# Rethinking Innovation Speed: Innovating with Speed and Scale



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# Rethinking Innovation Speed: Innovating with Speed and Scale

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## Abstract

*In an era marked by formidable global challenges, innovating with speed and scale is imperative; otherwise, innovations may fall short of their potential. The literature on innovation speed often focuses on speed to market and neglects the crucial importance of scaling innovations quickly and globally to achieve significant societal impact. To bridge this gap, we expand the conceptual model of innovation speed by incorporating aspects of innovation scaling. We identify potential tensions between speed and scale and propose a revised definition of innovation speed. Finally, we have outlined some promising avenues to initiate this important research trajectory.*

**Keywords:** Innovation Speed, Innovation Scaling(up), Tensions.

## 1. Introduction

Various sectors ,and society at large, are grappling with formidable pressing challenges of an urgent nature - such as climate change and healthcare crises. Digital technology advancements and technical breakthroughs have potential transformative impact and value across various individuals, organizations, ecosystems, and societies (Dabrowska et al., 2022).Digital innovation applying digital technologies to create new market offerings, business processes, and models (Nambisan et al., 2017), is a significant part of the solution to our most exigencies societal challenges ( e.g in healthcare, electronic health records (EHRs) have improved patient information management; In finance, mobile payment systems have enhanced financial inclusion; In energy, smart grids optimize energy distribution, and carbon capture technology reduces greenhouse gas emissions). These innovative solutions need to be provided fast to reduce the negative consequences of the challenges at hand, which is why innovation speed is highly relevant (Doer, 2021; OECD Science, Technology and Innovation Outlook 2023, 2023)

The prevailing literature recognizes innovation speed as a critical strategy for achieving and sustaining competitive advantages by keeping away competitors (first/early mover advantage and assets pre-emption) and by reducing the overall development cost (through fewer man-hours, redundancies, and errors) ( Kessler & Chakrabarti, 1996; Markman et al., 2005). One stream of the literature focuses on the consequences of innovation speed, for instance, on firm performance and product quality (Cankurtaran et al., 2013; Guo et al., 2020). Another stream of the literature has provided insights on the antecedents to innovation speed, lying within and outside the boundaries of the firms. For example, various scholars investigate firm-level determinants, such as strategic orientation, organizational capabilities, development process, leadership, incentive programs, team structure, and product complexity and newness (J. Chen et al., 2010; Cheng & Yang, 2019; Kessler & Chakrabarti, 1996; Marvel & Patel, 2018). Factors spanning across firm boundaries have also been investigated. Namely, the collaboration between the firm and external partners could impede and accelerate speed depending on the network centrality, knowledge management, and type of collaborators (Acharya et al., 2020; Milan et al., 2020; Ojha et al., 2023; Pan et al., 2024; Zhang et al., 2020). The external factors affecting innovation speed have also been studied, for instance, uncertainty, regulations, and technological turbulence (Briest et al., 2020a; W. Y. Chen & Jin, 2023; Mota et al., 2024).

The literature has been criticized for

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inconclusiveness and inconsistencies among findings and measurements and for particular emphasis on specific phases of the innovation process (Milan et al., 2020). The concept of innovation speed, intrinsically linked to the reduction of temporal gaps within and between each stage of the innovation process, necessitates a holistic examination. A comprehensive approach ensures that these temporal gaps are minimized, thereby enhancing the overall speed and effectiveness of innovation.

We inaugurate this research by reviewing the literature on innovation speed to identify neglected phases within the innovation process. Our findings reveal a pronounced focus on the research and development (R & D) and market introduction phases while critically neglecting the scaling-up stage.That said, the literature on innovation speed has not paid much attention to the fact that for large-scale societal benefits to be generated, innovations must not only be developed and introduced to the market but also scaled quickly and globally to address societal challenges at a sufficient scale. Hence, what is most relevant is innovation speed at scale(OECD Science, Technology and Innovation Outlook 2023, 2023; Doer, 2021).We argue for the need to extend the current scope of innovation speed literature by placing emphasis on scaling innovations. This extension involves examining the additional complexities that scaling introduces and highlighting the tensions that may emerge when bridging different stages of the innovation process. Finally, we outline promising avenues for future research and practical applications, emphasizing the importance of considering innovation speed at scale.

## 2. Methodology

The methodology employed in this research consists of a literature review, aimed at exploring: (1) What are the phases covered by innovation speed literature? and (2) What are the antecedents and consequences of innovation speed? (3) How do these antecedents and consequences of innovation speed interact with the scaling process?

In the first phase of the review, the primary focus was on innovation speed. A structured search was conducted using the Web of Science database, utilizing key terms such as "innovation speed," "product development time," "time to market," and "product development cycle time." The search results were refined into three categories—business, management, and economics—to ensure relevance to the study's scope. The search was limited to articles published between 2000 and 2024, to capture recent advancements, with the exclusion of journals not listed in the Academic Journal Guide 2021, ensuring the inclusion of high-quality, peer-reviewed sources.This search initially yielded 82 articles, which were further filtered based on their relevance to the study's objectives. After a preliminary review of titles and abstracts, 77 articles were shortlisted for further examination. Upon a more detailed review, including skimming through the introduction, methodology, and conclusions of the articles, a final set of 57 articles was selected for in-depth analysis. Additionally, we included 3 seminal articles from the 1990s that, while outside the specified time frame, are widely recognized for their foundational contributions to the field of innovation speed. These articles were added due to their significant influence on shaping contemporary understandings of the topic (see Table 1 in the appendix for a detailed summary of the articles reviewed). For each article, we investigated the scope of innovation speed by examining the stages of the innovation process, its antecedents, and its consequences. In the second phase of the review, we specifically focused on how the antecedents and consequences of innovation speed interact with the overlooked phase of scaling innovations. The analysis explored the tensions between maintaining innovation speed and ensuring successful scaling.

## 3. Innovation speed

Innovation speed is variously defined as the rapid transformation of ideas into marketable products or services (Milan et al., 2020), the time elapsed between initial discovery and commercialization (Markman et al., 2005), and the rate at which an idea moves from conception to marketable product (J. Chen et al., 2010). The fundamental emphasis across definitions lies in the time efficiency between the basic research and development phases and the market introduction (Kessler & Chakrabarti, 1996). Related terms such as innovation speed, new product development (NDP) speed, time-to-market, and cycle time have been used in previous studies(J. Chen et al., 2010; Kessler & Chakrabarti, 1996; Lynn et al., 1999).

The literature on innovation speed often neglects the scaling-up phase, with only a few studies addressing the interplay between speed and scale (see, for example, Hilmersson et al., 2023; Liu et al., 2022). Innovation scaling involves broadening the reach and enhancing the impact of innovations, encompassing strategic growth, market adaptation, and continuous evolution in response to both environmental and internal factors. It is characterized by its focus on expanding geographical reach, increasing the adoption base, and improving quality, fit, and sustainability (Islam, 2020; Gartner

& Moro, 2024; Di Pietro et al., 2018). Innovation scaling is part of the diffusion process, yet some scholars differentiate between innovation scaling and innovation diffusion. Foster & Heeks (2013) assert that while scaling is part of the diffusion process, it stands out as an independent concept through its deliberate and strategic actions.

That said, the literature on innovation speed has not paid much attention to the fact that for large-scale societal benefits to be generated, innovations must not only be developed and introduced to the market but also scaled quickly and globally to address societal challenges at a sufficient scale. In the pursuit of sustainable development and resilience, the combined principles of innovation speed and scaling are not just advantageous but indispensable. They emerge as pivotal determinants in effectively addressing and navigating the myriad challenges we face as a global community (OECD Science, Technology and Innovation Outlook 2023, 2023; Doer, 2021). In other words, to address our current societal and grand challenges, timely technical solutions alone are not enough. They have to be available and put into use broadly and at scale to contribute to societal solutions successfully. Hence, what is most relevant is *innovation speed at scale*, where innovation involves both invention and commercialization/utilization (Freeman, 1982; Schumpeter & Opie, 1934). Yet, innovation speed and scale have emerged as relatively separate themes of research in the innovation literature. Our aim here is, therefore, to conceptually bridge these concepts and streams of research in order to find paths forward for future research.

The recent worldwide scramble to distribute the COVID-19 vaccine underscores this point emphatically. Developing the vaccine rapidly was a monumental feat, yet its benefits hinge entirely on global access. Without widespread distribution, the virus could mutate more dangerously and continue to overwhelm healthcare systems globally. Similarly, innovative solutions to more complex social problems, such as climate change, must transcend regional implementation. A creative solution in one corner of the world, while others continue to pollute, accomplishes little or nothing. The benefits of such innovations must be shared on large scale to foster meaningful impact.

## 4. Speed consequences and antecedents

### 4.1. Consequences

Numerous scholars underscore the significance of innovation speed in attaining and maintaining organizational competitiveness, especially in an era characterized by persistent dynamic changes and increasing competition. Innovation speed is critical for maintaining competitive advantages in dynamic markets (Wu et al., 2022), enabling firms to be market leaders or fast followers (Milan et al., 2020) and allowing for rapid response to market changes and new market demands (J. Chen et al., 2010; Kessler & Chakrabarti, 1999; Markman et al., 2005). Innovation speed is thus crucial for a firm's success, leading to benefits such as earlier market entry and higher returns (Markman et al., 2005). Zhang et al. (2020) further emphasize this, showing that optimal innovation speed is key for maximizing performance, as it mediates the relationship between knowledge management and firm performance. In a similar vein, (Hilmersson et al., 2023) shed the light on a positive relation between innovation speed and the internalization of small & medium-sized enterprises. The quality attribute is also presented in the literature. A study by (Stanko et al., 2012) challenges the traditional belief that quicker innovation compromises quality. It finds that faster speed to market can correlate with higher product quality, particularly when the products are highly innovative to the firm and the market. in a later study, Cankurtaran et al. (2013), confirm the positive relation between speed and quality, yet it gives a nuance that, unless managed well, speeding up development could compromise thoroughness in testing and quality assurance, potentially leading to higher costs down the line if issues need to be rectified post-launch. Guo et al. (2020) posit that the interaction between innovation speed and quality negatively affects firm operational performance, which aligns with findings from J Chen et al. (2005). They discuss a trade-off between speed and quality. Whereas rushing to market may compromise quality, a thorough focus on quality may slow down the process, causing missed opportunities.

### 4.2. Antecedents

Several perspectives emerge as determinants of innovation speed on firm-level. (Kessler & Chakrabarti, 1996a) emphasize the importance of orientations and organizational capabilities as determinants at the micro level, including empowering teams, granting decision-making autonomy, and effectively organizing development processes. In their meta-analysis study on NDP speed, J. Chen et al. (2010) categorized antecedents into four primary groups: strategy, project, process, and team characteristics. Strategy antecedents include emphasizing speed to promote a time-oriented focus, top management support providing necessary resources, and goal clarity to ensure project objectives are well-defined and communicated. Project characteristics highlight how newness and complexity of products introduce uncertainties that potentially extend development time. Process-related antecedents such as process formalization, standardization and concurrency(Calantone & Di Benedetto, 2000), along with iterative approaches and learning mechanisms(See the lean startup Ries, 2011, Blank, 2020), streamline coordination and enhance adaptability, thereby accelerating development. Team characteristics focus on the influence of strong leadership, team experience, dedication, and empowerment in speeding up the NPD process. Furthermore, internal and external integration facilitate efficient information exchange and decision-making, while functional diversity within the team broadens the knowledge base, encouraging innovative and rapid solutions. These findings provide a structured insight into the dynamics influencing NPD speed, grounded in comprehensive statistical analysis. Knockaert & Spithoven (2014) build upon this by highlighting the correlation between a firm's capacity and its innovation speed, underscoring the significance of internal capabilities. However, Milan et al. (2020) present a counterargument by pointing out that while high absorptive capacity generally leads to innovation, it can also cause delays in early-stage technologies due to integration challenges. Moreover, Ojha et al. (2023) draw attention to the capacity for social exchange within organizations and its positive impact on knowledge sharing, consequently accelerating innovation. This implies that effective internal communication plays a role in accelerating the innovation process. A positive correlation between leadership and innovation speed has been established. The behavior of self-leadership – referring to the self-direction and self-motivation of the founder- proved to be a precursor to speeding up the new product development factors (Marvel & Patel, 2018). Cheng & Yang (2019) draw a positive link between leadership encouragement of creativity and innovation speed.

In a broader context, the importance of leadership in driving innovation speed extends beyond individual organizational boundaries. W. Liu et al. (2022) point out that effective leadership catalyzed the formation of a dynamic, responsive ecosystem. This involved setting a clear direction, facilitating knowledge sharing, and creating the right incentives for all partners. In this vein, there is also an emphasis on knowledge management and the need to balance knowledge acquisition and application to prevent cognitive overload and maintain a steady pace of innovation (Zhang et. al 2020). Managing external knowledge and relationships effectively enhances innovation speed and maintains a competitive edge (Acharya et al., 2020; Ojha et al., 2023). (Pan et al., 2024) explore how a firm's strategic positioning within a knowledge network, specifically its alliance composition and network centrality, critically influences the speed of radical innovation. Their study finds that while industry partners may decelerate innovation due to profit orientation and resource guarding, research and government partners can accelerate it by providing novel insights and support. Open innovation gets noticeable attention in the literature on innovation speed. Zhu, Xiao, Dong, & Gu (2019) find that horizontal open innovation, with its wide-ranging external collaboration, is better suited for novel business models to accelerate new product development, while vertical strategies, focusing on in-depth collaboration, align well with efficiency-driven models. Further, Toroslu, Herrmann, Chappin, Schemmann, & Castaldi (2023) reveal the complexities of open innovation in nascent ventures, indicating that while research and development collaborations can slow down early-stage ventures, joining industry associations does not have this drawback. Cui et al. (2018) show that IT-enabled absorptive capacity and implementation openness can significantly speed up new product development. The literature touched upon digital technologies and digital platforms and their role in fostering collaboration in an open innovation setting. Wu et al. (2022) investigate how digital platforms catalyse innovation speed for small and medium-sized enterprises by fostering platform synergy, enabling robust collaboration, and facilitating market access within digital ecosystems. W. Liu et al. (2022)illustrate how digital technology and open innovation can combine to accelerate innovation under crisis conditions, enabling rapid design sharing, manufacturing processes, and collaboration across diverse organizations.

Y. Liu et al. (2023) demonstrate how digital technology significantly reduces the innovation cycle, enabling firms to swiftly adapt and innovate in response to changing market needs. They accentuate two main attributes of digital technology: convergence and generativity, enabling innovation speed. The convergence aspect enables firms to integrate diverse elements such as customer interactions and partnerships, thus fostering a rapid innovation process (Henfridsson et al., 2018; Setia et al., 2013). The generative nature of digital technology, characterized by its adaptability and flexibility/re-programmability, facilitates rapid product and service development (Tilson et al., 2010). The role of Intellectual property rights (IPR) is also presented in this context as a negative moderator between digital technology and innovation speed (Y. Liu et al., 2023).

Environmental dynamics also have a role to play in innovation speed/ The pace of innovation has been found to be closely tied to the state of uncertainty, which is a defining characteristic of the current era. Kessler & Bierly (2002) posit that the efficacy of fast-paced innovation strategies is predominantly observed in contexts that exhibit predictable patterns and trends. In the same vein, Chen & Jin (2023) emphasize that uncertainty, in particular, tax uncertainty, impedes innovation speed. In contrast, Briest, Lukas, Mölls, & Willershausen (2020) elucidate the dual impact of uncertainty and competition, noting that while high uncertainty can catalyze innovation as firms strive to adapt, it might also curtail the success rate of new innovations.

# 5. Extending the scope: innovating with speed and scale

In this paper, we argue for the need to extend the focus of innovation speed to include innovation scaling. This conceptualization redefines innovation speed as the time elapsed from the initial research and development stages to achieving sufficient scale.

By extending the focus to include the scaling-up phase, we acknowledge the additional layer of complexity that this introduces. Scaling involves expanding innovations across various dimensions to amplify their impact. This can include geographical expansion into new regions, reaching different user segments, or applying successful models in diverse domains (Islam, 2020; Gartner & Moro, 2024; Di Pietro et al., 2018). This process often necessitates both external and internal transformations. Externally, it may require changing laws, policies, and institutional frameworks to facilitate the broader adoption of innovations (Sandberg & Hultberg, 2021; Rodriguez et al. 2021). Internally, it involves reorganizing functions, building capacity, and acquiring new knowledge through staffing and skill enhancement to support expanded operations (Palmié et al., 2023). Additionally, adapting solutions to various contexts is crucial (Rodríguez et al., 2021). Scaling may also involve shifts in cultural norms and values to transform societal behaviors for deeper, long-lasting change (Sandberg & Hultberg, 2021). In a business context, scaling addresses financial efficiency, process optimization, market expansion, and increased production capacity to ensure sustainable growth (Palmié et al., 2023). The interdependence of these dimensions highlights the inherent complexity of the scaling process, as each aspect influences and relies on the others, creating a dynamic and multifaceted challenge.

## 5.1. Tensions between speed to market and scaling up

Through the extension of the innovation speed framework to encompass innovation scaling, a number of seemingly paradoxical tensions have been identified. A comparative analysis of the factors that influence both concepts reveals a range of potential tensions that ought to be considered in order to advance our understanding of innovation dynamics.

**Autonomy vs Strategic planning**. One antecedent of innovation speed considerably present in the literature is decentralization and empowering the team with decision-making autonomy(J. Chen et al., 2010, 2015; Kessler & Chakrabarti, 1996b). However, the strategic planning and careful resource allocation necessitated for scaling up innovation (Billings et al. 2007a; O'Reilly and Binns 2019) might be in strong tension with autonomy.

Google historically implemented the "20% Time" policy, which allowed employees to spend 20% of their time on any project they chose, aiming to foster creativity and rapid innovation. This autonomy led to the development of significant products like Gmail and Google News, showcasing the benefits of decentralized decision-making. However, as Google scaled, it faced the challenge of aligning these innovative pursuits with its broader strategic goals. Over time, Google had to adjust this policy by adding more oversight and integrating these personal projects more tightly with its overall business objectives. This shift illustrates the tension between maintaining employee autonomy to drive quick innovations and the need for strategic planning to ensure these innovations align with the company's growth and market objectives, optimizing resource allocation across its expanding operations.

*Proposition 1: To innovate with speed and scale, organizations should empower autonomous teams for rapid development but align them with strategic oversight to ensure innovations can seamlessly integrate into long-term business goals.*

**Loosely Coupled VS Long-term Strategic Collaboration.** For innovation speed, extensive external collaboration through horizontal open innovation allows for rapid iteration and faster development cycles, capitalizing on diverse inputs and expertise (Zhu, Xiao, Dong, & Gu, 2019). However, when scaling innovation, the focus shifts towards forming strategic partnerships and navigating ecosystems carefully to ensure sustainable growth. This often necessitates a vertical collaboration strategy, focusing on deeper, more structured partnerships that may limit the flexibility but enhance the efficiency and depth of innovation processes (Capponi & Corrocher, 2022; Di Pietro et al., 2018). This also translates to tension between the loosely coupled, flexible nature that facilitates speed and the need for high integrity in the process of scaling (see structural flexibility vs structural integrity Lusch and Nambisan 2015)

The push for Electric Vehicles (EVs) has necessitated collaboration with flexibility and integrity. It involves horizontal open innovation, rapidly integrating ideas/technologies from various disciplines across sectors to develop innovative solutions quickly. This approach benefits from being loosely coupled with different actors in different settings. For expanding the green solutions (including EVs), firms ,like Volvo, focus on vertical collaborations, which involves forming long-term, strategic partnerships with governments and major energy providers to ensure the infrastructure for EVs is robust and reliable.

*Proposition 2:To innovate with speed and scale, companies must be ambidextrous, maintaining loosely coupled collaborations that drive rapid innovation while also fostering strategic, long-term partnerships that provide stability and support sustainable growth.*

**Standardization VS Adaptation**. Having a standardized process is positively related to innovation speed (Cankurtaran et al., 2013). Standards can also be needed in scaling innovation, for instance, to facilitate mass production and quality (see Lee & Restrepo (2015). One eminent tension that emerges in this vein is the paradoxical nature between the need for standardization and the necessity for adaptation when scaling into new segments, sectors, domains, and markets. (Di Pietro et al. 2018; Piaskowska, Tippmann, and Monaghan 2021). M-Pesa's success in Kenya was largely driven by the standardized process of transferring money via mobile phones. The simplicity, uniformity, and ease of adoption made the system highly efficient, enabling rapid expansion and fostering trust among users. This standardized approach allowed M-Pesa to quickly gain a foothold in the market and scale within Kenya. However, when M-Pesa expanded to other countries, such as South Africa and Tanzania, it had to adapt to different regulatory environments and market dynamics. In South Africa, for example, M-Pesa faced significant challenges that required adjustments to the business model, while in Tanzania, the service had to be tailored to meet different user needs. These adaptations slowed down scaling efforts compared to the rapid success in Kenya.

*Proposition 3:To innovate with speed and scale organizations shoud leverage standardized elements and processes for speed to market while remaining flexible enough to adapt to local market needs and regulatory environments.*

**Speed VS. Quality.** With the speed literature, numerous researchers shed light on a paradoxical tension between speed and quality (J. Chen et al., 2005; Guo et al., 2020). This tension could be translated to a tension between speed and scaling, as the latter relies heavily on quality (Di Pietro et al., 2018; Gartner & Moro, 2024; Islam, 2020). Boeing rushed the 737 Max to market in an effort to compete with Airbus' new aircraft, prioritizing speed in the design and development phase. To accelerate the process, Boeing implemented rapid design changes and cut down on testing and safety protocols, allowing the aircraft to be released quickly. However, this emphasis on speed to market came at the expense of crucial quality and safety considerations. As a result, Boeing failed to adequately address key risks before scaling production and distribution. This oversight led to two fatal crashes, grounding the 737 Max globally and demonstrating that prioritizing speed without proper safeguards in place can result in significant long-term failures.

*Proposition 4:To innovate with both speed and scale, organizations must implement rigorous quality controls to ensure long-term sustainability and trust. This means not compromising on quality even when aiming to go to market quickly, as maintaining high standards is crucial for successful scaling and customer trust.*

### 5.2. COVID-19 vaccine: Navigating all four tensions

The development of COVID-19 vaccines provides a comprehensive example of navigating the four key tensions in innovation: speed, quality, collaboration, and scaling. Traditionally, vaccine development spans years or decades, but the urgency of the pandemic pushed vaccines like Pfizer-BioNTech and Moderna's to be created in under a year, facilitated by advances in mRNA technology. Global collaborations among governments, pharmaceutical companies, and academic institutions, along with emergency use authorizations (EUAs) from regulatory agencies, allowed for expedited approval. A notable example is Operation Warp Speed in the U.S., which demonstrated how public-private partnerships could accelerate development by pooling resources and expertise.

Despite the fast-tracked process, ensuring vaccine safety and quality was paramount. Clinical trials, though compressed, adhered to rigorous standards, and post-approval safety monitoring continued. Challenges like maintaining the cold chain for mRNA vaccines highlighted the complexity of scaling, while public trust in the vaccines' safety was essential for widespread adoption. This required transparent communication from health authorities and stringent quality control.

The vaccine development process involved both fast-paced, loosely coupled partnerships and more structured long-term collaborations. Early-stage innovation benefited from independent research and flexible partnerships, such as the Pfizer-BioNTech collaboration on mRNA technology. As production scaled, strategic partnerships were crucial, like Pfizer's work with DHL on logistics or AstraZeneca's collaboration with the Serum Institute of India to supply lower-income countries.

Standardization and adaptation were vital in balancing speed and scale. Pfizer-BioNTech and Moderna used standardized production for rapid vaccine rollout, but adaptation was necessary for different regions, particularly in low-resource countries. For instance, AstraZeneca and Johnson & Johnson vaccines, which required standard refrigeration, were better suited for these environments.

Finally, balancing autonomy with strategic planning was key at the meta-organizational level. Companies like Moderna and Pfizer-BioNTech benefited from autonomy during early development, but scaling required coordinated efforts from governments and organizations like the WHO. Operation Warp Speed exemplified how top-down oversight could ensure the rapid and equitable distribution of vaccines globally.

## 6. Conclusion and research agenda

The innovation speed literature does not provide an answer to the question of how to innovate with speed at scale for the future. The literature at most extends to the initiation of commercialization. Considering the current global crisis and the associated risks, simply developing and commercializing innovations quickly is not enough. What is needed is the rapid scaling of these innovations to address societal challenges effectively. Therefore, the traditional view on innovation speed should span to the innovation scaling phase. This may amend the definition of innovation speed to be This conceptualization redefines innovation speed as the time elapsed from the initial research and development stages to achieving a sufficient scale.

From this combined perspective, we identify several promising avenues for future research. First, it is critical to understand how to manage the tensions between speed and scale. This could be done by conducting empirical studies on innovations that reached the market and scaled quickly. The dynamic capability framework could be one approach to adopt in the research, given its relevance to both literatures. In this vein, the research could also draw on ambidexterity, often seen as the capability to restructure the organization. This extends the application of ambidexterity, traditionally focused on exploration versus exploitation.

Second, in an effort to mitigate the tensions between innovation speed and scaling, researchers may investigate the role of digital technologies such as artificial intelligence (AI) and digital platforms. AI has great potential, for instance, to optimize workflows and predict bottlenecks, which can improve both the speed and quality of outputs. Digital platforms, characterized by their inherent granularity and modularity, are well-positioned to significantly contribute to reconciling the tensions between speed and scale. However, this may introduce new sorts of tension unique to platforms, namely stability versus flexibility, generativity versus control, and openness versus closeness. Digital platforms may also face challenges penetrating non-platform sectors

Third, it is clear that it requires an innovation ecosystem perspective which accounts for all relevant actors in the innovation and scaling process. While the innovation ecosystem literature has grown rapidly over the last decade (Granstrand & Holgersson, 2020) it has not sufficiently covered speed-related questions. How can the ecosystem be orchestrated to promote speed and scale? What can be done to avoid complex and time-consuming coordination, slowing innovation down? The Covid-19 case clearly shows that things can be done to innovate fast at scale, but we do not yet know exactly how.

Fourth, we should extend the view of fast scaling beyond the digital enterprise and platforms. One important area is human, which relates to how a sense of urgency can fuel innovation speed. This was clearly the case for Covid-19, but less so for many other global challenges. Why is that?

In conclusion, the innovation management research community can greatly benefit the society by shedding more light on how to innovate fast at scale. One part of this is connecting the dots of extant research on innovation speed and scaling, but it requires new empirical research too. With this article, we have provided a call for action and some promising avenues for starting this important research trajectory.

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# 8. Appendix

## Table 1

Reviewed articles sorted by their focus.

| Development/Market Introduction |
| --- |
| Kessler, E. H., & Chakrabarti, A. K. (1996). |
| Bayus, B. L. (1997). |
| Lynn, G. S., Morone, J. G., & Paulson, A. S. (1999). |
| Cantalone, R. J., & Benedeto, C. A. (2000). |
| Sherman, J. D., Souder, W. E., & Jenssen, S. A. (2000). |
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| Griffin, A. (2002). |
| Filippini, R., Salmaso, L., & Tessarolo, P. (2004). |
| Katz, S. M., Casey, R., & Aiman-Smith, L. (2005). |
| Markman, G. D., Gianiodis, P. T., Phan, P. H., & Balkin, D. B. (2005). |
| Jun, H. B., Ahn, H. S., & Suh, H. W. (2005). |
| Chen, C., Reilly, R. R., & Lynn, G. S. (2005). |
| Custodio, M. G., Thorogood, A., & Yetton, P. (2006). |
| Prasnikar, J., & Skerlj, T. (2006). |
| Carbonell, P., & Rodriguez, A. I. (2006). |
| Abdelsalam, H. M. E., & Bao, H. P. (2006). |
| Carrillo, J. E., & Franza, R. M. (2006). |
| Swink, M., & Song, M. (2007). |
| Heirman, A., & Clarysse, B. (2007). |
| Wu, L., De Matta, R., & Lowe, T. J. (2009). |
| Carbonell, P., & Rodriguez-Escudero, A. I. (2009). |
| Sherman, J. D., & Rhoades, R. G. (2010). |
| Carbonell, P., & Rodriguez-Escudero, A. I. (2010). |
| Danese, P., & Filippini, R. (2010). |
| Chen, C., Damanpour, F., & Reilly, R. R. (2010). |
| Goktan, A. B., & Miles, G. (2011). |
| McNally, R. C., Akdeniz, M. B., & Calantone, R. J. (2011). |
| Feng, T., Sun, L., Zhu, C., & Sohal, A. S. (2012). |
| Stanko, M. A., Molina-Castillo, F. J., & Munuera-Aleman, J. L. (2012). |
| Martínez-Sánchez, A. (2013). |
| Perols, J., Zimmermann, C., & Kortmann, S. (2013). |
| Eling, K., Langerak, F., & Griffin, A. (2013). |
| Cankurtaran, P., Langerak, F., & Griffin, A. (2013). |
| Knockaert, M., & Spithoven, A. (2014). |
| Oezer, O., & Uncu, O. (2015). |
| Chen, C., Lynn, G. S., & Reilly, R. R. (2015). |
| Shan, P., Song, M., & Ju, X. (2016). |
| Palmie, M., Zeschky, M., Winterhalter, S., Sauter, P. W., Haefner, N., & Gassmann, O. (2016). |
| Durmusoglu, S. S., Hirunyawipada, T., & McNally, R. C. (2017). |
| Behrens, J., & Patzelt, H. (2018). |
| Dong, J. Q., Wu, W., & Zhang, Y. (2019). |
| Wu, C.-H., & Lai, J.-Y. (2019). |
| Zhu, X., Xiao, Z., Dong, M. C., & Gu, J. (2019). |
| Briest, G., Lukas, E., Moells, S. H., & Willershausen, T. (2020). |
| Zhang, H., Zhang, X., & Song, M. (2020). |
| Milan, E., Ulrich, F., Faria, L. G. D., & Li-Ying, J. (2020). |
| Acharya, C., Ojha, D., Patel, P. C., & Gokhale, R. (2020). |
| Van den Broeke, M., Devoldere, B., Creemers, S., & Boute, R. (2021). |
| Wang, Z., Cai, S., Liang, H., Wang, N., & Xiang, E. (2021). |
| Ojha, D., Struckell, E., Acharya, C., & Patel, P. C. (2021). |
| Iqbal, M. (2021). |
| Hsiaog, Y.-C., & Wu, M.-H. (2022). |
| Wu, A., Song, D., & Liu, Y. (2022). |
| Ferreras-Méndez, J. L., Llopis, O., & Alegre, J. (2022). |
| Chen, W., & Jin, R. (2023). |
| Yassine, A., & Souweid, S. (2023). |
| Ojha, D., Dayan, M., Struckell, B., Dhir, A., & Pohlen, T. (2023). |
| Mota, P., Costa, J., & Gomes, P. (2024). |

| Upscaling/Large-Scale Diffusion |
| --- |
| Hilmersson, M., Johanson, J., & Lindahl, A. (2022). |
| Liu, X., Wang, S., & Zhang, C. (2022). |