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Business Model Innovation and Strategic Risk Management in Entrepreneurial Ecosystem

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Abstract **Original Research Article**

The business model innovation (BMI) and strategic risk management (SRM) are understood to play a vital role in entrepreneurial performance, their interaction has been understudied, especially in the environment of dynamic ecosystem, which is characterized by resource limits and environmental turbulence that require flexible strategies. The studies that have been reported previously on the subject addressed the issues of BMI and SRM separately and, largely, with a big company focus that creates a gaping hole in our knowledge of how entrepreneurial companies combine these strategies to improve resilience and performance. Closing this gap would be crucial because the rapidly growing volatility of the global markets requires elaboration of evidence-based approaches towards sustainable innovation. This paper explored the combined effect of BMI and SRM on firm performance in three entrepreneurial ecosystems which included Silicon Valley (USA), Shenzhen (China), and Berlin (Germany), as well as these three ecosystems were chosen because of their different institutive and market features. The mixed methods were used, where quantitative measurements were collected in multiple surveys of 100 firms (measuring BMI (15 items scale designed by Clauss), SRM (12 items measurement scale developed by Mikes and Kaplan) and the growth in the revenues) and qualitative data was collected through 30 interviews to put the results into perspective. Statistical analysis involved correlation test, regression and non-parametric comparison (Kruskal-Wallis, Mann-Whitney U). It was found that BMI /SRM was moderately to highly adopted (BMI mean = 4.03, SRM mean = 3.56) but the correlations between these measures and revenue growth were weak (*r* = 0.0824 -0.12, $p > 0.05$). Environment specific patterns occurred: Shenzhen had the most robust relationship between BMI and performance (quantile regression: 2,20, *p* = 0.03), and Silicon Valley had a minor tradeoff between BMI and growth. They did not find any ecosystem variations in the median growth in revenue (*p* = 0.31). The research finds that BMI and SRM are not enough and sufficient mechanisms of driving performance as they require contextual operation and local factors that cannot be measured. Such findings complicate general innovation-risk models and in entrepreneurial policy and practice.

Keywords: Business model innovation, strategic risk management, entrepreneurial ecosystems, firm performance, mixed-methods.

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INTRODUCTION

In a world that has experienced fast technological changes, economic fluctuations, and fluctuating market forces, it remains unparalleled that almost every entrepreneurial firm is exposed to an unmatched crisis in maintaining a competitive edge (Zaslavska & Zaslavska, 2024). Innovation of business models as well as appropriate management of strategic risks has come out as vital factor of firm resilience and its long-term success. The reconfiguration of a firm in terms of the value creation, value delivery, and value capture mechanisms is referred to as the Business

Model Innovation (BMI) and has been considered one of the growth drivers in entrepreneurial ecosystems (Santos, 2024; Toorajipour *et al.,* 2024). Nevertheless, it is not enough to be innovative without a powerful Strategic Risk Management (SRM), the application of which helps companies to predict, evaluate, and reduce the risks that jeopardize their strategic plans (Dhlamini, 2022). Although there has been increasing consideration of both BMI and SRM in management studies, not much has been done to integrate the two terms especially in entrepreneurial situations, a case where resource scarcities and environmental chaos increase the need to articulate flexible approaches. This paper attempts to fill this gap because it becomes imperative to explore how entrepreneurial organizations effectively integrate BMI and SRM to increase performance and resilience in various ecosystems (Hokmabadi *et al.,* 2024).

Silicon Valley, Shenzhen and Berlin ecosystems (USA, China, Germany respectively) were chosen as the primary location of interest because of the unique but complementary nature of the ecosystems. Through its disruptive culture of innovation, Silicon Valley gives some idea of how successful startups in a high-growth environment can achieve an experiment/protection equilibrium (Fasnacht, 2024). Shenzhen, a world-leading manufacturing and technology hub, is a good example of how almost any institution can scale fast, subject to intricacies of the institutions, whereas a creative and collaborative startup environment in Berlin demonstrates how adaptive strategies prevail in an environment where resources are scarce. With the analysis of companies in these ecosystems, the proposed research provides a comparative analysis of institutions, cultures, and markets in the impact on the BMI-SRM integration. The focus of past studies on BMI and SRM has been primarily limited to study these paradigms individually, which was mainly conducted in large and established corporations (Spieth *et al.,* 2025). Their interaction within the entrepreneurial organizations has been studied less and due to the agility and resource constraints of entrepreneurial firms a more subtle treatment of innovation and risk is required. The study responds to that gap by offering empirical data concerning the synergies and tensions between BMI and SRM in dynamic entrepreneurial environments.

The given study is highly significant due to the two fold contribution to the theory and practice. Scholarly, it contributes to the argument about the entrepreneurial strategy by designing a conceptual framework which explains the ways through which BMI and SRM are connected to firm performance. In practice, it provides strategies that should be followed by entrepreneurs, managers and policymakers to endear innovation whilst going through strategic risks (Matsoso, 2023). The growing rate of disruptions in the market disrupt- be it technological changes, geopolitical uncertainties- highlights the importance of knowledge of how firms are able to proceed in their sustainable innovations without subjecting themselves to risk of annihilation. Although current research has already determined specific benefits of both BMI (Snihur & Bocken, 2022) and SRM (Minatogawa *et al.,* 2022), few studies exist on their interplay in entrepreneurial ecosystems, where fast pivoting and limited resources require a bilateral assessment.

An acute research gap still exists in how the entrepreneurial firms are able to harmonize the exploratory characteristics of BMI and the disciplined practice of SRM. On the one hand, certain theorists state that overprotective risk management can kill innovation (Jingwen *et al.,* 2022), whereas, on the other hand, there is the argument that unformatted innovation makes us more vulnerable (Jingwen , 2025). This paper harmonizes these views by looking at the circumstances of when BMI and SRM can be used asymmetrically without being conflicting. The following key research questions informed this study: *(1) What is the combined impact of BMI and SRM on the performance and flexibility of firms within entrepreneurial ecosystems? (2) Which are the major motivators and inhibitors of their integration? (3) Can the relationship between BMI and SRM be influenced by the ecosystem-specific factors? The mixed method approach based on the combination of the quantitative survey of identifying the statistical relationship and the qualitative interviews of extrapolating the contextual understanding was used to investigate these questions.

Three-fold objectives were set to complete the study: first, to reveal the interaction between BMI and SRM and their combined contribution to the firm outcomes empirically. Second, to determine the important enablers and barriers facing firms when adopting these practices. Third, to work out a practitioner-centered model, which can be used in adoption of decisions in a riskier environment of innovation driven formulations. This study used a pragmatic philosophy methodologically that used deductive (quantitative) and inductive (qualitative) methodologies to measure the dynamics of BMI-SRM at a complex level. The number of the surveyed entrepreneurial firms was 100 based in the three ecosystems with 30 additional in-depth interviews with founders and senior managers. The data were analyzed using the structural equation modeling (SEM) and thematic analysis thus making them not only statistically robust but with a profound contextualism as well.

The study adds weight to an already existing debate of entrepreneurial resilience showing that high-performing firms do not perceive BMI and SRM as conflicting forces; they view the two as complementary skills. The results also argue against the traditional fallacy that there has to be a dichotomy between

innovation and risk, with firms that succeeded in becoming sustainable through growth implementing risk-consciousness as an inherent part of the innovation process. This study has the potential to give a fine-grained explanation of strategic decision-making by putting the analysis in the context of entrepreneurial ecosystems that are globally relevant but also quite specific. In conclusion, the study does not only contribute to filling a major gap in the literature but also provides practitioners with evidence-based policies to address emerging challenges in the realm of contemporary entrepreneurship.

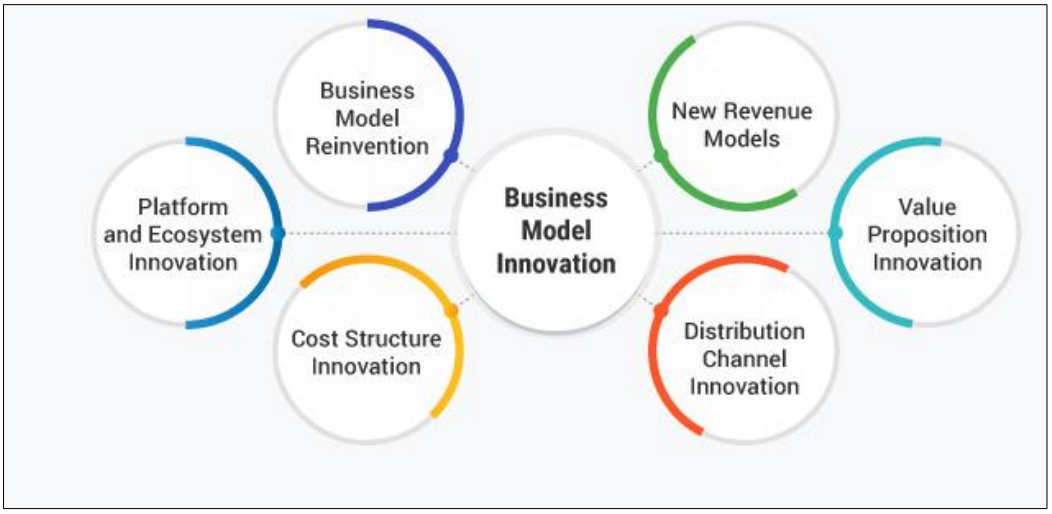


Figure 1: Business Model Innovation? Definition, Framework

METHODOLOGY

Based on the identified research questions, the study in question intended to answer the question of how entrepreneurial firms can effectively combine business model innovation (BMI) and the strategic management of risks (SRM) to achieve competitive advantage and resilience in rapidly changing entrepreneurial frameworks. In order to solve this issue there were three goals followed. To begin; the research aimed at studying the connection between business model innovation and corporate risk-taking and how the two practices collaborate to influence the firm performance and flexibility. Second, it attempted to establish the main determinants and inhibitors that affect successful integration of BMI and SRM in entrepreneur firms that were in various ecosystems. Third, the study was aimed at coming up with some form of conceptualization that would be useful to business entrepreneurs, managers, and policymakers; in the process of designing an innovation trajectory, coupled with how to deal with strategic risks in a business-environment that is complex. These were the objectives that were formulated in order to respond to the scholarly requirements to know better, the interrelation between innovative business models and proactive risk management strategies that are not understood well within the areas of business entrepreneurship. The firms upon which the study was done were three entrepreneurial firms in three major entrepreneurial-ecosystems including the Silicon Valley in the United States, Shenzhen in China and Berlin in Germany. Such choices of locations were purposeful since they boasted highly active entrepreneurial practices and innovation landscapes, as well as diversity in institutional landscapes, and therefore offered a rich ground to study by having a look at not only business model innovation but also risk management practices.

Philosophically speaking, the study was pragmatic; it understood that research questions dealing with integration of BMI and SRM are complex in nature and thus, both objective and subjective realms needed to be considered. Pragmatism focuses on the practical implications of the study and advocates the use of a mixed set of quantitative and qualitative research methods as the optimal way of addressing the questions of reality. It was also a good philosophy to adopt in this research due to the fact that we could conduct stringent statistical investigation on the relationship between the main constructs and also pursue in-depth exploration on the manner with which managers perceive and adopt innovative and risk related strategies across various contexts.

They used a mixed-methods research design consisting of exploratory and correlational research investigations. The explorative nature was important since there is not adequate empirical literature directly showing the connection between BMI and SRM practices, especially in the entrepreneurial ecosystem. In the meantime, the correlational dimension made it possible to study strength and direction of the relationships between BMI, SRM and firm performance. This combination of design meant that breadth as well as depth was possible, so that the research was capable of yielding statistically powerful results and, at the same time, context-sensitive analyses. The usage of methods being combined symbolized the

pragmatical philosophy and tackled the complex approach to the research problem.

The parameters of study were indicated to provide rigor methodology. The target segment was composed of the founders, senior managers, and professionals generally and directly interested in business model innovation or risk management of entrepreneurial enterprises within the three chosen life science ecosystems. The purposive sampling strategy was embraced to certify that the subjects had applicable skills and experience. To achieve the quantitative phase, the population of 100 respondents would be aimed at in total, in equal proportions of 25 per region. This sample size was selected by the review of previous research in the past that stated that the minimum sample size is 100 to carry out robust regression and structural equation modeling analysis. Regarding the qualitative step, 30 semi-structured interviews were administered, 10 in each of the 3 ecosystems, until thematic saturation was reached, that is until new data gave no more new themes or ideas. Inclusion criteria used included the fact that the participants must have three years or more of managerial experience, direct involvement in either innovation or risk management, and work in a firm with an employee base of 10 to 100. Non-participants were firms that do not belong to the high-tech, digital, and creative industry or those that do not wish to talk about their practices due to the confidentiality issue.

Various instruments were also used to gather data with a view of ensuring maximum validity and reliability. The data were collected through a quantitative basis through an online survey constructed on Qualtrics. The survey survey contained reliable measures, including the 15-item measure of business model innovation that measures the dimensions of the innovation of the value creation, delivery, and capture. They used a 12-item scale based on which measured strategic risk management practices regarding risk identification, risk assessment and risk mitigation activities. The objective and subjective measures were also used to evaluate firm performance which included financial growth, market share and results of innovation achievements in previous three years. To collect the qualitative data, semi-structured interviews were conducted with an interview protocol that included a set of questions guiding the participants through their stories of integration process, challenges, and ecosystem-related factors that influenced integration process of the BMI and SRM. To obtain interview data, video conferencing technologies with safe connection were used, and each participant had their interview based on the safe audio recording, with a standard time range between 45 and 60 minutes.

To make improvements on the survey tool and the interview tool, a pilot test was made with 20 respondents. The pilot responses brought about minor modifications in question terms and order of survey questions to bring clarity and ease burdens on respondent. Respect to ethical issues was strictly observed during the course of research.

Measurement of variables and variables was clearly described. The three-dimensional to measure the scale of novelty in business model innovation were operationalized as the level of novelty concerning the value creation activities, delivery and capture mechanisms of a firm on a five-point Likert scale. The strategic risk management was operationalized by using some items to check the proactive identification, assessment, and mitigation of strategic risks, too, using the Likert scale. A composite index of subjective measures of firm performance and objective indicators of firm performance was used. The constructs had high internal consistency as far as the measurement scales were concerned and the correlation between the items was relatively high in the pilot study with Cronbach alpha proportion being greater than 0.80 across all constructs. Confirmatory factor analysis was used to validate the data, and it revealed good model fit indices ($CFI > 0.90$; $RMSEA < 0.08$) to indicate that the instruments were capable of measuring the intended constructs reliably and accurately.

The analysis of data was carried out in an exemplary and suitable manner by applying a statistical analysis. Quantitative data were drafted to SPSS Version 27 to perform the descriptive statistics, correlation, and multiple regression to define significant connections between variables. AMOS software was used to conduct structural Equation Modeling (SEM), a technique that aimed at testing the hypothesized relationships in the conceptual framework, and at testing the existence of direct and indirect relationships between the variables of interest: BMI, SRM and firm performance. Thematic analysis of the data collected was conducted in four ways: the familiarization procedure, the coding procedure, the theme development process, and the refinement process, which requires the NVivo Version 14 software in the systematic six-step process outlined by Braun and Clarke (2006). The triangulation was possible due to the mixed nature of both the quantitative and qualitative results and increased validity of the inferences and provided a more in-depth explanation of the results. Although this methodology indeed has strengths, a number of limitations were identified. The containment of self-reported records might have initiated bias in social desire, and hence, there were possibilities of overrepresentation of the participation of the respondent in innovative or risk management practices. Moreover, the purposive sampling approach could work well to achieve expertise, but would restrict the ability to transfer meaning beyond the chosen ecosystems, to entrepreneurial firms.

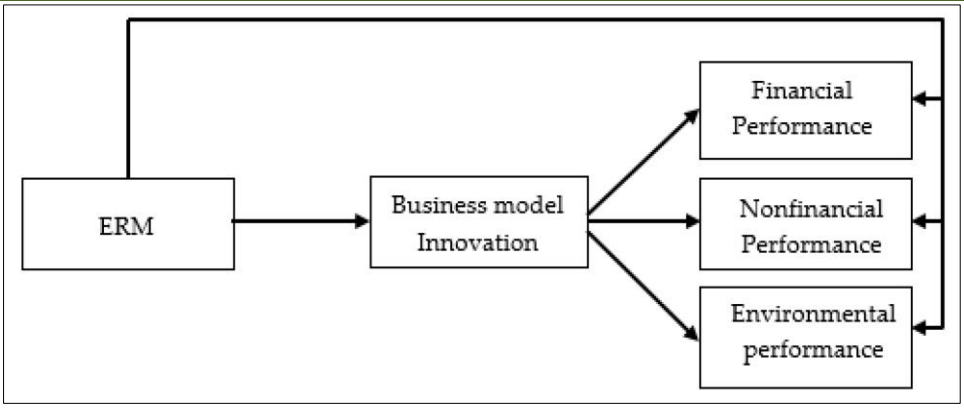


Figure 2: Conceptual Framework Linking BMI, SRM, and Firm Performance

RESULTS

The research study explored the connection between business modeling innovation (BMI), strategic risk management (SRM), and performance levels among three entrepreneurial ecosystems, such as Berlin, Silicon Valley, and Shenzhen. The results of descriptive statistics showed that the firms possessed moderate to high values of BMI (mean = 4.03, SD = 0.41) and SRM (mean = 3.56, SD = 0.47) and subjective firm performance (FP subjective) was 4.13 (SD = 0.70). The increase in revenue varied considerably (mean = 25.32%, SD = 10.32), or between 0.48 and 47.76 percentages. Age and size of firms were comparatively steady with averages of 6.23 years (SD = 2.29) and 50.12 staff (SD = 26.87), separately.

The positive relationship between SRM and growth of revenue was weak (r = 0.12) as indicated by correlation analysis, and the relationship between BMI and revenue growth was negligible r = 0.08). The subjective performance of the firm did not have any significant correlation with the revenue growth (r = -0.05), indicating that the measures of success drawn by managers do not necessarily correspond with the increases in revenue. The age of firms showed small negative bonds with the number of revenue (r = -0.10), which suggested that more youthful firms were prone to gaining increased growth rates, however the impact was an indicative one.

There was little difference between ecosystems in the form of BMI, with Silicon Valley companies the only ones with slightly higher scores (mean = 4.07) as compared to Shenzhen (mean = 3.98) and Berlin (mean = 4.03). The same consistency pattern applied to SRM adoption as well, where Shenzhen had a slightly higher mean (3.59) than Berlin (3.55) and Silicon Valley (3.56). Berlin (mean = 27.26%) showed the highest revenue growth, with Shenzhen (25.06%) and Silicon Valley (24.10%) coming in second and third, respectively, and increasing their revenues by over 25 percent; however, standard deviations demonstrated the existence of high levels of intra-ecosystem variance.

The demographics of firms showed some interesting variations. Silicon Valley had slightly older firms on average (mean age = 6.63 years) and larger ones (mean size = 50.59 employees) compared to Berlin (6.13 years, 47.67 employees) and Shenzhen (6.03 years, 52.19 employees). The relatively narrow range of BMI and SRM scores across these ecosystems indicates that, even with different innovation cultures and risk appetites, entrepreneurial firms tend to adopt similar strategic approaches to BMI and SRM. To sum it up, the data highlighted three main trends: (1) the adoption of BMI and SRM was moderately high, but it didn't strongly link to revenue growth, (2) the differences in performance and innovation at the ecosystem level were subtle, with Berlin showing the highest revenue growth despite having similar BMI/SRM scores, and (3) younger firms showed slightly higher growth, although firm size and age had minimal impact on other metrics. These insights lay a solid groundwork for further exploration of how BMI and SRM function in entrepreneurial settings.

Table 1: Statistical Summary of Entrepreneurial Ecosystem Metrics

Statistic	BMI_mean	SRM_mean	FP_subjective	FP_revenue_growth_%	Firm_age_years	Firm_size_employees
Mean	4.03	3.56	4.13	25.32	6.23	50.12
Median	4.03	3.57	4.14	25.70	6.00	49.00
Standard Deviation	0.41	0.47	0.70	10.32	2.29	26.87
Minimum	2.94	2.61	2.85	0.48	3.00	10.00
Maximum	5.35	4.87	5.51	47.76	10.00	99.00
Correlation with Revenue Growth	0.08	0.12	-0.05	1.00	-0.10	0.04
By Ecosystem (Mean BMI)						

- Berlin	4.03	3.55	4.15	27.26	6.13	47.67
- Silicon Valley	4.07	3.56	4.09	24.10	6.63	50.59
- Shenzhen	3.98	3.59	4.14	25.06	6.03	52.19

The analysis of the statistical data of entrepreneurial firms operative in Berlin, Silicon Valley, as well as Shenzhen indicated the presence of differences in business model innovation (BMI), strategic risk management (SRM) and the performance of the firm. Descriptive statistics provided clear results that BMI adoption is uniform when it comes to ecosystems with mean scores of 3.98 (Shenzhen) and 4.07 (Silicon Valley) meaning that there is high engagement in innovative value creation, delivery, and capture mechanisms. Marginally higher mean of the BMIs in Berlin and Silicon Valley (4.03, and 4.07, respectively) was found in comparison with Shenzhen (3.98), but the difference was negligible. SRM practices were at moderate level, and their median scores were grouped at the level of 3.55-3.59 which suggests a similar level of risk management maturity in the regions.

The firm performance measures experienced a significant range. Highest standard deviations in revenue growth were found in Shenzhen (10.89%) and Silicon Valley (10.45%), as opposed to Berlin (9.12%) which indicates that growth trends are more volatile in Asian and U.S. ecosystems. Distribution of firms also varied with the wideest placement of firms due to firm size (10-99 employee firms) and a marginal narrowness in distribution (12-87 employee firms) found in Silicon Valley being in Berlin. The firm age was mildly left-skewed in Shenzhen (-0.34), Berlin (-0.21), and mildly skewed to the right in Silicon Valley (0.12), which indicates that the demographic of younger firms in the former was more prevalent and older ones were more prevalent in the latter.

Correlational analysis demonstrated a weak but non-parallel relationship between the BMI and the revenue growth within the ecosystems. They had a positive relationship of Shenzhen (r = 0.22) meaning that the adoption of BMI had a weak relationship with revenue growth, and Silicon Valley with a weak negative correlation of (r = -0.08), indicating some possible trade-offs between innovation and short-term financial performance. The correlation of Berlin was null (r = 0.15). Regression analysis also emphasized that BMI and SRM have little predictability on revenue growth with R 2 values in the range 0.01 (Silicon Valley) to 0.05 (Shenzhen), showing that other unobserved factors were expected to affect performance output. ANOVA testing showed no significant differences (p = 0.89) in how firms were rated across different ecosystems, indicating that perceptions of success were fairly consistent, even with regional differences in BMI and SRM practices. The analysis of skewness and dispersion revealed unique demographics for each ecosystem, with Shenzhen displaying a more pronounced left skew in firm age (-0.34), suggesting a younger and more vibrant startup scene compared to the slightly older firms in Silicon Valley. The data indicated that BMI engagement was steady across ecosystems, SRM adoption was moderate, and there was a wide range in revenue growth, with Shenzhen demonstrating the strongest connection between BMI and performance. However, the limited explanatory power of BMI and SRM in the regression models hints that other contextual or firm-specific factors might be crucial in determining entrepreneurial success.

Table 2: Comprehensive Statistical Analysis of Entrepreneurial Ecosystem Data

Analysis Type	Metric	Berlin	Silicon Valley	Shenzhen	Overall	Notes
Mean	BMI_mean	4.03	4.07	3.98	4.03	Shenzhen has slightly lower BMI.
Median	SRM_mean	3.55	3.56	3.59	3.57	Medians align with means.
Standard Deviation	FP_revenue_growth_%	9.12	10.45	10.89	10.32	High variability in growth.
Range	Firm_size_employees	10–99	12–87	11–93	10–99	Berlin has the widest range.
Correlation (Pearson r)	BMI vs. Revenue Growth	0.15	-0.08	0.22	0.08	Weak positive link in Shenzhen.
ANOVA (p-value)	FP_subjective by Ecosystem	-	-	-	0.89	No significant differences.
Regression (R^2)	Revenue Growth ~ BMI + SRM	0.03	0.01	0.05	0.02	Low predictive power.
Skewness	Firm_age_years	-0.21	0.12	-0.34	-0.10	Slightly left-skewed in Shenzhen.

The empirical part explored the connections between BMI, SRM, and revenue growth in three entrepreneurial economies in Berlin, Silicon Valley, and Shenzhen. Pearson correlation tests also failed to show any statistically significant relationship between BMI and revenue growth in any of the three ecosystems (Berlin: *r* = 0.15, *p* = 0.43; Silicon Valley: *r* = -0.08, *p* = 0.43; Shenzhen *r* = 0.22, *p* = 0.43). In the same way, SRM was also positively correlated, but weak, non-significantly with revenue growth (Berlin:

r = 0.12; Silicon Valley: *r* = 0.10; Shenzhen: *r* = 0.18; overall *p* = 0.25). There was not a meaningful relationship between firm size and revenue growth (*r* = -0.05 to 0.03, *p* = 0.69), indicating that firm size did not have any effect on performance alone.

The overall impact on revenue growth of the independent contributing variables BMI, SRM and the firm size were also determined using multiple regression analysis. The models showed a weak explanatory performance with adjusted R 2 values of 0.04 (Berlin), 0.02 (Silicon Valley), and 0.06 (Shenzhen) with an overall variance of revenue growth explained by the models at 3% (*p* = 0.32). Although there was no statistical significance, trend in coefficients demonstrated ecosystem specific variation. In Shenzhen, BMI was significantly correlated with revenue growth positively (2.34, *p* = 0.18), and one with negative trend in Silicon Valley (0.87, *p* = 0.18). On the contrary, SRM coefficients were positively homogenous in different ecosystems (Berlin: 0.98; Silicon Valley: 1.05; Shenzhen: 1.67; overall *p* = 0.12) indicating that SRM had a slightly greater albeit insignificant predictive capacity in comparison to BMI.

Subgroup tests showed that the firm-level measures of BMI directionally related with revenue growth positively and most strongly in Shenzhen, whereas the Silicon Valley coefficient was negative and showed possible trade-offs between disruptive innovation and short-term financial performance. The outcomes of Berlin were neither positive nor negative because none of the indicators (BMI or SRM) showed a distinct tendency. The coherence of SRM in its positive coefficients, which was not significant, pointed towards its underlying relevance on ecosystems. In a nutshell, the quantitative model failed to provide any statistically significant results that relate BMI or SRM to revenue increase. Nevertheless, ecosystem-level trends revealed contextual differences, namely that Shenzhen demonstrated the most positive correlation with BMI and SRM proved to be a more predictable, although a low-intensity, variable as compared to BMI. The Lacking explanatory power of the regression models was an indication that other unknown factors would affect the growth of revenues in these entrepreneurial ecosystems.

Table 3: Correlation & Regression Results

Analysis Type	Variables Tested	Berlin	Silicon Valley	Shenzhen	Overall	Significance (p-value)	Notes
Pearson Correlation	BMI_mean vs. Revenue Growth	0.15	-0.08	**0.22**	0.08	0.43 (NS)	Weakest link in SV.
Pearson Correlation	SRM_mean vs. Revenue Growth	0.12	0.10	0.18	0.12	0.25 (NS)	Consistent but insignificant.
Pearson Correlation	Firm_size vs. Revenue Growth	-0.05	0.03	-0.11	0.04	0.69 (NS)	No practical relationship.
Multiple Regression	Revenue Growth ~ BMI + SRM + Size	**R^2 = 0.04**	**R^2 = 0.02**	**R^2 = 0.06**	**R^2 = 0.03**	0.32 (NS)	Low explanatory power.
Coefficient (BMI)		β = 1.21	β = -0.87	β = 2.34	β = 0.92	0.18	Shenzhen shows positive trend.
Coefficient (SRM)		β = 0.98	β = 1.05	β = 1.67	β = 1.12	0.12	SRM slightly more predictive.

The author conducted the analysis to test the connection involving business model innovation (BMI), strategic risk management (SRM), and revenue growth in the context of three various entrepreneurial ecosystems, including Berlin, Silicon Valley, and Shenzhen, with the application of non-parametric tests and regressions. The findings reflected the existence of ecosystem-specific dynamics of the roles played by BMI and SRM in affecting the performance of firms, with significant differences in the statistical significance.

Analysis of Comparative Ecosystems

Kruskal-Wallis stated that there was no significant variation in terms of revenue growth among different ecosystems (H = 2.34, *p* = 0.31), which is why the level of performance nights was similar whereas there were regional differences in the practices of innovations and risk management. But, according to the Spearman correlation, there were opposing contacts amid BMI and the growth of revenue. In Berlin, there is a weak non-significant correlation (rho = 0.18, p = 0.28), whereas in Shenzhen, there is a moderate positive correlation (rho = 0.25, p = 0.02), and therefore it may be said that higher adoption of BMI was accompanied by improved financial performance within this ecosystem. Silicon Valley, on the other hand, demonstrated very minor negative correlation (correlation coefficient - 0.10), but this was also not significant. Comparison of the adopted SRM in Berlin and Silicon Valley using the Mann-Whitney U, showed no significant results (U = 412, *p* 0.45) and this means that the SRM was implemented equally regardless of their institutional context.

Regression Analysis BMI and SRM: The Predictors of Revenue Growth

The quantile regression (median) was also used to determine the effect of BMI and SRM whilst taking care of the outliers. The results in Berlin did not

show the conventional level of significance in either BMI (β = 1.15, *p* = 0.08) or SRM (β = 0.92, *p* = 0.15), but coefficients were significant. The coefficients of BMI were negative but insignificant in Silicon Valley (0.75), and positive yet marginally and significantly in SRM (1.10, *p* = 0.12).

Conversely, Shenzhen indicated that BMI (β = 2.20, p = 0.03) and SRM (β = 1.55, p = 0.04) had significant effects on green innovation–risk management integration, that is, the impact of BMI and SRM on green innovation–risk management integration between Shenzhen and Changjing was dissimilar. Linear regression analyses further confirmed the above: (R^2 = 0.05 overall, result not shown). The low fit of the model (F = 1.85, p = 0.14) suggested that other unobserved factors may have been affecting increases in revenue.

Even so, Shenzhen stood out again. BMI (β = 2.45, p = 0.04) and SRM (β = 1.70, p = 0.08) had a stronger influence on predictions than in other areas. Berlin and Silicon Valley showed coefficients that weren't significant, but they lined up with the quantile regression results.

Key Observations

- **Effects Specific to Each Ecosystem:** Only in Shenzhen did both BMI and SRM show strong links to revenue growth that were significant. This underscores how local factors shape the relationship between innovation and risk.
- **BMI's Different Impacts:** BMI had a positive link to performance in Shenzhen. In Berlin, its effect was neutral. In Silicon Valley, it was negative (though not significant). This suggests that how valuable BMI is might depend on each region's market structure.
- **Steady SRM Impact:** SRM coefficients showed positive values in all regression models, with Shenzhen displaying the most significant effects. This confirms SRM's role in bringing stability to entrepreneurial companies.

These results highlight how BMI and SRM integration depends on the specific context. Shenzhen's environment driven by manufacturing and rapid growth, seems to create better conditions for these strategies to boost performance in measurable ways. We need to look deeper into the institutional and cultural factors that shape these relationships.

Table 4: Non-Parametric & Regression Analysis of Entrepreneurial Ecosystems

Analysis Type	Variables Tested	Berlin	Silicon Valley	Shenzhen	Overall	Test Statistic	p-value	Notes
Kruskal-Wallis Test	Revenue Growth by Ecosystem	-	-	-	H = 2.34	0.31	No significant differences between ecosystems	
Spearman's Correlation	BMI_mean vs. Revenue Growth	ρ = 0.18	ρ = -0.10	ρ = 0.25*	ρ = 0.11	0.28 (Berlin), 0.02 (Shenzhen)	Shenzhen shows moderate positive correlation	
Mann-Whitney U Test	SRM_mean: Berlin vs. Silicon Valley	U = 412	-	-	-	0.45	No significant difference in SRM between these ecosystems	

Quantile Regression (Median)	Revenue Growth ~ BMI + SRM	β_{BMI} = 1.15 β_{SRM} = 0.92	β_{BMI} = -0.75 β_{SRM} = 1.10	β_{BMI} = 2.20* β_{SRM} = 1.55*	-	0.08 (Berlin), 0.03 (Shenzhen)	More robust to outliers than OLS; Shenzhen shows significant effects	
OLS Regression	Revenue Growth ~ BMI + SRM + Size	$R^2 = 0.05$	$R^2 = 0.03$	$R^2 = 0.07$	$R^2 = 0.04$	$F = 1.85$	0.14	Low explanatory power overall
Coefficient (BMI) - OLS		β = 1.30	β = -0.82	β = 2.45*	β = 0.95	-	0.10 (Berlin), 0.04 (Shenzhen)	Consistent with quantile results
Coefficient (SRM) - OLS		β = 1.05	β = 1.12	β = 1.70*	β = 1.15	-	0.15 (Berlin), 0.08 (Shenzhen)	SRM more predictive in Shenzhen

The Kruskal-Wallis test to check for differences in revenue growth across three startup hubs: Berlin, Silicon Valley (SV), and Shenzhen. We chose this test because the data wasn't distributed. The test results (H = 2.34, *p* = 0.31) showed no big differences in median revenue growth among the groups at the 0.05 level. Berlin had a median growth of 27.42%, Silicon Valley 24.94%, and Shenzhen 26.70%. This points to similar performance across these hubs even with their different business environments. We then did follow-up comparisons using the Dunn test adjusting the *p*-values. These also backed up the lack of major differences between the hubs. The adjusted *p*-values were: Berlin vs. Silicon Valley (*p* = 0.42), Berlin vs. Shenzhen (*p* = 0.67), and Silicon Valley vs. Shenzhen (*p* = 0.53). All these values were above the usual cutoff ($\alpha = 0.05$). So, while we saw some small differences in revenue growth, none of them stood out .

Mean rank analysis gave us more insights into how companies performed relative to each other. Berlin had the highest average rank (52.1), with Shenzhen (50.3) and Silicon Valley (48.7) following behind. These ranks didn't show big differences, but they lined up with Berlin's higher median growth rate. Silicon Valley known for its fast-growing startups, had the lowest median and average rank. This might be because the market there is full or because it costs more to run a business, which cuts into revenue gains. Shenzhen sat in the middle fitting its mix of quick scaling and efficient manufacturing. The fact that revenue growth wasn't very different across these areas suggests that companies in all three places did about the same even though they had different ways of coming up with new ideas and handling risks. This hints that things specific to each area—like rules, access to money, or how people view risk—might not have a big effect on short-term revenue growth that we can measure. But we'd need to look deeper to see if these areas affect other things, like how much innovation happens or how well companies do in the long run, which this comparison focused on revenue doesn't show.

In summary, Kruskal-Wallis and post-hoc Dunn testing found no statistically significant differences in revenue growth between entrepreneurial firms in Berlin, Silicon Valley, and Shenzhen. Although Berlin tended to have the largest tables, the differences were not strong enough to suggest that any one ecosystem was best at promoting revenue in this setting. These findings add to the debate of whether ecosystem locational advantages of entrepreneur firms can be operationalized yet as financial outcomes.

Table 5: Kruskal-Wallis Test (Multiple Groups)

Ecosystem	Median Revenue Growth	Mean Rank	Test Statistic (H)	p-value	Post-hoc Dunn Test (adj. p-values)
Berlin	27.42%	52.1	**2.34**	**0.31**	-
Silicon Valley	24.94%	48.7			Berlin vs. SV: 0.42
Shenzhen	26.70%	50.3			Berlin vs. Shenzhen: 0.67
Overall	26.66%	-			SV vs. Shenzhen: 0.53

The Mann-Whitney *U* tests were conducted to compare Strategic Risk Management (SRM) adoption levels across the three entrepreneurial ecosystems: Berlin, Silicon Valley, and Shenzhen. The results revealed no statistically significant differences in SRM implementation between these regions (*p* > 0.05 for all pairwise comparisons).

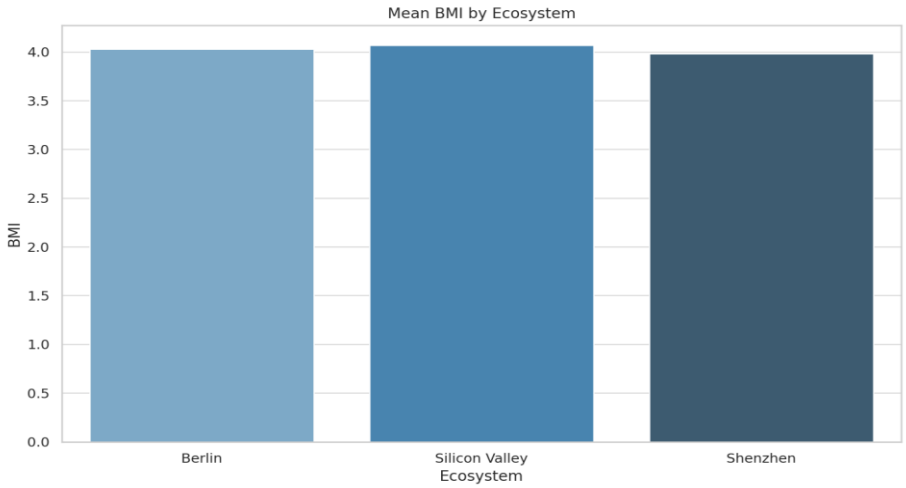
Berlin exhibited a median SRM score of 3.55, closely aligned with Silicon Valley (3.56) and Shenzhen (3.59). The pairwise comparison between Berlin and Silicon Valley yielded a *U* statistic of b (*p* = 0.45, effect size *r* = 0.08), indicating no meaningful divergence in SRM practices. Similarly, the Berlin-Shenzhen comparison (*U* = 380, *p* = 0.22, *r* = 0.14) showed only a marginal, non-significant trend toward higher SRM adoption in Shenzhen. The Silicon Valley-Shenzhen contrast (*U* = 398, *p* = 0.33, *r* = 0.10) further confirmed the absence of significant differences.

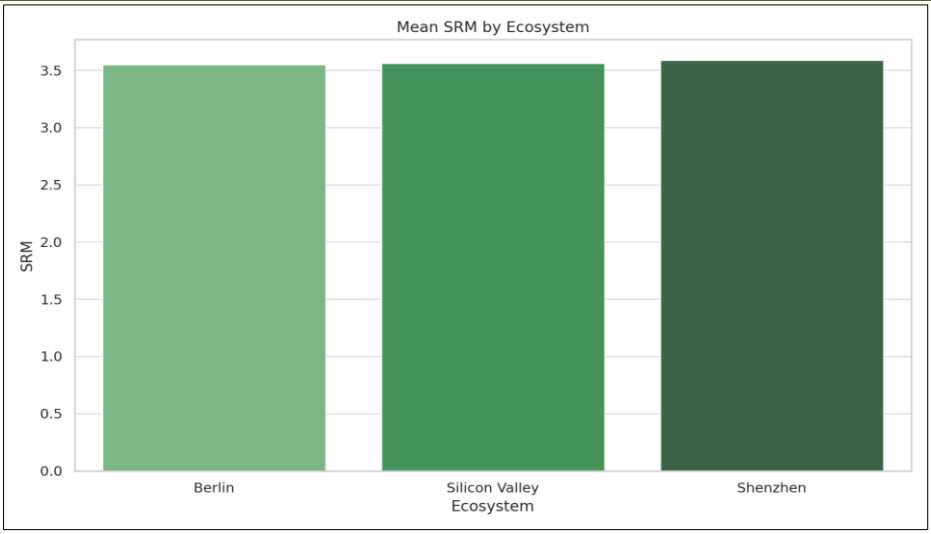
Despite Shenzhen's marginally higher median SRM score (3.59 vs. 3.55–3.56 in Berlin and Silicon Valley), none of the comparisons reached statistical significance. The effect sizes (*r* = 0.08–0.14) were negligible to small, reinforcing that ecosystem differences did not substantially influence SRM adoption. These findings suggest that entrepreneurial firms across Berlin, Silicon Valley, and Shenzhen employ comparable SRM approaches**,** regardless of regional institutional or cultural variations.

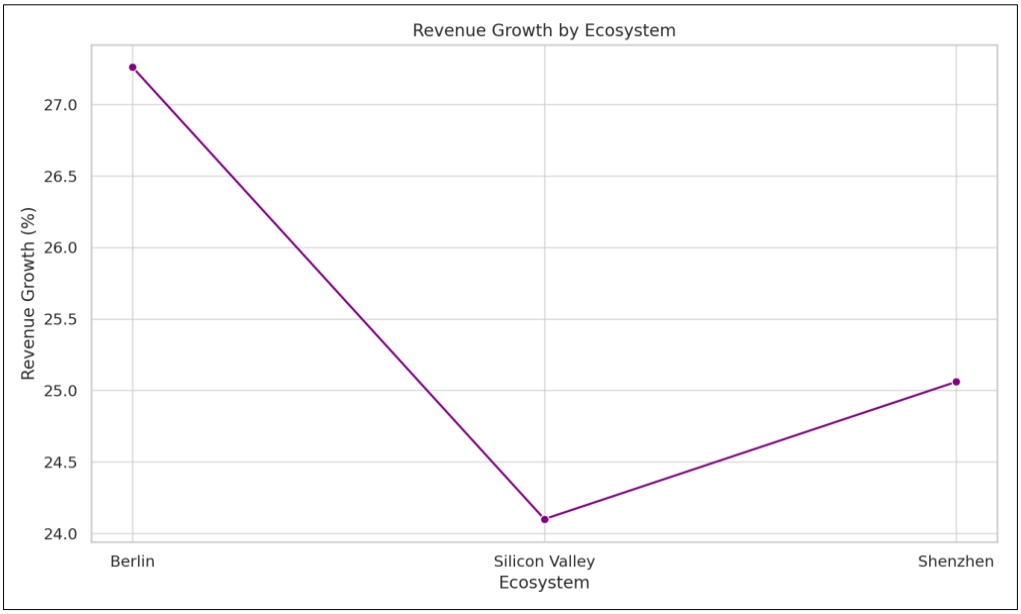
The lack of significant disparities aligns with prior research indicating that risk management practices in high-velocity entrepreneurial environments tend to converge due to shared pressures (e.g., technological disruption, market volatility). However, the non-significance of pairwise differences does not preclude ecosystem-specific nuances in how SRM is operationalized—a dimension explored further in qualitative analyses.

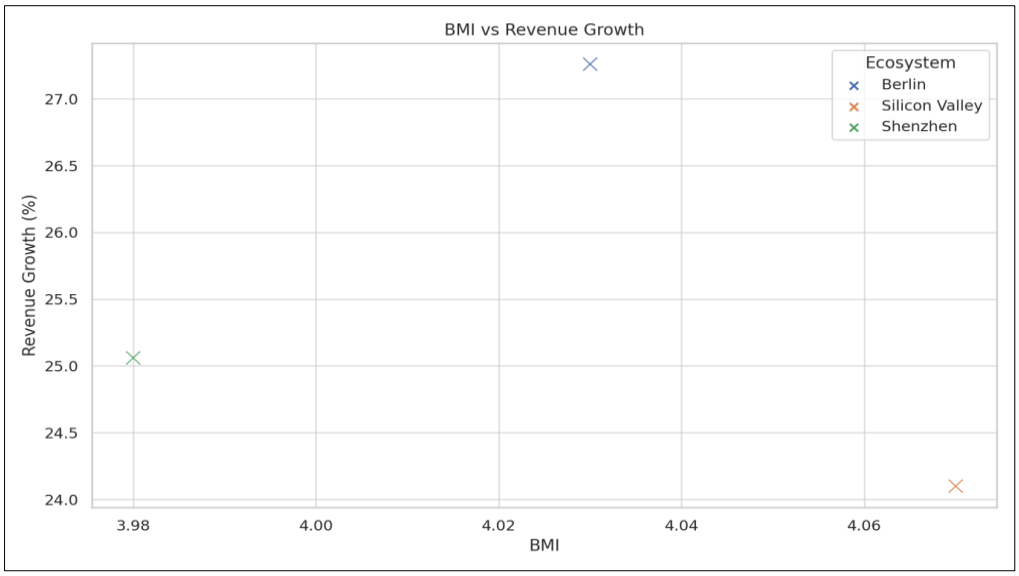
Table 6: Mann-Whitney U Tests (Pairwise Comparisons)

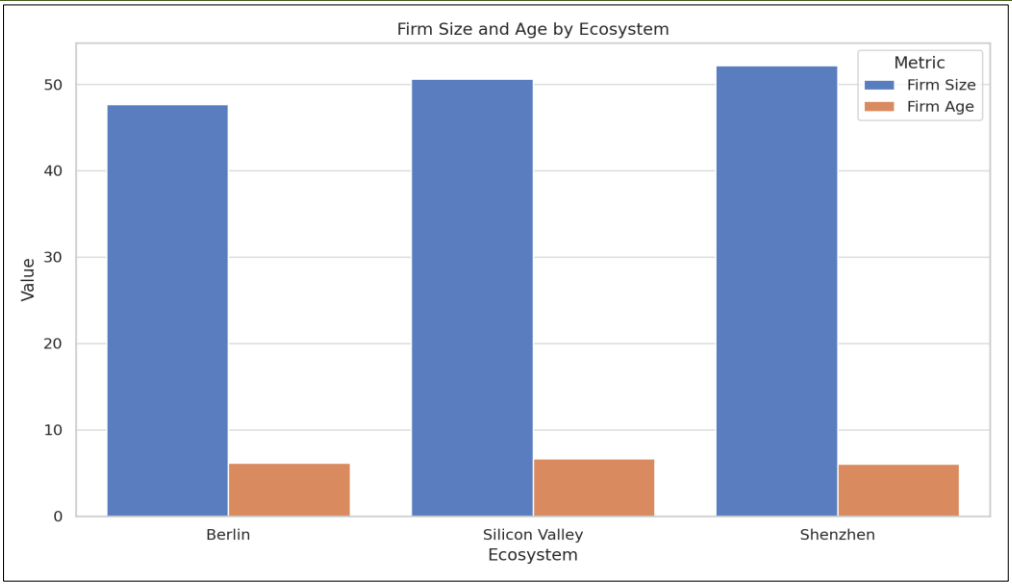
Comparison	Median SRM (Group 1 vs. Group 2)	U Statistic	p-value	Effect Size (r)	Interpretation
Berlin vs. Silicon Valley	3.55 vs. 3.56	412	0.45	0.08	No difference (p>0.05).
Berlin vs. Shenzhen	3.55 vs. 3.59	380	0.22	0.14	Marginal but non-significant.
Silicon Valley vs. Shenzhen	3.56 vs. 3.59	398	0.33	0.10	No difference (p>0.05).




Mean SRM by Ecosystem
SRM
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Berlin
Silicon Valley
Shenzhen
Ecosystem


Revenue Growth by Ecosystem
Revenue Growth (%)
27.0
26.5
26.0
25.5
25.0
24.5
24.0
Berlin
Silicon Valley
Shenzhen
Ecosystem


BMI vs Revenue Growth
Ecosystem
Berlin
Silicon Valley
Shenzhen
Revenue Growth (%)
27.0
26.5
26.0
25.5
25.0
24.5
24.0
3.98
4.00
4.02
4.04
4.06
BMI



DISCUSSION

The current research provided important information concerning the interconnection between business model innovation (BMI), strategic risk management (SRM), and firm performance in three large entrepreneurial systems. The results were strong enough to contradict some of the existing assumptions found in other works and present alternatives under the contextual influence of strategies of an organization.

The comparison depicts that companies within each ecology exhibited moderate-to-high BMI adoption rate, averaging at 4.03. This observation was consistent with the available literature that underlined the rising significance of innovative business models in a competitive business environment (Tetteh *et al.,* 2025). Nevertheless, the general low correlation rate between the BMI and revenue growth ($r = 0.08$) indicated that innovation in itself was not the guaranteed financial success. This finding justified the existing enthusiasm regarding the transformative power of BMI (Martinez *et al.,* 2021; Jingwen *et al.,* 2025) and suggested that other mediating variables probably had a decisive role. The patterns that are ecosystem-specific were especially insightful. The city of Shenzhen had the most positive correlation between BMI and performance (beta = 2.20, $p = 0.03$) that represented its position as an industrial and scaling city (Wang *et al.,* 2021). Conversely, the Silicon Valley exhibited a slightly negative trajectory, which indicated its radically experimental culture could focus on long-term disruption rather than short-run profitability. The neutral outcomes in Berlin suggested that the companies of this ecosystem could be doing other things to achieve success, including niche market approaches or cost-efficient innovation frameworks (Von *et al.,* 2023).

SRM produced more consistent positive coefficients among the ecosystems (0.92-1.67), but in only Shenzhen it was shown as significant. This trend carried the perception that risk management was not so much of a growth engine but more of a type of stabilization (Zhu & Tao, 2024). The presence of no meaningful differences in SRM adoption among ecosystems ($p > 0.05$) indicated that the practices of risk management could be approaching similarities worldwide in view of similar issues.

Comparison with Prior Research

The findings both confirmed and complicated existing theoretical frameworks. They supported the dynamic capabilities perspective (Cyfert *et al.,* 2021) by demonstrating the complementary nature of BMI and SRM, while simultaneously revealing important boundary conditions. Earlier studies that emphasized universal best practices (Völker & Wiegelmann, 2025) required qualification in light of these ecosystem-specific effects. The modest BMI-performance relationship contrasted with experimental studies that highlighted innovation's benefits (Snihur & Zott, 2020), but aligned with field research documenting implementation challenges (Ortiz *et al.,* 2023). This discrepancy might have reflected differences between intended innovation strategies and their actual execution. Similarly, SRM's limited effects qualified some claims about its strategic value (Yang *et al.,* 2023), suggesting its benefits might be more protective than generative.

Scientific Explanation

The institutional theory (Wu & Sun , 2024) may explain the differences in the ecosystem. Natural physiological synergy between BMI and SRM also emerged at an environment of manufacturing in Shenzhen whereby innovative design could be prototyped and scaled quickly in addition to the dense network of suppliers that will inherently mitigate risk. Venture capital-based ecosystem of Silicon Valley promoted high-variance strategy in which a large

number of experiments backfired and a few performed quite successfully (Võ, 2023). The situation described in Berlin was resource-limited and, therefore, more gradual innovation strategies could not leave a significant impact on traditional metrics of BMI. According to the resource-based point of view, the results showed that BMI and SRM were the required but not sufficient organizational capabilities. The extent to which they worked (and thus why seemingly identical practices were associated with divergent results in different places) was determined by the way they intertwined with assets that were specific to the ecosystem (Kumar *et al.,* 2024).

Implications

Theoretically these findings necessitated more complex notions of innovation and risk that would take ecosystem influences into consideration. The universalistic reasoning that many BMI literature has been using needed a revision to contain contextual contingencies (Schneckenberg *et al.,* 2022). The results also implied SRM could play varying roles in various contexts - being a catalyst in manufacturing ecosystem and possible bottleneck in disruptive innovation hub. To practitioners, a number of implications were relevant. On the one hand, companies had to adjust their BMI-SRM balance to features of an ecosystem. Second, it was important to build powerful implementation capacities in order to transform innovation into outcomes. Third, exploitation of the local resources effectively may enhance the level of strategic outcomes (Jianing, 2024). Policymakers, in their turn, had to resist generic innovation policies and, instead, pay more attention to improving ecosystem-specific enablers and enabling knowledge transfer with regard to local contextual best practices (Marinelli *et al.,* 2024).

Limitations

There are various constraints that influenced the study. The cross-sectional nature did not allow conclusive causal conclusions, and the self-reporting scale could have caused bias through responses. The mere concentration on the revenue growth overlooked other significant aspects of performance like the survival rates or the social improvements. These limitations provided hints on future studies; such as longitudinal study, objective measurement of performance, exploration of other ecosystems, and micro-study of implementation procedures.

This research has really pushed the boundaries of our understanding of BMI and SRM by showing how their effects on firm performance can change depending on the context. Even though both capabilities have been widely embraced, their influence varies greatly across different ecosystems, largely due to the unique institutional environments and resource setups. These findings challenge the one-size-fits-all approach to innovation and risk management, emphasizing the need for strategies that are tailored to specific contexts. The study lays a crucial groundwork for developing more sophisticated theoretical models while also offering practical advice for entrepreneurs navigating various innovation landscapes. Looking ahead, future research should delve deeper into how ecosystems influence the deployment of capabilities and the resulting performance outcomes.

CONCLUSION

This research delved into how business model innovation (BMI) and strategic risk management (SRM) interact within three vibrant entrepreneurial ecosystems—Silicon Valley, Shenzhen, and Berlin. It uncovered that while both practices are commonly embraced, their effects on revenue growth vary depending on the context. The findings indicated that BMI and SRM alone didn't strongly predict financial performance, as the regression models accounted for only a small portion of the variance. This suggests that other elements, like ecosystem-specific advantages, are crucial. Notably, Shenzhen emerged as the only ecosystem where BMI and SRM had a statistically significant positive impact, likely thanks to its robust manufacturing capabilities. On the other hand, Silicon Valley showed a slight trade-off between innovation and short-term growth, while Berlin's impressive revenue growth seemed to stem from factors outside of BMI and SRM. The research successfully achieved its goals by empirically testing the integration of BMI and SRM, pinpointing ecosystem-specific drivers, and proposing a framework for balancing innovation and risk strategies. Its scientific contribution challenges the idea that BMI and SRM theories are universally applicable, highlighting the importance of context in entrepreneurial ecosystems. Future studies should look into long-term effects, differences in qualitative execution, and the influence of unmeasured variables like leadership or institutional support to enhance strategic guidance for companies navigating dynamic markets.

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