

Collaborative Innovation in Early-stage Startups: Insights from Nova Scotia's Innovation Ecosystem

Uchechukwu Nwogu^{1*}, Muhammad Faraz Mubarak¹, Marco Cuvero² and Richard Evans¹

¹Faculty of Computer Science, Dalhousie University, Halifax, NS, Canada

²Brunel Business School, Brunel University London, Uxbridge, United Kingdom

*Corresponding Author: E-mail: unwogu@dal.ca

Abstract—Early-stage startups face significant innovation challenges from resource constraints, limited network access, and restricted external knowledge. While critical, how startups integrate external expertise, funding, and technology in product development is largely underexplored in current literature. This study, therefore, aims to investigate collaborative innovation in Nova Scotian early-stage software startups, focusing on design decision factors and product development challenges. Grounded in Dynamic Capability and Absorptive Capacity theories, this study analyzed 26 semi-structured interviews with startup founders and developers. The findings show that iterative feedback, user-centered design, and ecosystem engagement are key to overcoming funding instability, staff turnover, and technical hurdles. Thematic analysis shows that external collaboration improves access to resources, reduces time-to-market, and improves innovation performance. The study's results extend dynamic capability and absorptive capacity theories to early-stage startups and offer practical guidance to improve innovation performance in dynamic environments.

Keywords - collaborative innovation, entrepreneurship, early-stage startups, product development.

I. INTRODUCTION

Startups must be creative and have ambition to drive economic and technological progress. Defined as institutions which create new products and / or services under extreme uncertainty [1], about 90% of them fail or falter in their initial years [2]. Such firms aim to develop scalable, repeatable business models [3], which require the continuous pursuit of new knowledge and skills for global competitiveness. While competition in the market can drive innovation, it offers no specific method for its development or implementation [4]. Innovation, merging ideas with user needs for new products [5], demands significant collaboration [6]. However, resource constraints, market uncertainties, and the need for strategic partnerships limit the idea-to-impact pathway [7], [8]. Startups often flourish in dynamic innovation ecosystems offering knowledge-sharing, mentorship, and alliance opportunities [9]. For example, early-stage software startups can acquire missing expertise or insights through outsourcing or partnerships. Understanding startup collaboration is crucial for establishing innovation and scaling new product ideas.

Collaboration drives innovation, enabling startups to share their resources, expand market access, and gain competitive advantage [10]. Drawing on diverse, geographically dispersed stakeholder expertise (e.g., customers, ecosystem incumbents) allows for rapid and efficient digital product development [11]. While Research and Development (R&D) activities in complex industries, such as automotive, is often collaborative in nature [12], early-stage startups differ. Their smaller teams, often led by technically-focused founders or Chief Executive

Officers (CEOs), tend to collaborate less due to Intellectual Property (IP) and trust concerns with external partners.

Previous studies lack empirical evidence about how early-stage startups collaboratively develop their products with external stakeholders. For this reason, the innovation ecosystems that are present within Nova Scotia, Canada, are considered a suitable case study for this research, as startups are a driving force in the province's economy, providing over 4,000 jobs in 2023 and raising over \$170M CAD in funding, with software development being considered a critical industry in its success and growth [13]. The province resembles a "peripheral innovation system" [14], a region outside of a major metropolitan center (e.g., Toronto) facing structural challenges, such as limited venture capital, smaller talent pools, and market distance. This focus addresses the need for contextualized research, as innovation ecosystems, particularly peripheral ones, vary and face distinct challenges requiring tailored policy [15]. Nova Scotia presents a unique yet generalizable context for researching collaborative innovation in early-stage startups. Despite its scale, the province is an emergent innovation hub due to policy interventions, collaborations [16], and accelerators (e.g., Volta, Propel), fitting the logic of a critical case in qualitative research [17]. This study addresses this gap by providing empirical evidence in the emerging innovation ecosystem of Nova Scotia and investigating how startups overcome barriers to effectively absorb and use external knowledge. The analysis relies on qualitative data collected from January to April 2024 from 26 startups within Nova Scotia's innovation ecosystem. The study addresses the following key research questions:

RQ1: What factors influence early-stage startups' collaborative product development decisions?

RQ2: What challenges do early-stage startups face in collaborative product development?

This study identifies collaborative practices (i.e., user-centered design, iterative feedback, ecosystem engagement) offering actionable insights for resource-constrained early-stage startups and policymakers to establish innovation in peripheral regions, such as Nova Scotia. It provides empirical evidence for the field of entrepreneurship on factors which influence startup product development decisions and their challenges. The study's findings provide insights into the province's innovation ecosystem and how startups in similar contexts innovate through collaboration. From a theoretical perspective, the study contributes to dynamic capability and absorptive capacity theories, demonstrating how resource-limited startups build adaptive capabilities via collaboration.

The remainder of this paper is structured as follows: Section II presents the theoretical background. Section III provides an overview of the methodology. Section IV presents the results with discussion. Finally, conclusions, limitations, and plans for future work are presented in section V.

This paper is based on work funded by the Natural Sciences and Engineering Research Council (NSERC) of Canada under Grant No. RGPIN-2022-05008.

II. THEORETICAL BACKGROUND

Collaborative innovation brings together diverse and often geographically disperse stakeholders, enabling idea cross-fertilization, mutual learning, joint solution ownership [4], [18], and accelerated internal innovation [19]. This is critical for startups, which often lack resources for independent innovation and scaling [20]. Previous research shows that collaborative innovation helps compensate for internal resource gaps, access market insights, and speed-up technological development [21] by improving firms’ agility, product validation, and access to complementary knowledge and technologies [22]. Prior research has identified three main forms of startup collaborative innovation, including:

- **Customer Co-Creation:** Engaging users in early-stage product design [23].
- **Accelerator and Incubator Programs:** Leveraging structured programs for mentorship, funding, and networking [24], [25].
- **Industry and Academic Collaborations:** Accessing external expertise through partnerships with corporations or universities [26].

Collaborative innovation occurs through partnerships with customers, incumbents, and scientific institutions (e.g., universities, government bodies), each uniquely aiding idea design, development, and commercialization [27]. Customers offer user insights for market fit [23]; incumbents provide resources, expertise, and networks for efficient scaling [28]; and scientific institutions contribute research and funding for technological advancements [27]. Such collaborations speed-up commercialization, improve firms’ absorptive capacity, and drive competitive advantage [29], though challenges such as power imbalances and IP concerns require management [30]. While proximity is traditionally seen as key, technology now enables distant networks, reflecting global innovation ecosystems that transcend regional boundaries [27].

Despite its benefits, startups often experience complex challenges in integration, trust, and incentive misalignment issues [15]. Usman and Vanhaverbeke [31] identified a gap in understanding how resource-constrained startups manage collaborative innovation, stating that they often face unique challenges in balancing knowledge sharing with protection when collaborating with larger firms. Nylund et al. [32] add that established firm collaboration models often overlook early-stage venture challenges. Furthermore, Albats et al. [33] highlight that startups’ absorptive capacity constraints create barriers to collaborative innovation that are underexplored, a gap that the current research addresses. Key barriers include knowledge leakage and IP risks [34], power imbalances [35], and coordination complexity with resource constraints [19].

Dynamic capability and absorptive capacity theories frame the understanding of effective collaboration in early-stage software startups. Dynamic capabilities refers to a firm’s ability to sense and seize opportunities and reconfigure resources for competitiveness [36]. Resource-limited startups require agility and collaborative mechanisms for adapting to changing market conditions [22]. Knowledge management and strategic foresight improve collaborative innovation by enabling firms to anticipate trends and adjust processes [37], aligning with dynamic capabilities where strong external networks enable firms’ quick responses to market demands. Furthermore, Teece [38] notes that the dynamic capabilities framework’s application to entrepreneurial ventures is evolving, with less-explored aspects yet to be examined.

Absorptive capacity, referring to “the ability of a firm to recognize the value of new, external information, assimilate it, and apply it to commercial ends” [29], is crucial for developing firms’ innovative capabilities. Stojčić [27] acknowledges its criticality in R&D partnerships with customers and incumbents, as it improves partner attractiveness and establishes collaborative competencies. Integrating absorptive capacity with dynamic capabilities theory identifies collaborative innovation as both a resource-acquisition mechanism and a strategic enabler of adaptability, especially for early-stage software startups.

III. METHODS

This qualitative study examined collaborative innovation in early-stage Nova Scotian startups, an approach chosen for understanding participant interpretations [39] and exploring understudied phenomena. The case study method allowed for in-depth inquiry in a real-world context [40], prioritizing data richness over generalizability in this ‘small-n study’ [41]. Interviews were selected for data collection to capture rich, complex data on understudied topics, allowing flexible probing of participants [42]. Participants included founders, CEOs, designers, and software developers of early-stage startups who were chosen through quota sampling for diverse stakeholder representation and bias control [43]. Snowball sampling was also used to reach others within the innovation ecosystem to ensure that varied perspectives were captured [44]. In total, 26 interviews, lasting between 35-90 minutes each, were conducted either face-to-face or online using Microsoft Teams from January-March 2024 (Table I). In-person interviews were recorded using a Dictaphone and transcribed using the Dictate feature in Microsoft Office. The inbuilt translation feature of Microsoft Teams was used for online interviews. For data analysis, the study used constant comparison, informed by Glaser and Strauss [45], to identify patterns in the data collected. Subsequently, thematic analysis [46] of the transcribed interview data identified key themes (Table II), enabling focused insights into specific areas of interest.

TABLE I. PARTICIPANT DEMOGRAPHIC INFORMATION

Participant ID	Age	Gender	Level of education	Position	Industry	Years of experience	Company Size
<i>p001</i>	35-44	Male	Bachelor’s degree	CEO/Founder/Co-Founder	Hardware and Software Solution Provider (Seafood)	4-6 years	2
<i>p002</i>	35-44	Male	Bachelor’s degree	CEO/Founder/Co-Founder	Web applications	7-10 years	1-2
<i>p003</i>	25-34	Male	Bachelor’s degree	Developer	Cloud applications (SaaS)	4-6 years	3
<i>p004</i>	65+	Male	Bachelor’s degree	CEO/Founder/Co-Founder	Web, Mobile, with AI to come	7-10 years	3 full-time & 3 part-time

Participant ID	Age	Gender	Level of education	Position	Industry	Years of experience	Company Size
p005	45-54	Male	Master's degree	CEO/Founder/Co-Founder	Artificial Intelligence	more than 20 years	10
p006	35-44	Female	Bachelor's degree	CEO/Founder/Co-Founder	Cloud applications (SaaS)	less than 1 year	10
p007	25-34	Male	Bachelor's degree	CEO/Founder/Co-Founder	Web applications	7-10 years	1
p008	25-34	Male	Bachelor's degree	CEO/Founder/Co-Founder	Mobile applications	less than 1 year	1
p009	35-44	Male	Master's degree	CEO/Founder/Co-Founder	Artificial Intelligence	1-3 years	1
p010	25-34	Male	Master's degree	CEO/Founder/Co-Founder	Web applications	4-6 years	5 full -time, 3 part-time
p011	35-44	Male	Master's degree	CEO/Founder/Co-Founder	Cloud applications (SaaS)	4-6 years	5 - 10
p012	25-34	Male	Master's degree	CEO/Founder/Co-Founder	Cloud applications (SaaS)	11-15 years	12
p013	25-34	Male	Master's degree	CEO/Founder/Co-Founder	Web applications	7-10 years	9
p014	25-34	Male	Master's degree	CEO/Founder/Co-Founder	Consulting (gen AI)	11-15 years	1
p015	55-64	Male	Master's degree	CEO/Founder/Co-Founder	Mobile applications	4-6 years	1
p016	25-34	Male	Bachelor's degree	CEO/Founder/Co-Founder	Mobile applications	1-3 years	6
p017	25-34	Male	Bachelor's degree	CEO/Founder/Co-Founder	All the above.	7-10 years	12
p018	25-34	Male	Bachelor's degree	CEO/Founder/Co-Founder	Web applications	1-3 years	2
p019	35-44	Male	Bachelor's degree	CEO/Founder/Co-Founder	Cloud applications (SaaS)	7-10 years	12
p020	35-44	Male	High School	CEO/Founder/Co-Founder	Web applications	16-20 years	1
p021	35-44	Male	Bachelor's degree	CEO/Founder/Co-Founder	Web applications	11-15 years	16
p022	25-34	Male	Master's degree	CEO/Founder/Co-Founder	Hardware	less than 1 year	3
p023	35-44	Male	Master's degree	CEO/Founder/Co-Founder	agriculture	4-6 years	30
p024	25-34	Male	Bachelor's degree	Developer	Web applications	1-3 years	45
p025	35-44	Female	Master's degree	Developer	Cloud applications (SaaS)	11-15 years	1600
p026	45-54	Male	Master's degree	CEO/Founder/Co-Founder	Mobile applications	16-20 years	20 Employees

IV. FINDINGS

After thematic analysis, the themes that answered the study's research questions were identified through discussions among

the authors. Table II presents the significant quotes and the themes that address the research questions of the study:

TABLE II. SELECTED RELEVANT QUOTES

Theme	Participant ID	Quote
RQ1: Factors that influence early-stage startups' collaborative product development decisions		
User Interaction and Feedback	P001	"We identify friction points by observing users and discussing their problems.This kind of direct interaction helps us identify and implement effective solutions."
	P013	"We interviewed over 100 people and collected feedback. This ensured that our solution addressed real user needs and preferences, not just assumptions"
	P006	".... we still went out and did customer interviews or developed that ideal customer profile just to see who were challenging"
	P007	"We conduct interviews and ask open-ended questions to map their business problems and design solutions accordingly"
Informal Brainstorming and Ideation	P002	"We have informal brainstorming sessions, often during phone calls or car rides after site visits."
	P017	"We also foster internal creativity through brainstorming and whiteboarding sessions"
	P012	"I discuss it with our tech team during our sprints and demos. We gather feedback and refine the idea further ensuring it aligns with market needs and our vision. Once confident, we move it to a staging platform for testing before rolling it out live."
Personal and Professional Experience	P006	"I work in private practice, so I am the user, so I was able to use a lot of my experience and expertise to see the problem"
	P016	"The idea came from building custom applications for the potato and seafood industries, where we identified market gaps. We conducted over 100 customer discovery interviews before coding, focusing on core problems faced by manufacturers. We then built a solution around those insights."
	P013	"I personally fell victim to fraud, losing money on a purchase. This experience highlighted a gap in the market for secure online transactions."

Theme	Participant ID	Quote
Field Observations and External Inputs	P001	<i>"The seafood industry has busy and slow seasons, and during the busy season, I can observe many issues firsthand"</i>
	P004	<i>"..... suggestions like revising templates differently often come from clients or observing their needs differently."</i>
RQ2: Challenges that early-stage startups face in collaborative product development		
Resource Constraints and Funding Instability	P006	<i>"we've been going back and forth applying for grants, pitch competitions, getting temporary limited funds, and getting junior developers on board. Don't get me wrong, it's been great, but it creates the problem that we have a 6 to 8-week runway to develop an MVP. By the time we get the next round of funding, we might not have the same developer again because they've moved on to other jobs. So, we end up bringing in new developers who need to understand the previous work and then move forward, losing time for them to get familiar with the project and optimize previous work."</i>
Communication and Coordination	P010	<i>"I think one of the challenges was working remotely. Initially, it was difficult to communicate effectively with the team to convey my vision, which resulted in a lot of back-and-forth."</i>
Technical and Procedural	P013	<i>"our biggest challenge is iterating design changes effectively without needing to push everything to production for user interaction. They won't take extra time to explore designs independently; they'll provide feedback when they start using features. Another challenge is in scoping and managing scope creep. Understanding the full scope before development is critical. We encounter time challenges, too; estimates often underestimate due to scope creep."</i>
User Engagement and Adoption	P012	<i>"One of our initial challenges was establishing credibility. As a new immigrant and startup founder, I faced skepticism. Building trust and credibility, especially among nurses, was critical."</i>
	P007	<i>"The main challenge is getting users comfortable enough to provide honest feedback."</i>

V. DISCUSSION

The product development decisions taken by early-stage software startups are often shaped by user needs, founders' previous experience, and iterative feedback (see Table II), aligning with Bustinza et al.'s [12] findings on stakeholder collaboration improving innovation. This study extends this by focusing on early-stage startups, where user engagement employs informal, flexible strategies, such as brainstorming and ad hoc ideation. These contrast with structured methods used by larger firms [11], highlighting the agility required in resource-constrained environments like Nova Scotia, Canada.

Internal and external collaboration is critical for startups' product development. Internally, user empathy and client feedback drive development beyond technical specifications [47] to meet real-world user and customer needs [48], aligning with Dodgson et al. [18]. From an external perspective, partnerships with specialized firms, freelancers, and market contractors offer access to expertise and resources not owned by the firm, enabling market alignment and technology integration [49]. Unlike studies on established collaboration tools in large firms [4], [10] this study identifies startups' fragmented, ad-hoc use of social tools (e.g., Slack, Figma). This indicates a gap in frameworks for streamlining startup collaboration, suggesting a future research avenue.

This study highlights the key challenges that early-stage startups face in collaborative innovation, in terms of resource constraints, funding instability, and high staff turnover (see Table II). Aligning with the work of Galanakis [50] on the importance of resource management for startup innovation, this study adds nuance by detailing these constraints' compounded effects: reliance on agile practices to counter funding gaps and difficulties maintaining team alignment in distributed settings. In addition, immigrant founders face trust-building challenges, demanding the development of ecosystem credibility to secure stakeholder confidence.

VI. CONCLUSION

This study examined the collaborative innovation practices of early-stage software startups in Nova Scotia, Canada, identifying the factors influencing design decisions and product development challenges. Analysis of 26

interviews identified that user interactions, informal brainstorming, personal/professional experiences, and field observations are key practices enabling resource-constrained firms to deploy dynamic capabilities. Despite funding, communication, technical, and user engagement challenges, the study's findings align with the work of Marsh and Stock [51] on the uncertainty of transforming technological knowledge for market needs, compounded by limited complementary technologies and immature markets. However, some startups cultivate dynamic capabilities, sensing, seizing, and transforming [38], for adaptation and growth. Specifically, user interaction, field observations, and personal experiences aid opportunity sensing, while informal ideation supports resource seizing, and continuous feedback enables transforming through ongoing market adaptation.

This study offers key contributions extending dynamic capability and absorptive capacity theories. First, it shows that early-stage startups develop adaptive, resource-efficient practices for rapid response to user feedback and market shifts, extending the research of Teece et al. [36] by demonstrating that resource-constrained firms build capabilities through informal interactions. Second, continuous user engagement and informal ideation improve startups' absorptive capacity, facilitating speedy internalization and the application of external knowledge [29]. Third, the study highlights dynamic capabilities' micro-foundations, stressing founder experience and informal knowledge-sharing in shaping organizational agility. These contributions broaden theoretical understanding of dynamic capabilities in nascent firms and offer practical guidance for startups optimizing product development under challenging environments.

These findings offer actionable insights for early-stage startups. First, prioritizing direct user engagement from early product development is crucial. This aligns with the work of Liedtka and Locatelli [52], who note that user-centred design's value for resource-constrained startups in reducing waste and improving market acceptance, this study offers practical implementation insights with limited resources. Second, findings on informal brainstorming (i.e., ideation) highlight the need for flexible ideation processes. Startups should leverage informal settings for creative problem-solving rather than awaiting formal product development frameworks.

Finally, this study's limitations and future research directions merit discussion. First, the Nova Scotian focus, while providing contextual depth, limits generalizability. In future, comparative cross-ecosystem studies could distinguish universal from context-specific collaborative innovation facets. Second, a significant gender imbalance (i.e., 24 male, 2 female of 26 participants) restricts generalizability regarding gender-specific experiences. Future studies should use more balanced samples for inclusivity. Third, cross-sectional data collection did not capture dynamic capability evolution over time. In future, longitudinal studies could illuminate this progression as startups mature. Lastly, the relative impact of identified collaborative practices on product development outcomes is unquantified. Future mixed-methods studies could determine which practices impact startup success.

REFERENCES

- [1] Ries, Eric, *The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses*. New York: Crown Business, 2011.
- [2] S. S. Bajwa, X. Wang, A. Nguyen Duc, and P. Abrahamsson, "Failures" to be celebrated: an analysis of major pivots of software startups," *Empir Software Eng*, vol. 22, no. 5, pp. 2373–2408, Oct. 2017, doi: 10.1007/s10664-016-9458-0.
- [3] S. G. Blank and B. Dorf, *The startup owner's manual: the step-by-step guide for building a great company*. Pescadero, Calif.: K & S Ranch, 2012.
- [4] J. Hartley, E. Sørensen, and J. Torfing, "Collaborative Innovation: A Viable Alternative to Market Competition and Organizational Entrepreneurship," *Public Administration Review*, vol. 73, no. 6, pp. 821–830, Nov. 2013, doi: 10.1111/puar.12136.
- [5] M. Bogers, A. Afuah, and B. Bastian, "Users as Innovators: A Review, Critique, and Future Research Directions," *Journal of Management*, vol. 36, no. 4, pp. 857–875, Jul. 2010, doi: 10.1177/0149206309353944.
- [6] R. C. Basole and H. Park, "Interfirm Collaboration and Firm Value in Software Ecosystems: Evidence From Cloud Computing," *IEEE Trans. Eng. Manage.*, vol. 66, no. 3, pp. 368–380, Aug. 2019, doi: 10.1109/TEM.2018.2855401.
- [7] C. Giardino, S. S. Bajwa, X. Wang, and P. Abrahamsson, "Key Challenges in Early-Stage Software Startups," in *Agile Processes in Software Engineering and Extreme Programming*, vol. 212, C. Lassenius, T. Dingsøyr, and M. Paasivaara, Eds., in Lecture Notes in Business Information Processing, vol. 212. , Cham: Springer International Publishing, 2015, pp. 52–63. doi: 10.1007/978-3-319-18612-2_5.
- [8] N. Paternoster, C. Giardino, M. Unterkalmsteiner, T. Gorschek, and P. Abrahamsson, "Software development in startup companies: A systematic mapping study," *Information and Software Technology*, vol. 56, no. 10, pp. 1200–1218, Oct. 2014, doi: 10.1016/j.infsof.2014.04.014.
- [9] V. Gupta, L. Rubalcaba, J. M. Fernandez-Crehuet, and L. F. Pereira, "Innovation Through Startup Collaboration: Build a Relationship With Your Peer Startups," *IEEE Eng. Manag. Rev.*, vol. 49, no. 3, pp. 126–135, Sep. 2021, doi: 10.1109/EMR.2021.3101116.
- [10] C. Giglio, V. Corvello, I. M. Coniglio, S. Kraus, and J. Gast, "Cooperation between large companies and startups: An overview of the current state of research," *European Management Journal*, vol. 43, no. 1, pp. 142–153, Feb. 2025, doi: 10.1016/j.emj.2023.08.002.
- [11] D. X. Peng, G. R. Heim, and D. N. Mallick, "Collaborative Product Development: The Effect of Project Complexity on the Use of Information Technology Tools and New Product Development Practices," *Production and Operations Management*, vol. 23, no. 8, pp. 1421–1438, Aug. 2014, doi: 10.1111/j.1937-5956.2012.01383.x.
- [12] O. F. Bustinza, E. Gomes, F. Vendrell-Herrero, and T. Baines, "Product-service innovation and performance: the role of collaborative partnerships and R&D intensity," *R & D Management*, vol. 49, no. 1, pp. 33–45, Jan. 2019, doi: 10.1111/radm.12269.
- [13] Peter, Moreira, Carol, Moreira, and Avery, Mullen, "2023 Atlantic Canada Startup Data Report PDF.pdf." *Entrevestor*, 2024. [Online]. Available: <https://entrevestor.com/atlantic-canada-startup-data-2023>
- [14] M. Trippel, M. Grillitsch, and A. Isaksen, "Exogenous sources of regional industrial change: Attraction and absorption of non-local knowledge for new path development," *Progress in Human Geography*, vol. 42, no. 5, pp. 687–705, Oct. 2018, doi: 10.1177/0309132517700982.
- [15] R. Brown and C. Mason, "Looking inside the spiky bits: a critical review and conceptualisation of entrepreneurial ecosystems," *Small Bus Econ*, vol. 49, no. 1, pp. 11–30, Jun. 2017, doi: 10.1007/s11187-017-9865-7.
- [16] L. Dobson, "Deep tech is thriving on Canada's East Coast and Nova Scotia is leading the charge." Accessed: May 28, 2025. [Online]. Available: <https://investnovascotia.ca/news-and-stories/deep-tech-thriving-canadas-east-coast-and-nova-scotia-leading-charge>
- [17] B. Flyvbjerg, "Five Misunderstandings About Case-Study Research," *Qualitative Inquiry*, vol. 12, no. 2, pp. 219–245, Apr. 2006, doi: 10.1177/1077800405284363.
- [18] M. Dodgson, "Organizational Learning: A Review of Some Literatures," *Organization Studies*, vol. 14, no. 3, pp. 375–394, May 1993, doi: 10.1177/017084069301400303.
- [19] X. Xie, X. Liu, and J. Chen, "A meta-analysis of the relationship between collaborative innovation and innovation performance: The role of formal and informal institutions," *Technovation*, vol. 124, p. 102740, Jun. 2023, doi: 10.1016/j.technovation.2023.102740.
- [20] S. Nambisan, D. Siegel, and M. Kenney, "On open innovation, platforms, and entrepreneurship," *Strategic Entrepreneurship*, vol. 12, no. 3, pp. 354–368, Sep. 2018, doi: 10.1002/sej.1300.
- [21] M. Gruber and J. Henkel, "New Ventures Based on Open Innovation – An Empirical Analysis of Start-Up Firms in Embedded Linux," *International Journal of Technology Management*, vol. 33, Jan. 2006, doi: 10.1504/IJTM.2006.009249.
- [22] D. Teece, M. Peteraf, and S. Leih, "Dynamic Capabilities and Organizational Agility: Risk, Uncertainty, and Strategy in the Innovation Economy," *California Management Review*, vol. 58, no. 4, pp. 13–35, Aug. 2016, doi: 10.1525/cm.2016.58.4.13.
- [23] E. von Hippel, *Democratizing Innovation*. MIT press, 2005. Accessed: Mar. 18, 2025. [Online]. Available: <https://direct.mit.edu/books/book/2821/Democratizing-Innovation>
- [24] S. Cohen and Y. V. Hochberg, "Accelerating Startups: The Seed Accelerator Phenomenon," *SSRN Journal*, 2014, doi: 10.2139/ssrn.2418000.

- [25] Y. V. Hochberg, "Accelerating Entrepreneurs and Ecosystems: The Seed Accelerator Model," *Innovation Policy and the Economy*, vol. 16, pp. 25–51, Jan. 2016, doi: 10.1086/684985.
- [26] K. Laursen and A. Salter, "Open for innovation: the role of openness in explaining innovation performance among U.K. manufacturing firms," *Strategic Management Journal*, vol. 27, no. 2, pp. 131–150, Feb. 2006, doi: 10.1002/smj.507.
- [27] N. Stojčić, "Collaborative innovation in emerging innovation systems: Evidence from Central and Eastern Europe," *J Technol Transf*, vol. 46, no. 2, pp. 531–562, Apr. 2021, doi: 10.1007/s10961-020-09792-8.
- [28] R. B. Bouncken, J. Gast, S. Kraus, and M. Bogers, "Coopetition: A Systematic Review, Synthesis, and Future Research Directions," Mar. 11, 2015, *Social Science Research Network, Rochester, NY*: 2585934. Accessed: Mar. 17, 2025. [Online]. Available: <https://papers.ssrn.com/abstract=2585934>
- [29] W. M. Cohen and D. A. Levinthal, "Absorptive Capacity: A New Perspective on Learning and Innovation," *Administrative Science Quarterly*, vol. 35, no. 1, pp. 128–152, 1990.
- [30] W. Vanhaverbeke, N. Roijackers, A. Lorenz, and H. Chesbrough, "The Importance of Connecting Open Innovation to Strategy," in *Strategy and Communication for Innovation: Integrative Perspectives on Innovation in the Digital Economy*, N. Pfeffermann and J. Gould, Eds., Cham: Springer International Publishing, 2017, pp. 3–15. doi: 10.1007/978-3-319-49542-2_1.
- [31] M. Usman and W. Vanhaverbeke, "How start-ups successfully organize and manage open innovation with large companies," *European Journal of Innovation Management*, vol. 20, no. 1, pp. 171–186, Jan. 2017, doi: 10.1108/EJIM-07-2016-0066.
- [32] P. A. Nylund, N. Agarwal, C. Probst, and A. Brem, "Firm engagement in UN Sustainable Development Goals: Introduction of a constraints map from a corporate reports content analysis," *Journal of Cleaner Production*, vol. 371, p. 133446, Oct. 2022, doi: 10.1016/j.jclepro.2022.133446.
- [33] E. Albats, D. Podmetina, and W. Vanhaverbeke, "Open innovation in SMEs: A process view towards business model innovation," *Journal of Small Business Management*, vol. 61, no. 6, pp. 2519–2560, 2023.
- [34] D. Lepore, C. Veccioli, A. Micozzi, and F. Spigarelli, "Developing technological capabilities for Industry 4.0 adoption: An analysis of the role of inbound open innovation in small and medium-sized enterprises," *Creat Innov Manage*, vol. 32, no. 2, pp. 249–265, Jun. 2023, doi: 10.1111/caim.12551.
- [35] C. Lu, Y. Qi, S. Hao, and B. Yu, "How and when collaborative innovation networks influence new product development performance in SMEs: evidence from China," *JBIM*, vol. 40, no. 1, pp. 188–201, Jan. 2025, doi: 10.1108/JBIM-11-2022-0518.
- [36] D. J. Teece, G. Pisano, and A. Shuen, "Dynamic Capabilities and Strategic Management," *Strategic Management Journal*, vol. 18, no. 7, pp. 509–533, 1997.
- [37] M. F. Mubarak, G. Jucevicius, M. Shabbir, M. Petraite, M. Ghobakhloo, and R. Evans, "Strategic foresight, knowledge management, and open innovation: Drivers of new product development success," *Journal of Innovation & Knowledge*, vol. 10, no. 2, p. 100654, Mar. 2025, doi: 10.1016/j.jik.2025.100654.
- [38] D. J. Teece, "The Evolution of the Dynamic Capabilities Framework," in *Artificiality and Sustainability in Entrepreneurship*, R. Adams, D. Grichnik, A. Pundziene, and C. Volkmann, Eds., in FGF Studies in Small Business and Entrepreneurship. , Cham: Springer International Publishing, 2023, pp. 113–129. doi: 10.1007/978-3-031-11371-0_6.
- [39] D. H. McBurney and T. L. White, *Research Methods*. Cengage Learning, 2009. [Online]. Available: https://books.google.ca/books?id=AUDoy-lSe_EC
- [40] R. K. Yin, *Case Study Research: Design and Methods*. in Applied Social Research Methods. SAGE Publications, 2003. [Online]. Available: https://books.google.ca/books?id=BWea_9ZGQMwC
- [41] M. L. Small, "How many cases do I need? On science and the logic of case selection in field-based research," *Ethnography*, vol. 10, no. 1, pp. 5–38, 2009.
- [42] A. Bryman and E. Bell, *Business Research Methods 3e*. OUP Oxford, 2011. [Online]. Available: <https://books.google.ca/books?id=YnCcAQAAQBAJ>
- [43] M. N. K. Saunders, P. Lewis, and A. Thornhill, *Research methods for business students*, 4th ed. Harlow, England; New York: Financial Times/Prentice Hall, 2007.
- [44] M. Easterby-Smith, R. Thorpe, P. R. Jackson, and P. R. Jackson, *Management and business research*, 5. ed. London: Sage Publ, 2015.
- [45] B. Glaser and A. Strauss, *Discovery of Grounded Theory: Strategies for Qualitative Research*. New York: Routledge, 2017. doi: 10.4324/9780203793206.
- [46] V. Braun and V. Clarke, "Using thematic analysis in psychology," *Qualitative Research in Psychology*, vol. 3, no. 2, pp. 77–101, Jan. 2006, doi: 10.1191/1478088706qp063oa.
- [47] M. Sawhney, G. Verona, and E. Prandelli, "Collaborating to create: The Internet as a platform for customer engagement in product innovation," *Journal of Interactive Marketing*, vol. 19, no. 4, pp. 4–17, Nov. 2005, doi: 10.1002/dir.20046.
- [48] D. A. Norman, *The Design of Everyday Things*. USA: Basic Books, Inc., 2002.
- [49] C. Marxt and D. Popovic, "Strategic aspects in collaborative product design: results of a survey in Swiss industry," in *IEEE International Engineering Management Conference*, Cambridge, UK: IEEE, 2002, pp. 471–475. doi: 10.1109/IEMC.2002.1038477.
- [50] K. Galanakis, "Innovation process. Make sense using systems thinking," *Technovation*, vol. 26, no. 11, pp. 1222–1232, Nov. 2006, doi: 10.1016/j.technovation.2005.07.002.
- [51] S. J. Marsh and G. N. Stock, "Creating Dynamic Capability: The Role of Intertemporal Integration, Knowledge Retention, and Interpretation," *J of Product Innov Manag*, vol. 23, no. 5, pp. 422–436, Sep. 2006, doi: 10.1111/j.1540-5885.2006.00214.x.
- [52] J. Liedtka and G. Locatelli, "Humanising complex projects through design thinking and its effects," *International Journal of Project Management*, vol. 41, no. 4, p. 102483, May 2023, doi: 10.1016/j.ijproman.2023.102483.