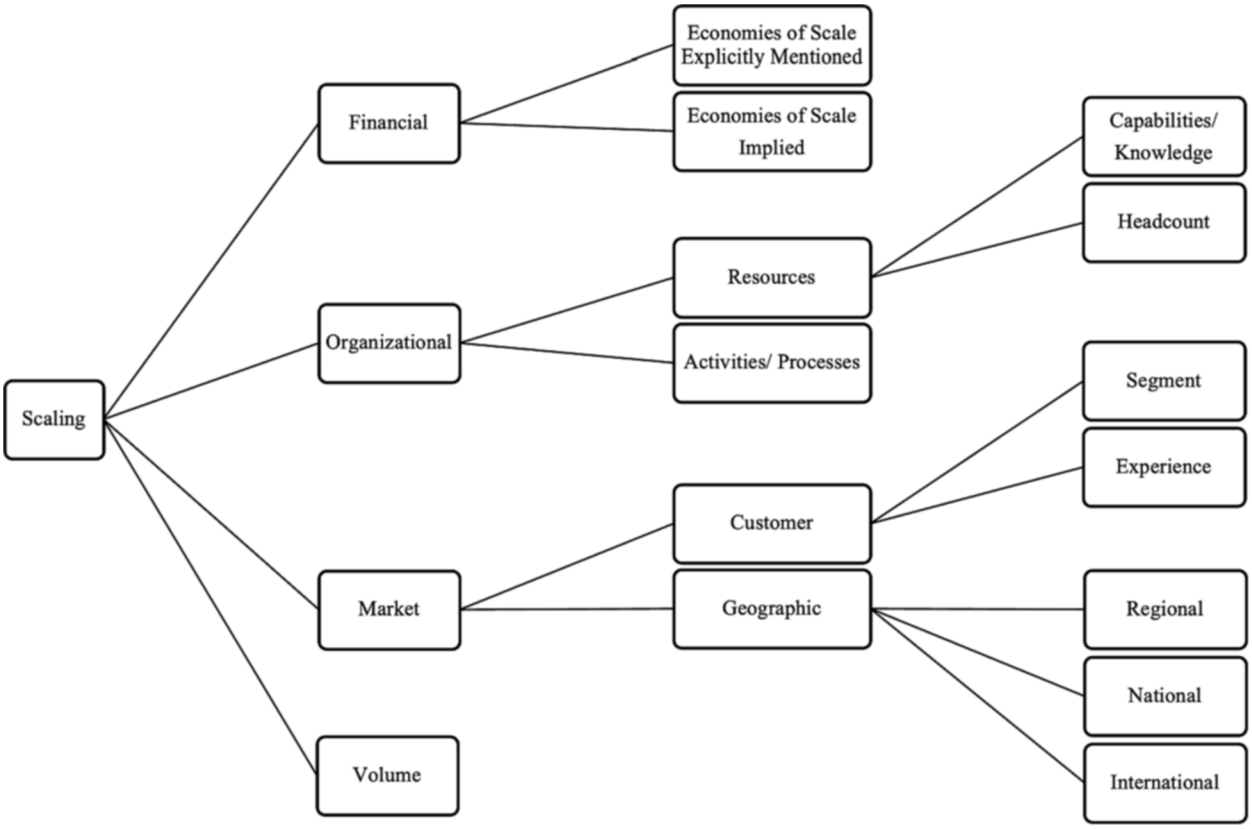


Fig. 2. Inductive derivation of four main categories of scaling.

Table 4
Exemplary definitions of each scaling category and its sub-categories.

Main Category	Exemplary Definitions per Sub-Category	Articles per Sub-Category
Financial	**Economies of Scale Explicitly Mentioned:**"Internationalization's benefits manifest in higher revenues or lower costs. First, and most importantly, authors refer to benefits from scale economies: the firm benefits from extending product lifecycles and from spreading costs over larger or more markets" (Richter, 2014, p. 173); "A classic source of economies of scale is the spreading of fixed costs across greater volume of output" (Dranove & Shanley, 1995, p. 56) **Economies of Scale Not Explicitly Mentioned:**"The first dimension of scalability is the degree to which increased input can create higher output. The second dimension of scalability relates to the ability of the business model to accelerate the returns on the additional investment" (Nielsen & Lund, 2018, p. 66); "When a crowdsourcing platform adds participants at a quick pace while they increase very few additional resources to service those members, they are scaling up" (Kohler, 2018, p. 100)	**Economies of Scale Explicitly Mentioned:** Badorf et al., 2019; Baumers et al., 2016; Baumers & Holweg, 2019; Dranove & Shanley, 1995; Ge & Huang, 2014; Karaomerlioglu, 1997; Kian et al., 2021; Kopczewski et al., 2018; McGrath & Hoole, 1992; Monaghan et al., 2020; Nilsson, 1997; Piaskowska et al., 2021; Richter, 2014; Spanos, 2012; Stringham et al., 2015; Teitel, 1974; Tone & Sahoo, 2003 **Economies of Scale Not Explicitly Mentioned:** Asante et al., 2021; Bailey & Tatikonda, 2018; Ben-Ner & Siemsen, 2017; Bennett & Hall, 2020; Kohler, 2018; Nielsen & Lund, 2018
Market	**Geographic** **Regional:**"This article's research objective is to study the combinations of governance conditions under which smart city pilot projects scale-up to an entire city" (Bundgaard & Borrás, 2021, p. 1) **National:**"The case study focuses on the impact of national subsidy (and particularly the project proposal grant) on the scaling up of niche policy by combining interests of both the local municipality and the central bureaucrat structures" (Ohta, 2019, p. 219); "Surprisingly, we encountered a social organization appearing to use bricolage to scale extensively into a variety of locations" (Busch & Barkema, 2021, p. 741) **International:**"We find that international organizations' initiatives are scaled from country to country either in an ad-hoc manner (organically) or through the direction and planning of headquarters (strategically)" (Ambos & Tatarinov, 2022, p. 102) **Customer** **Segment:**"To grow by scaling, a company expands product development around core technologies and offerings, expands product lines and increases the intensity of marketing by using existing distribution channels to reach new customer groups with related needs" (Von Krogh & Cusumano, 2001, p. 54); "Scaling, in this context, means first expanding their business to customers outside the entrepreneurs' immediate surroundings and then steadily increasing the number of customers to a point where the entrepreneurs can sustain their livelihood, provide for their family from the enterprise, and even create jobs for others in the community" (Wierenga, 2020, p. 64) **Experience:**"With an intent to expand the market by exploiting the product, the literature suggests targeting alternative parts of customers' value chains" (Raja et al., 2017, p. 122)	**Regional:** Bundgaard & Borrás, 2021 **National:** Bento & Fontes, 2016; Busch & Barkema, 2021; Ohta, 2019 **International:** Ambos & Tatarinov, 2022 **Segment:** Fosfuri et al., 2016; Munoz et al., 2014; Onwuegbuzie & Mafimisebi, 2021; Pesch, 2015; Vassallo et al., 2019; Von Krogh & Cusumano, 2001; Walske & Tyson, 2015; Wierenga, 2020; Zhao & Lounsbury, 2016 **Experience:** Raja et al., 2017; Smith et al., 2016
Organizational	**Activities / Processes**"Spreading excellence within an organization as it grows" (Shepherd & Patzelt, 2020, p. 1); "In doing so, the article explores how leadership activities can be 'scaled up' to affect institutions through the intermediary of an organization" (Bisel et al., 2017, p. 410) **Resources** **Capabilities / Knowledge:**"Scaling, where existing assets and capabilities are reallocated to help the new venture grow" (O'Reilly & Binns, 2019, p. 51); "Only a few SCs have demonstrated the ability to survive and scale up through improving their productivity/efficiency without compromising on internal democracy" (Pansera & Rizzi, 2020, p. 22) **Headcount:**"Firms might thus decide to scale up by hiring more employees to better pursue business opportunities" (Coad et al., 2017, p. 27); "Debbie came in and put in place a much stronger, solid foundation with a lot of opportunity to grow, and developed the plan on how to scale it—how to bring people in, orient them, get them effective faster, and unlock their potential" (Bahrami, 2013, p. 68)	**Activities / Processes:** Besharov, 2019; Bisel et al., 2017; Hietschold et al., 2020; Murase et al., 2014; Papazu & Nelund, 2018; Shepherd & Patzelt, 2020; von Krogh et al., 1994 **Capabilities / Knowledge:** Dushnitsky & Matusik, 2019; Hardy, 2004; O'Reilly & Binns, 2019; Pansera & Rizzi, 2020; Patel et al., 2011; Rousseau, 2007 **Headcount:** Bahrami, 2013; Bettencourt et al., 2007; Coad et al., 2017
Volume	"We define production ramp-up as the period of time following the introduction of a new process into a production facility with the objective to scale up production output from the small batches used in laboratory environments to the large volumes requested by the market" (Terwiesch & Xu, 2004, p. 70); "A key design goal of this article is to achieve scalability in terms of high throughput and low latency by making use of the sharding strategy with the two-layer hierarchical consensus structure" (Kwak et al., 2020, p. 1391)	Coad et al., 2020; Deif & ElMaraghy, 2017; Kwak et al., 2020; Liu et al., 2021; Slayton & Spinardi, 2016; Terwiesch & Xu, 2004; Wells, 2016; Yasunaga, 2020; Yli-Kauhaluoma, 2006

Synthesizing these insights leads us to the following proposition: Whereas growth designates increases of a focal indicator in isolation, scaling should be understood as growth that is associated with certain performance improvements. This conclusion corroborates Coviello's (2019, p. 15) verdict that scaling cannot occur without growth, but growth can occur without scaling. For instance, if firms promote some products by offering them below cost, they may be able to achieve growth in sales, but they do not scale the product by doing so.

Hence, we define scaling as an *increase in the size of a focal subject that is accompanied by a larger-than-proportional increase in the performance resulting from the said subject*. In this definition, "subject" refers to what is being scaled (e.g., number of products sold, number of customers, number of markets served). This definition has several important

Table 5
Evolution of scaling research across time.

		Financial	Market	Organizational	Volume	Total
Phase 1:	1974	1				1
Infancy	1992	1				1
	1994			1		1
	1995	1				1
	1997	2				2
	2001		1			1
	2003	1				1
Phase 2:	2004			1	1	2
Childhood	2006				1	1
	2007			2		2
	2011			1		1
	2012	1				1
	2013			1		1
Phase 3:	2014	2	1	1		4
Adolescence	2015	1	2			3
	2016	1	4		2	7
	2017	1	1	2	1	5
	2018	4		1		5
	2019	2	2	3		7
	2020	3	1	3	2	9
	2021	2	3		2	7
	2022		1			1
	Total	23	16	16	9	64

implications. First, it indicates that, in addition to economies of scale, economies of scope and synergies among firms can also contribute to successful scaling. Economies of scope and synergies imply that the combined output grows more than the combined input, creating a potential for performance improvements. Second, in a management context, performance usually means economic performance and returns, usually financial returns (e.g., Keupp et al., 2012; Nag et al., 2007). However, the general definition of scaling that we propose is able to accommodate performance improvements in any of the pillars of the triple-bottom line (Bansal, 2005; Elkington, 2018). Thus, "performance" in the above definition can be "economic performance", "environmental performance", and/or "social performance". This definition is, therefore, applicable to impact scaling as well. Third, scaling is not limited to new ventures. While established organizations may be unable to multiply their total sales figure or any other indicator of their overall performance, they may still be able to scale focal products, services, or markets and achieve strong improvements in subject-specific performance indicators. Finally, our definition can be transformed into quantitative measures of scaling that make it possible to compare multiple instances of scaling with one another (e.g., scaling across organizations or scaling of one organization across time). Specifically, we propose three measures that capture different aspects of scaling. We call these measures *scaled development of subject size*, *scaled development of focal performance*, and *scaling factor*, respectively. We define them as:

$$\text{Scaled development of subject size} = \frac{\text{Size of subject in period t}}{\text{Size of subject in period (t}-1)} \quad (1)$$

In (1), "subject" refers to what is being scaled (e.g., number of products sold, number of customers, number of markets served).

$$\text{Scaled development of focal performance} = \frac{\text{Focal performance in period t}}{\text{Focal performance in period (t}-1)} \quad (2)$$

In (2), "focal performance" refers to the values of a selected performance indicator that result from the subject being scaled (e.g., revenues associated with a new product rather than total revenues of a firm).

$$\text{Scaling factor} = \frac{\text{Scaled development of focal performance}}{\text{Scaled development of subject size}} \quad (3)$$

Since scaling is defined as an increase in the size of a focal subject that is accompanied by a larger-than-proportional performance increase, the *scaling factor* must be greater than 1 for scaling to occur. If the *scaling factor* is less than or equal to 1, then the *scaled development of subject size* and the *scaled development of focal performance* may indicate growth, but they do not measure scaling. The *scaled development of subject size* and the *scaled development of focal performance* indicate growth if they are greater than 1, stagnation if they are equal to 1, and even degrowth if they are smaller than 1.

It should be noted that our definition does not specify a certain threshold for the *scaled development of subject size* that an instance under consideration must exceed in order to count as a case of scaling. In this regard, our general definition deviates from the approach adopted in some prior scaling studies that used the term "scaling" to designate instances in which the focal subject grew by at least 20 % or some other percentage (e.g., OECD, 2007). Put differently, some prior studies only included instances with a value for the *scaled development of subject size* of at least 1.2 (in the example of 20 %) in their sample of scaling cases. Even though our inclusive definition of scaling does not specify a minimum growth rate or *scaled development of subject size*, we do not want to imply that specifying such a threshold is inappropriate. Our general definition does not specify a threshold because the growth rates that can be observed in real life differ enormously across contexts (cf. Coviello, 2019). Any threshold set without taking a specific context into account would be arbitrary. In contrast to a general definition, individual studies typically deal with a specific context and may, hence, be able to determine a threshold suited to their particular context. We encourage the authors of individual studies to discuss why they opted for or against specifying a minimum *scaled development of subject size* and – if they specified one – why they chose the selected value. Irrespective of whether they specify a minimum threshold for the *scaled development of subject size* or not, we further encourage future scaling studies to use one of the above measures or a combination of these measures to provide consistent quantitative assessments of scaling and organizations' performance in scaling.

4. Paths for future research

Our literature review and an additional analysis of keywords in the seven focal sub-disciplines of management research serve as a foundation for a systematic research agenda. Our research agenda consists of four parts: First, we examine how frequently each of the four scaling types we identified occurs across the seven sub-disciplines of the

management field. We propose avenues for extending the study of a scaling type in those sub-disciplines in which it has been featured rarely so far. We refer to this extension as "deepening" the analysis of scaling in the sub-disciplines. Second, we evaluate the keywords of all articles published in the leading journals of the seven management sub-disciplines since 2019 to identify "hot topics" in management science. We take a closer look at the 20 most frequently mentioned keywords and propose paths for research on scaling in the context of these hot topics. We refer to this approach of linking scaling to new topics as "broadening" the analysis of scaling.[1] Third, we assess the methods used in prior scaling research, so that future research can enrich the methodological perspectives applied to each of the four scaling categories. In the same vein, we elaborate on research opportunities emerging from conceptual considerations. Fourth, we urge future research not to neglect possible downsides or caveats of scaling.

4.1. Deepening scaling research: Studying types of scaling underexplored in a sub-discipline

Table 6 shows that financial scaling has frequently been studied in the "Operations and Technology Management" area, but rarely in the leading "Innovation" journals and not at all in the leading outlets of "Entrepreneurship and Small Business Management" and "Organizational Studies". These research gaps are unfortunate because financial scaling can shed light on central questions in these sub-disciplines. For instance, the entrepreneurship domain could use the financial-scaling concept when studying how entrepreneurs can make the transition from launching a new venture into a viable business. Similarly, the innovation field could use it to examine how firms can manage the transition from introducing a new product to the market into a profitable product line. Organization studies could investigate the organizational challenges and processes of realizing economies of scale.

Table 6 reveals that market scaling is the type of scaling that is covered in most academic sub-disciplines. It has so far only been absent from the leading journals in "International Business and Area Studies". Considering that market scaling includes, among others, international scaling and the scaling of customer segments and customer experience, this research gap is quite surprising and potentially detrimental. International business scholars could leverage the market-scaling concept to study the effectiveness of internationalization strategies. Additionally, they could leverage it to study how firms from highly developed countries can expand their business to serve the poor.

Furthermore, market scaling has been scarcely tackled in the three sub-disciplines: (a) "Operations and Technology Management," (b) "Organizational Studies," and (c) "Strategy." It could be leveraged to address such central questions as: (a) What actions increase the performance of new applications for existing technologies? (b) What challenges do firms experience and which processes allow them to benefit the most when they open their firms to new customer segments and new value propositions? (c) What determines the effectiveness of diversification?

To date, organizational scaling has predominantly been studied in "General Management," "Entrepreneurship and Small Business Management," and "Organization Studies" (cf. Table 6). In contrast, it has only been addressed once or not at all in the leading outlets of (a) "International Business and Area Studies," (b) "Operations and Technology Management," and (c) "Strategy". Questions in these sub-disciplines that could benefit from leveraging the organizational-scaling concept include, but are certainly not limited to: (a) How does organizational scaling that occurs across several international locations differ from organizational scaling that occurs primarily in a single location? (b) How do new technologies affect organizational scaling? Do certain technologies impede organizational scaling? How could such impediments be overcome? (c) How does organizational scaling affect strategy-as-practice (cf. Vaara & Whittington, 2012)? How do different approaches of "strategy as practice" affect organizational scaling?

Finally, volume scaling has mostly been covered in "Operations and Technology Management", but neither in the leading journals of "International Business and Area Studies" nor "Strategy." Nevertheless, the volume-scaling concept could contribute to both domains. Volume scaling might be a desirable goal for some products that can satisfy basic needs of people at the bottom of the pyramid (Chaudhuri et al., 2021; Vassallo et al., 2019). International Business scholars may find it insightful to ask: What are suitable approaches to scaling at the bottom of the pyramid? The strategy field could leverage the volume-scaling concept to study the growing emphasis on premium products by such prominent firms as Daimler (Mocker & Fonstad, 2017). These premium strategies might lower the firms' absolute output. In these strategies, volume scaling might be more strongly driven by reducing input than by increasing output. It would be intriguing to ask: What are the implications of such a strategy compared to a volume-scaling strategy that is primarily driven by increasing output?

4.2. Broadening scaling research: Studying scaling in the context of "hot topics"

Management research, like most arenas of social interactions, is characterized by trends and fashions (Bort & Kieser, 2011). Their popularity can be seen as a reflection of their contemporary relevance and of a certain need for action. It therefore seems promising to study how these trending topics affect scaling or, vice versa, how scaling affects these trending topics. To be able to link trending topics and scaling, we first had to identify "hot topics" in the management field. To do so, we perused the 74 journals representing the 7 selected sub-disciplines of the management field. Drawing on the Web of Science database, we assessed the author-supplied keywords of all papers and reviews published by these 74 journals since 2019. In total, these 23,000+ publications featured more than 50,000 distinct keywords. The frequency with which the keywords appeared across the 23,000+ articles ranged from 1 to 806. Notably, 20 author-supplied keywords occurred more than 200 times, with *"Innovation"* (806), *"Entrepreneurship"* (777), *"Sustainability"* (492), *"Gender"* (406), and *"Covid-19"* (391) being the most common ones (see Table 7).

Scaling is vital in the context of innovation, be it technological or non-technological innovation (Ortigueira-Sánchez et al., 2022). According to O'Reilly and Binns (2019), successful innovation consists of three components: "ideation, to generate potential new business ideas; incubation, to validate these ideas in the market; and scaling, to reallocate the assets and capabilities needed to grow the new business" (p. 49). While the importance of scaling for innovation has long been established, fruitful avenues for linking scaling to innovation topics continue to persist. Our above elaborations on scaling in the academic sub-disciplines already indicated some possibilities for further research. Additional questions to be addressed in future research include, among others: (1) How are different types of innovation – e.g., product innovation, process innovation, administrative innovation, and business model innovation (Palmié et al., 2023) – scaled differently? (2) How do characteristics of an innovation – for example, radical versus incremental, disruptive versus sustaining, competence-destroying versus competence-enhancing innovation (Christensen et al., 2018; Gatignon et al., 2002) – affect how it is scaled? (3) How can companies scale innovations in digital servitization (Heredia et al., 2022; Linde et al., 2021) (4) How can firms scale innovations in and for smart cities (Gassmann et al., 2019)?

Innovation scholars could also develop research questions on scaling

[1] Deepening and broadening scaling research are not mutually exclusive. A single future study may explore a scaling category that is hitherto under-researched in a given sub-discipline (thereby, deepening the analysis of this scaling category in this sub-discipline) by linking this scaling category to a "hot topic" (thereby, broadening the analysis of this scaling category).

Table 6
Scaling depictions across sub-disciplines.

	Financial	Market	Organizational	Volume	Total
Entrepreneurship and Small Business Management	0	2	4	1	7
General Management, Ethics, Gender, and Social Responsibility	5	4	5	1	15
Innovation	2	7	2	1	12
International Business and Area Studies	3	0	0	0	3
Operations and Technology Management	10	1	0	4	15
Organization Studies	0	1	4	2	7
Strategy	3	1	1	0	5
Total	23	16	16	9	64

Table 7
20 most-common author-supplied keywords across 74 management journals.

Keyword	Occurrence
Innovation	806
Entrepreneurship	777
Sustainability	492
Gender	406
Covid-19	391
Technological Innovation	381
Corporate Social Responsibility	343
China	342
Supply Chain Management	326
Uncertainty	271
Performance	252
Industry 4.0	248
Artificial Intelligence	239
Blockchain	231
Leadership	230
SMEs	215
Machine Learning	214
Firm Performance	208
Institutional Theory	204

and the specific digital technologies that are listed among the 20 most-common keywords in the management field, namely Industry 4.0, artificial intelligence (AI), blockchain, and machine learning. Such digital technologies may offer many opportunities for scaling. AI, for instance, "can identify redundancies within business processes and offer optimal resource utilization for improved performance" (Olan et al., 2022, p. 605). However, apart from a few exceptions (e.g., Sjödin et al., 2021), the questions of how these digital technologies can contribute to scaling, how firms can leverage them to advance the four types of scaling, and how to scale digital technologies themselves, have not been intensively studied so far.

Similar to innovation, the relevance of scaling to entrepreneurship has long been acknowledged (Wennekers & Thurik, 1999). Nevertheless, research on scaling in the context of entrepreneurship topics is still far from being saturated. The following ideas may extend the research agenda that we outlined for the entrepreneurship sub-discipline above: (1) How do different approaches to entrepreneurial decision making – effectuation versus causation (Palmié et al., 2019; Sarasvathy, 2001) – affect scaling? (2) How do entrepreneurial bricolage and resource constraints (Busch & Barkema, 2021; Liu et al., 2021) affect scaling? (3) How does scaling differ depending on the type of opportunity emergence – opportunity creation versus opportunity discovery (Alvarez & Barney, 2008)? (4) Do social entrepreneurs scale differently than "conventional" entrepreneurs? (5) How do serial entrepreneurs alter their scaling efforts across time?

It would also be interesting to study scaling in the context of small and medium-sized enterprises (SMEs) (Kusa et al., 2021; Zimmerman & Zeitz, 2002). Since small firms might be unable to realize economies of scale and compete on the basis of price (Beliaeva et al., 2020), they frequently have to employ competitive strategies other than those adopted by large firms. This observation stimulates some questions to be addressed in future research: Which of the four scaling categories are most heavily affected by differences in firm size? Under which conditions and for which type of scaling might a small firm size be beneficial? How do small firms deal with their limitations?

As indicated by the frequent mentioning of "sustainability", "corporate social responsibility", and "gender", management researchers respond to the desire of many political and societal stakeholders to conserve our planet, reduce social inequalities, and have companies contribute to the transition toward a more sustainable and more just economy. Scaling is crucial to realizing this desire. For instance, volume scaling is required to maximize the environmental impact of developing "green" products. Market scaling is required to get environmentally friendly products out of their niche and bring them to new customer segments and geographic regions. Organizational scaling helps businesses have sufficiently strong and plentiful capabilities and resources to advance the transition toward a more sustainable and more just economy. Finally, financial scaling is essential as it makes it economically more attractive for firms to contribute to this pro-environmental and pro-social transition. In light of the urgency and salience of environmental and social problems, we encourage scholars to explore the association between environmental sustainability, social sustainability, and the four types of scaling more intensively. Exemplary research questions are: (1) Does a firm's sustainability orientation affect its ability to scale and the way it scales? (2) How does the scaling of environmental and/or social indicators relate to and differ from the scaling of economic indicators? (3) How does managing for other stakeholders besides or instead of shareholders – pursuing a "relational approach" rather than a "transactional approach" to stakeholders (Bridoux & Stoelhorst, 2016; Haefner et al., 2021) – affect a firm's scaling performance? (4) How does a firm's emphasis on diversity, equality, and inclusion (DEI) affect its ability to scale and the way it scales? On the one hand, greater DEI may improve decision quality (Cox & Blake, 1991; Nielsen & Huse, 2010; Wanous & Youtz, 1986; Yaniv, 2011), which could benefit scaling. On the other, a greater emphasis on DEI could mean that a broader set of criteria influences organizational decisions, which could make it less likely that the most "scaling friendly" decision options are selected.

The link between scaling and "(firm) performance" has one of the longest histories in scaling research. The association between a firm's (economic) performance and the various scaling categories was nicely illustrated more than two decades ago: "Conceptually, several economic benefits can be gained by exporting. The most obvious are gains related to scale and scope economies […] as achieved from larger volumes of sales and production made possible by revenue growth in the geographic extension of markets" (Lu & Beamish, 2001). In recent years, however, research linking scaling and (firm) performance has decreased significantly. Moreover, management research as a whole tends to focus almost exclusively on the economic dimension when it is talking about "firm performance" and neglects firms' environmental performance and social performance (Brown et al., 2021; Keupp et al., 2012; Lee et al., 2001; Nag et al., 2007). In view of the growing environmental and social concerns of societal stakeholders, paying more attention to the under-explored pillars of the "triple-bottom line" (Bansal, 2005; Elkington, 2018) is a suitable way to revitalize research on the scaling-performance

nexus. Thus, scholars could ask: How do the effects of specific scaling strategies on a firm's environmental or social performance differ from their effects on a firm's economic performance?

Like virtually everyone in recent years, the academic literature has devoted enormous attention to the Covid-19 pandemic (Donthu & Gustafsson, 2020). The pandemic opens intriguing opportunities for scaling research. It allows scholars to study the scaling of R&D tasks, production processes, distribution channels, and infrastructures in high speed. While several studies have already taken advantage of these opportunities (e.g., Moerchel et al., 2022; Mouzas & Bauer, 2022; Tietze et al., 2020; Verma & Gustafsson, 2020), the pandemic still offers unexploited research potential. For instance, scholars need not restrict themselves to asking how companies scale under the given conditions but could consider such questions as: (1) How do mega shocks (such as a pandemic) affect a firm's ability to scale and the way in which it scales? (2) How can firms increase the resilience of their scaling efforts against external shocks?

Scholars could also address a trending topic whose popularity was not initiated but certainly boosted by the Covid-19 pandemic – namely, uncertainty. The relationship between scaling and uncertainty seems an interesting path for research to pursue. On the one hand, one could argue that at least some forms of scaling cause firms to experience increases in uncertainty. For example, market scaling raises uncertainty because it often subjects the focal organization to varying economic and legal contexts, cultures, and additional supply chain challenges. The question then becomes: How can firms deal with the higher levels of uncertainty induced by scaling? On the other hand, one could study the effect of uncertainty on scaling. Exemplary research questions read: (1) How does uncertainty affect a firm's ability to scale and the way in which it scales? (2) How do measures to minimize or deal with uncertainty affect a firm's ability to scale and the way in which it scales? (3) How do different types of uncertainty and risk (e.g., Beckman et al., 2004; Milliken, 1987) affect different types of scaling differently?

Another topic boosted by the pandemic, but worthy of investigation irrespective of it, is "supply chain management". While an ineffective supply chain management can constrain a firm's ability to scale, the interplay between supply chain management and scaling has received relatively little attention in recent years. Potential queries in this area include: (1) How can firms collaborate with their suppliers and customers to foster scaling? (2) How can they orchestrate their ecosystems to advance scaling? (3) How do suitable alliance strategies, collaboration modes, and ecosystem strategies differ across the different scaling types?

"Leadership" – an evergreen in management science – could also be fruitfully combined with scaling. Scholars could investigate the effect of personal leadership styles as well as of strategic leadership approaches on the various types of scaling. Exemplary inquiries are: (1) Does paradoxical leadership (Shao et al., 2019; Zhang et al., 2015) favor scaling? (2) When should firms adopt a top-down approach to bolster scaling and when should they prioritize a bottom-up approach?

Finally, looking at the remaining two entries on the hot topics list – "China" and "institutional theory" – from a scaling perspective points toward a potential context dependence of scaling. Scholars could thus ask: How do cultural, legal, and other societal factors affect scaling? However, firms do not need to take their institutional environment as given but can try to influence it by engaging in institutional work or institutional entrepreneurship (e.g., Chatterjee et al., 2021; Schweitzer et al., 2022). Hence, scholars could examine what role the different types of scaling play in institutional entrepreneurship.

Given the outstanding frequency of these keywords in the recent management literature, studies linking them to scaling should be met with considerable interest among management scientists.

4.3. Methodological enrichment

The four scaling categories differ significantly in the methods that dominate them. Financial scaling has mostly been studied with quantitative research designs (15 out of 23 articles [65 %]), market scaling with qualitative designs (8 out of 16 articles [50 %]), organizational scaling in a conceptual manner (6 out of 16 articles [38 %]), and volume scaling again with qualitative designs (5 out of 9 articles [56 %]). Across the four categories, the share of articles employing quantitative methods ranges from 22 % to 65 %, the share of qualitative methods from 22 % to 56 %, and the share of conceptual approaches from 13 % to 38 %. That each of the three methodological alternatives is the most frequently chosen option in at least one of the categories implies that every method can make notable contributions to scaling research. The uneven distribution of these methods also indicates that our understanding of every scaling category might benefit from further efforts relying on a method that has been under-utilized in the respective category so far.

4.4. Research opportunities emerging from conceptual considerations

The relatively high share of conceptual work among the reviewed scaling studies indicates that scaling is receptive to this kind of research. Scaling offers many more intriguing opportunities for conceptual work, with our article opening up even more of these opportunities.

First, the management literature has devoted increasing attention to the microfoundations of relevant phenomena over the last couple of years (Cowen et al., 2022; Palmié et al., 2023). We consequently encourage scholars to study the microfoundations of scaling performance. Microfoundational research examines how individual-level characteristics, the actions of individuals, and their interaction lead to organizational-level outcomes (Felin et al., 2015). It would be intriguing to examine how the actions and interactions of managers and employees influence a firm's scaling performance.

Second, scholars could explore how modulating the unit of analysis can expand our knowledge. What are the antecedents and moderators of scaling performance when the research focus is shifted from the scaling of firms to the scaling of ecosystems? An ecosystem can be defined as a network of hierarchically independent, yet interdependent heterogeneous firms that collectively generate an output and a related value offering for a defined audience (Thomas & Autio, 2020).

Third, promising avenues emerge from the relationships and interdependencies between the four scaling categories that we have identified. Scholars could examine such questions as: (1) What synergies and conflicts exist among scaling categories? (2) Are there some factors that facilitate one type of scaling, but not another one? (3) Does it matter in which sequence firms pursue different types of scaling? What differences exist between firms that pursue one particular sequence of scaling and firms that pursue another sequence? (4) Is there something like a transferable scaling capability that can be developed by engaging in one type of scaling and subsequently be put to use in other scaling categories?

Last but not least, it could be revealing to disentangle the respective effects of the individual components that jointly constitute scaling performance. Our analysis of the scaling concept shows that scaling is the outcome of an increase in the size of a focal subject in combination with a disproportionally large increase in the associated performance. Several large-scale studies indicate that profitable firms are more likely to achieve growth than high-growth firms are to achieve profitability (Ben-Hafaïedh & Hamelin, 2022; Brännback et al., 2009; Davidsson et al., 2009). These findings indicate that factors exist that enhance the size of the focal subject without enhancing – possibly even reducing – the associated performance. We encourage scholars to examine which factors primarily drive scaling by increasing the size of a focal subject, which factors primarily drive scaling by increasing the associated performance, and which factors benefit subject size and performance to similar extents.

4.5. Further research on the caveats and dark sides of scaling

Scaling and the associated performance improvements are typically desirable for the scaling organization and for at least some of its stakeholders. Nevertheless, scaling has some caveats and dark sides. First, it is not uncommon that firms perform well with respect to some performance indicators but considerably less well with respect to others. Such divergence frequently occurs across the pillars of the triple-bottom line (e.g., a firm with a strong economic performance might display a poor environmental performance), but it can also occur across different performance indicators within one pillar (e.g., a firm with strong revenues exhibits low EBIT). Consequently, it is possible that firms successfully scale a focal subject from the perspective of some performance indicators but fail to scale it from the perspective of others. It may, therefore, be advisable to specify the performance measure used for assessing whether a firm scaled or not.

Second, scaling can be driven by the externalization of costs. Whether an organization scales or "merely" grows without scaling may, thus, not be a matter of better or worse substantive skills but of the ability and willingness to externalize or internalize adverse effects. For instance, a manager of a firm selling fast-moving consumer goods told us that his firm was able to scale its eco-friendly products business because the additional costs of producing eco-friendly instead of conventional products were passed on to the firm's suppliers.

Third, scaling products and services with better environmental performance than their alternatives can still contribute to environmental degradation. Generally speaking, improving the environmental performance of products/services can decouple the production and use of these products/services from the extent of resources consumed toward these ends and from the adverse environmental impact associated with these processes. The laws of thermodynamics, however, impose limits on the effectiveness of decoupling (Georgescu-Roegen, 1986; Lonca et al., 2019). Thus, improving the environmental performance of product/service creation and consumption does not necessarily reduce the absolute levels of resource input and adverse environmental impact. Rather, it could also mean that resource input and adverse environmental impact grow at a slower rate when more of the products/services with the improved environmental performance are created and produced than it would grow when more "conventional" products are created and produced. This caveat corresponds to the distinction between "absolute decoupling" and "relative decoupling" in the sustainability literature (e.g., Palmié et al., 2021; Sanyé-Mengual et al., 2019).

5. Conclusion

A shortcoming of organizational growth and, hence, one of the stimuli of the emerging interest in scaling are inconsistent and puzzling findings regarding the relationship between growth and firm performance. According to a widespread assumption among scholars and managers, firms that grow fast will end up being profitable. However, large-scale studies indicate repeatedly that high-growth firms frequently fail to achieve profitability (Ben-Hafaïedh and Hamelin, 2022; Brännback et al., 2009; Davidsson et al., 2009). Scholars recently suggested that distinguishing between growth and scaling could be a way to resolve this puzzle (Autio et al., 2021). However, what exactly scaling is, and how it can be defined and measured, has remained unclear. To overcome this situation and to facilitate the development of a cumulative body of knowledge, our study reviewed the academic literature and found that four broad applications of the scaling concept can be distinguished: market scaling, volume scaling, financial scaling, and organizational scaling. Setting scaling apart from growth and looking for a common core across these applications, we then developed a general definition of scaling. According to our inclusive definition, scaling describes an *increase in the size of a focal subject that is accompanied by a larger-than-proportional increase in the performance resulting from the said subject*. We also proposed a set of measures that allow scholars and practitioners alike to compare the scaling performance of multiple organizations and track their scaling performance over time. We finally proposed an elaborate, multi-part research agenda to advance the theoretical and empirical knowledge on scaling. The research agenda calls: for tackling hitherto underexplored types of scaling in seven subdisciplines of management; for linking scaling to "hot topics" in the field; for achieving methodological and conceptual progress; and for considering the caveats and dark sides of scaling.

Scaling, as it is defined here in line with recent comments on the topic, considers changes in the size of a certain subject in conjunction with the associated changes in organizational performance. We encourage scholars to specify the focal subject in their study (what is being scaled?) and the performance indicator they use. Scaling offers an enormous potential for research that combines rigor and relevance. We hope that our article minimizes ambiguities and helps scholars build on each other by providing a common point of reference.

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CRediT authorship contribution statement

Maximilian Palmié: Writing – review & editing, Writing – original draft, Validation, Supervision, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Vinit Parida:** Writing – review & editing, Writing – original draft, Supervision, Formal analysis, Conceptualization. **Anna Mader:** Writing – review & editing, Writing – original draft, Resources, Conceptualization. **Joakim Wincent:** Writing – review & editing, Supervision, Conceptualization.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Lists of articles depicting scaling

Appendix A. Articles with a "pure" depiction of scaling

Ambos & Tatarinov (2022)
Asante et al. (2021)
Badorf et al. (2019)
Bahrami (2013)
Bailey & Tatikonda (2018)
Baumers et al. (2016)

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Baumers & Holweg (2019)
Ben-Ner & Siemsen (2017)
Bennett & Hall (2020)
Bento & Fontes (2016)
Besharov (2019)
Bettencourt et al. (2007)
Bisel et al. (2017)
Bundgaard & Borrás (2021)
Busch & Barkema (2021)
Coad et al. (2020)
Coad et al. (2017)
Deif & ElMaraghy (2017)
Dranove & Shanley (1995)
Dushnitsky & Matusik (2019)
Fosfuri et al. (2016)
Ge & Huang (2014)
Hardy (2004)
Hietschold et al. (2020)
Karaomerlioglu (1997)
Kian et al. (2021)
Kohler (2018)
Kopczewski et al. (2018)
Kwak et al. (2020)
Liu, Beltagui, et al. (2021)
McGrath & Hoole (1992)
Monaghan et al. (2020)
Munoz et al. (2014)
Murase et al. (2014)
Nielsen & Lund (2018)
Nilsson (1997)
O'Reilly & Binns (2019)
Ohta (2019)
Onwuegbuzie & Mafimisebi (2021)
Pansera & Rizzi (2020)
Papazu & Nelund (2018)
Patel et al. (2011)
Pesch (2015)
Piaskowska et al. (2021)
Raja et al. (2017)
Richter (2014)
Rousseau (2007)
Shepherd & Patzelt (2020)
Slayton & Spinardi (2016)
Smith et al. (2016)
Spanos (2012)
Stringham et al. (2015)
Teitel (1974)
Terwiesch & Xu (2004)
Tone & Sahoo (2003)
Vassallo et al. (2019)
von Krogh & Cusumano (2001)
von Krogh et al. (1994)
Walske & Tyson (2015)
Wells (2016)
Wierenga (2020)
Yasunaga (2020)
Yli-Kauhaluoma (2006)
Zhao & Lounsbury (2016).

Appendix B. Articles with a "mixed" depiction of scaling

André & Pache (2016)
Assenova (2020)
Barbour & Luiz (2019)
Bauwens et al. (2020)
Bloom & Chatterji (2009)
Bucher et al. (2016)
Cavallo et al. (2019)
Chalmers et al. (2021)
Chaudhuri et al. (2021)
Chliova & Ringov (2017)
De Silva et al. (2021)
DeSantola & Gulati (2017)
Giudici et al. (2020)
Goworek et al. (2018)

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Lall & Park (2022)
Lehrer et al. (2017)
Lindholm-Dahlstrand et al. (2019)
Liu, Kwong, et al. (2021)
Ometto et al. (2019)
Perrini et al. (2010)
Porter et al. (2020)
Reuber et al. (2021)
Smith & Stevens (2010)
VanSandt et al. (2009)
Vickers & Lyon (2014)
Zhao & Di Benedetto (2013)
Ziaee Bigdeli et al. (2016)

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