

From Accelerator Programs to Business Model Innovation in Startups: The Roles of Program Quality, Knowledge Spillovers and Founder Absorptive Capacity

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Abstract: Business model innovation (BMI) is an important mechanism through which startups refine their value proposition, adapt to market needs and strengthen their growth potential. Although accelerator programs are widely used to support early-stage ventures, the knowledge-based mechanisms through which they are associated with BMI remain insufficiently understood. This study examines how accelerator program quality is associated with business model innovation in accelerated startups, focusing on the mediating roles of knowledge spillover exposure and founders' absorptive capacity. Drawing on knowledge spillover theory and the absorptive capacity perspective, we conceptualise accelerator programs as structured knowledge environments where startups access external knowledge through mentoring, training, peer interaction, expert feedback, market validation, investor exposure and ecosystem connections. We argue that perceived program quality is associated with BMI because higher-quality accelerator experiences provide founders with more relevant opportunities to access, interpret and apply external knowledge. However, this process also depends on founders' absorptive capacity, understood as their ability to recognize, assimilate, transform and exploit such knowledge. Using cross-sectional survey data from 226 founders of startups that participated in accelerator programs in Spain, the study tests a Partial Least Squares Structural Equation Modelling (PLS-SEM) model linking perceived program quality, knowledge spillover exposure, founders' absorptive capacity and BMI. The findings indicate that perceived accelerator program quality is positively associated with knowledge spillover exposure, founders' absorptive capacity and business model innovation. Knowledge spillover exposure partially mediates the relationship between program quality and BMI. Although founders' absorptive capacity does not show a significant direct effect on BMI, its total effect becomes significant when the indirect path through knowledge spillover exposure is considered. The study contributes to accelerator research by shifting attention from accelerator participation to perceived program quality and by explaining BMI as a knowledge-driven outcome of acceleration. It also contributes to knowledge spillover and absorptive capacity perspectives by showing how accelerated startups transform external knowledge exposure into business model reconfiguration.

Keywords: Accelerator Program Quality; Business Model Innovation; Knowledge Spillovers; Founders' Absorptive Capacity; Accelerated Startups.

1. Introduction

Startup accelerators have emerged as influential entrepreneurial intermediaries that connect early-stage ventures with mentoring, specialised education, financial resources, feedback, and network access (Kohler, 2016; Cohen *et al.*, 2019; Ulmer and Pape, 2022). They are typically defined as fixed-term, cohort-based programs that provide intensive and structured support to help startups reach key development milestones (Cohen *et al.*, 2019; Del Sarto *et al.*, 2023). Prior research suggests that participation in accelerator programs is associated with improved venture development trajectories, including faster access to capital, revenue scaling, employment growth, and broader ecosystem development through network building and resource mobilization (Fehder, 2023; Assenova and Amit, 2024).

Despite these contributions, the internal processes through which accelerator programs support startup innovation remain insufficiently understood (Cohen *et al.*, 2019; García-Ochoa, De-Pablos-Heredero and Jiménez, 2020). This ambiguity is partly explained by program heterogeneity, as accelerators differ in curriculum structure, duration, mentor expertise, cohort composition, and the nature of the support provided (Cohen *et al.*, 2019; Seitz, Lehmann and Haslanger, 2024; Doçaj, 2025). Recent scholarship conceptualise accelerators as open, knowledge-rich environments where ventures access external information through networks of mentors, peers, investors, and other ecosystem actors (Hallen, Cohen and Bingham, 2020; del Sarto, Cruz-Cázares and Di Minin, 2022). Within these settings, knowledge spillover exposure offers a promising mechanism for explaining how perceived program quality may be associated with innovation-related change, although the ways in which program quality dimensions shape such exposure remain underexplored (Cohen, Bingham and Hallen, 2018; Cuvero *et al.*, 2023).

Prior accelerator research has generated important insights into startup survival, funding, growth, and performance (Hallen, Cohen and Bingham, 2020; Assenova and Amit, 2024). However, less is known about

whether and how accelerator programs contribute to deeper changes in startups' business model logic (Doçaj, 2025). Business model innovation (BMI), understood as changes in a firm's value offering, value creation architecture, and revenue logic, remains less directly examined as an outcome of accelerator program quality (Miroshnychenko *et al.*, 2021; Urbaniec and Žur, 2021). This gap is important because BMI can be treated as a proximal transformation outcome of acceleration, reflecting how startups refine the way they create, deliver, and capture value before such changes appear in distal performance indicators (Sorescu, 2017; Rechter and Avnimelech, 2025).

Absorptive capacity (ACAP) is also central to this knowledge-based explanation, as it helps explain why some founders are better able than others to recognize, assimilate, transform, and exploit external knowledge (Alejandra Flechas Chaparro and Salles Camargo Júnior, 2021). In particular, it remains unclear how founder-level ACAP contributes to the transformation of accelerator-based knowledge spillovers into business model reconfiguration (Chang and Assenova, 2025). Therefore, this paper examines perceived accelerator program quality as a knowledge-enabling condition and investigates how knowledge spillover exposure and founders' absorptive capacity are associated with business model innovation in accelerated startups. Specifically, this study addresses the following research questions:

RQ1. How is accelerator program quality associated with business model innovation in accelerated startups?

RQ2. What role do knowledge spillovers play in the relationship between accelerator program quality and business model innovation?

RQ3. How does founders' absorptive capacity contribute to the transformation of accelerator-based knowledge into business model innovation?

The proposed model is tested using cross-sectional post-program survey data from 226 founders of startups that participated in accelerator programs in Spain. The study focuses on founders' assessments of accelerator program quality, knowledge spillover exposure, absorptive capacity, and business model innovation linked to the acceleration experience. The proposed relationships are analysed using Partial Least Squares Structural Equation Modelling (PLS-SEM), which is suitable for examining latent constructs, mediation relationships, and complex models based on multiple indicators (F. Hair Jr *et al.*, 2014).

This study contributes to accelerator research by shifting attention from accelerator participation and distal performance outcomes toward perceived program quality, knowledge-based mechanisms, and business model innovation as a proximal transformation outcome. The remainder of the paper reviews the relevant literature and hypotheses, describes the methodology, presents the results, and discusses the main implications, limitations, and avenues for future research.

2. Theoretical Background and Hypotheses

2.1 Startup Accelerators as Knowledge-Intensive Entrepreneurial Support Programs

Startup accelerators function as knowledge-intensive entrepreneurial support programs that go beyond simple resource provision (Hallen, Cohen and Bingham, 2020; De Andrade and Pinheiro, 2023). Although their fixed-term, cohort-based structure facilitates access to seed capital and workspace, their distinctive value lies in concentrating and structuring external knowledge flows in an intensive, time-compressed environment (Cohen *et al.*, 2019; García-Ochoa, De-Pablos-Heredero and Jiménez, 2020; Assenova and Amit, 2024). In doing so, accelerators act as innovation intermediaries that connect early-stage ventures with mentors, peers, investors, experts, and business networks that support venture development (Goswami and Ivey, 2018; Rechter and Avnimelech, 2025).

Within these environments, startups access both tacit and explicit knowledge. Tacit knowledge is acquired through informal interactions, mentoring, peer learning, investor feedback, and physical proximity, while explicit knowledge is delivered through curricula, workshops, technical seminars, and digital knowledge platforms (Goswami and Ivey, 2018; Cuvero *et al.*, 2023; Del Sarto *et al.*, 2023). These mechanisms help startups compensate for resource and capability limitations associated with early-stage ventures and support founders in interpreting feedback, reducing uncertainty, and refining their venture assumptions (Battistella, De Toni and Pessot, 2017; Cohen, Bingham and Hallen, 2018; Seitz, Lehmann and Haslanger, 2024). This knowledge-intensive view provides the basis for examining how program quality shapes startups' knowledge spillover exposure.

2.2 Accelerator Program Quality and Knowledge Spillover Exposure

Start-up accelerators should not be viewed as uniform interventions, as they differ in their organizational designs, practices, and support structures (Cohen *et al.*, 2019). Program quality can therefore be understood as a multidimensional construct reflecting the relevance of the curriculum, mentor expertise, and the effectiveness of investor and ecosystem network access (Assenova and Amit, 2024; Seitz, Lehmann and Haslanger, 2024). High-quality programs are more likely to provide broad, intensive, and paced consultation routines that facilitate rapid learning and help founders navigate market uncertainty (Hallen, Cohen and Bingham, 2020).

These design choices are expected to shape the intensity, diversity, and usefulness of startups' knowledge spillover exposure. Accelerators are increasingly conceptualised as open environments or information-rich coworking spaces that facilitate interactions among mentors, peers, investors, corporate partners, and other ecosystem actors (del Sarto, Cruz-Cázares and Di Minin, 2022; Del Sarto *et al.*, 2023). Within these settings, knowledge spillovers emerge through formal and informal interactions that expose startups to external technical, market, entrepreneurial, and strategic knowledge (Cuvero *et al.*, 2023; Del Sarto *et al.*, 2023). By structuring mentoring, cohort interaction, investor access, and feedback opportunities, higher-quality programs may help founders access and interpret external knowledge that is relevant for strategic change (Hallen, Cohen and Bingham, 2020; Rechter and Avnimelech, 2025). Based on this logic, we propose:

H1: Accelerator program quality is positively associated with startups' knowledge spillover exposure.

2.3 Business Model Innovation in Accelerated Startups

Business model innovation (BMI) refers to a new-to-the-firm change in at least one of three core dimensions: the value offering, the value creation architecture, or the revenue model logic (Sorescu, 2017; Miroshnichenko *et al.*, 2021). Unlike incremental product innovation, BMI involves a broader reconfiguration of how a venture creates, delivers, and captures value (Miroshnichenko *et al.*, 2021; Ramadan *et al.*, 2023). This outcome is particularly relevant for startups, which are often engaged in the search for a repeatable and scalable business model (Battistella, De Toni and Pessot, 2017). In this sense, BMI can be understood as a proximal transformation outcome of acceleration, whereas funding and revenue growth represent more distal indicators of venture development (Del Sarto *et al.*, 2023; Rechter and Avnimelech, 2025).

High-quality accelerator programs may contribute to BMI by providing structured support that helps founders question, validate, and refine key business model assumptions. Through mentoring, investor feedback, peer learning, and exposure to external expertise, founders can identify weaknesses in their value propositions, validate market needs, adjust customer relationships, and reconsider revenue or cost structures before costly implementation (Cohen, Bingham and Hallen, 2018; Del Sarto *et al.*, 2023). Therefore, when accelerator support is well structured, relevant, and connected to high-quality expertise and networks, founders are better positioned to refine how their ventures create, deliver, and capture value. Based on this logic, we propose:

H2: Accelerator program quality is positively associated with business model innovation in accelerated startups.

2.4 Founders' Absorptive Capacity as a Knowledge Transformation Capability

Absorptive capacity (ACAP) refers to a firm's ability to recognize, assimilate, transform, and exploit external knowledge for commercial purposes (Cohen, Bingham and Hallen, 2018; Del Sarto *et al.*, 2023). In new ventures, this capability is closely tied to founders' prior knowledge and cognitive frameworks, as startups often lack formalized routines for acquiring, interpreting, and applying external knowledge (Cohen, Bingham and Hallen, 2018). Founders' ability to process external information therefore becomes central to early-stage learning, particularly in resource-constrained startups that must rapidly transform external knowledge into innovation. High-quality accelerator programs may strengthen founders' ACAP by exposing them to structured and intensive learning mechanisms. Expert mentoring, iterative feedback, peer interaction, curricula, and access to industry-specific expertise can help founders interpret market information, identify opportunities, and process knowledge in a time-compressed context (Cohen, Bingham and Hallen, 2018; Del Sarto *et al.*, 2023). Through these mechanisms, accelerator program quality may support founders' internal learning capabilities and their ability to reconfigure business model elements. Therefore, we propose:

H3: Accelerator program quality is positively associated with founders' absorptive capacity.

Founders with stronger ACAP are better able to recognize, interpret, and engage with knowledge flows within the accelerator's open environment (Alejandra Flechas Chaparro and Salles Camargo Júnior, 2021; del Sarto, Cruz-Cázares and Di Minin, 2022). This founder-level capability helps them identify valuable informal knowledge spillovers that might otherwise be overlooked or misinterpreted (Cuvero *et al.*, 2022, 2023). By interpreting external information from mentors, peers, and investors more effectively, founders with higher ACAP may increase their effective exposure to relevant external knowledge (del Sarto, Cruz-Cázares and Di Minin, 2022; Fehder, 2023; Chang and Assenova, 2025). Thus:

H4: Founders' absorptive capacity is positively associated with startups' knowledge spillover exposure.

Furthermore, ACAP should contribute to business model innovation (BMI) because founders need to transform external insights into changes in the venture's business model logic (Urbaniec and Žur, 2021; Guckenbiehl, de Zubielqui and Lindsay, 2024). BMI entails a comprehensive reconfiguration of the firm's value offering, creation architecture, and revenue logic (Bouncken, Kraus and Roig-Tierno, 2021; Miroshnychenko *et al.*, 2021; Li *et al.*, 2022). This requires founders to move beyond simple acquisition to a transformation stage, where external knowledge is combined with the venture's internal knowledge base to facilitate strategic renewal (Von Delft *et al.*, 2019; Miroshnychenko *et al.*, 2021). In this sense, ACAP serves as the transformative capability that enables founders to use external knowledge for business model reconfiguration rather than just incremental improvements (Li *et al.*, 2022; Del Sarto *et al.*, 2023). Based on this logic:

H5: Founders' absorptive capacity is positively associated with business model innovation.

Finally, while prior studies show that ACAP can act as a mediator or a moderator, for this study, we test it as part of an integrated partial mediation model (Guckenbiehl, Corral De Zubielqui and Lindsay, 2021; Vincent and K.A., 2021; Pigola and Fischer, no date). Knowledge exposure alone is not enough to produce strategic change; founders must be able to interpret and exploit that knowledge (Cohen, Bingham and Hallen, 2018; Arif *et al.*, 2026). Accelerator program quality may influence BMI directly through its design, but it is also likely to influence it indirectly through the mechanisms of knowledge spillover exposure and founders' ACAP (Cohen, Bingham and Hallen, 2018; Fehder, 2023). Therefore, these factors are expected to partially mediate the relationship between program quality and business model innovation.

H6: Knowledge spillover exposure and founders' absorptive capacity partially mediate the relationship between accelerator program quality and business model innovation.

Overall, this study examines BMI at the accelerated-startup level, using founders' perceptions of accelerator program quality. The model proposes that perceived program quality is associated with BMI directly and indirectly through knowledge spillover exposure and founders' absorptive capacity. Figure 1 summarizes the proposed model and hypotheses.

3. Methodology

3.1 Research Design

This study adopts a quantitative, cross-sectional survey design to examine the associations between perceived accelerator program quality, knowledge spillover exposure, founders' absorptive capacity, and business model innovation. The unit of analysis is the accelerated startup, captured through founder-level or key respondent survey responses. Accordingly, the study does not evaluate accelerator organizations as independent units, nor does it use objective accelerator-level indicators. Instead, accelerator program quality is operationalized as perceived program quality, reflecting respondents' assessment of the structure, relevance, and usefulness of the support received during the acceleration process.

Given the cross-sectional nature of the data, the analysis does not claim causal inference. Rather, it examines whether the observed associations are consistent with the proposed knowledge-based mechanism linking perceived program quality, knowledge spillover exposure, founders' absorptive capacity, and business model innovation. Figure 1 presents the research model tested in this study.

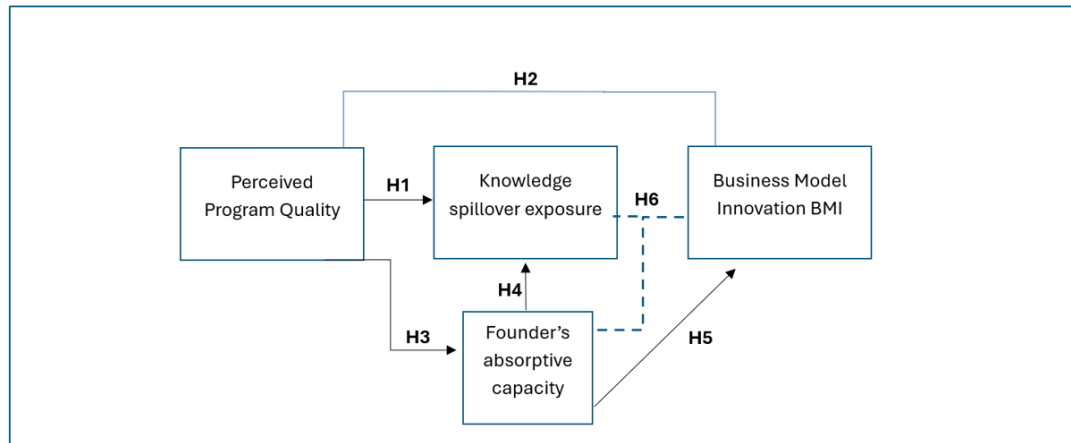


Figure 1: Research model

3.2 Sample and Data Collection

The empirical context consists of startups that participated in accelerator programs in Spain. Data were collected through a structured survey addressed to founders or key representatives with direct knowledge of their startup's accelerator experience. The questionnaire captured respondents' perceptions of accelerator program quality, their exposure to different sources of knowledge during the program, their absorptive capacity, and the extent to which their venture modified different elements of its business model.

The survey was distributed to a database of 1,745 founders of accelerated startups identified across 45 Spanish accelerator programs, resulting in a response rate of approximately 13%. Although the sampling frame covered founders identified through 45 Spanish accelerator programs, the response rate was approximately 13%, and the distribution of respondents across individual programs could not be fully assessed. Consequently, non-response bias cannot be ruled out, and the sample should not be interpreted as statistically representative of the entire population of accelerated startups in Spain. After screening the responses and removing incomplete or duplicate entries, the final sample consisted of 226 valid startup-level responses. To maintain consistency in the unit of analysis, each response was treated as representing one accelerated startup. The final dataset therefore reflects founder-level perceptions of program quality and knowledge mechanisms, together with self-reported business model innovation outcomes.

3.3 Measures

To analyse the different constructs, we developed scales based on the existing literature. We measured the independent variable, Business Model Innovation, using a Likert scale with nine sub-dimensions, each of which was measured using a three-item scale. The nine dimensions correspond to the classic Business Model framework: value proposition, customer segments, distribution channels, customer relationships, revenue streams, key resources, key activities, partnerships, and costs. This scale, therefore, has been considered a Formative Higher-Order Construct (HOC) composed of nine primary second-order dimensions.

To assess perceived program quality, we used an 8-item Likert scale, including program structure, curriculum relevance, curriculum uniqueness, exclusivity of information and materials, effectiveness of market interaction, innovation in program interactions, clarity regarding post-program startup, and quality of funding opportunities.

Knowledge Spillover exposure was measured using a five-item scale considering the extent of contribution from face to face, contribution of provided materials R&D activities, technological knowledge and entrepreneurial knowledge. Finally, founders' absorptive capacity was measured using a two-item reflective scale adapted from prior literature. The short scale was retained to reduce respondent burden in a survey covering multiple constructs and because both items capture the founders' ability to assimilate and apply external knowledge. Although the indicators showed unequal loadings, the construct met the recommended thresholds for composite reliability ($\rho_c = 0.820$) and average variance extracted ($AVE = 0.709$).

A PLS-SEM model was used to assess the scale and construct validity. To test the validity of the measurement model, the recommendations of (Benitez *et al.*, 2020) were followed. The results are shown in Table 1. For the latent variables, ρ_c was found to be higher than 0.77 and Average Variance Extracted (AVE) was found to be

higher than 0.5. Some of the weights are not significant, but since the loadings are significant and to maximize content validity, it is recommended to retain them in the measurement model. Discriminant analysis was checked using Heterotrait-monotrait ratio (HTMT).

Table 1: Scale and construct analysis

Construct	Type	Items / Dimensions	pc	AVE	VIF range	Weight range	Loading range
Perceived program quality	Formative	8	—	—	1.814–3.068	0.044–0.305	0.739–0.869
Knowledge spillover exposure	Reflective	5	0.893	0.628	—	0.229–0.283	0.761–0.817
Founders' absorptive capacity	Reflective	2	0.820	0.709	—	0.204–0.864	0.669–0.976
Business model innovation	Formative	9	—	—	3.098–4.533	0.032–0.382	0.761–0.917

Note: For formative constructs, VIF values, weights and loadings are reported. For reflective constructs, composite reliability (pc), AVE, weights and loadings are reported. Significance levels: *** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$.

4. Results

To test the hypotheses, a PLS-SEM analysis was performed using the SMART-PLS application. Considering that there are both composite and reflective variables in the model, the use of PLS is especially indicated (Benitez et al., 2020). Table 2 shows the model that has been tested. Overall fit of the estimated model has been analysed using the SRMR, and dULS indicators. In all cases these indicators are within the values considered acceptable for the models to be a good representation of data (Benitez, et al., 2020).

Table 2: Structural model

Independent Variable	Knowledge Spillover	Absorptive Capacity	Business Model Innovation
Program quality	0.775*** (25.343)	0.275*** (4.049)	0.659*** (8.346)
Knowledge spillover	—	—	0.177* (2.359)
Absorptive capacity	0.126** (3.198)	—	0.098 (1.857)
R ²	0.668	0.075	0.712
Model fit	SRMR = 0.035 (HI95 = 0.042)	dULS = 0.376 (HI95 = 0.529)	

Note: t-values in parentheses. Significance levels: *** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$; † $p < 0.1$.

Hypotheses 1 and 3 state that program quality is positively associated with knowledge spillover exposure and founders' absorptive capacity. The results support both H1 ($\beta = 0.775$, $p < 0.001$) and H3 ($\beta = 0.275$, $p < 0.001$). H2 proposed that program quality is positively associated with business model innovation, and this relationship is also supported ($\beta = 0.659$, $p < 0.001$).

Regarding H4 and H5, the effect of founders' absorptive capacity on knowledge spillover exposure is positive and significant ($\beta = 0.126$, $p < 0.01$), supporting H4. However, the direct effect of absorptive capacity on business model innovation is positive but not statistically significant ($\beta = 0.098$, n.s.). Therefore, H5 is not supported for the direct relationship between absorptive capacity and business model innovation.

Table 3: Indirect effects

Path	Indirect Effect	Total Effect
AC–BMI	0.022 (1.862)	0.120* (2.323)
PQ–BMI	0.170** (2.657)	0.829*** (30.055)

Note: t-values in parentheses. Significance levels: *** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$; † $p < 0.1$.

Finally, hypothesis 6 holds that both Absorptive Capacity and Knowledge Spillover mediate the relationship between Program Quality and Business Model Innovation. In table 3 the indirect effects and total effects are

considered. As we can see, the total indirect effect of Program Quality on BMI is positive and significant ($\beta=0.170$, $p<0.01$). Following (Nitzl, Roldan and Cepeda, 2016), VAF was computed ($VAF=20.5$), indicating a partial complementary mediation. That partially supports H6.

Nevertheless, Table 3 shows that the total effect of absorptive capacity on business model innovation is positive and significant ($\beta = 0.120$, $p < 0.05$). This indicates that, although absorptive capacity does not directly explain business model innovation, it contributes indirectly through knowledge spillover exposure.

5. Discussion and Conclusion

The results support the relevance of perceived accelerator program quality for business model innovation. First, the findings contribute to accelerator research by showing that program quality is associated with business model innovation and by clarifying some of the mechanisms underlying this relationship. They also support Knowledge Spillover Theory as a relevant framework for explaining how acceleration programs contribute to startup transformation.

Second, the findings extend the knowledge-spillover perspective by showing that knowledge-spillover exposure and founders' absorptive capacity jointly contribute to the relationship between perceived program quality and business model innovation. However, this mediation is partial, suggesting that other mechanisms may also be involved, including mentor credibility, peer learning, strategic networks, investor feedback, and entrepreneurial self-efficacy. Future research should examine how these mechanisms contribute to business model reconfiguration.

Third, the findings contribute to the knowledge-management literature by clarifying the role of founders' absorptive capacity. Although its direct association with BMI was not statistically significant, absorptive capacity contributed indirectly through knowledge-spillover exposure, and its total effect was significant. This suggests that it helps founders interpret and apply the external knowledge accessed through accelerator programs.

The findings also have practical implications. Accelerator organizers should design programs that provide relevant knowledge, effective mentoring, and meaningful interaction with ecosystem actors. For founders, benefiting from acceleration may depend not only on the support offered but also on their ability to internalize and apply the knowledge accessed during the program.

The study has several limitations. Its cross-sectional design precludes causal conclusions, while the relatively low response rate creates a potential risk of non-response bias. Moreover, the self-reported measures reflect respondents' perceptions rather than objective accelerator-level characteristics, and the study does not distinguish between founder- and accelerator-level effects. Finally, absorptive capacity was measured using only two items with unequal loadings. Although the construct met reliability and convergent-validity thresholds, future research should use a more comprehensive multidimensional scale. Longitudinal studies using objective measures and multilevel designs could address these limitations.

Despite these limitations, the study provides evidence that perceived program quality, knowledge-spillover exposure, and founders' absorptive capacity are relevant to understanding business model innovation in accelerated startups.

Ethics Declaration

This study is based on survey data collected from founders or key representatives of startups that participated in accelerator programs. Participation was voluntary, and responses were treated confidentially and used only for academic research purposes. No personal identifying information is reported in the paper.

AI Declaration

AI-assisted tools were used to support language refinement, structure development, and citation organization during the preparation of this paper. All AI-assisted outputs were reviewed, edited, and validated by the author, who remains fully responsible for the final content of the manuscript.

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