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Effectuation Dynamics in AI Entrepreneurship: A Multi-case Study

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Abstract: This study investigates the evolution mechanism of effectuation logic in artificial intelligence (AI) startups, with particular attention to the moderating role of dynamic capabilities. Drawing upon Sarasvathy's effectuation theory and the dynamic capabilities framework, we examine how AI-induced environmental uncertainty influences entrepreneurs' decision-making logic and how this logic evolves as ventures mature. Through multiple case studies of six relatively successful AI startups in China, we identify a three-stage evolution pathway: exploration, integration, and optimization. Our findings reveal that dynamic capabilities—specifically sensing, seizing, and reconfiguring capabilities—serve as critical moderators in this evolutionary process, while also demonstrating reciprocal relationships with effectual reasoning. We discuss the limitations inherent in studying successful ventures and explicitly articulate boundary conditions for our theoretical propositions, acknowledging that our findings may characterize successful adaptation strategies rather than typical entrepreneurial behavior.

Keywords: Effectuation; AI startups; Entrepreneurial decision-making; Strategic adaptation

1. Introduction

The rapid advancement of artificial intelligence technologies has fundamentally transformed the entrepreneurial landscape, creating unprecedented opportunities alongside formidable challenges for new ventures. AI startups operate in environments characterized by multiple layers of uncertainty: technological uncertainty regarding AI capabilities and limitations, market uncertainty concerning customer needs and adoption patterns, and regulatory uncertainty surrounding governance frameworks for AI deployment.Traditional strategic planning approaches, which assume predictable futures and rational goal-setting based on comprehensive market analysis, often prove inadequate in such volatile and

ambiguous contexts. This reality has prompted scholars and practitioners alike to examine alternative decision-making logics that may better suit the unique demands of AI entrepreneurship in an era of technological disruption and continuous innovation.

Effectuation theory, originally proposed by Sarasvathy based on empirical research with expert entrepreneurs, offers a compelling framework for understanding entrepreneurial decision-making under conditions of genuine uncertainty.[1] Unlike causation logic, which begins with predetermined goals and systematically seeks optimal means to achieve them through competitive analysis and planning, effectuation starts with available means—who the entrepreneur is, what they know, and whom they know—and allows goals to emerge dynamically through stakeholder interactions and environmental contingencies.[2] Research has accumulated substantial evidence demonstrating that expert entrepreneurs frequently employ effectuation principles when facing high uncertainty, particularly in nascent industries where market boundaries remain undefined and customer preferences are still forming. The AI industry presents a paradigmatic case of such nascent market conditions, where technological possibilities outpace market understanding and regulatory frameworks struggle to keep pace with innovation.

However, extant literature provides limited understanding of how effectuation logic evolves throughout an AI startup's lifecycle. While early-stage ventures may rely heavily on effectual principles to navigate initial uncertainty and discover viable opportunity spaces, as they grow and markets begin to stabilize, their decision-making approaches likely undergo significant transformation.[3] The dynamic capabilities framework offers valuable conceptual resources for understanding this evolution, as it addresses how firms achieve and sustain competitive advantage in rapidly changing environments through sensing, seizing, and reconfiguring capabilities.[4] Yet the relationship between effectuation and dynamic capabilities remains underexplored, representing a significant gap in our theoretical understanding of entrepreneurial adaptation under technological uncertainty.

This study addresses these theoretical gaps by investigating three interrelated research questions: (1) How does AI-induced uncertainty influence the initial emphasis on effectuation logic in AI startups? (2) How does effectuation logic evolve as AI startups mature and environmental conditions change? (3) How do dynamic capabilities moderate the evolutionary process of effectuation logic? Through multiple case studies of six AI startups in China, we develop theoretical propositions that advance understanding of entrepreneurial decision-making dynamics under conditions of technological uncertainty and rapid environmental change. Our findings contribute to both effectuation theory and dynamic capabilities research while offering practical implications for entrepreneurs, investors, and policymakers navigating the complex landscape of AI venture development.

2. Theoretical Background and Literature Review

2.1. Effectuation Theory

Effectuation represents a distinct logic of entrepreneurial action that contrasts fundamentally with traditional causation-based approaches to strategy and decision-making that have long dominated both management education and practice. While causation processes take a particular effect as given and focus on selecting between means to achieve that predetermined effect through systematic analysis and optimization, effectuation processes take a set of means as given and focus on selecting between possible effects that can be created with that set of means through iterative experimentation and stakeholder interaction.[1] This distinction has profound implications for how entrepreneurs approach uncertainty, resource constraints, and opportunity development in nascent ventures operating in volatile environments where traditional prediction-based planning provides limited

guidance and may even prove counterproductive by encouraging premature commitment to strategies based on unreliable forecasts.

Five core principles distinguish effectual reasoning from causal reasoning in entrepreneurial contexts, each representing a fundamental reorientation of how entrepreneurs approach key strategic challenges. The bird-in-hand principle emphasizes starting with available means—who the entrepreneur is, what they know, and whom they know—rather than predetermined goals that may prove unattainable or inappropriate given evolving circumstances. The affordable loss principle focuses on what entrepreneurs can afford to lose in pursuing opportunities rather than expected returns from uncertain ventures that cannot be reliably calculated. The crazy quilt principle involves building partnerships through stakeholder self-selection and commitment rather than competitive analysis and strategic partner selection based on predetermined criteria. The lemonade principal advocates leveraging contingencies and unexpected events as opportunities for value creation rather than avoiding or managing them as threats to existing plans. Finally, the pilot-in-plane principle emphasizes human agency and co-creation of the future through action rather than prediction-based planning that treats the future as something to be forecasted and prepared for rather than shaped and created.[5]

Table 1. Comparison of Effectuation and Causation Principles

Dimension	Effectuation Logic	Causation Logic
Starting Point	Available means (who I am, what I know, whom I know)	Predetermined goals and target returns
Risk Orientation	Affordable loss principle	Expected return maximization
Partner Selection	Self-selection through stakeholder commitments	Competitive analysis and strategic selection
Contingencies	Leverage unexpected events as opportunities	Avoid surprises through careful planning
Control View	Control unpredictable future through action	Predict future to control outcomes

Source: Adapted from Sarasvathy (2001) and Read et al. (2009)

2.2. Dynamic Capabilities Framework

The dynamic capabilities framework addresses a fundamental question in strategic management: how do firms achieve and sustain competitive advantage in rapidly changing environments where traditional sources of advantage based on valuable, rare, and inimitable resources erode quickly as competitors imitate, substitute, or leapfrog?[6] Teece's elaboration identifies three core processes constituting dynamic capabilities: sensing involves scanning the environment through various mechanisms to identify emerging opportunities and potential threats before they become obvious to competitors; seizing refers to mobilizing resources effectively to capture value from identified opportunities, often requiring significant investment decisions under uncertainty; reconfiguring involves continuous transformation and realignment of organizational assets, structures, and capabilities to maintain evolutionary fitness as markets and technologies evolve. Together, these three processes enable firms to maintain competitive positions in dynamic markets where traditional competitive advantages are continuously challenged and undermined by environmental change.

Research has increasingly examined dynamic capabilities in entrepreneurial contexts, recognizing that startups face particularly acute adaptation challenges that differ qualitatively from those confronting established firms with abundant resources.[7] Unlike established organizations with abundant slack resources, formal routines, and historical experience to

draw upon, startups must develop sensing, seizing, and reconfiguring capabilities with severely limited assets, nascent organizational structures, and founders who are often learning while doing in contexts where neither markets nor technologies are well understood. This resource constraint and organizational fluidity make the intersection of effectuation and dynamic capabilities especially relevant for understanding how AI startups evolve their strategic approaches over time as they accumulate resources, develop organizational routines, and learn from market feedback about what works and what does not.

2.3. Integrating Effectuation and Dynamic Capabilities

While effectuation and dynamic capabilities have developed as largely separate research streams with distinct intellectual origins and research communities, we argue that they share fundamental theoretical affinities that not only justify their integration but suggest they may be deeply complementary in explaining entrepreneurial success under uncertainty. Both frameworks emerged as intellectual responses to limitations of static, prediction-based strategic thinking that dominated management theory and education for decades. Both emphasize adaptation over prediction, flexibility over commitment, and co-evolution of organizations with their environments rather than attempts to predict and control environmental conditions.[8]

The integration reveals several important theoretical connections. First, effectuation's bird-in-hand principle shares substantial conceptual ground with resource-based foundations underlying dynamic capabilities—both begin with existing resource endowments rather than externally defined opportunities. Second, the crazy quilt principle aligns with the relational dimension of dynamic capabilities; research demonstrates that sensing capabilities depend on relationship networks providing access to distributed information.[9] Entrepreneurs employing the crazy quilt principle simultaneously build relational infrastructure supporting sensing capabilities.

Third, effectuation's lemonade principle resonates with the adaptive core of dynamic capabilities. Both frameworks view environmental turbulence not merely as threat but as potential source of value and competitive advantage. Fourth, and central to our framework, we propose that dynamic capabilities moderate effectuation logic evolution by influencing how entrepreneurs interpret environmental signals and respond to changing uncertainty levels. Strong sensing capabilities enable earlier recognition of when conditions have stabilized sufficiently to warrant greater reliance on causation logic. Seizing capabilities provide execution mechanisms for acting on strategic insights. Reconfiguring capabilities facilitate organizational adaptations as decision-making logic shifts.[10]

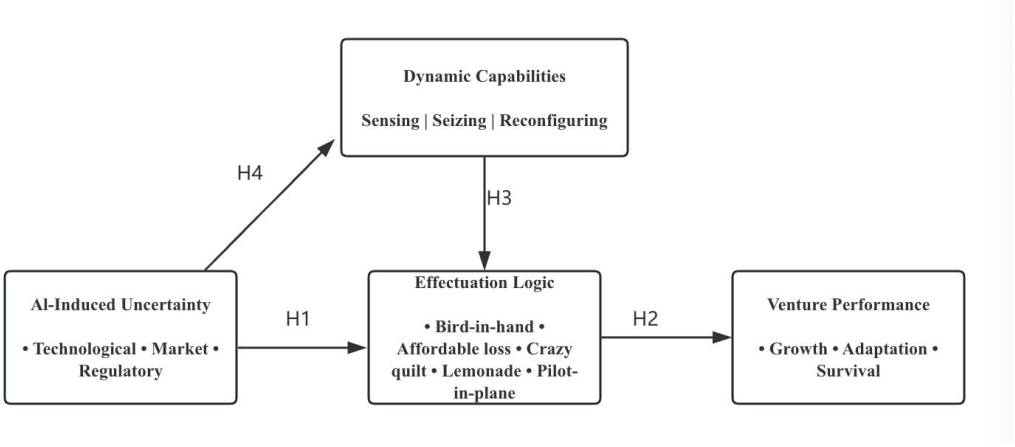

Figure 1. Conceptual Framework: Effectuation Logic Evolution in AI Startups

3. Research Methodology

3.1. Multiple Case Study Approach

We employed a multiple case study methodology to investigate the evolution of effectuation logic in AI startups, following established protocols for rigorous qualitative research that enable theory development from empirical observations.[11] Case study research is particularly appropriate when examining complex phenomena within their real-life context, when boundaries between phenomenon and context are not clearly evident, and when multiple sources of evidence are required to develop comprehensive understanding of mechanisms and dynamics.[12] The evolution of entrepreneurial decision-making logic represents precisely such a phenomenon—deeply embedded in organizational context, shaped by multiple interacting factors including founder characteristics, environmental conditions, and organizational development, and requiring rich processual data to understand the mechanisms and dynamics involved in how entrepreneurs adapt their approaches over time.

We selected six AI startups in China following theoretical sampling principles designed to maximize learning while enabling cross-case comparison. Selection criteria included: (1) founding date between 2015 and 2020 to ensure sufficient operational history; (2) primary focus on AI technology development or application; (3) successful completion of at least one funding round beyond seed stage as indicator of venture viability; and (4) willingness to provide extensive access to founding team members and organizational documents.

Table 2. Case Company Profiles

Company	AI Application Domain	Founded	Employees	Funding Stage	Interviews
Alpha AI	Natural Language Processing	2016	150-200	Series B	12
Beta Tech	Computer Vision	2017	80-120	Series A	9
Gamma Labs	Predictive Analytics	2015	200-300	Series C	14
Delta Systems	Autonomous Systems	2018	50-80	Series B	11
Epsilon AI	Healthcare AI	2017	100-150	Series A	8
Zeta Corp	Financial AI	2016	180-250	Series C	15

Note: Company names are pseudonyms to protect confidentiality.

3.2. Data Collection and Analysis

Data collection employed multiple methods to enable triangulation and develop comprehensive understanding. Semi-structured interviews with founders and senior team members constituted the primary data source, with 42 interviews conducted averaging 75 minutes each. Archival documents including business plans, investor presentations, internal memos, and board materials provided historical perspective. Observation notes from 17 site visits enabled contextual understanding of organizational dynamics and decision-making processes in action.

Table 3. Data Sources by Company

Company	Interviews	Documents	Observations	Hours
Alpha AI	8	45	3 site visits	32
Beta Tech	6	38	2 site visits	24

Company	Interviews	Documents	Observations	Hours
Gamma Labs	9	52	4 site visits	38
Delta AI	5	28	2 site visits	18
Epsilon	7	41	3 site visits	28
Zeta Corp	7	36	3 site visits	26

3.3. Sample Characteristics and Potential Biases

An important methodological consideration concerns sample characteristics and their implications for interpreting findings. All six case companies had achieved relative success by our study period, having secured substantial venture capital funding, demonstrated sustained growth, and established recognized positions in their respective AI domains. This sample composition introduces potential survivorship bias that warrants explicit acknowledgment and discussion.

Survivorship bias may affect our findings in several important ways. First, the effectuation patterns we observe may characterize successful AI startups specifically rather than AI startups generally. Ventures that did not survive may have employed different decision-making logics. Second, the evolutionary trajectories we identify may reflect paths leading to success rather than typical developmental paths. Third, the moderating role of dynamic capabilities may appear more pronounced because successful capability development contributed to survival.

We view this bias not as invalidating findings but as defining scope conditions for our propositions. Our theoretical framework describes decision-making evolution patterns of relatively successful AI ventures operating under high technological and market uncertainty. Whether identical patterns characterize less successful ventures remains an empirical question for future research.

4. Findings

4.1. AI-Induced Uncertainty and Initial Effectuation Emphasis

Our analysis reveals that AI-induced uncertainty manifests across multiple interconnected dimensions that collectively shape entrepreneurs' initial decision-making approaches and create conditions favoring effectual over causal reasoning. Technological uncertainty arises from the rapid and often unpredictable pace of AI capability advancement, where today's cutting-edge approaches may become obsolete within months as new architectures, training methods, and applications emerge. Market uncertainty stems from undefined customer segments, unclear value propositions, and uncertain adoption patterns in emerging AI applications where potential users may not yet understand how AI could address their needs or transform their operations. Regulatory uncertainty reflects the evolving and often inconsistent policy landscape governing AI deployment, data usage, algorithmic accountability, and sector-specific requirements that vary across jurisdictions and continue to develop in response to technological changes.

Across all six cases, founders reported high initial reliance on effectual principles when confronting these multidimensional uncertainties, consistent with theoretical expectations regarding effectuation's applicability under Knightian uncertainty conditions. The founder of Alpha AI provided a characteristic explanation: 'When we started, we had absolutely no idea which specific market segment would ultimately value our computer vision technology or what specific applications would generate sustainable revenue. We didn't try to predict—we

started with our technical capabilities and let market feedback guide us toward opportunities. Any attempt at detailed market forecasting would have been pure fiction given how rapidly everything was changing.'

The affordable loss principle proved particularly salient in AI ventures, where research and development investments can escalate rapidly and unpredictably due to computational requirements, talent acquisition costs, and iterative experimentation needs. Beta Tech's founder noted: 'We made every significant decision based on what we could afford to lose, not what we might potentially gain. With AI development costs being so unpredictable and outcomes so uncertain, expected return calculations were essentially meaningless exercises in false precision. What mattered was ensuring we could survive failed experiments and continue iterating.' This risk orientation allowed ventures to experiment broadly across potential applications and business models while limiting downside exposure and preserving resources for continued iteration and learning.

The crazy quilt principle manifested strongly as founders built initial partnerships through stakeholder self-selection rather than strategic partner analysis. Delta AI's founder explained: 'We didn't have the luxury of carefully analyzing and selecting optimal partners. Instead, we worked with whoever showed genuine interest and willingness to commit resources—early customers who were willing to experiment, investors who understood the uncertainty, and technical partners who shared our vision. These relationships, built through mutual commitment rather than strategic calculation, became the foundation for everything we achieved.'

4.2. Three-Stage Evolution Pathway

Our longitudinal analysis identifies a three-stage evolution in how successful AI startups employ effectuation logic, with dynamic capabilities moderating the transitions between stages. This evolutionary pattern emerged consistently across all six cases despite differences in AI domains, founding team backgrounds, and specific market contexts, suggesting robust underlying mechanisms driving the evolution of entrepreneurial decision-making under technological uncertainty. However, the timing of transitions and intensity of logic shifts varied based on company-specific factors including technological maturity of their AI domain, competitive dynamics, and founding team prior experience.

Stage 1: Exploration (High Effectuation). In the exploration stage, ventures exhibit high reliance on all five effectuation principles as the dominant logic guiding strategic decisions. Decision-making is predominantly means-driven, with entrepreneurs leveraging existing technical capabilities, personal relationships, and domain knowledge rather than pursuing externally defined market opportunities or predetermined business goals. The crazy quilt principle is particularly active as founders build initial stakeholder networks through self-selection—working with partners who find the venture's direction interesting and are willing to make commitments rather than selecting partners through competitive analysis. Sensing capabilities during this stage focus on broad environmental scanning to identify potential opportunity spaces without premature commitment to any direction. As Gamma Labs' CEO described: 'Our sensing in the early days was fundamentally about pattern recognition—noticing anomalies in customer conversations, unexpected application possibilities, surprising responses to our prototypes. We weren't looking for anything specific; we were open to anything interesting that might point toward viable opportunities we hadn't anticipated.'

Stage 2: Integration (Balanced Logic). As ventures accumulate market knowledge, identify promising application domains, and develop more refined understanding of customer needs, they transition to an integration stage characterized by selective application of effectuation principles combined with increasing causation elements. Ventures begin to formulate more specific goals based on accumulated learning while maintaining flexibility in

means selection and partnership approaches. Seizing capabilities become more prominent as entrepreneurs develop organizational mechanisms to capture value from identified opportunities and move beyond pure experimentation toward more focused execution. Epsilon's founder described this critical transition: 'After about two years of exploration, we knew our target industries and had a clearer sense of what customers valued about our AI solutions. But we remained flexible about specific products, features, and business models. We could set meaningful goals without sacrificing the adaptability that had served us well during our early exploration phase.'

Stage 3: Optimization (Strategic Causation). In the optimization stage, ventures shift toward predominantly causation-based logic while strategically retaining effectual principles for novel challenges, unexpected opportunities, and continued innovation in adjacent domains. Goal setting becomes more systematic with longer planning horizons, formal analytical processes become more prominent in major decisions, and resource allocation follows more structured approaches based on strategic priorities. Reconfiguring capabilities are critical during this stage as organizations restructure processes, systems, and roles to support scaled operations and execution efficiency while maintaining the innovative capacity that drove early success. However, successful ventures maintain effectual capabilities as contingent resources for navigating new uncertainties. Zeta Corp's founder explained the evolution clearly: 'We now have formal three-year strategic plans, detailed budgets, and structured decision processes for our core business. But our early effectual instincts remain valuable—even essential—when we enter new markets, face unexpected competitive moves, or encounter disruptive technological shifts that render our existing plans obsolete. The ability to switch between logics has become a strategic asset.

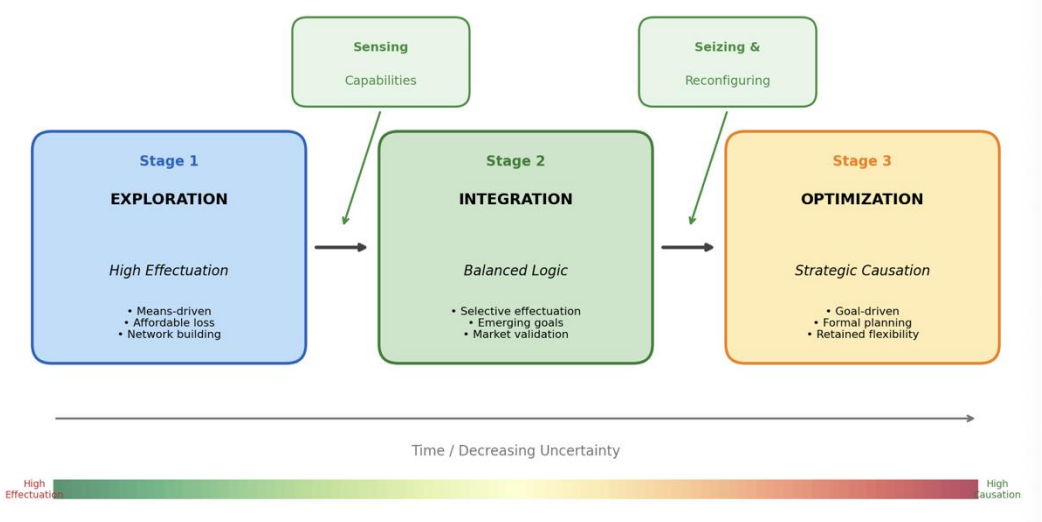

Figure 2. Three-Stage Evolution Pathway of Effectuation Logic

4.3. Dynamic Capabilities as Moderators

Our analysis reveals those dynamic capabilities moderate both the effectiveness and timing of transitions between effectuation stages, serving as critical enablers of successful strategic evolution. Ventures with stronger sensing capabilities recognized earlier when market conditions had stabilized sufficiently to warrant increased reliance on causation logic and formal planning approaches. These ventures could identify patterns in customer feedback, competitive dynamics, and technological evolution that signaled when uncertainty had reduced to levels where prediction became more feasible and planning more productive. Those with robust seizing capabilities executed transitions more successfully, developing the

organizational infrastructure, processes, and resource deployment mechanisms needed to capitalize on identified opportunities without the paralysis that can accompany major strategic logic shifts. Ventures with well-developed reconfiguring capabilities adapted their organizations more smoothly to support evolving decision-making approaches, modifying structures, incentives, and cultures as strategic requirements changed with venture maturation.

Importantly, the interaction between effectuation and dynamic capabilities operates bidirectionally, creating reinforcing cycles that shape venture development trajectories. While dynamic capabilities moderate effectuation evolution, effectual practices also contribute significantly to dynamic capability development. The crazy quilt principle, by building diverse stakeholder networks through self-selection, creates the relational infrastructure and information channels that enhance sensing capabilities and provide early warning signals of market changes. The lemonade principle cultivates organizational alertness and cognitive flexibility that supports rapid opportunity recognition and seizing when unexpected possibilities emerge. The affordable loss principle enables the experimentation that builds organizational learning routines underlying reconfiguring capabilities, as ventures that can afford to fail can also afford to learn from their failures.[13] This reciprocal relationship suggests that effectuation and dynamic capabilities co-evolve over the venture lifecycle, with each framework's elements reinforcing the other's development in successful ventures and creating compounding advantages over time.

Table 4. Summary of Key Propositions

Proposition	Statement
P1	In successful AI startups, higher levels of AI-induced uncertainty are associated with greater initial reliance on effectuation principles.
P2	Successful AI startups follow a three-stage evolution pathway from exploration (high effectuation) through integration (balanced logic) to optimization (strategic causation).
P3a	Sensing capabilities positively moderate the transition from exploration to integration by enabling earlier recognition of market stabilization.
P3b	Seizing capabilities positively moderate successful execution of logic transitions between stages.
P3c	Reconfiguring capabilities positively moderate organizational adaptation during the transition from integration to optimization.
P4	Effectual practices contribute to dynamic capability development through network building (sensing), environmental alertness (seizing), and experimentation (reconfiguring).

5. Discussion

5.1. Theoretical Contributions

This study advances entrepreneurship theory in several important ways that extend our understanding of how entrepreneurs navigate uncertainty and adapt their decision-making approaches over time. First, we extend effectuation research by demonstrating that effectuation logic evolves systematically as ventures mature and environmental uncertainty changes, rather than representing a static alternative to causation that entrepreneurs simply choose based on preference or situation. Prior research has largely treated effectuation and causation as competing logics that entrepreneurs select between based on individual preferences or situational factors; our findings reveal a dynamic, developmental relationship between these logics that unfolds predictably over the venture lifecycle.[14] Specifically, we identify a three-stage evolution pathway—exploration, integration, and optimization—that characterizes how successful AI startups' decision-making approaches transform in response to accumulating knowledge and changing uncertainty profiles.

Second, we establish substantive theoretical linkages between effectuation and dynamic capabilities frameworks that go beyond noting superficial similarities to identify specific mechanisms through which these perspectives connect and interact in shaping entrepreneurial outcomes. While scholars have occasionally noted that both frameworks emphasize adaptation and flexibility, our analysis reveals specific mechanisms of connection.[15] The bird-in-hand principle shares resource-based foundations with dynamic capabilities; the crazy quilt principle builds relational infrastructure supporting sensing; the lemonade principle cultivates adaptive orientation central to seizing; and effectual experimentation develops learning routines underlying reconfiguring. These connections suggest that effectuation may constitute a cognitive and behavioral foundation upon which dynamic capabilities are constructed in resource-constrained nascent ventures, providing a developmental pathway from entrepreneurial cognition to organizational capability.

5.2. Boundary Conditions and Limitations

Several boundary conditions delimit the scope and applicability of our theoretical contributions, and acknowledging these limitations is essential for appropriate interpretation and application of our findings. First, and most significantly, our sample comprises exclusively successful ventures that had achieved significant funding and growth milestones by the time of our study. This sampling approach was both practical—successful ventures are more willing and able to participate in extended research engagements and provide richer historical documentation—and theoretically motivated, as understanding successful adaptation requires examining ventures that have demonstrably adapted successfully. However, the evolutionary patterns and dynamic capability relationships we identify may characterize successful adaptation strategies rather than typical entrepreneurial behavior more broadly, and we cannot determine from our data whether failed ventures followed different patterns or similar patterns with different execution or timing.

Second, all cases are drawn from China's AI ecosystem, and institutional factors including government AI initiatives, distinct capital market characteristics, and cultural orientations toward entrepreneurship and risk-taking may influence decision-making approaches in ways that limit generalizability to other national contexts. China's significant government support for AI development, the distinctive characteristics of its venture capital ecosystem, and cultural factors affecting entrepreneurial cognition and behavior may all shape the patterns we observe. Third, our theoretical framework assumes relatively continuous environmental change characteristic of AI industries; industries characterized by punctuated equilibrium—long periods of stability interrupted by radical disruptions—might yield different evolutionary dynamics and transition patterns.

Fourth, the role of founding team characteristics deserves more systematic attention than our research design permits. Our data suggest that founders' prior experiences in both entrepreneurship and established organizations, cognitive styles and problem-solving approaches, and network positions and social capital endowments influence both initial effectuation emphasis and subsequent evolutionary trajectories. However, our case-based methodology does not allow rigorous analysis of how these individual-level factors interact with environmental uncertainty and organizational capabilities. Quantitative research designs that can systematically examine founder characteristics as moderating variables would valuably complement our qualitative findings and extend our theoretical framework.

5.3. Practical Implications

Our findings offer actionable guidance for AI entrepreneurs, investors, and policymakers navigating the complex landscape of AI venture development. For entrepreneurs, the central

insight is that different decision-making logics suit different venture stages, and recognizing when transitions are appropriate may be as important as executing effectively within any particular logic. Excessive reliance on causation during early exploration—attempting to develop detailed business plans and market analyses when fundamental uncertainties prevent meaningful prediction—may lead to premature commitment to strategies that prove untenable and missed opportunities that only become visible through experimentation. Conversely, excessive reliance on effectuation during later stages—continuing to let a thousand flowers bloom when markets have clarified and execution efficiency becomes paramount—may impede the scaling and operational discipline required for competitive success. Successful navigation requires developing the sensing capabilities to recognize when environmental conditions warrant logic transitions and the organizational capabilities to execute those transitions effectively without losing the adaptive capacity that drove early success.

For investors, our findings suggest that evaluating AI startups effectively requires stage-appropriate assessment criteria that recognize the developmental nature of entrepreneurial decision-making. Early-stage ventures operating in high-uncertainty environments should be assessed primarily on the quality of their effectual processes—the technical and human resources they bring to bear, the partnerships they forge through stakeholder engagement, the contingencies they leverage into opportunities, and the learning they accumulate through experimentation—rather than the precision or apparent sophistication of their business plans, which cannot be meaningfully evaluated given fundamental uncertainties. Later-stage ventures that have transitioned toward integration or optimization warrant greater attention to strategic clarity, execution capability, and competitive positioning. Investors might also consider dynamic capability development as a leading indicator of successful stage transitions, examining whether ventures are building the sensing, seizing, and reconfiguring capabilities that will enable them to evolve their approaches as conditions change.

For policymakers concerned with fostering healthy AI entrepreneurial ecosystems, our findings highlight the importance of regulatory frameworks that accommodate entrepreneurial experimentation while protecting legitimate public interests. Overly rigid or premature regulations may impede the effectual processes through which AI startups discover viable applications and business models. Yet complete regulatory absence may create uncertainties that distort effectual processes by making stakeholder commitments contingent on regulatory resolution. Calibrated regulatory engagement that evolves with industry maturation may best support the healthy development of AI ventures.

6. Conclusion

This study investigates the evolution mechanism of effectuation logic in AI startups, with particular attention to the moderating role of dynamic capabilities in shaping how entrepreneurs adapt their decision-making approaches as ventures mature and environmental conditions transform. Through multiple case studies of six relatively successful AI ventures operating in China's dynamic entrepreneurial ecosystem, we identify a three-stage evolution pathway—exploration, integration, and optimization—that characterizes how successful entrepreneurs' decision-making logic evolves in response to accumulating market knowledge, establishing customer relationships, and navigating the distinctive uncertainties of artificial intelligence ventures. Our analysis reveals that dynamic capabilities, specifically sensing, seizing, and reconfiguring capabilities, serve as critical moderators in this evolutionary process, enabling entrepreneurs to recognize when logic transitions are warranted by changing environmental conditions and to execute those transitions successfully through appropriate organizational adaptations.

The integration of effectuation and dynamic capabilities frameworks advances entrepreneurship theory by establishing substantive linkages between these complementary

theoretical perspectives that have developed largely independently despite sharing fundamental commitments to adaptation, flexibility, and co-evolution with environmental conditions. We demonstrate that effectuation and dynamic capabilities share deep theoretical affinities and interact in shaping entrepreneurial decision-making trajectories over the venture lifecycle in ways that create compounding advantages for ventures that successfully develop both effectual reasoning capacity and dynamic organizational capabilities. The effectual principles that guide nascent ventures in discovering opportunities and building initial stakeholder networks may constitute cognitive and behavioral foundations upon which dynamic capabilities are subsequently constructed as ventures mature and face new adaptive challenges.

We acknowledge that our focus on successful ventures introduces survivorship bias that limits the generalizability of our findings to the broader population of AI startups, many of which do not survive long enough to complete the evolutionary journey we describe. The evolutionary patterns we identify may characterize successful adaptation strategies rather than typical entrepreneurial behavior, and we cannot determine from our data alone whether failed ventures followed different patterns, similar patterns with different execution, or were simply unable to develop the dynamic capabilities needed to navigate transitions successfully. Future research should examine whether these patterns extend to less successful ventures, whether alternative developmental patterns might lead to success in different contexts, whether the relationships we identify hold across different institutional and technological environments, and how individual founder characteristics moderate the evolution of decision-making logic over the venture lifecycle. Despite these acknowledged limitations, our study offers nuanced theoretical insights and practical guidance for understanding how successful AI entrepreneurs navigate the distinctive uncertainties of artificial intelligence—insights that hold significance for scholars, practitioners, and policymakers grappling with entrepreneurship in an era of accelerating technological transformation and unprecedented market uncertainty.

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