Journal of Innovation and Entrepreneurship

Linking Open Innovation to Firm Performance through Innovation Capability and Business Model Innovation

--Manuscript Draft--

Manuscript Number:	JIAE-D-26-00217
Full Title:	Linking Open Innovation to Firm Performance through Innovation Capability and Business Model Innovation
Article Type:	Research
Funding Information:	Albanian National Agency for Scientific Research and Innovation — Mr Rezart Prifti
Abstract:	The article analyzes the chain of events from Open Innovation to Firm Performance. Based on literature, a sequential capability-building mechanism analyzes the relationship through Innovation Capability (IC) and Business Model Innovation (BMI). The article tests a fully mediated structural model using both PLS-SEM and CB-SEM to ensure methodological robustness. Both approaches conclude that relationships are positive, significant, and considerably consistent. In both analyses, the effects increase along the innovation channel, emphasizing innovation capability as a substantial driver of business model innovation, and business model innovation as the closest determinant of performance. In both estimates, sequential indirect effects, open innovation on non-financial performance, is significant, thus confirming the full mediation. Open innovation does not improve performance directly, its impact is generated through capability development, and subsequently through business model innovation. Explained variance is moderate and highly consistent across models, strong measurement quality, and excellent discriminant validity standards. The article adds value to the proposed theoretical mechanism by strengthening it. Main contribution of the study is empirical demonstration that open innovation enhances performance when transformed into internal innovation capabilities and subsequently captured by business model innovation. The results of this analysis offer practical value for managers looking to transform collaborative openness into sustained performance outcomes through a structured capability chain and business model re-modelling.
Corresponding Author:	Rezart Prifti, Assoc. Prof University of Tirana Tirane, ALBANIA
Corresponding Author E-Mail:	r.prifti@umb.edu.al
Corresponding Author Secondary Information:	
Corresponding Author's Institution:	University of Tirana
Corresponding Author's Secondary Institution:	
First Author:	Rezart Prifti, Ph.D
First Author Secondary Information:	
Order of Authors:	Rezart Prifti, Ph.D
Order of Authors Secondary Information:	
Suggested Reviewers:	
Additional Information:	
Question	**Response**
Are you submitting this manuscript to a Thematic Series/Special Collection?	No

Linking Open Innovation to Firm Performance through Innovation Capability and Business Model Innovation

Assoc. Prof. Rezart Prifti

Department of Economics, Entrepreneurship and Finance, Barleti University, Tirane, Albania

Corresponding author: Rezart Prifti

Address: Department of Economics, Entrepreneurship and Finance, Barleti University, Rr. Frang Bardhi**,** Tirane, 1046, Albania

Phone: +366 692092960

Email: r.prifti@umb.edu.al

Acknowledgments

The data collected and the research carried out was made possible by a grant from the National Agency for Scientific Research and Innovation in Albania.

Declarations

Conflict of Interest: The authors declare that they have no conflict of interest.

Funding: This research received funding from the National Agency for Scientific Research and Innovation in Albania.

Informed consent: Informed consent was obtained from all participants prior to data collection.

Linking Open Innovation to Firm Performance through Innovation Capability and Business Model Innovation

Abstract

The article analyzes the chain of events from Open Innovation to Firm Performance. Based on literature, a sequential capability-building mechanism analyzes the relationship through Innovation Capability (IC) and Business Model Innovation (BMI). The article tests a fully mediated structural model using both PLS-SEM and CB-SEM to ensure methodological robustness. Both approaches conclude that relationships are positive, significant, and considerably consistent. In both analyses, the effects increase along the innovation channel, emphasizing innovation capability as a substantial driver of business model innovation, and business model innovation as the closest determinant of performance. In both estimates, sequential indirect effects, open innovation on non-financial performance, is significant, thus confirming the full mediation. Open innovation does not improve performance directly, its impact is generated through capability development, and subsequently through business model innovation. Explained variance is moderate and highly consistent across models, strong measurement quality, and excellent discriminant validity standards. The article adds value to the proposed theoretical mechanism by strengthening it. Main contribution of the study is empirical demonstration that open innovation enhances performance when transformed into internal innovation capabilities and subsequently captured by business model innovation. The results of this analysis offer practical value for managers looking to transform collaborative openness into sustained performance outcomes through a structured capability chain and business model re-modelling.

Keywords: open innovation, innovation capability, business model, firm performance
Jel codes: O3, M10, L25, L21

Introduction

When researching modern issues such as how do companies grasp and sustain performance under the context of knowledge dispersion and competitive turbulence open innovation (OI), innovation capabilities (IC), and business model innovation (BMI) emerge as crucial factors in this process. According to (Chesbrough, 2017; Huizingh, 2011) OI research emphasizes that companies increasingly rely on purposeful inbound and outbound knowledge flows across organizational structures to spur innovation and optimize commercialization of opportunities. (Laursen & Salter, 2006a) argue that the breadth and depth of external collaboration makes up the openness of of a company, meaning how widely and intensively they draw on external knowledge sources. In addition, innovation capability in literature is characterized as a meta-capability of the organization that helps firms to continuously generate and operationalize innovation through coordinated routines, systems, and managerial processes (Lawson & Samson, 2001). Empirical analyses link innovation capability to organizational knowledge processes (Lin, 2007). Taking it all together these vantage points converge on a stable premise that openness widens access to heterogeneous knowledge, however capability development relies on whether this knowledge can be assimilated, recombined, and used for meaningful innovation outcomes (Huizingh, 2011; Lawson & Samson, 2001; Lin, 2007). Business model innovation expands this view by shifting the focal point from innovation in processes alone to innovation in the architecture of value creation, delivery, and capture, simply the main logic of BMI. Recent studies argue that BMI is triggered by environmental changes or shifts, especially digital transformation, because digital technologies dramatically change mechanisms and may require more adaptable and coherent re-framing across business model elements to overcome the "digital paradox" of high investment but limited returns (Ancillai et al., 2023; Ritter & Pedersen, 2020). This article, keeping in consideration the theoretical approach, concisely investigates the relationship among the three constructs and ultimately how it translates to firm performance.

Literature Review

An early idea by (Chesbrough, 2004) is that valuable propositions can come both inside and outside the firm and can reach markets through internal and external routes. Later work, made clear that the idea of closed innovation is better viewed as an ideal type than a well-established universal baseline, because practices that now labeled as open have long existed but not unified conceptually (Bigliardi et al., 2021; Chesbrough, 2004). The widely adopted definition of open innovation is "*the purposive inbound and outbound knowledge flows intended to accelerate internal innovation and expand the external use of innovation*" (Chesbrough & Appleyard, 2007). This definition supports the distinction among outside-in, inside-out, and coupled processes (Chesbrough & Bogers, 2014; Enkel et al., 2009). Later research broadened the definition of OI beyond the R&D view and toward innovation across networks and ecosystems, with the need to examine OI in terms of content, context dependency, and process, to change from early-based evidence in simple designs, to large samples design capable of testing mechanisms and contingencies (Huizingh, 2011). More contemporary research emphasizes that OI positons digital transformation as an enabler that lowers coordination barriers and improves the integration of suppliers and customers into the process of innovation creation (Robertsone & Lapiņa, 2023).

In this study we operationalize OI following Laursen & Salter, (2006) three-dimensional measurement with external-search view openness, captured via search breadth meaning the number of external sources used, and the research depth meaning the intensity of use across sources. This definition of the concept adaptation for the conceptual model in the study aligns with the inflow/outflow logic of Chesbrough (2006), while making possible the empirical evaluation through search and pattern observation (Laursen & Salter, 2006b). Extending the logic that it is widely accepted as firm transformational mechanism of inputs, the second step toward capability-based approach is firms' ability to integrate and utilize external knowledge internally, thus making innovation capability very important (Pundziene et al., 2023). The logic flow here is also consistent with the absorptive-capacity theory emphasizing that internal R&D improves not only knowledge generation but also the ability to assimilate external knowledge (Bigliardi et al., 2021; Cohen & Levinthal, 1990), meaning that openness increases knowledge variety while innovation capabilities whether that variety becomes usable and creates value (Bigliardi et al., 2021; Huizingh, 2011).

Capability characteristics differ based on OI modes. Literature emphasizes that inbound openness needs more searching, evaluating, and internalizing external knowledge (Enkel et al., 2009; Laursen & Salter, 2006), on the other hand outbound OI requires governance and commercialization capabilities and business model (Chesbrough, 2006; Pundziene et al., 2022), lastly, coupled OI needs partner-management and coordination capabilities for co-creation (Enkel et al., 2009). Since, the study targets ICT companies, the

capability logic is reinforced in digitally intensive environments where digital transformation enables and raises the need for capabilities to coordinate, and manage cross-boundary knowledge flows (Robertsone & Lapiņa, 2023). Based on the theoretical chain the study raises the logic that innovation capability reflects the firm's ability to transform knowledge into new products, services, and processes, thus the hypothesis goes:

H1: Open innovation positively influences innovation capability.

According to (Lawson & Samson, 2001) innovation capability does not produce isolated innovation outcomes, rather it is seen as an organizational capability enabling companies to persistently generate and operationalize innovations across product, services, processes, and managerial contexts. In this aspect, innovation capability is seen more as routines and practices with the purpose of sustaining new explorations and instream exploitation, rather than a single practice. In line with this view, literature argues that innovation capability definition leans toward learning, knowledge transformation, idea generation, and exploitation of internal and external resources (Iddris, 2016; Mendoza-Silva, 2021; Migdadi, 2021). Extending beyond internal capability logics, ecosystem-oriented work suggests that SMEs' innovation capabilities can be strengthened through collaboration in knowledge ecosystems, where knowledge co-creation and intermediary support enhance technological and collaborative capabilities, especially in resource-constrained contexts (Shahzad et al., 2025). For the purpose of this paper, innovation capability is defined based on Lin, (2007) as a firm-level capability embodied in the organization's ability to innovate across key domains – product, process, and management innovation and empirically tied to organizational knowledge sharing processes (Iddris, 2016; Lin, 2007). Following the capability framework we theoretically connect CI and business model innovation by following their proximity to reconfigure resources and routines under environmental changes (Vu, 2020). The idea is that capability building and intermediary support, strengthens technological and collaborative capabilities in firms, positioning them to reconfigure sources, channels and value frameworks establishes the proximity to business model change, since these are the commonly implicated activities in business model innovation (Shahzad et al., 2025; Vu, 2020). In synthesis of the dynamic capabilities' theory, capabilities enable firms to reconfigure their resources, innovation capability gives firms these skills, routines, and processes needed to redesign value proposition, revenue architecture, and operational configurations. Business model innovation embodies the structural manifestation of these capabilities, hence the second hypothesis:

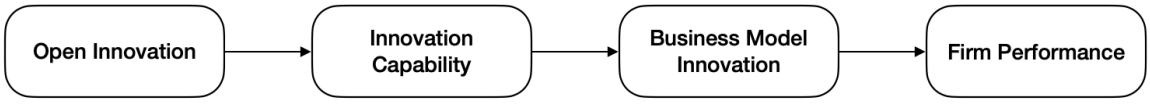
H2: Innovation capability positively influences business model innovation.

Business model innovation is imperative for explaining firm renewal because it represents the systemic configuration in how companies organize transactions and create value, rather than isolated changes in products and processes (Zott & Amit, 2007). In addition to the idea of architectural perspective of business model literature, research emphasizes that the core of business model is the configuration of relevant elements and the architecture linking them, rather than any isolated element (Foss & Saebi, 2017; Teece, 2010). Staying withing the architectural logic Foss & Saebi, (2017 and Teece, (2010) argue that business model innovation is conceptualized designed, novel, and non-trivial changes to business elements or the linkages among them. Business model innovation is also seen as process oriented, as an unfolding set of generative and implementation mechanisms (Andreini et al., 2022). In today world, a substantial driver of business model innovation is digital transformation. Digital transformation, seen as digital capability, affects multiple business model components, hence requiring business model redesign to incorporate technological investments into realized value (Ritter & Pedersen, 2020). Research argues that despite digital transformation can reshape value creation, delivery, and capture mechanisms, many companies struggle to convert this digital investment into returns (Ancillai et al., 2023). For the purpose of this article business model innovation is defined as how firms design boundary spanning transactions, distinguishing novelty-centered business model design, and efficiency-centered business model design (Zott & Amit, 2007). Novelty centered design reflects "new ways of conducting economic changes", while efficient-centered design focuses on transaction efficiency with the focus of cost reduction. The capability-based perspective provides a theoretically coherent basis for linking innovation capabilities to BMI. Lastly, based on previous theory we deduct a business model to performance link (Latifi et al., 2021; Salfore et al., 2023; Zott & Amit, 2007). Literature reports that business model. Design is associated with entrepreneurial firm performance and identify a robust positive association across time and environmental regimes, hence the third hypothesis:

H3: Business model innovation positively influences non-financial performance.

The above hypothesis are based in well-established theory, and integrating the above suggests a transformation logic. While here on the conceptual model illustrated in figure 1, a sequential mediation relationship is also tested, implying that: **H4:** Open innovation has a positive indirect effect on non-financial performance through innovation capability and business model innovation.

Figure 1 Conceptual Model

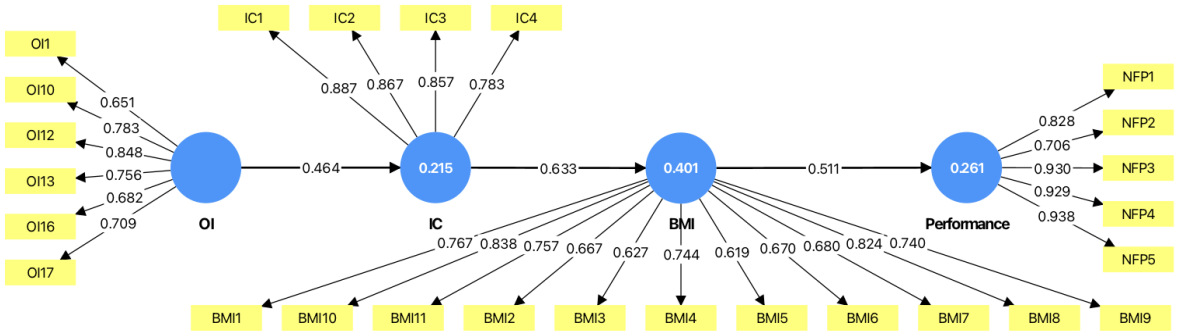


Source: Author's

Methods and Results

Data were collected from 87 firms across diverse industries. Respondents were senior managers responsible for innovation-related activities. A structured survey instrument was used. The sample size is appropriate for structural equation modeling, and robustness checks were conducted using both PLS-SEM and CB-SEM as complementary estimation approaches to mitigate sample-size sensitivity concerns. In addition, Bootstrapping (5,000 resamples) was applied to assess statistical significance of direct and indirect effects. Figure 2 illustrates the results of the conceptual model tested after some iterations by reducing low loading factors across constructs, always without damaging the construct theoretical aspect.

Figure 2 Analysis output of the conceptual model with SmartPLS4



Source: Author's calculations

Table 1 illustrates model measurement data. All constructs demonstrated strong reliability with Cronbach α's and composite reliability (CR > 0.7), and convergent validity (AVE > 0.7) well above 0.5 average variance extracted (AVE) (Cronbach, 1951; Stone, 1978).

Table 1 Reliability testing output

Construct	**α**	**CR**	**AVE**
BMI	.898	.894	.614
IC	.870	.859	.637
NFP	.919	.914	.708
OI	.866	.883	.721

Structural model evaluation shows that standardized path coefficients illustrated in table 2 are moderate to strong of value. Meaning that all hypothesis are supported and specifically: open innovation has a moderate effect on innovation capability, innovation capability has a significant effect on business model innovation, and lastly business model innovation has a significant effect on firm performance. The path coefficient analysis gives a structurally coherent and theoretically clean view. In both evaluation methods it shows structural robustness of the model, and indicates the capability-transformation logic raised earlier in the theoretical approach described.

Table 2 Structural Model Evaluation

Path	β	t	p
OI → IC	**0.363**	3.126	.002
IC → BMI	**0.676**	5.016	.000
BMI → NFP	**0.527**	4.268	.000

Table 3 Indirect and Mediated Effects

Path	β	t	p
IC → Performance	0.324	3.824	.000
OI → BMI	0.294	4.062	.000
OI → Performance	0.150	2.665	.008

Analyzing indirect effects looking for a sequential mediation we notice that all indirect paths are significant (Table 3). Specifically, open innovation does not directly affect performance. Open innovation effects operate entirely through capability and business model transformation. The total indirect effect is 0.150 and for organizational research it is meaningful, confirming full sequential mediation. When comparing the explained variance in both estimation methods we notice a slight inflation in IC R-squared values. Table 4, illustrates the explained variances in both estimation methods. In the PLS method IC indicator of explained variance is slightly inflated, and CB method slightly inflates BMI and NFP R^2. However, results indicate stable explanatory capacity across estimation methods, and good values overall.

Table 4 Explained Variance (R^2)

Construct	PLS R^2	CB R^2
IC	0.215	0.132
BMI	0.401	0.457
NFP	0.261	0.278

Further the analysis section checks for discriminant validity (Table 5 - 6) with both HTMT and Fornell - Larcker confirming clean construct separation, and no cross-method validity conflicts (Fornell & Larcker, 1981; Hair et al., 2019).

Table 5 HTMT testing

	BMI	IC	OI
BMI			
IC	0.687		
OI	0.588	0.532	
Performance	0.516	0.294	0.374

Table 6 Fornell-Larcker criterion

	BMI	IC	OI	Performance
BMI	0.725			
IC	0.633	0.849		
OI	0.529	0.464	0.741	
Performance	0.511	0.279	0.341	0.871

Following the model analysis table 7 illustrates fit indices with parameters taken under consideration with constrains.

Table 7 CB-SEM Fit Indices

Index	Value	Interpretation
χ^2/df	1.954	Good
RMSEA	0.105	Borderline
SRMR	0.097	Borderline
CFI	0.894	Near acceptable
TLI	0.877	Borderline

Taking in consideration the sample size of 87 and the number of parameters 39, fit indices table is interpreted carefully when RMSEA is slightly elevated and CFI/TLI are at their borderline values. PLS tends to be more stable under small samples (Hair et al., 2018, 2021), hence in this case PLS gives estimation robustness and CB covariance validation. However, while adequate sample size, it still remains modest. To ensure methodological robustness, the proposed model was estimated using both PLS-SEM and CB-SEM. The structural relationships remained stable across estimation techniques, and the sequential mediation mechanism was confirmed in both analyses. This cross-method validation enhances confidence in the theoretical inferences. Lastly, bootstrapping results indicate that all hypothesized structural paths are positive and statistically significant. Specifically, open innovation exerts a moderate effect on innovation capabilities (OI → IC: $\beta = 0.464$, $t = 5.205$, $p < .001$), innovation capabilities strongly predict business model innovation (IC → BMI: $\beta = 0.633$, $t = 9.851$, $p < .001$), and business model innovation, in turn, has a substantive positive impact on performance (BMI → Performance: $\beta = 0.511$, $t = 4.393$, $p < .001$). The model explains a meaningful proportion of variance in the endogenous constructs (R^2IC = 0.215, 95% CI [0.093, 0.424], $t = 2.514$, $p = .012$; R^2BMI = 0.401, 95% CI [0.267, 0.589], $t = 4.839$, $p < .001$; R^2Performance = 0.261, 95% CI [0.092, 0.545], $t = 2.125$, $p = .034$). Effect-size assessment further shows that the IC → BMI relationship is large ($f^2 = 0.670$), BMI → Performance is large ($f^2 = 0.354$), and OI → IC is medium-to-large ($f^2 = 0.274$), indicating substantive explanatory contributions. Finally, mediation analysis supports the proposed sequential mechanism: innovation capabilities significantly influence performance indirectly via BMI (IC → Performance indirect = 0.324, $t = 3.824$, $p < .001$), and open innovation has a significant indirect effect on BMI (OI → BMI indirect = 0.294, $t = 4.062$, $p < .001$) and on performance through the full chain (OI → IC → BMI → Performance indirect = 0.150, $t = 2.665$, $p = .008$), consistent with a sequential mediation pattern in which the effect of OI is transmitted through IC and BMI.

Discussion

The study modestly contributes in innovation and strategic management theoretic research by empirically confirming a sequential transformation mechanism linking open innovation to performance, through innovation capability and business model innovation. Using PLS-SEM and CB-SEM analyses the structural logic proved sustainable and theoretically coherent. First, the article finds that open innovation alone does not enhance performance. Open innovation instead acts as an upstream strategic orientation that stirs the development of internal innovation capabilities. The article confirms the mechanism that these capabilities serve as the primary engine for business model innovation, which ultimately drives firms' performance outcomes. Taking in consideration that the strongest path in both models is IC > BMI, means that the main role in building and translating external openness into structural business renewal is held by innovation capabilities. Second, an important theoretical clarification comes from the sequential mediation results. Existing literature assumes a direct open innovation to performance link, meanwhile this article findings demonstrate that the relationship is fully mediated. As explained earlier the theoretical chain of events, this supports the dynamic capability theory pressing the small related processes through which external knowledge becomes strategically valuable. Third, the article relies on the robustness across estimation methods by strengthening the theoretical claims, consistent path coefficients, and explained variance, hence the author believes that the observed relationships reflect stable underlying structural and theoretical relationships. Lastly, from a managerial perspective, this article findings suggests that managers trying to improve performance should not stop at just collaborative openness, but should be proactive by investing in capability development processes that make possible the reconfiguration of business models.

Limitations

Despite its theoretical and empirical contributions, this study presents several limitations that suggest directions for future research. First, the cross-sectional design constrains causal inference, as the proposed sequential pathway—from open innovation to innovation capability, business model innovation, and performance—cannot be temporally verified. Longitudinal or time-lagged research designs would allow stronger conclusions regarding the evolution of these relationships and the sequencing of capability development and structural transformation. Second, although the sample size is adequate for structural modeling and robustness was confirmed across both PLS-SEM and CB-SEM approaches, broader replication with larger and more heterogeneous samples would enhance external validity. Future studies should examine the model across different industries, institutional contexts, and levels of technological turbulence to identify potential boundary conditions. Third, the focus on non-financial performance captures important strategic and reputational outcomes but does not fully reflect economic returns; incorporating objective financial indicators, growth measures, or market-based metrics would provide a more comprehensive performance assessment. Fourth, performance outcomes are inherently multifactorial, and additional antecedents—such as environmental dynamism, leadership orientation, digital maturity, or organizational culture—may strengthen explanatory power or introduce moderating effects. Finally, while innovation capability is modeled as a central mechanism, its micro foundations remain underexplored; future research could shed more light to the specific routines, managerial practices, and resource configurations that enable capability formation and business model transformation. Overall, by identifying and validating a sequential capability–business model pathway linking openness to performance, this study advances innovation and strategic management scholarship while opening multiple avenues for deeper theoretical refinement and empirical extension.

References

Ancillai, C., Sabatini, A., Gatti, M., & Perna, A. (2023). Digital technology and business model innovation: A systematic literature review and future research agenda. *Technological Forecasting and Social Change*, *188*, 122307. https://doi.org/10.1016/J.TECHFORE.2022.122307

Andreini, D., Bettinelli, C., Foss, N. J., & Mismetti, M. (2022). Business model innovation: a review of the process-based literature. *Journal of Management and Governance*, *26*(4), 1089–1121. https://doi.org/10.1007/S10997-021-09590-W/TABLES/1

Bigliardi, B., Ferraro, G., Filippelli, S., & Galati, F. (2021). The past, present and future of open innovation. *European Journal of Innovation Management*, *24*(4), 1130–1161. https://doi.org/10.1108/EJIM-10-2019-0296

Chesbrough, H. (2004). Open Innovation: The New Imperative for Creating and Profiting from Technology. *European Journal of Innovation Management*, *7*(4), 325–326. https://doi.org/10.1108/14601060410565074

Chesbrough, H. (2006). Open Innovation: A New Paradigm for Understanding Industrial Innovation. *Open Innovation*, 1–12. https://doi.org/10.1093/OSO/9780199290727.003.0001

Chesbrough, H. (2017). The future of open innovation. *Research Technology Management*, *60*(1), 35–38. https://doi.org/10.1080/08956308.2017.1255054

Chesbrough, H., & Bogers, M. (2014). Explicating open innovation: Clarifying an emerging paradigm for understanding innovation. *New Frontiers in Open Innovation*, 3–28. https://doi.org/https://doi.org/10.1093/acprof:oso/9780199682461.003.0001

Chesbrough, H. W., & Appleyard, M. M. (2007). Open Innovation and Strategy. *California Management Review*, *50*(1), 57–76. https://doi.org/https://doi.org/10.1093/acprof:oso/9780199682461.003.0001

Cohen, W., & Levinthal, D. (1990). Absorptive capacity: A new perspective on learning and innovation. *Special Issue: Technology, Organizations, and Innovation.*, *35*(1), 128–152. https://doi.org/https://doi.org/10.2307/2393553

Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *Cambridge.Org*, *3*(16), 297–334. https://doi.org/https://doi.org/10.1007/BF02310555

Enkel, E., Gassmann, O., & Chesbrough, H. (2009). Open R&D and open innovation: exploring the phenomenon. *R&D Management*, *39*(4), 311–316. https://doi.org/10.1111/J.1467-9310.2009.00570.X

Fornell, C., & Larcker, D. F. (1981). Evaluating Structural Equation Models with Unobservable Variables and Measurement Error. *Journal of Marketing Research*, *18*(1), 39–50. https://doi.org/10.1177/002224378101800104

Foss, N. J., & Saebi, T. (2017). Fifteen Years of Research on Business Model Innovation. *Journal of Management*, *43*(1), 200–227. https://doi.org/10.1177/0149206316675927

Hair, J. F., Hult, G. T. M., Ringle, C. M., Sarstedt, M., Danks, N. P., & Ray, S. (2021). *Partial Least Squares Structural Equation Modeling (PLS-SEM) Using R. Classroom Companion: Business*. https://doi.org/10.1007/978-3-030-80519-7

Hair, J. F., Sarstedt, M., & Ringle, C. M. (2019). Rethinking some of the rethinking of partial least squares. *European Journal of Marketing*, *53*(4), 566–584. https://doi.org/10.1108/EJM-10-2018-0665

Hair, J. F., William C. Black, Barry J. Babin, Ralph E., & Anderson, S. (2018). Multivariate data analysis. In *Journal of Human Resource and Sustainability Studies* (8th ed.). Pearson Education Limited. https://books.google.com/books/about/Multivariate_Data_Analysis.html?hl=id&id=0R9ZswEACAAJ

Huizingh, E. K. R. E. (2011). Open innovation: State of the art and future perspectives. *Technovation*, *31*(1), 2–9. https://doi.org/10.1016/J.TECHNOVATION.2010.10.002

Iddris, F. (2016). Innovation Capability : A Systematic Review and Research Agenda. *Interdisciplinary Journal of Information, Knowledge, and Management*, *11*, 235–260. https://doi.org/https://doi.org/10.28945/3571

Latifi, M. A., Nikou, S., & Bouwman, H. (2021). Business model innovation and firm performance: Exploring causal mechanisms in SMEs. *Technovation*, *107*, 102274. https://doi.org/10.1016/J.TECHNOVATION.2021.102274

Laursen, K., & Salter, A. (2006a). Open for innovation: the role of openness in explaining innovation performance among UK manufacturing firms. *Strategic Management Journal*, *27*(2), 131–150.

Laursen, K., & Salter, A. (2006b). Open for innovation: The role of openness in explaining innovation performance among U.K. manufacturing firms. *Strategic Management Journal*, *27*(2), 131–150. https://doi.org/10.1002/smj.507

Lawson, B., & Samson, D. (2001). Developing innovation capability in organisations: A dynamic capabilities approach. *International Journal of Innovation Management*, *5*(3), 377–400. https://doi.org/https://doi.org/10.1142/S1363919601000427?urlappend=%3Futm_source%3Dresearchgate.net%26utm_medium%3Darticle

Lin, H. F. (2007). Knowledge sharing and firm innovation capability: An empirical study. *International Journal of Manpower*, *28*(3–4), 315–332. https://doi.org/10.1108/01437720710755272

Mendoza-Silva, A. (2021). Innovation capability: a systematic literature review. *European Journal of Innovation Management*, *24*(3), 707–734. https://doi.org/10.1108/EJIM-09-2019-0263

Migdadi, M. M. (2021). Organizational learning capability, innovation and organizational performance. *European Journal of Innovation Management*, *24*(1), 151–172. https://doi.org/10.1108/EJIM-11-2018-0246

Pundziene, A., Adams, R., Grichnik, D., Volkmann, C., Pundziene, A., Adams, R., Grichnik, D., & Volkmann, C. (2023). Artificiality and Sustainability in Entrepreneurship. Exploring the Unforeseen and Paving the Way to a Sustainable Future. *FGF Studies in Small Business and Entrepreneurship*, 3–16. https://doi.org/10.1007/978-3-031-11371-0_1

Pundziene, A., Nikou, S., & Bouwman, H. (2022). The nexus between dynamic capabilities and competitive firm performance: the mediating role of open innovation. *European Journal of Innovation Management*, *25*(6), 1460–1060. https://doi.org/10.1108/EJIM-09-2020-0356

Ritter, T., & Pedersen, C. L. (2020). Digitization capability and the digitalization of business models in business-to-business firms: Past, present, and future. *Industrial Marketing Management*, *86*, 180–190. https://doi.org/10.1016/J.INDMARMAN.2019.11.019

Robertsone, G., & Lapiņa, I. (2023). Digital transformation as a catalyst for sustainability and open innovation. *Journal of Open Innovation: Technology, Market, and Complexity*, *9*(1), 100017. https://doi.org/10.1016/J.JOITMC.2023.100017

Salfore, N., Ensermu, M., & Kinde, Z. (2023). Business model innovation and firm performance: Evidence from manufacturing SMEs. *Heliyon*, *9*(6), e16384. https://doi.org/10.1016/J.HELIYON.2023.E16384

Shahzad, K. ;, Hafeez, S. ;, Heimo, T. ;, Mäenpää, A. ;, Mubarak, M. F., & Evans, R. (2025). Developing the Innovation Capabilities of SMEs: The Role of Intermediary Firms in Knowledge Ecosystems. *IEEE Transactions on Engineering Management*, *72*, 604–618. https://doi.org/10.1109/TEM.2025.3543779

Stone, M. (1978). Cross-validation:a review 2 . *Series Statistics*, *9*(1), 127–139. https://doi.org/10.1080/02331887808801414

Teece, D. J. (2010). Business models, business strategy and innovation. *Long Range Planning*, *43*(2–3), 172–194. https://doi.org/https://doi.org/10.1016/j.lrp.2009.07.003

Vu, H. M. (2020). A review of dynamic capabilities, innovation capabilities, entrepreneurial capabilities and their consequences. *Journal of Asian Finance, Economics and Business*, *7*(8), 485–494. https://doi.org/10.13106/JAFEB.2020.VOL7.NO8.485

Zott, C., & Amit, R. (2007). Business model design and the performance of entrepreneurial firms. *Organization Science*, *18*(2), 181–199. https://doi.org/https://doi.org/10.1287/orsc.1060.0232