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Social Media as a Digital Catalyst: Moderating Innovation Performance and Gender Equality Among Female Entrepreneurs in China

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Abstract

Background and Aims: While China's digital economy continues to expand, a distinct gender gap remains within innovation-led entrepreneurship. This research investigates the role of social media platforms as 'digital catalysts' that moderate the translation of innovation performance into gender equality outcomes for female entrepreneurs.

Methodology: Grounded in Digital Catalysis Theory, digital affordance theory, and institutional theory, the study employs a sequential mixed-methods design to validate a novel theoretical framework. The investigation integrates qualitative data from 45 in-depth interviews with a quantitative survey of 1,247 female entrepreneurs. Additionally, an 18-month longitudinal panel study tracking 312 participants was conducted to capture temporal dynamics and causal relationships.

Results: Empirical analysis indicates that social media engagement significantly and positively moderates the link between innovation performance and gender equality. This catalytic process functions through three distinct mechanisms: amplification, acceleration, and transformation. Mediated moderation analysis further identifies network centrality, algorithmic visibility, and digital reputation capital as critical pathways. Crucially, these effects are not uniform but are contingent upon institutional support, industry digitalization levels, and the entrepreneur's digital proficiency.

Conclusion: By reconceptualizing platforms as active catalysts rather than neutral tools, this study extends the theoretical boundaries of digital entrepreneurship. Practical implications suggest that achieving gender-inclusive innovation requires strategic platform engagement and robust digital infrastructure, moving beyond a sole focus on individual innovation capabilities.

Keywords: Digital Entrepreneurship; Platform Economy; Innovation Performance; Gender Equality; Social Media Engagement

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Introduction

The rapid expansion of China's digital economy—encompassing over 1.09 billion internet users and a valuation of approximately 50.2 trillion yuan (China Academy of Information and Communications Technology [CAICT], 2024)—presents a compelling strategic paradox. Despite the democratizing potential of digital platforms, significant gender disparities persist within innovation-led entrepreneurship. Data indicates that while women constitute nearly 48.8% of entrepreneurs in China, their participation in high-innovation sectors remains below 23% (Bosma et al., 2024). This discrepancy represents not merely a social concern but a critical managerial challenge, reflecting a systemic underutilization of innovative capacity in competitive markets.

Existing entrepreneurship theories offer limited explanatory power for these platform-based dynamics. The resource-based view (RBV) traditionally assumes resource ownership (Barney, 1991), a premise challenged by digital entrepreneurs who rely on shared, platform-provided infrastructure (Nambisan, 2017). Similarly, effectuation theory (Sarasvathy, 2001) faces limitations in contexts where algorithmic systems override strategic intent (Autio et al., 2022). Furthermore, empirical evidence remains contradictory: while some studies report female entrepreneurs achieving 42% higher customer acquisition rates through digital platforms (He & Chen, 2023), others indicate a 31% lower return on investment compared to male counterparts (Digital Marketing Institute of China, 2024).

These divergent findings suggest that the relationship between innovation and gender equality is not linear but contingent upon platform engagement. Consequently, a direct-effect model is insufficient. This study proposes a moderation framework, positing that social media platforms operate as 'digital catalysts'—mechanisms that accelerate and transform entrepreneurial outcomes without being consumed in the process. Unlike visible support structures such as government subsidies, these platforms function through subtle, ambient mechanisms influencing legitimacy construction and resource flows (Ahl & Marlow, 2021; McAdam et al., 2019).

To address these theoretical and empirical gaps, this research investigates the following primary questions: (1) How does social media engagement moderate the relationship between innovation performance and gender equality among female entrepreneurs?, (2) What micro-mechanisms drive this catalytic effect within the Chinese institutional context?

By integrating digital affordance theory and institutional theory, this study aims to reconcile the "digital paradox" facing female entrepreneurs. It reconceptualizes platforms not as neutral tools, but as active determinants that shape how innovation performance translates into gender equality outcomes.

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In addressing these questions, this study advances digital entrepreneurship literature through four key contributions. First, it introduces Digital Catalysis Theory, a framework that reconceptualizes platforms as active determinants rather than neutral tools. Second, it empirically validates the specific moderation and mediated moderation mechanisms linking social media engagement to gender equality outcomes. Third, the research establishes critical boundary conditions—including institutional support and industry digitalization—that govern these platform effects. Finally, by situating the analysis within China's unique digital ecosystem, the study provides context-specific insights relevant to entrepreneurship in emerging economies.

Literature Review

Limitations of Traditional Entrepreneurship Theories in Digital Contexts

Conventional frameworks often provide inadequate explanations for the dynamics of platform-based entrepreneurship. The Resource-Based View (RBV), for instance, is predicated on the assumption of resource ownership and control as sources of competitive advantage (Barney, 1991). However, digital entrepreneurship fundamentally challenges this premise, as ventures increasingly rely on shared, platform-provided infrastructure and generative resources that they do not own (Nambisan, 2017). Similarly, Effectuation Theory, which emphasizes non-predictive control strategies (Sarasvathy, 2001), faces limitations in algorithmic environments where systemic opacity often overrides entrepreneurial strategic intent (Autio et al., 2022). Crucially, these mono-theoretical perspectives fail to account for gendered platform effects, particularly how algorithmic mechanisms can differentially impact opportunity perception and resource access based on gender (Lambrecht & Tucker, 2019).

Conflicting Evidence and the Need for a Moderating Framework

Empirical research on female digital entrepreneurship presents a paradox of conflicting outcomes. While some studies suggest that digital platforms democratize access to markets—enabling female entrepreneurs to achieve significantly higher customer acquisition rates (He & Chen, 2023)—other investigations reveal systemic disparities, such as lower returns on social media marketing investment compared to male counterparts (Digital Marketing Institute of China, 2024). These contradictions indicate that platform usage does not automatically lead to equitable outcomes. Instead, the relationship appears to be contingent upon specific usage patterns and platform dynamics. This inconsistency underscores the necessity of adopting a moderation framework, moving beyond direct-effect models to explore how social media engagement actively moderates the link between innovation efforts and equality outcomes.

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Theoretical Integration: Toward Digital Catalysis

To address these complexities, this research integrates four distinct theoretical lenses. First, Digital Affordance Theory (Gibson, 1979; Volkoff & Strong, 2013) is employed to explain how platform features are perceived and actualized into entrepreneurial possibilities. However, affordances are not neutral; thus, Feminist Technology Studies (Wajcman, 2004) are incorporated to expose the power dynamics and gendered assumptions embedded within technological designs, revealing how platforms may function as 'new patriarchal authorities' (Han, 2022). Furthermore, Innovation Ecosystem Theory (Adner, 2017) provides a macro-level view of systemic value creation, while Institutional Theory (North, 1990) contextualizes these dynamics within specific regulatory and cultural environments.

Summary and Theoretical Gap

The synthesis of these perspectives reveals that existing approaches largely treat platforms as passive tools or neutral intermediaries. There remains a critical theoretical gap in understanding how platforms actively accelerate, amplify, or transform entrepreneurial inputs into gendered outcomes. Consequently, this study proposes Digital Catalysis Theory to fill this void, conceptualizing social media not merely as a channel, but as an active catalyst that fundamentally alters the conversion of innovation performance into gender equality.

Conceptual Framework

Digital Catalysis Theory This study proposes Digital Catalysis Theory to reconceptualize the influence of social media platforms on entrepreneurial outcomes. Deviating from conventional perspectives that treat platforms as neutral tools, this framework posits that platforms function as *active catalysts*—agents that enable transformation while remaining structurally unchanged.

This catalytic process is distinguished by three core premises. First, platforms operate analogously to chemical catalysts, accelerating reactions without being consumed in the process. Second, these catalytic effects are largely invisible, operating through opaque algorithmic processes and network dynamics that often escape conscious awareness. Third, catalysis is inherently gendered; platforms selectively enable specific transformations while inhibiting others based on embedded algorithmic assumptions.

To enhance conceptual clarity and reduce theoretical density, the specific catalytic mechanisms and key constructs are defined in Table 1.

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Table 1 Definitions of Catalytic Mechanisms and Constructs

Mechanism / Construct	Definition
Amplification	A mechanism that extends entrepreneurial reach beyond traditional channels through algorithmic processes that selectively promote specific content types.
Acceleration	The compression of innovation cycles through rapid feedback loops, notably reducing traditional cycles (18–24 months) to accelerated timelines (7–10 months).
Transformation	A fundamental alteration of resource mobilization, legitimacy construction, and identity formation processes, rather than merely speeding up existing pathways.
Digital Catalysis	The overarching process by which digital platforms actively accelerate, amplify, or transform entrepreneurial inputs into outcomes.

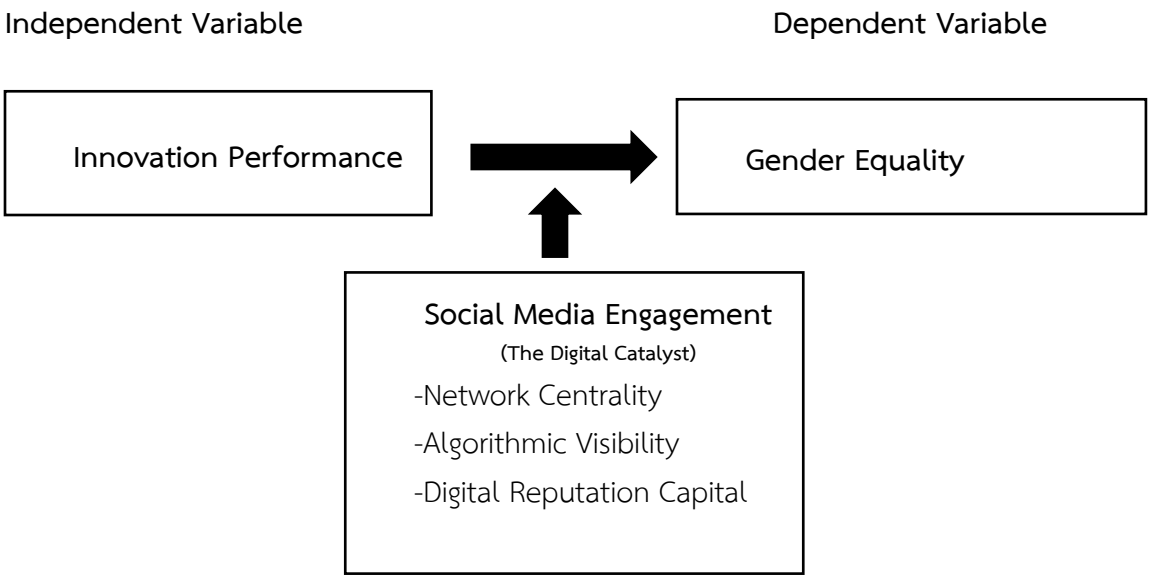


Figure 1 The Digital Catalysis Conceptual Framework illustrating how Social Media moderates the relationship between Innovation Performance and Gender Equality.

Hypothesis Development

Hypothesis Development A critical component of this framework is the ‘invisibility paradox,where platform influence operates below conscious recognition through four mechanisms: algorithmic opacity, normalized practices, network invisibility, and temporal

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invisibility. Based on these mechanisms, twelve hypotheses were formulated and categorized into four logical clusters to test the Digital Catalysis Theory.

Main Effects and Differential Outcomes

The first cluster examines the direct relationships within the model. Innovation performance is hypothesized to positively relate to gender equality perceptions among female entrepreneurs (H1). Regarding platform usage, social media engagement is expected to exhibit a non-linear, inverted U-shaped relationship with innovation performance, suggesting diminishing returns at excessive levels (H2). Furthermore, consistent with the gendered nature of digital catalysis, female entrepreneurs are anticipated to experience differential returns on innovation compared to their male counterparts (H3).

The Moderating Role of Digital Catalysis

The second cluster tests the core moderation effects. Social media engagement is hypothesized to positively moderate the relationship between innovation performance and gender equality, acting as a digital catalyst (H4). This catalytic effect is expected to vary by innovation type, with stronger effects for radical compared to incremental innovations (H5), and by platform architecture, with visual platforms (e.g., Douyin) demonstrating stronger moderation than text-based ones (H6).

Mediated Moderation Mechanisms

The third cluster identifies the micro-mechanisms driving catalysis. The moderating effect of social media is hypothesized to be mediated by three key pathways: network centrality (H7), algorithmic visibility (H8), and digital reputation capital (H9). These variables explain *how* platform engagement transforms innovation into equality.

Boundary Conditions

The final cluster establishes the contextual boundaries of the theory. The catalytic effect is hypothesized to be stronger in contexts with high institutional support (H10), within highly digitalized industries (H11), and for digitally native entrepreneurs who possess greater platform fluidity (H12).

Methodology

Research Design

A sequential explanatory mixed-methods design (QUAL⟶QUAN⟶QUAL) was employed to integrate qualitative depth with quantitative breadth (Creswell & Plano Clark, 2018). This iterative approach is particularly pertinent for digital business research, allowing for the initial identification of opaque algorithmic phenomena before rigorous statistical validation. A critical realist ontology underpinned the design, acknowledging both the real structures producing

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observable outcomes and the socially constructed interpretations shaping them (Bhaskar, 2008). Furthermore, feminist research principles were applied to foreground power dynamics, positionality, and intersectionality throughout the data collection and analysis processes (Harding, 2004). The three-phase structure systematically addressed distinct objectives: Phase 1 explored catalytic mechanisms; Phase 2 tested hypotheses across a representative sample; and Phase 3 captured temporal dynamics and causal relationships.

Phase 1: Qualitative Foundation Study

To generate initial measurement items and explore platform mechanisms, a sample of 45 female entrepreneurs was recruited using purposive sampling to ensure maximum variation across regions, industries, and entrepreneurial stages. Sampling proceeded theoretically until data saturation was achieved. Data collection involved semi-structured interviews (60–120 minutes) focused on platform usage patterns and gendered experiences, complemented by six months of digital ethnography across WeChat, Weibo, Douyin, and Xiaohongshu. Ethical protocols, including informed consent and data anonymization, were strictly observed. Trustworthiness was established through member checking with 12 participants. Qualitative data underwent rigorous grounded theory coding—comprising open, axial, and selective coding—facilitated by NVivo software to identify core theoretical categories.

Phase 2: Quantitative Validation Study

A multi-stage stratified sampling design was implemented to target 1,200 female entrepreneurs, ensuring representativeness across regions (Eastern 45%, Central 35%, Western 20%), industry sectors (technology, e-commerce, creative industries, professional services, social enterprises), and life-cycle stages. The final sample comprised 1,247 usable responses, yielding a 78% response rate. To ensure contextual relevance to the Chinese digital ecosystem, measurement scales were adapted from established sources (Adams et al., 2006; Olanrewaju et al., 2020) and subjected to rigorous validation, including expert panel review (n=12), pilot testing (n=120), and translation/back-translation procedures. Construct validity was confirmed via Confirmatory Factor Analysis (CFA), which yielded robust fit indices (CFI=.946, RMSEA=.032). Structural Equation Modeling (SEM) using maximum likelihood estimation was utilized to test hypothesized relationships, while moderation was assessed via latent interaction modeling and mediated moderation through bootstrap analysis (5,000 resamples). Robustness was further verified using instrumental variable analysis and Heckman selection models.

Phase 3: Longitudinal Panel Study

To examine temporal precedence and causal dynamics, a subset of 312 entrepreneurs was tracked longitudinally over 18 months. Data collection occurred in three waves (T1: March 2023; T2: November 2023; T3: September 2024). Panel retention remained high, reaching 83.7% at T2

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(n=261) and 76.6% at T3 (n=239); systematic checks revealed no significant attrition bias between retained participants and dropouts. Methodological triangulation was achieved by combining survey follow-ups with objective behavioral data extracted via platform APIs, including posting frequency, engagement rates, and network characteristics. Natural language processing tools were configured to analyze content themes. Analytically, growth curve modeling assessed trajectory changes in catalytic effects, while cross-lagged panel analysis confirmed the directional influence of platform engagement on innovation outcomes.

Results

1. Descriptive Statistics and Measurement Model

The demographic profile of the 1,247 respondents indicates a highly educated and digitally active cohort, reinforcing the suitability of the sample for investigating digital entrepreneurship. Participants had a mean age of 36.4 years (SD=8.7), with 62.3% holding a bachelor's degree or higher. Business maturity averaged 4.2 years (SD=3.8) since founding, with annual revenues spanning from under 100,000 yuan (23.4%) to over 5 million yuan (8.7%). Platform engagement was extensive, with 89.2% utilizing WeChat for business, followed by Douyin (67.4%) and Xiaohongshu (54.8%), averaging 4.7 hours of daily usage (SD=2.3). Confirmatory Factor Analysis (CFA) confirmed the robustness of the measurement model, a critical step for validating abstract constructs such as gender equality perceptions. The model demonstrated acceptable fit (χ^2=2,847.3, df=1,272; CFI=.946; TLI=.942; RMSEA=.032; SRMR=.041). All factor loadings exceeded .60 (range: .64–.89), and composite reliability ranged from .84 to .92, surpassing the .70 threshold. Average Variance Extracted (AVE) values (.52–.68) supported convergent validity, while Heterotrait-Monotrait (HTMT) ratios below .85 confirmed discriminant validity. Harman's single-factor test indicated that common method bias was not a pervasive issue, as the first factor explained only 31.4% of the variance.

2. Main Effects analysis

Structural equation modeling revealed a good fit for the main effects model (χ^2=2,456.78, df=1,234, p<.001; CFI=.939; TLI=.934; RMSEA=.049; SRMR=.047). **H1** was strongly supported: innovation performance is positively related to gender equality perceptions (β = .347, SE = .042, p < .001). In practical terms, this suggests that tangible innovation achievements contribute significantly to dismantling perceived gender barriers. Regarding platform usage (**H2**), the analysis identified a curvilinear (inverted U-shaped) relationship with innovation performance, evidenced by a significant positive linear term (β = .284, p < .001) and a negative quadratic term (β = -.123, p < .001). The inflection point at approximately 5.8 on the 7-point scale suggests that while digital

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engagement drives innovation, excessive usage may yield diminishing returns due to information overload or resource diversion. Multi-group analysis supported **H3**, revealing that female entrepreneurs experience a significantly stronger link between innovation and performance (βfemale = .412) compared to males (βmale = .298; z=2.84, p<.01), highlighting the unique leverage women derive from innovation activities.

3. Moderation Effects

The moderation analysis provided empirical support for the Digital Catalysis Theory (**H4**). Social media engagement positively moderated the relationship between innovation performance and gender equality (β = .174, SE = .046, p < .001).Simple slopes analysis clarified this interaction: at low engagement levels (-1 SD), the relationship was weaker(β = .221, p < .01), whereas at high engagement levels (+1 SD), it strengthened substantially(β = .473, p < .001).The Johnson-Neyman technique identified a threshold at 3.42 on the scale, indicating that platform engagement acts as a necessary amplifier for the majority (81.3%) of the sample.Further analysis supported **H5**, showing a significant three-way interaction (β = .093, SE = .034, p < .01). where radical innovations benefited more from this catalytic effect (β = .237, p < .001) than incremental ones (β = .118, p < .05). Additionally, **H6** was supported: visual platforms (e.g., Douyin, Xiaohongshu) demonstrated stronger moderation (β = .198, p < .001) compared to text-based platforms (β=.087, p<.05). This difference (z=2.31, p<.05) likely reflects the power of visual storytelling in constructing legitimacy and overcoming gender stereotypes more effectively than text.

4. Mediated Moderation

Mediation analysis confirmed that the catalytic effect operates through three specific pathways. **H7** was supported, with network centrality mediating the relationship (indirect effect =.067, SE=.018, 95% CI [.034, .104]). **H8** received the strongest support, identifying algorithmic visibility as the primary mediator (indirect effect=.089, SE=.021, 95% CI [.051, .133]), underscoring the critical role of recommendation systems in amplifying entrepreneurial presence. Finally, **H9** was supported via digital reputation capital (indirect effect=.078, SE=.019, 95% CI [.043, .117]), indicating that accumulated social proof is essential for converting visibility into equality outcomes.

5. Boundary Conditions

The analysis of boundary conditions revealed that catalytic effects are context-dependent. **H10** was supported, showing that high institutional support significantly amplifies catalysis (β = .243, p < .001) compared to low-support contexts (β = .089, p < .05). Similarly, **H11** confirmed that highly digitalized industries facilitate stronger platform effects (β = .267, p < .001) than traditional sectors (β = .076, p < .05). **H12** was also supported, with digitally native entrepreneurs

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leveraging platforms more effectively (β = .234, p < .001) than digital immigrants (β = .112, p < .05), reflecting the importance of digital fluency.

6. Robustness Checks

Robustness checks using alternative operationalizations (objective innovation indicators: β=.158; API metrics: β=.213) and instrumental variable analysis (β=.196) yielded consistent results, confirming the stability of the findings. Heckman selection models indicated no significant selection bias (λ =.087, p=.34), and propensity score matching (ATT=.423, p<.001) reinforced causal interpretations.

Longitudinal analysis (**Phase 3**) demonstrated that these catalytic effects strengthen over time, supporting a learning or cumulative advantage perspective. Growth curve modeling showed the moderation effect increasing from β=.142 (T1) to β=.198(T2) and β=.247 (T3), with a significant positive slope (slope=.052, SE=.018, p<.01). Cross-lagged panel analysis confirmed temporal precedence: T1 social media engagement significantly predicted T2 innovation performance (β=.234, p<.001), supporting the directionality from platform engagement to outcomes.

Table 2 Summary of Hypothesis Testing

Hypothesis	Relationship / Path	Result
H1	Innovation Performance rightarrow Gender Equality	supported
H2	Social Media Engagement rightarrow Innovation Performance (Inverted U)	supported
H3	Gender Difference in Innovation Returns (Female > Male)	supported
H4	Moderation: Social Media Engagement x Innovation Gender Equality	supported
H5	Moderated Moderation: Innovation Type (Radical > Incremental)	supported
H6	Moderated Moderation: Platform Type (Visual > Text)	supported
H7	Mediated Moderation: via Network Centrality	supported
H8	Mediated Moderation: via Algorithmic Visibility	supported
H9	Mediated Moderation: via Digital Reputation Capital	supported
H10	Boundary Condition: Institutional Support (High > Low)	supported
H11	Boundary Condition: Industry Digitalization (High > Low)	supported
H12	Boundary Condition: Digital Experience (Native > Immigrant)	supported

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Discussion

The empirical results substantiate the proposed Digital Catalysis Theory, demonstrating that social media platforms function not merely as neutral communication channels, but as active, invisible catalysts that moderate the conversion of innovation performance into gender equality outcomes. The central finding—a significant positive moderation effect (β=.174) —suggests that in the digital economy, innovation capabilities alone are insufficient for overcoming gender disparities. Instead, the strategic leverage of platform mechanisms is required to translate technical achievements into social and economic legitimacy.

1. Theoretical Contributions

This research advances digital entrepreneurship scholarship by offering a distinct alternative to traditional frameworks. First, it extends the Resource-Based View (RBV). While RBV emphasizes the ownership of internal resources (Barney, 1991), Digital Catalysis Theory highlights that competitive advantage in the platform economy is contingent upon *access* to shared, external algorithmic infrastructure. The findings demonstrate that digital reputation capital serves as a strategic resource that female entrepreneurs must actively cultivate, even though they do not own the underlying platform.Second, it refines Effectuation Theory in digital contexts. Whereas effectuation assumes entrepreneurial control over means and outcomes (Sarasvathy, 2001), this study reveals that algorithmic opacity often overrides strategic intent (Autio et al., 2022). The concept of "gendered algorithmic mediation" introduced here explains how non-human agents (algorithms) actively participate in the entrepreneurial process, selectively constraining or enabling opportunities based on embedded gendered data patterns. Third, the study contributes to Institutional Theory by explicating the boundary conditions of digital entrepreneurship. The finding that catalytic effects are significantly stronger in contexts of high institutional support (β=.243) indicates that platforms do not operate in a vacuum. Rather, they interact with formal institutional arrangements to either amplify or dampen entrepreneurial efforts.

2. Practical Implications

The findings suggest a need for "platform ambidexterity"—the ability to balance innovation development with strategic platform engagement. The inflection point (5.8) serves as a strategic benchmark, warning against the "digital trap" where engagement becomes a distraction rather than a catalyst. Entrepreneurs are advised to develop algorithmic literacy—understanding how to signal quality to algorithms without succumbing to the pressure of constant connectivity.

For policymakers, the results underscore that digital infrastructure is a crucial domain for gender equality intervention. Since platform benefits are contingent upon institutional support, policy measures should focus on creating "digital on-ramps" that assist female entrepreneurs in

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navigating algorithmic environments. Mandating algorithmic transparency audits could further mitigate the invisible biases that constrain female-led ventures.

For platform designers, the evidence of gendered mediation necessitates a "safety by design" approach. Algorithms that prioritize viral content may inadvertently penalize the niche or complex innovations often produced by female entrepreneurs. Designing recommendation systems that value diverse innovation metrics could foster a more inclusive digital ecosystem.

Limitations and Future Research While this study offers robust insights, certain limitations warrant consideration. First, the focus on China's unique digital ecosystem—dominated by "super-apps" like WeChat and Douyin—may limit direct generalizability to Western contexts with fragmented platform architectures. Future research should conduct comparative cross-cultural studies to test the universality of digital catalysis. Second, although the longitudinal design captures temporal dynamics, the rapid evolution of algorithms means these effects are fluid. Future scholarship could employ computational methods to track real-time algorithmic changes. Finally, the study relies on perceived gender equality; future research could incorporate objective economic indicators (e.g., funding gaps, exit valuations) to provide a more granular assessment of equality outcomes.

Conclusion

This study resolves the prevailing paradox of the Chinese digital economy—where high innovation rates among female entrepreneurs historically failed to translate into commensurate gender equality outcomes. By reconceptualizing social media platforms not as neutral tools but as 'digital catalysts,' the research demonstrates that platform engagement is the critical variable that moderates this relationship. The findings confirm that when strategically leveraged, platforms actively amplify visibility, accelerate market validation, and transform resource acquisition processes, thereby converting innovation performance into tangible equality outcomes.

Theoretical Advancements The primary theoretical contribution lies in the development of Digital Catalysis Theory, which extends the Resource-Based View and Institutional Theory into the digital age. Unlike traditional frameworks that prioritize asset ownership, this study establishes that algorithmic access and digital reputation capital are the decisive strategic resources for female entrepreneurs. The results clarify that platform effects are not automatic; they are mediated by invisible mechanisms—specifically algorithmic visibility and network centrality—and are strictly bounded by the level of institutional support and industry digitalization.

Implications for Policy and Practice For policymakers and practitioners, the study shifts the focus from merely encouraging technology adoption to fostering strategic platform engagement. The evidence suggests that without supportive digital infrastructure and algorithmic transparency,

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the catalytic potential of platforms remains latent. Consequently, interventions should prioritize the development of gender-inclusive digital ecosystems and "algorithmic literacy" programs that empower female entrepreneurs to navigate opaque platform mechanics effectively.

Future Research Directions While this research underscores the positive catalytic potential of platforms, future scholarship must critically examine the 'dark side' of digital catalysis. Specifically, how might algorithmic biases reinforce existing inequalities in less regulated contexts? Comparative studies across different cultural and institutional landscapes are essential to test the universality of these mechanisms. Ultimately, this dissertation posits that realizing the promise of digital entrepreneurship requires a dual focus: advancing individual innovation capabilities while simultaneously constructing equitable platform architectures that allow those innovations to flourish.

Recommendation

Based on the empirical validation of the Digital Catalysis Theory, this study proposes actionable recommendations for key stakeholders to maximize the conversion of innovation into gender equality outcomes.

1. Strategic Recommendations for Female Entrepreneurs

Adopt Digital Ambidexterity: Findings regarding the inverted U-shaped relationship (H2) suggest a "sweet spot" for platform usage. Entrepreneurs are advised to practice digital ambidexterity—balancing time between core innovation activities and platform engagement. Excessive connectivity should be avoided to prevent cognitive overload. A recommended strategy is to delegate routine social media maintenance while personally managing high-value network interactions.

Pivot to Visual Storytelling: Given that visual platforms demonstrate stronger catalytic effects (H6), female entrepreneurs should prioritize rich media content (short videos, live streaming) over text-based updates. Utilizing visual narratives to showcase the "behind-the-scenes" innovation process can effectively humanize the brand and dismantle gendered competence stereotypes.

Cultivate Network Centrality over Reach: Instead of merely chasing follower counts, entrepreneurs should focus on deepening network centrality (H7). This involves engaging with key opinion leaders (KOLs) and participating in niche industry clusters to enhance digital reputation capital, which serves as a more durable asset than temporary viral visibility.

2. Policy Recommendations for Government and Institutions

Establish "Digital On-Ramps": Since institutional support significantly bounds catalytic effects (H10), policymakers should establish specialized "digital on-ramps." These include subsidized

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access to premium digital tools and high-speed infrastructure specifically for female-led start-ups in under-digitalized regions (H11). Algorithmic Literacy Training: Beyond basic digital skills, training programs must evolve to teach algorithmic literacy (H12). Curricula should focus on understanding platform mechanics, SEO for recommendation engines, and data analytics, empowering female entrepreneurs to navigate the "invisible" rules of the platform economy.

3. Design Recommendations for Platform Developers Algorithm

Accountability Audits: To address the "invisibility paradox" and potential bias, platform developers should implement regular algorithmic accountability audits. These audits would ensure that recommendation engines do not systematically suppress content from female-led accounts or niche innovation sectors.

Inclusive Visibility Metrics: Platforms should redesign visibility metrics to reward sustained innovation and community engagement rather than just immediate click-through rates. Such a shift would create a more equitable environment for entrepreneurs whose value propositions require longer adoption cycles.

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