Dec 11th, 12:00 AM

Scaling Agility in Incumbent Firms: A Literature Review

Julian Frey
University of Bamberg, julian.frey@uni-bamberg.de

Scaling Agility in Incumbent Firms: A Literature Review

Completed Research Paper

Julian Frey
University of Bamberg
An der Weberei 5, 96047 Bamberg, Germany
julian.frey@uni-bamberg.de

Abstract

Scaling agility as a process of applying agile concepts to more extensive parts of the organization promises incumbent firms to achieve the same benefits as their digital competitors. However, copying digital-born companies' approaches seems problematic, as incumbent firms are distinct from their digital competitors. Thus, this research aims to consolidate what we know about scaling agility in incumbent firms. To answer this question, I conduct a structured literature review to understand scaling agility for incumbent firms better, resulting in the four dimensions of structure, methodology, governance, and dependencies with nine themes: coordination, processes, roles, effectiveness, risk management, budgeting, measurement, architecture, and culture/mindset. Moreover, the review develops six avenues for future research. With this, the literature review provides an integrative picture of scaling agility, enhances conceptual clarity, and helps practitioners by providing an overview to use in their efforts to scaling agility in incumbent firms.

Keywords: Scaling agility, incumbent firms, literature review

Introduction

The increasing share of information and communications technologies in value creation and delivery of new products challenges incumbent firms *"born in the pre-digital age"* (Oberländer et al. 2021, p- 1). Market and customer convergence (Lyytinen et al., 2016), increased speed of product development, and customer expectations for fast reactions (Tallon et al., 2019) challenge incumbents. The fate of firms that fail to address these challenges is vividly described in well-known cases such as Kodak (Lucas & Goh, 2009), GE, Nike, and Lego (Davenport & Westerman, 2018). Overall, seven of eight digital transformations are assessed to be non-successful (Wade & Shan, 2020). To avoid this fate, incumbents actively execute scaling agility – a process of extending the initial adoption of agile concepts (e.g., principles, methods, and practices) to larger parts of an organization (Limaj & Bernroider, 2022; Fuchs & Hess, 2018). This is demonstrated by organizations such as ING (Calnan & Rozen, 2019) that scale agility. Scaling agility includes structural and procedural changes organizations undertake during digital transformation (Vial, 2019). While scaling agility and its related organizational concepts are not novel to software organizations or digital-born organizations (such as Google or Spotify), incumbent firms are often new to this (Gerster et al., 2020). The promises of scaling agility across digital-born organizations (Tumbas et al., 2018) or traditional software organizations (Dikert et al., 2016) have been debated.

However, scaling agility and its effects on structures and processes focusing on incumbent firms has been less analyzed, and there is limited consolidated knowledge. Many incumbent firms pursue scaling agility by following the approaches from digital-born organizations. For instance, the so-called Spotify model – where organizations are set up in product-oriented, cross-functional and highly autonomous teams (called squads) – is a popular approach incumbent firms use as a blueprint to establish a fully agile unit (cf. Gerster

et al., 2020). Still, simply copying the approaches of digital-born companies seems to be a problematic root metaphor as incumbent firms are distinct from their digital competitors and view digital technologies as rather infrastructural (Tumbas et al., 2018), and their organizational structure is not set up for digital product architectures (Drechsler et al., 2020). The problem is that organizations need to understand how they can reap the benefits proposed by scaling agility to avoid lagging behind digital organizations. Still, only 4 percent of companies reach the goals associated with scaling agility (De Smet, 2018). This highlights the problematic issues caused by a lack of a consolidated understanding of scaling agility. At the same time, practical relevance and a need for answers have been expressed emphatically because the challenges of digital transformation for established companies often are more complex than expected (Alleau & Balssa, 2020; Rigby et al., 2018). In the course of this, research constitutes that organizations are at *"comparably early stages of adopting agile forms of organizational design"* (Gerster et al., 2020, p. 99). Previous research focuses on *"the implementation of large-scale agile in software development"* (Kischelewski & Richter, 2020, p. 12) but excludes other business functions (e.g., marketing or sales), demonstrating the need for an overarching review that incorporates precursors and covers the organization holistically.

As the implementation accelerates across incumbent firms, reviewing what has been established and what is still unknown is sensible. I, therefore, pose the following research questions: *What do we know about scaling agility in incumbent firms? What are the potential avenues for future research?*

To answer these questions, I conduct a structured literature review following Wolfswinkel et al. (2013) and analyze 42 papers to understand scaling agility for incumbent firms better, resulting in four dimensions with nine themes. Following this introduction, I summarize the background, detail the methodology, present the findings, shed light on fruitful future research endeavors in the field and discuss the implications for theory and practice.

Background

The concept of scaling agility has evolved from a variety of preceding terms. Therefore, it is helpful to first introduce and compare these different terms before summarizing the state of the art in the literature review. As Limaj and Bernroider (2022, p. 2) put it, *"scaling agility (also referred to in the literature as 'agile at scale' or 'agile transformation' or 'agile transition') can have many forms."* Table 1 shows the different terminologies used and how different researchers define them. Comparing these different terminologies in the first place seems sensible to build common ground. I will do so chronologically in the following.

Large-scale agile is used to describe the phenomenon that agile methodologies are applied in software development in *"at least six teams"* (Dikert & Paasivara, 2016, p. 88). Agile at scale refers to *"launching dozens or hundreds of agile teams"* (Rigby et al., 2018, p. 4). This is a broad definition focusing on size only. Large-scale agile transformation widens the scope of the phenomenon towards the organizational level, showing how agile methods become popular outside the software development sphere and be applied *"on an organizational level"* (Fuchs and Hess, 2018, p. 2). Also, this definition is rooted in the observation that "agile methods" have become increasingly popular in incumbent firms, and not only in digital organizations. With agile forms of organizational design, Gerster et al. (2020) strengthen this focus on incumbent firms and explicitly introduce the structural component of the phenomenon: *"structures where the entire organization follows fully agile forms of organizational design"* (Gerster et al., 2020, p. 85). Most recently, "scaling agility" has been defined as the *"process of diffusing the initial adoption of agile concepts (e.g., principles, methods and practices) to additional organizational units"* (Limaj & Bernroider, 2022, p. 1). This definition incorporates most of the properties of the phenomenon described in the previous definitions. The definition emphasizes the *principles* mentioned in the definition of Dingsøyr et al., the *methods* mentioned in the definition of Fuchs & Hess, the *size* aspect of Dikert & Paasivara and Rigby et al., and the *extension* towards organizational units outside of the software development function by Fuchs & Hess and Gerster et al. For the literature review, I thus follow the definition used by Limaj & Bernroider.

Another way to classify these terms is offered by Power (2014). He points to phenomena often confused or not delineated in scaling agility. He distinguishes between (1) agile teams within large organizations, (2) the application of agile approaches on a large scale within large organizations, and (3) the concept of organizational agility, i.e., the organization as a whole is agile. Scaling agility can be placed in the second of these three differentiations. Within this second differentiation of Power's concept, the phenomenon has evolved over time as outlined above. This evolution reflects the changes that have taken place in practice as

more organizations have become more digital; hence integral parts of product delivery are increasingly driven by IT (Hund et al. 2021; Nambisan et al. 2017). This evolution of scaling agility – from IT units to more significant parts of the organization responsible for product delivery – increases the confusion about what scaling agility entails. Hence, consolidating the knowledge about scaling agility, based on a differentiated understanding of the underlying terminology, seems promising for its advancement.

Used terminology	Authors	Used definition
Large-scale agile	Dingsøyr et al., 2014, p. 3	"agile development in everything from large teams to large multi-team projects to making use of principles of agile development in a whole organization"
	Dikert & Paasivara, 2016, p. 88	"software development organizations with 50 or more people or at least six teams"
Agile at scale	Rigby et al. 2018, p. 4	"launching dozens or hundreds of agile teams"
Large-scale agile transformation	Fuchs & Hess, 2018, p. 2	"we understand the large-scale application of agile methods on an organizational level with multi-team settings that consist of '50 or more people or at least six teams'"
Agile forms of org-anizational design	Gerster et al., 2020, p. 85	"structures where the entire organization follows fully agile forms of organizational design"
Scaling agility	Limaj & Bernroider, 2022, p. 1, based on Fuchs & Hess, 2018	"process of diffusing the initial adoption of agile concepts (e.g., principles, methods and practices) to additional organizational units"

Table 1. Various conceptualizations of scaling agility

Methodology

I conduct a structured literature review to derive a conceptual framework to better understand the facets of scaling agility that are particularly relevant for incumbent firms (Rowe 2014). The review follows Wolfswinkel et al. (2013), is based on Grounded Theory (Gioia et al. 2013), and adheres to Templier and Paré's (2018) recommendations for transparency. Following the five-step approach by Wolfswinkel et al., I (1) *defined inclusion/exclusion criteria, identified the field of research, determined the appropriate sources and decided on the specific search terms* (see Figure 1). I searched for "Scal*" OR "Trans*" AND "Agil*" in outlets that are included in Harzing's Quality list for the "Management Information Systems, Knowledge Management", "General & Strategy" and "Operations Research, Management Science, Production & Operations Management" categories. I searched for the papers in Web of Science (WOS; on topic; no restriction of publication year, up until 2022) and in the AISeL for the four leading AIS conferences (on abstract; last five years only as I assume that fertile conference contributions from earlier years will have been published in a journal by then). After this first step, I (2) *conducted the search*, (3) *selected appropriate contributions by refining the sample*, (4) *conducted the analysis* and (5) *presented the results*. Details to the methodological procedure (Steps 1 to 3) can be found in *Figure 1*.

To begin, I identified an initial pool of 105 sources that are reviewed by reading the title, keywords, and abstract. Based on this, all those papers are included that deal with scaling activities of agile in general as full papers or research-in-progress papers. This step excludes papers such as speeches, discussion articles, or other non-peer-reviewed contributions and duplicates. All the matching papers make up the intermediate pool (n=89). In the next step, all papers are full-text screened. Papers that explicitly deal with scaling activities of agile within incumbent firms are included in the final pool. Papers analyzing digital-born organizations have also been screened but are excluded as this represents our boundary condition. In this step, papers that do not deal with any scaling component in detail or with a different thematic area (e.g., papers on cloud computing that do not explicitly address scaling of agile) are excluded. In addition, a backward and forward search is performed. The final selection contains 42 papers, which are subsequently analyzed in detail and are part of this literature review.

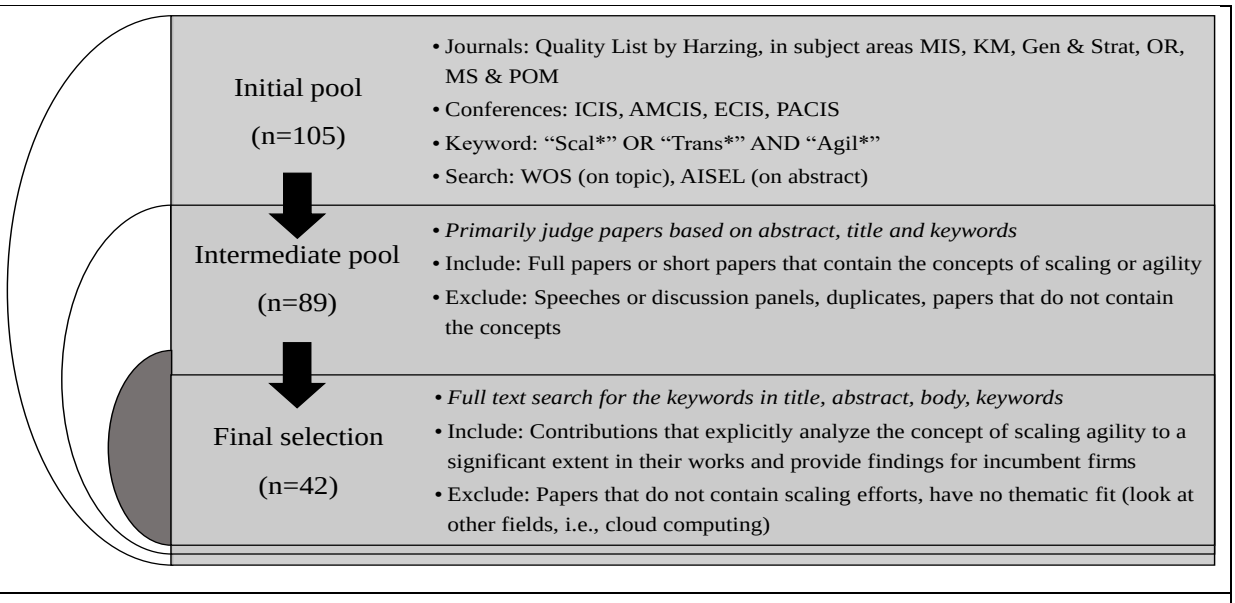

Figure 1. Literature review process

Following Paré und Templier's recommendations, I strive to keep the literature review process as transparent as possible. Accordingly, I follow all individual steps of the guideline where possible. The first step (problem formulation) is described in the introduction of this paper.

The second step (*the literature review*) and the respective substeps (how the literature search is performed, multiple publication types, the comprehensiveness of search & restrictions if applicable, and how I consider the reputation of the sources) are all described in this paper. I did not conduct multiple search strategies or apply additional strategies to minimize publication bias other than keeping the range of publication outlets and quality broad at the beginning of the search. The third step (*screening for inclusion*) is also followed as I describe in this section how primary studies are screened and selected and provide a description of the screening process (see *Figure 1*). Regarding the treatment of studies using the same data, I analyze them independently as I focus on consolidating all themes and dimensions and do not quantitatively analyze the results. In step four (*quality assessment*), the review is transparent about "how quality assessment is performed". In step five (*data extraction*) and in step six (*data analysis and interpretation*), I adhere to all requirements except for two. "Results of parallel independent coding process" is not possible as a single author, and the consideration of the quality of the studies is not considered explicitly in the interpretation but through the quality filters applied for the final approval of the final pool of papers. These filters are already strict to ensure that all sources have proper quality assurance.

For *the analysis*, articles are read in detail, and the different coding steps are executed to come up with aggregate categories that summarize the research body. The papers were read in detail and summarized in a structured manner. For the structured summary, the research question, approach, core results, contributions to science, contributions to research, and limitations were written down. Based on this, the papers were evaluated in terms of what do we know about scaling agility after reading the paper. In addition, descriptive data from the papers were noted, which can be found in Table 2 and elsewhere. After this evaluation, the respective core contribution to scaling agility for incumbent firms was titled with a 1st order concept. After this titling had taken place, all concepts including the direct quotation from the source were clustered in a round by topic. These clusters were then given an abstracted summary of the content and titled with a theme name. Following the same procedure, the final round of abstraction then clustered these themes into aggregate dimensions. These dimensions were also given a description based on the theme descriptions. Based on the approach by Gioia et al. (2013), Figure 2 shows a selective section of the analysis. The inductive approach to analyzing the literature allows for the formation of concepts, themes, and aggregate dimensions. This results in an analysis deeply rooted in the data. The abstraction of 1st-order concepts (i.e., precise, direct statements from the analyzed sources) to 2nd-order themes and then to aggregated dimensions helps extract abstracting insights from the data. The following findings section is structured along these dimensions and themes.

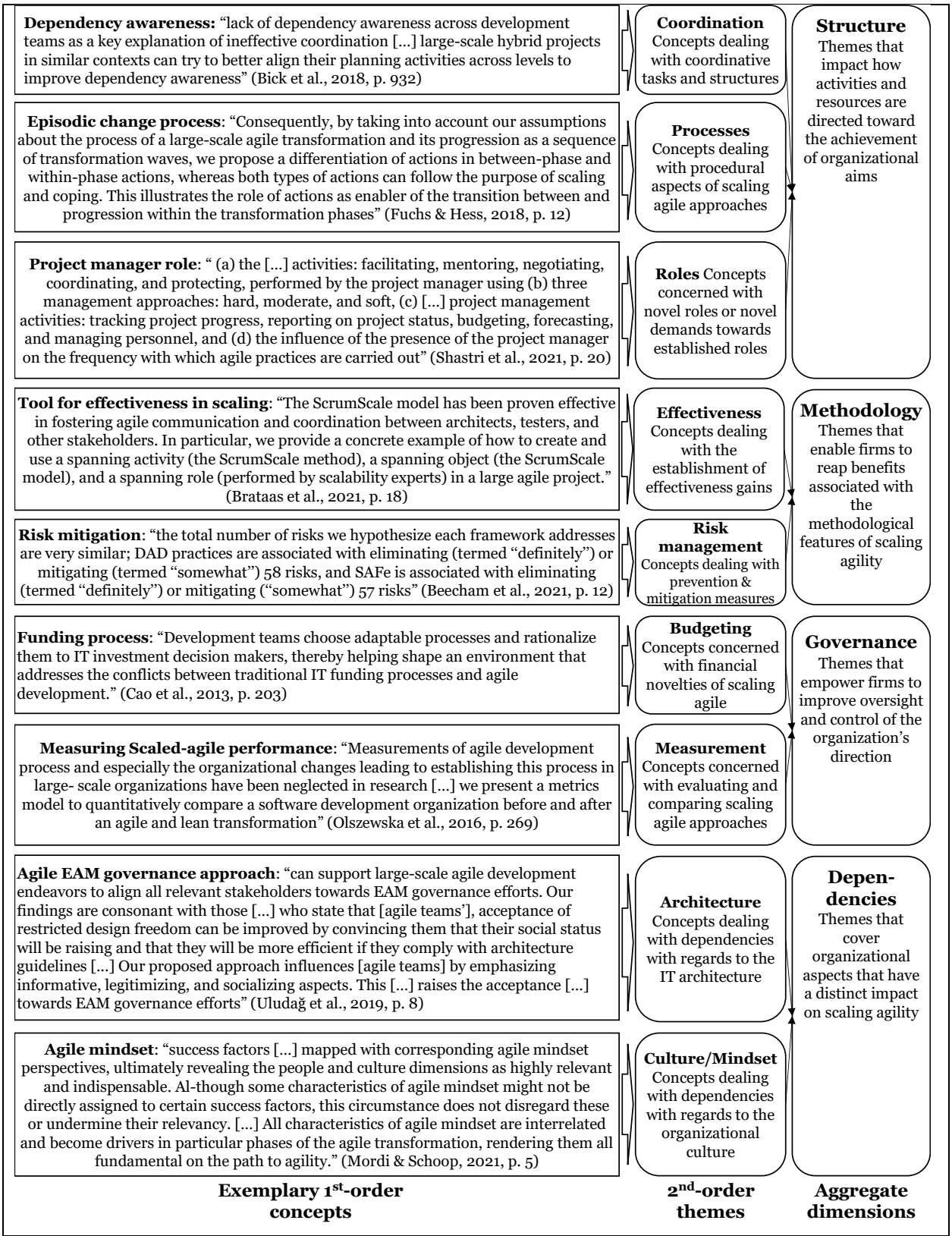

Figure 2. Data structure

Findings

I identify several concepts that can be aggregated into nine themes and four aggregate dimensions. I will present each dimension separately. Before I do so, I describe the metadata of the reviewed studies.

First, the relatively high amount of recent conference contributions shows the topicality of the research field For instance, 12 out of 46 sources have been published within the last two years. Moreover, nearly all sources identified in the initial pool published before 2017 have been assessed as non-relevant due to content reasons, not "age" reasons indicating that this topic has been addressed in earnest within the last five years.

Second, most studies employ qualitative methods (see 'Method' column in Table 2), which suggests an increased need for explanation and, at the same time, a lack of generalizability and validation of findings to date. This is supported by the fact that most studies do not use a clear deductive theory (column seven). Only the socio-technical systems theory (STST) stands out, being applied four times.

Third, concerning the level of analysis (column four), research has taken place at the organizational level (26 papers), team level (19 papers), and individual level (11 papers). Please note that the total amount does not equal the total amount of analyzed papers, as some address two or more levels. Ten papers address two levels; eight address the team and the organizational level, and the residual two address the individual and the organizational level. Four contributions address all three levels, with three being literature reviews and one a quantitative paper.

Fourth, many of the papers do not indicate in which specific industry context the data collection took place (column five). Industries being named most frequently are Software (seven times), followed by Government and Banking (three times each); three industries are mentioned twice (Automotive, Insurance, and Telecommunications). Thus, only a few insights can be derived from this. One interesting aspect, however, is that most of the software industry papers (six out of seven) apply a case study design. Other methods to approach the phenomenon in this context are nonexistent (such as mixed methods or design science) or near nonexistent (such as quantitative studies).

Fifth, having the different forms of scaling agility in mind from the introduction of this paper, column two depicts which exact concept of scaling agility is being followed in the paper. I differentiate here between four different, mutually exclusive types of categories: IT agile with project focus (ITaP), IT agile, enterprise agile without including the business units (EA/B), and enterprise agile (EA).

- *ITaP* refers to works that explicitly analyze scaling approaches to agile within the IT function only and also mention that these approaches are project-based and not designed to be permanent (which is the premise established scaling frameworks such as the Scaled Agile Framework (SAFe) or Large Scale Scrum (LeSS) have). Based on a screening of term usage and its meaning in the specific paper, I place seven papers into this category.
- *IT agile* refers to works that analyze permanent, not project-based, scaling approaches to agile within the IT function. Based on a screening of term usage and its meaning in the specific paper, I place twelve papers into this category.
- *EA/B* refers to works that describe same phenomena as the group of IT agile papers but call it enterprise agile. It is therefore congruent in content with IT agile and therefore not mutually exclusive, but is used as a separate term in the literature. Eight papers fall into this category.
- *EA* refers to all works that analyze approaches to scaling agility that truly go beyond the IT function, i.e., all works that analyze the evolutionary approach of scaling agility as described in the introduction; 15 papers are assigned to this category.

However, no clear clusters emerge in combination with the other characteristics, which is particularly exciting about this distinction of the categories used. This suggests that a clear distinction of the categories (in terms of different types of scaling agility) has no particular practical relevance for their dimensions and topics. Thus, a move away from a focus on the precise differentiation of these concepts to an analysis of the individual themes in terms of practice-oriented, value-creating insights seems logical. It is precisely on these distinct dimensions and themes ('Form' column in Table 2) that I want to focus on in this paper.

	Paper	Form	Dimension | Theme	Level	Industry*	Method	Theory
1	Alsaqaf et al. 2019	ITaP	Governance | Measurement	T	Various	Explor. CS	-
2	Batra et al. 2020	EA	Methodology | Effectiveness	I	-	Survey	-
3	Beecham et al. 2021	ITaP	Methodology | Risk	O	Software	CS	-
4	Bick et al. 2018	ITaP	Structure | Coordination	T	Software	GT	-
5	Bjarnason et al. 2012	ITaP	Governance | Measurement	T	Software	Positivist CS	-
6	Brataas et al. 2021	EA	Methodology | Effectiveness	T, O	Banking	MM	-
7	Cao et al. 2013	ITaP	Governance | Budgeting	T, O	-	Positivist CS	AST
8	Daneva et al. 2013	IT agile	Methodology | Effectiveness	T, O	-	Positivist CS	-
9	Dikert et al. 2016	EA/B	Structure, Methodology, Dependencies	I, T, O	-	LR	-
10	Fuchs et al. 2018	EA	Structure | Processes	O	Insurance	Explor. CS	STST
11	Gandomani et al. 2015	EA/B	Structure | Coordination, Processes, Roles	O	-	GT	-
12	Gandomani et al. 2016	EA/B	Structure | Roles	I	-	GT	-
13	Gerster et al. 2018	EA	Structure | Coordination	O	Various	Positivist CS	STST
14	Gill et al. 2018	IT agile	Methodology | Effectiveness	I, T, O	Various	DS	-
15	Gregory et al. 2016	IT agile	Structure | Roles	I	-	MM	-
16	Heikilla et al. 2015	IT agile	Structure | Coordination	T, O	Software	Positivist CS	-
17	Hoda et al. 2017	IT agile	Methodology	I, T, O	-	LR	-
18	Hovorka et al. 2006	IT agile	Structure | Coordination, Processes	-	Government	Positivist CS	-
19	Hron et al. 2021	EA	Methodology	O	-	LR	-
20	Kasauli et al. 2021	EA/B	Structure | Coordination	T, O	-	CS	-
21	Kiely et al. 2017	ITaP	Structure | Processes	T	-	Positivist CS	-
22	Kischelewski et al. 2020	EA/B	Structure, Methodology, Dependencies	O	-	LR	-
23	Korpivaara et al. 2021	EA	Governance | Measurement	O	Various	Explor. CS	
24	Limaj et al. 2020	EA	Dependencies | Architecture	O	Banking	GT	-
25	Luong et al. 2021	EA	Dependencies | Culture/Mindset	I	-	Survey	-
26	Mikalsen et al. 2021	EA	Structure | Coordination	-	-	Positivist CS	STST
27	Moe et al. 2019	ITaP	Structure | Coordination	T	Finance, ICT	Positivist CS	
28	Mordi et al. 2021	EA	Dependencies | Culture/Mindset	-	-	Conceptual	STST
29	Olszewska et al. 2016	IT agile	Governance | Measurement	O	Software	Survey	-
30	Paasivara et al. 2014	EA/B	Structure | Coordination	T, O	TelCo	GT	-
31	Pernstal et al. 2013	EA/B	Methodology	O	Automotive	SMS	-
32	Pernstal et al. 2015	IT agile	Structure | Coordination	T	Automotive	Positivist CS	-
33	Pradhan et al. 2021	EA/B	Methodology | Effectiveness	O	Software	CS	-
34	Rojas et al. 2019	EA	Structure | Coordination	T	-	Conceptual	-
35	Rolland et al. 2016	ITaP	Methodology | Effectiveness	-	Government	Interpr. CS	-
36	Russo et al. 2021	IT agile	Governance | Measurement, Budgeting	O	Government	MM	-
37	Schuch et al., 2020	EA	Structure | Coordination	O		Explor. CS	STST
38	Shastri et al. 2020	EA	Structure | Roles	I	-	MM	-
39	Stahl et al. 2017	IT agile	Methodology | Effectiveness	T, O	Various	Survey	-
40	Stray et al. 2019	ITaP	Structure | Coordination	T		Explor. CS	
41	Trippensee et al. 2021	EA	Structure, Methodology	I, T, O	-	LR	-
42	Tsilonis et al. 2022	EA	Governance | Measurement	O	-	DS	-
43	Uludag et al. 2019	EA	Dependencies | Architecture	I, O	Various	LR	-
44	Uludag et al. 2020	EA	Dependencies | Architecture	I, O	Insurance	Positivist CS	-
45	Usman et al. 2018	IT agile	Governance | Measurement, Budgeting	T, O	TelCo	Explor. CS	-
46	Zheng et al. 2011	IT agile	Structure | Coordination	T	Infrastructure	GT	-

Form: EA = Enterprise Agile, EA/B = "EA" but without business units included, ITaP = IT agile but in a project context
Level of analysis: I = Individual, O = Organizational, T = Team
Industry: * = if reported
Method (categorization based on Sarker et al., 2018): CS = Case Study, DS = Design Science, Explor. = Exploratory, GT = Grounded Theory, Interp. = Interpretive, LR = Lit. Review, MM = Mixed Method, SMS = Systematic Mapping Study
Theory used: AST = Adaptive Structuration Theory, STST = Socio-technical systems theory

Table 2. Literature characteristics

Structure

The Structure dimension consists of all identified themes that impact how activities and resources are directed toward the achievement of organizational aims. The column *Dimension | Theme* in Table 2 shows 22 articles related to the 'Structure' dimension, covering three themes: Coordination (14 articles), Processes (7), and Roles (7). Please note that numbers do not add up to 22, as some sources (for instance, literature review articles) pertain to more than one theme.

14 articles have raised the issue of coordination mechanisms. Work in this field deals with how coordination and communication in teams and across teams and unit boundaries can be designed in the best possible way. The analysis of complex coordination mechanisms seems to be particularly difficult for incumbent firms with their large legacy structures. For example, Bick et al. (2018) address the issue of dependency awareness and find that increased Dependency Awareness plays an important role in scaling agility planning, which can increase the likelihood of success. Gerster et al. (2020) look at the structural setups in which coordination can be most effectively designed and thus scaling agility works best. Further publications deal with the structuring of so-called communities of practice (Paasivaara and Lassenius 2014) and with coordination in the course of operational release planning (Heikkila et al. 2015), or look at requirements prioritization (La Rojas and Macias 2019), requirements communication (Pernstal et al. 2015), and the challenges of requirements engineering (Kasauli et al. 2021), in detail. For instance, Kasauli et al. constitute that *"neither traditional requirements engineering nor scaled-agile frameworks provide satisfying concepts to manage requirements knowledge effectively, when developing at the scale and speed that our case companies desire"* (p. 24).

Concerning the Process theme, two papers show insights into how processes change for incumbent firms. For example, Fuchs & Hess (2018) show how the entire scaling process can be conceptualized and structured as an episodic change process. Moreover, they identify three categories of challenges to successfully scale agility: "*a) coordination of different organizational worlds, b) difficult selection of the right people, and c) suitability of agile methods*" (Fuchs & Hess, 2018, p. 14). In particular, firms should be aware of barriers such as legal issues, norms, and security requirements that might render scaling agility an exhausting and unattainable goal. Awareness of these limitations should be an essential realization for companies. This can help organizations strengthen their scaling agility endeavors. Hovorka et al. (2006) analyze how fostering communication networks can support agile development processes. Gandomani & Nafchi (2015) provide a process framework for scaling agility that emphasizes iterativity, graduality, continuity, and a value focus. Kiely et al. (2017) look at general approaches that elicit how process improvement can be achieved in scaling agility when teams are globally distributed – a case in many incumbent firms. The authors identify that firms with distributed structures worldwide face operations process declines.

Nonetheless, they can mitigate but not completely erase these declines by reducing temporal distance and multi-teaming of employees. The third group of papers addresses the Roles aspect. Gandomani and Nafchi (2016) look at people- and role-induced challenges in the context of scaling approaches, while Shastri et al. (2021) focus on the analysis of the role of the project manager, which is supposed to disappear but still exists. Gregory et al. (2016) deal with how to circumvent certain reservations of employees in the context of scaling. For incumbent firms, these discoveries reveal that particular scaling-agility-induced changes require special attention to novel roles. All papers here operate primarily on an individual analysis level.

In addition, the literature reviews in this dimension also reveal some challenges and success factors regarding both coordination and processes (Dikert et al. 2016; Kischelewski and Richter 2020). Those challenges often extend into practices, for instance, building up cross-functional change teams and implement inter-team coordination practices (Trippensee and Remané, 2021). The works in this category help bring conceptual clarity and delineate the difference between IT agile and enterprise agile. Dikert et al. aptly describe what they mean by "enterprise agile" here, confirming that their study can be categorized into our definition of *IT agile*. They state that *"for ensuring the success of the whole transformation, it seems to be important that other organizational functions support and adopt agile,"* (p. 106), confirming our notion, that they analyze the scaling of agile methodologies only within the IT function but not including business functions. Overall, the structure theme reveals that incumbent firms face numerous distinct challenges they must carefully address to successfully scale agility.

Methodology

The Methodology dimension covers themes that enable firms to reap benefits associated with the methodological features of scaling agility. Table 2 lists 14 articles assigned to the 'Methodology' dimension, covering two themes: Effectiveness (13 articles) and Risk (2).

In the Effectiveness theme, topics such as quality requirements of scaling agility (Pradhan & Nanniyur, 2021) in a software company and underlying assumptions (Rolland et al., 2016) of scaling agility are being analyzed. Analyses show *"how the problematization approach can generate new insights in an active area of research that is highly relevant to IS practitioners"* and that the *"largeness' of agile projects can be perceived in terms of the complexity of the various 'knowledge boundaries' across the actors and technologies involved"* (Rolland et al., 2016, p. 2). In addition, papers dealing with the use of delivery stories (Daneva et al., 2013), the topic of job-work-fit concerning increased method acceptance (Batra, 2020), the phenomenon of continuous integration (Stahl et al., 2017) as well as with the application of novel methods and frameworks to improve agile elicitation (Brataas et al., 2021) and the application of unique methods in the course of scaling (e.g., Hron and Obwegeser 2022 with Scrum). Finally, the literature review by Hoda et al. (2017) provides various insights into applying agile development methods in the context of scaling, including method reconciliation, method analysis, and method tailoring.

In the context of the Risk theme, only one paper was identified that explicitly deals with it. Beecham et al. (2021) analyze whether scaled-agile frameworks (specifically SAFe and Disciplined Agile Delivery (DAD)) address global risks in the course of agile software development and find that risks relating to users and customers, in particular, are well mitigated. In contrast, risks in the context of the environment are addressed only to a limited extent. Findings from the literature review by Dikert et al. (2016) come to complementary conclusions. For example, risk is spoken of here primarily in the context of reversion to other methodologies (i.e., in a different, also essential understanding of risk).

Governance

The Governance dimension entails all themes that empower firms to improve oversight and control of the organization's direction. Table 2 shows nine articles related to the 'Governance' dimension, addressing two themes: Measurement (6 articles) and Budgeting (3).

Within the Measurement theme, for instance, Bjarnason et al. (2012) deal with the issue of overscoping problems in the context of scaling agility. The findings from the paper shed light on how incumbent firms can improve their scoping. More precisely, they identify six causes for overscoping: continuous requirements inflow, a lack of software resource availability, a low development team involvement in the early phases of product development, requirements not agreed with development teams, detailed requirements specification produced upfront and an unclear vision of overall goal. However, firms can mitigate these negative causes by implementing one coherent scope and release planning flow, cross-functional teams, and gradual, iterative requirements detailing. Incumbent firms should actively implement these mitigation mechanisms upfront to scale agility successfully. Other papers focus on quantifying the value of scaling agility. For instance, Tsilionis et al. (2022) develop a framework to support identifying value added by scaling agility. Olszewska et al. (2016) look at how to achieve a resilient quantitative performance measurement. Alsaqaf et al., on the other hand, deal with quality requirements in scaling agility (Alsaqaf et al., 2019). Moreover, research has analyzed the challenges for incumbent firms to conduct precise work effort estimations for product developments in scaling agility (Usman et al., 2018). The paper identifies that firms tend to underestimate work efforts because of unclear requirements structurally, overestimation of team expertise levels, and project scale and distribution across global sites. However, depending on project size, team maturity, and customer priority, firms can reduce underestimation and, thus, better govern their agile product developments.

So far, only a few works deal with the topic of budgeting. Cao et al. (2013) deal with approaches to transfer the funding processes of classic IT projects to agile approaches. They emphasize the need for stakeholders in incumbent firms to be cognizant that agile product budgeting decisions require more continuous feedback and negotiations based on changing customer values. They emphasize that *"force-fitting traditional approaches to contract risk management will thus result in irreconcilable conflicts between decision makers who approve funding for IT projects and project managers who select appropriate methodologies to implement such projects"* (Cao et al., 2013, p. 203). Russo (2021) develops a command-

and-control system that aims to improve the success of scaling agility. With the help of his model, incumbent firms can be equipped with the right tool to understand the dynamics between stakeholders involved in the agile organization and its success, identifying the choice of the right skills of a firm's employees as most important.

Dependencies

The Dependencies dimension covers all themes that look at organizational aspects that distinctly impact scaling agility. Seven articles have been assigned to the 'Dependencies' dimension: Five articles are associated with the Architecture theme and two with the Culture/Mindset theme.

The dependency issue includes factors highly dependent on scaling agility but is often not directly considered as part of it. Here, the topics of architecture and culture/mindset can be identified from the analyzed papers. Three papers deal with the architecture topic in detail. Uludag et al. (2019) deal with the topic of architecture in general in the context of scaling agility and highlight the need for creating awareness for and establishing knowledge about enterprise architecture in the organization. For incumbent firms, they recommend introducing knowledge-sharing formats such as communities of practice. Uludag and Matthes (2020) analyze the unique role of enterprise architecture as a discipline and enterprise architects as a particular role. They conclude that more architecture decision responsibility resides in the agile teams. This requires firms to equip teams with the right skills to enact these responsibilities. At the same time, the enterprise architect switches from a command and control philosophy to an advisory servant role. Limaj et al. (2020) complement this work by addressing the topic of legacy systems emphasizing the particular need for incumbent firms to take these legacy systems into account. They identify wrapping and migration as successful strategies for the technical issues of modernizing legacy IT systems. Further, they see three distinct non-technical barriers that incumbent firms must be aware of missing human capital, regulation, and legacy culture. Kischelewski et al. (2020) emphasize the importance of architecture standards and distinct architecture roles to address the challenges of scaling agility in incumbent firms.

Mordi & Schoop (2021) and Luong et al. (2021) represent the first works on organizational culture and mindset. Both papers are very recent and shed light on the potential effects of organizational culture and the organizational and individual mindset on scaling agility. Mordi & Schoop's work is distinguished by its conceptual development of the agile mindset – particular characteristics that employees in incumbent firms should be equipped with to be prepared for scaling agility. The work of Luong et al. (2021) is quantitative, finding that emotional intelligence significantly impacts factors such as motivation, anxiety, trust, and communication competence – all factors that can be influenced by organizational culture. This theme, in particular, also shows the topicality of the entire thematic complex of scaling agility; while research has already been dealing with agile software development methods and later agile work in general in individual teams and the IT unit as a whole for 20 years, the development from IT agile to enterprise agile is leading to a new push of research work in fields related to scaling agility.

Discussion

Overall, nine dimensions within four themes are identified through the analysis of the literature. Figure 3 depicts a relationship model of the dimensions and themes identified. The model represents a structured synthesis of the content of the individual papers, which helps view scaling agility holistically and allows for positioning future research avenues (marked with Ax). We can see that the three major themes are the right structure, the establishment of effective governance and the right handling of agile methods in established companies. In addition, dependencies on architecture and culture/mindset play a decisive role. While the work in all these topics already provides insights, open questions arise at the same time, which potentially can be answered by further research. Table 3 then presents additional explanations on these respective avenues based on the analysis and synthesis of the work examined and provides potential research endeavors. These research questions are based on (1) further research opportunities identified in the literature itself (see the analysis) and (2) on blank spots that the individual papers themselves do not mention but that emerge from the overall consideration of the papers.

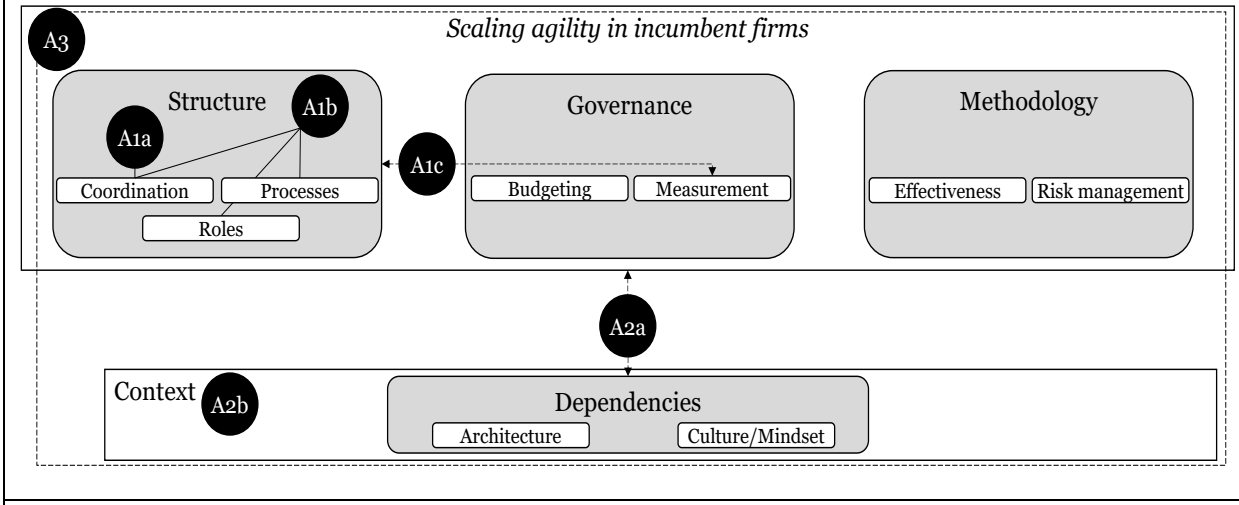

Figure 3. Scaling agility landscape for incumbents and avenues for future research

First, the Coordination theme reveals various follow-up research suggestions (see **A1a** in Figure 3 and Table 3). Most research has focused on the coordination theme, and, maybe even due to this, many potential research questions are associated with this theme. For instance, investigating coordination "where multiple agile teams need to collaboratively create a single software product based on longer release cycles" (Bick et al., 2018, p. 948), more overarching investigations into the coordination of agile release planning and requirements engineering are mentioned. Moreover, many papers (e.g., Bick et al., 2018; Gerster et al. 2020), that identify success factors for structures acknowledge that their analyses require supplementation of longitudinal data and application in different contexts to assess the success of the structures underlying scaling agility in incumbent firms (**A1b**). Furthermore, the analyses from Gerster et al. (2020) and Batra et al. (2020) both suggest creating a better understanding of the different phases of scaled-agile approaches.

Hence, a process view would be beneficial for further research. Fuchs et al. (2018) provide such a first process view by proposing to treat scaling agility as an episodic, socio-technical change process except when companies take a big bang approach. However, they limit their research by noticing that they do not provide concrete guidance on responding to the challenges and barriers attached to this change. Such challenges to understanding the processes of scaling agility and respective effective responses are partly addressed by literature reviews conducted by Dikert et al. (2016) and Kischelewski et al. (2020). Additionally, deepening the understanding of the optimal setup of scaling agility connected to the Measurement theme is a promising field for future studies (**A1c**). For instance, Bjarnason et al. (2012) suggest analyzing identified practices over time to solve the issue of overscoping in incumbent firms. Tsilionis et al. (2022) as well as Olszewska et al. (2016) emphasize that their developed models to quantify scaling agility success should be tested in different contexts.

Second, the literature synthesis reveals additional research potential (blank spots): The reciprocal effects of dependencies on the other three identified dimensions have been little explored. Showing how these dependencies should be best designed or managed would increase the understanding of scaling agility. In particular, investigating the influence of the IT architecture (e.g., Uludag et al., 2019) and the culture or, on an individual level, the mindset (e.g., Mordi & Schoop, 2021) seems promising (**A2a**). In line with this, referring to the characteristics analysis, a deeper exploration of scaling agility concerning different contextual factors is a meaningful, potentially insightful further research direction (see **A2b** in Table 3).

Third, scaling agility as a phenomenon remains relatively nascent, mainly being investigated through qualitative approaches (**A3**). Further quantitative studies to test derived propositions and hypotheses are useful. The need for an increased application and development of generalizability and related theories in this context is also illustrated in Table 2 (see the last column). Hence, the lack of confirmatory theory application evident from the last column of Table 2 identified in the findings can also be understood as a research mandate to develop new theories that can contribute to the further development of the research field. Various works suggest developing process models that help us understand the evolution over time.

Moreover, works from the roles (e.g., Uludag et al., 2019) and the culture/mindset theme (e.g., Mordi & Schoop, 2021) identify effects on individuals' identities and thus suggest applying identity theories on scaling agility. Lastly, studies that look at the socio-technical nature of scaling agility are identified to be worthwhile endeavors.

Avenues for future research		**Potential Research Questions**
A1. Deepen theme-based research	A1a. Coordination	• How do underlying coordinating mechanisms impact the performance of scaling agility? • How can coordination best be managed in scaling agility?
	A1b. Structure	• How do effective organizational structures that aim for scaling agility look like? • How do they evolve over time? • What are tensions that exist within these constructs? • How do the interfaces between the agile parts and the remaining non-agile parts work?
	A1c. Structure and Measurement	• How can the success of different structures (e.g., coordination efforts, adapted processes, or new roles) be measured?
A2. Expansive research	A2a. Dependencies	• How does IT architecture relate to scaling agility? • How does organizational culture shape and is shaped by scaling agility?
	A2b Analysis of contextual factors	• To what extent does the context of the analysis (e.g., the industry, customer groups, regulatory environment) of scaling agility influence specific structural or methodological phenomena? • To what extent do IT agile and Enterprise Agile as contextual factors impact our understanding of scaling agility?
A3. Explanatory research	A3. Theorizing	• How can we generate generalizable results? • How do findings apply in other settings? • What theories can help to understand the dimensions and themes further? • How can the analysis of scaling agility advance theory?

Table 3. Avenues for future research and potential research questions

Theoretical and practical contributions

The literature review answers the question, what do we know about scaling agility in organizations?, with the comprehensive division into four dimensions and nine themes. Based on this, I point out six potential research opportunities, the treatment of which promises exciting insights. The analysis helps us in structuring the research domain by (1) showing its themes (Structure, Methodology, Governance, and Dependencies) and (2) helping improve conceptual clarity about scaling agility and showing the evolution from the IT domain to the overall organization. In addition, this work enables addressing blank spots. The analysis is consistent with literature reviews on the original conceptual sense of large-scale agile. It identifies, amongst others, coordination and organizational culture as open research streams. Also, the review indicates that the validation of findings from research on large-scale agile (i.e., in the understanding of IT agile) seems helpful in applying lessons learned in the analysis of scaling agility in IT departments to the analysis of scaling agility in the overall organization (see A2b in Table 3).

The findings of this analysis contribute to an integrative picture of scaling agility for incumbent firms. In doing so, I aim to help both research and practice. I extend the insights gained from previous literature

reviews by Dikert et al. (2016) (limited to IT agile) and Kalenda et al. (2018), as well as Kischelewski & Richter (2020) (focus on challenges and success factors). This paper does so by getting a holistic view on scaling agility for incumbent firms to confirm and update (a large number of the publications are from the last three years) as well as extend the content of these insights. The analysis shows that scaling agility in incumbent firms goes hand in hand with considerable barriers (e.g., coordinative, procedural, and contextual) that limit the potential benefits for incumbent firms. By focusing on the consequences for incumbent firms, this review surfaces that scaling agility for incumbent firms promises to be worthwhile. Yet, challenges exist that digital-born organizations do not encounter.

This review also tries to resolve the discrepancy between agile approaches or methodologies and organizational agility (Conboy & Carroll, 2019) and the concept of scaling agility and agile forms of organizational design (Gerster et al., 2020). The relationship can be described as follows: Agile forms of organizational design are the organizational vehicle that uses agile approaches to achieve organizational agility (Gerster et al., 2020). The goal of scaling agility is to increase the flexibility of an organization in response to changes in customer requirements and, to a lesser extent, to changes in the market environment – something attributed to organizational agility. Along with this, organizational agility can be classified as the goal of scaling agility. An analysis of which smaller-scale goals and measurement factors underlie organizational agility has been conducted by Tallon et al. (2019). The analysis shows (see Table 2) that most of the statements are the same, regardless of the form of scaling agility. This helps consolidate the content because it shows that the analysis of the dimensions can disregard whether it is IT agile or enterprise agile. Nevertheless, we can note differences in the foci of these groups of papers. IT agile papers focus on technical aspects, while EA papers focus more on structures and dependencies. Nonetheless, whether the paper addresses IT agile or enterprise agile should at least continue to be included as a context factor in scaling agility analyses.

Furthermore, this work also contributes to an improved, consolidated understanding of the various concepts that Conboy and Carroll (2019), as well as Power (2014), have lamented. Thus, by linking goals to the dimensions of scaling agility, I contribute to an improved conceptual understanding of the phenomenon and the related goals and contextual factors. We can also see an evolution in the understanding of scaling agility from a phenomenon confined to the IT development functions to a phenomenon including complete IT and business functions within organizations. This development is not coincidentally in lockstep with the development of organizational agility, a directly intended goal of scaling agility. Just as research on organizational agility has increasingly focused on the influence of IT (Tallon et al., 2019), the phenomenon of scaling agility out of the IT units has also spread to large parts of organizations.

Regarding the practical contribution, this research thus answers calls for executable, practice-oriented insights (Alleau & Balssa, 2020; Rigby et al., 2018) by providing a structure for practitioners to use in their efforts to scaling agility. Moreover, this review contributes to a better understanding of the issues that companies need to consider to optimize their digital transformation activities and goals (Drechsler et al., 2020). Simply copying the approaches of digital-born organizations is not a promising solution for incumbent firms. A more nuanced understanding of the peculiarities underlying the structure, methodology, governance, and dependencies is required for scaling agility successfully.

Limitations

This work has limitations. First, limitations are inherent to the methodology based on our boundary conditions, such as an analysis focusing on incumbent firms and selecting certain outlets and keywords underlying the analysis. While steps 1 through 3 (Define, Conduct Search, and Refining) were conducted using the most objective criteria possible, the process remains subjective. Likewise, papers describing similar phenomena using other terms were not included. Also, it should be noted that the conducted literature review only represents a part of the literature and is dependent on the search string used. However, I tried to keep this limitation as small as possible by using a search string as broad as possible, which simultaneously includes all commonly known terms of the phenomenon. In addition, although quality assurance was ensured by selecting specific outlets and content (see methodology section), greater differentiation in the quality of the papers among themselves was not carried out. Future work could confirm and, if necessary, specify the results obtained by more strongly differentiating the sources according to quality measures. Second, there are limitations in the content of the work. For instance, the studies' specific comparable characteristics (see Table 2) are only sometimes known (e.g., the industry

context). Furthermore, the focus is on the parts of the work that deal explicitly with scaling; other potentially influencing topics should have been considered. Third, focusing on dimensions and themes puts the distinction according to different concept definitions into the background. While I have argued why this benefits a holistic view of scaling agility, it also represents a potential oversimplification of the concept.

Conclusion

The nine themes aggregated in this review consolidate our knowledge and the six research avenues point out directions to further advance our understanding of scaling agility in incumbent firms. These findings should equip both researchers and practitioners to approach the multifaceted challenges of scaling agility in a more structured and nuanced way.

References

Alleau, B. and Balssa, A. (2020). "Simultaneous Transformation - Inventive IT." Capgemini Invent. Retrieved February 2023, from https://www.capgemini.com/wp-content/uploads/2021/09/SimultaneousTransformation_InventiveIT_FINAL2020.pdf.

Alsaqaf, W., Daneva, M. and Wieringa, R. (2019). "Quality requirements challenges in the context of large-scale distributed agile: An empirical study," *Information and Software Technology* 110, 39–55.

Batra, D. (2020). "Job-work fit as a determinant of the acceptance of large-scale agile methodology," *Journal of Systems and Software,* 168.

Beecham, S., Clear, T., Lal, R. and Noll, J. (2021). "Do scaling agile frameworks address global software development risks? An empirical study," *Journal of Systems and Software*, 171.

Bick, S., Spohrer, K., Hoda, R., Scheerer, A. and Heinzl, A. (2018). "Coordination Challenges in Large-Scale Software Development: A Case Study of Planning Misalignment in Hybrid Settings," *IEEE Transactions on Software Engineering,* 44 (10), 932–950.

Bjarnason, E., Wnuk, K. and Regnell, B. (2012). "Are you biting off more than you can chew? A case study on causes and effects of overscoping in large-scale software engineering," Information and Software Technology 54 (10), 1107–1124.

Brataas, G., Martini, A., Hanssen, G. K. and Raeder, G. (2021). "Agile elicitation of scalability requirements for open systems: A case study," *Journal of Systems and Software,* 182.

Calnan, M. and Rozen, A. (2019). "ING's Agile Transformation—Teaching an Elephant to Race," *Journal of Creating Value*, 5 (2), 190–209.

Cao, L., Mohan, K., Ramesh, B. and Sarkar, S. (2013). "Adapting funding processes for agile IT projects: an empirical investigation," *European Journal of Information Systems,* 22 (2), 191–205.

Conboy, K. (2009). "Agility from First Principles: Reconstructing the Concept of Agility in Information Systems Development," *Information Systems Research*, 20 (3), 329–354.

Conboy, K. and Carroll, N. (2019). "Implementing Large-Scale Agile Frameworks: Challenges and Recommendations," *IEEE Software,* 36 (2), 44–50.

Daneva, M., van der Veen, E., Amrit, C., Ghaisas, S., Sikkel, K., Kumar, R., Ajmeri, N., Ramteerthkar, U. and Wieringa, R. (2013). "Agile requirements prioritization in large-scale outsourced system projects: An empirical study," *Journal of Systems and Software,* 86 (5), 1333–1353.

Davenport, T. H., & Westerman, G. (2018). Why so many high-profile digital transformations fail. *Harvard Business Review*, *9*(4), 15.

De Smet, A., Lurie, M., & St George, A. (2018). Leading agile transformation: The new capabilities leaders need to build 21st-century organizations. *McKinsey & Company*, 1-27.

Dikert, K., Paasivaara, M. and Lassenius, C. (2016). "Challenges and success factors for large-scale agile transformations: A systematic literature review," *Journal of Systems and Software,* 119, 87–108.

Fuchs, C. and Hess, T. (2018). "Becoming Agile in the Digital Transformation: The Process of a Large-Scale Agile Transformation," In: *Thirty-ninth International Conference on Information Systems*, San Francisco 2018.

Gandomani, T. J., & Nafchi, M. Z. (2015). An empirically-developed framework for Agile transition and adoption: A Grounded Theory approach. *Journal of Systems and Software*, *107*, 204-219.

Gandomani, T. J. and Nafchi, M. Z. (2016). "Agile transition and adoption human-related challenges and issues: A Grounded Theory approach," *Computers in Human Behavior*, 62, 257–266.

Gerster, D., Dremel, C. and Kelker, P. (2018). "Agile Meets Non-Agile": Implications of Adopting Agile Practices at Enterprises," In: *24th Americas Conference on Information Systems*.

Gerster, D., Dremel, C., Brenner, W. and Kelker, P. (2020). "How Enterprises Adopt Agile Forms of Organizational Design," *The DATABASE for Advances in Information Systems,* 51 (1), 84–103.

Gill, A. Q., Henderson-Sellers, B., & Niazi, M. (2018). Scaling for agility: A reference model for hybrid traditional-agile software development methodologies. *Information Systems Frontiers*, *20*, 315-341.

Gioia, D., Corley, K. G. and Hamilton, A. L. (2013). "Seeking Qualitative Rigor in Inductive Research," *Organizational Research Methods,* 16 (1), 15–31.

Gregory, P., Barroca, L., Sharp, H., Deshpande, A. and Taylor, K. (2016). "The challenges that challenge: Engaging with agile practitioners' concerns," *Information and Software Technology*, 77, 92–104.

Heikkila, V. T., Paasivaara, M., Rautiainen, K., Lassenius, C., Toivola, T. and Jarvinen, J. (2015). "Operational release planning in large-scale Scrum with multiple stakeholders - A longitudinal case study at F-Secure Corporation," *Information and Software Technology,* 57, 116–140.

Hess, T., Matt, C., Benlian, A. and Wiesböck, F. (2016). "Options for formulating a digital transformation strategy," *MIS Quarterly Executive* 15(2).

Hoda, R., Salleh, N., Grundy, J. and Tee, H. M. (2017). "Systematic literature reviews in agile software development: A tertiary study," *Information and Software Technology,* 85, 60–70.

Hovorka, D. S., & Larsen, K. R. (2006). Enabling agile adoption practices through network organizations. *European Journal of Information Systems*, *15*(2), 159-168.

Hron, M. and Obwegeser, N. (2022). "Why and how is Scrum being adapted in practice: A systematic review," *Journal of Systems and Software,* 183.

Hund, A., Wagner, H.-T., Beimborn, D. and Weitzel, T. (2021). "Digital innovation: Review and novel perspective," *The Journal of Strategic Information Systems,* 30 (4), 101695.

Kasauli, R., Knauss, E., Horkoff, J., Liebel, G. and Neto, F. G. (2021). "Requirements engineering challenges and practices in large-scale agile system development," Journal of Systems and Software 172.

Kiely, G., Kiely, J. and Nolan, C. (2017). "Scaling Agile Methods to Process Improvement Projects: A Global Virtual Team Case Study," In: *Twenty-third Americas Conference on Information Systems*, Boston, 2017.

Kischelewski, B. and Richter, J. (2020). "Implementing Large-Scale Agile - an Analysis of Challenges and Success Factors," In: *28th European Conference on Information Systems*.

Korpivaara, I., Tuunanen, T., & Seppänen, V. (2021). Performance measurement in scaled agile organizations. In *Proceedings of the Annual Hawaii International Conference on System Sciences (HICSS)*, Hawaii, 2021.

La Rojas and Macias, J. A. (2019). "Toward collisions produced in requirements rankings: A qualitative approach and experimental study," *Journal of Systems and Software,* 158.

Limaj, E. and Bernroider, E. W. (2022). "A taxonomy of scaling agility," *The Journal of Strategic Information Systems,* 31 (3), 101721.

Limaj, E., Bernroider, E. and Ivanova, M. (2020). "Facing Legacy Information System Modernization in Scaling Agility in the Banking Industry: Preliminary Insights on Strategies and Non-technical Barriers," In: *Forty-First International Conference on Information Systems*, India, 2020.

Lucas Jr, H. C., & Goh, J. M. (2009). Disruptive technology: How Kodak missed the digital photography revolution. *The Journal of Strategic Information Systems*, *18*(1), 46-55.

Luong, T. T., Sivarajah, U. and Weerakkody, V. (2021). "Do Agile Managed Information Systems Projects Fail Due to a Lack of Emotional Intelligence?," *Information Systems Frontiers* 23 (2), 415–433.

Lyytinen, K., Yoo, Y., & Boland Jr, R. J. (2016). Digital product innovation within four classes of innovation networks. *Information Systems Journal*, *26*(1), 47-75.

Mikalsen, M., Moe, N. B., Wong, S. I., & Stray, V. (2021). Agile Information System Development Organizations Transforming to Large-Scale Collaboration. In: *Forty-Second International Conference on Information Systems,* Austin, 2021.

Moe, N. B., Dahl, B. H., Stray, V., Karlsen, L. S., & Schjødt-Osmo, S. (2019). Team autonomy in large-scale agile. In *Proceedings of the Annual Hawaii International Conference on System Sciences (HICSS)*, Hawaii, 2019.

Mordi, A. and Schoop, M. (2021). "Scaling with an Agile Mindset â•fi A Conceptual Approach to Large-Scale Agile," In: *2021 Americas Conference on Information Systems*.

Nambisan, S., Lyytinen, K., Majchrzak, A. and Song, M. (2017). "Digital Innovation Management: Reinventing Innovation Management Research in a Digital World," *MIS Quarterly*, 41 (1), 223–238.

Oberländer, A. M., Röglinger, M., & Rosemann, M. (2021). Digital opportunities for incumbents–A resource-centric perspective. *The Journal of Strategic Information Systems*, *30*(3), 101670.

Olszewska, M., Heidenberg, J., Weijola, M., Mikkonen, K. and Porres, I. (2016). "Quantitatively measuring a large-scale agile transformation," *Journal of Systems and Software,* 117, 258–273.

Paasivaara, M. and Lassenius, C. (2014). "Communities of practice in a large distributed agile software development organization - Case Ericsson," *Information and Software Technology,* 56 (12), 1556–1577.

Pernstal, J., Gorschek, T., Feldt, R. and Floren, D. (2015). "Requirements communication and balancing in large-scale software-intensive product development," *Information and Software Technology,* 67, 44–64.

Power, K. (2014). "A Model for Understanding When Scaling Agile Is Appropriate in Large Organizations," In: Torgeir Dingsøyr/Nils Brede Moe/Roberto Tonelli et al. (Eds.). Agile Methods Large-Scale Development, Refactoring, Testing, and Estimation - *XP 2014 International Workshops*. Cham, Springer, 83–92.

Pradhan, S. and Nanniyur, V. (2021). "Large scale quality transformation in hybrid development organizations - A case study," *Journal of Systems and Software,* 171.

Rigby, D. K., Sutherland, J. and Noble, A. (2018). "Agile at scale. How to go from a few teams to hundreds," *Harvard business review*, 96 (3), 88–96.

Rolland, K. H., Fitzgerald, B., Dingsoyr, T. and Stol, K.-J. (2016). "Problematizing Agile in the Large: Alternative Assumptions for Large-Scale Agile Development," In: *Thirty-seventh International Conference on Information Systems*, Dublin 2016.

Rowe, F. (2014). What literature review is not: diversity, boundaries and recommendations. *European Journal of Information Systems*, 23, 241–255. https://doi.org/10.1057/ejis.2014.7

Russo, D. (2021). "The Agile Success Model: A Mixed-methods Study of a Large-scale Agile Transformation," *ACM Transactions on Software Engineering and Methodology,* 30 (4).

Sarker, S., Xiao, X., Beaulieu, T., & Lee, A. S. (2018). Learning from first-generation qualitative approaches in the IS discipline: An evolutionary view and some implications for authors and evaluators (PART 1/2). *Journal of the Association for Information Systems*, *19*(8), 1.

Schuch, F., Gerster, D., Hein, D., & Benlian, A. (2020). Implementing Scaled-Agile Frameworks at Non-Digital Born Companies-A Multiple Case Study. In *Proceedings of the Annual Hawaii International Conference on System Sciences (HICSS)*, Hawaii, 2020.

Shastri, Y., Hoda, R. and Amor, R. (2021). "The role of the project manager in agile software development projects," *Journal of Systems and Software,* 173.

Stahl, D., Martensson, T. and Bosch, J. (2017). "The continuity of continuous integration: Correlations and consequences," Journal of Systems and Software 127, 150–167.

Tallon, P. P., Queiroz, M., Coltman, T. and Sharma, R. (2019). "Information technology and the search for organizational agility: A systematic review with future research possibilities," *The Journal of Strategic Information Systems*, 28 (2), 218–237.

Templier, M. and Paré, G. (2018). "Transparency in literature reviews: an assessment of reporting practices across review types and genres in top IS journals," *European Journal of Information Systems,* 27 (5), 503–550.

Trippensee, L. and Remané, G. (2021). "Practices for Large-Scale Agile Transformations: A Systematic Literature Review," In: *2021 Americas Conference on Information Systems*.

Tsilionis, K. and Wautelet, Y. (2022). "A model-driven framework to support strategic agility: Value-added perspective," *Information and Software Technology*, 141.

Tumbas, S., Berente, N. and vom Brocke, J. (2018) "Born Digital: Growth Trajectories of Entrepreneurial Organizations Spanning Institutional Fields," In: *Thirty-Eighth International Conference on Information Systems*, Seoul, Korea.

Uludag, Ö. and Matthes, F. (2020). "Investigating the Role of Enterprise Architects in Supporting Large-Scale Agile Transformations: A Multiple-Case Study," In: *Twenty-sixth Americas Conference on Information Systems*, Salt Lake City, 2020.

Uludag, Ö., Nägele, S. and Hauder, M. (2019). "Establishing Architecture Guidelines in Large-Scale Agile Development Through Institutional Pressures: A Single-Case Study," In: *Twenty-fifth Americas Conference on Information Systems*, Cancun, 2019.

Usman, M., Britto, R., Lo Damm and Borstler, J. (2018). "Effort estimation in large-scale software development: An industrial case study," *Information and Software Technology,* 99, 21–40.

Vial, G. (2019). "Understanding digital transformation: A review and a research agenda," *The Journal of Strategic Information Systems,* 28 (2), 118–144.

Wade, M., & Shan, J. (2020). Covid-19 Has Accelerated Digital Transformation, but May Have Made it Harder Not Easier. *MIS Quarterly Executive*, *19*(3).

Weber, Y. and Tarba, S. Y. (2014). "Strategic Agility: A State of the Art Introduction to the Special Section on Strategic Agility," *California Management Review*, 56 (3), 5–12.

Wolfswinkel, J. F., Furtmueller, E. and Wilderom, C. P. M. (2013). "Using grounded theory as a method for rigorously reviewing literature," *European Journal of Information Systems,* 22 (1), 45–55.

Zheng, Y., Venters, W., & Cornford, T. (2011). Collective agility, paradox and organizational improvisation: the development of a particle physics grid. *Information Systems Journal*, *21*(4), 303-333.