Navigating Business Model Innovation in Chinese Manufacturing: Insights and Implications

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ABSTRACT

Despite an increasing number of manufacturing companies innovating their business models in the digital economy, how innovative business models are formed has remained an under-researched area, especially in the manufacturing industry. This study addresses the particular research gap by analyzing the business model innovation process and identifies and explores five conditions that influence the business model innovation process: creative ideas, value proposition optimization, transaction structure reconstruction, profit model exploration, and dynamic potential accumulation. Then, based on the data of 238 respondents in Chinese manufacturing companies, the fuzzy-set approach is employed by conducting Qualitative Comparative Analysis (fsQCA) to explore the configurations of the innovative business model formation process. The results show that high levels of business model innovation can be achieved through different configurations: (1) creative ideas, value proposition optimization, and transaction structure reconstruction combined with dynamic potential accumulation, (2) creative ideas, value proposition optimization, and profit model exploration combined with dynamic potential accumulation, (3) value proposition optimization, and profit model exploration combined with transaction structure reconstruction, and (4) transaction structure reconstruction combined with dynamic potential accumulation. This study contributes to the theoretical literature on business model innovation and provides practical information for manufacturing companies looking to innovate their business models.

Keywords-business model innovation; manufacturing industry; digital economy; process perspective; fsQCA

I. INTRODUCTION

The development of the manufacturing industry is the lifeblood of China's economy. As the digital economy is globally prospering, the manufacturing industry in China still faces huge challenges, e.g., a lack of innovation capabilities, over-reliance on core technologies from developed countries, and failure to effectively combine technology and industry. Not only do these issues hinder economic growth, but also reduce the economy's resilience to risks and international competitiveness. Despite facing many challenges, Chinese manufacturing firms, such as Haier, Huawei, and Xiaomi, have gained recognition from consumers around the world through Business Model Innovation (BMI). During the critical period of economic growth slowdown and the transition into the "new normal" and the "post-pandemic era", managers are increasingly contemplating how Chinese manufacturing companies can enhance their competitiveness and achieve high profitability through innovative business models. BMI sits at the top of the agenda for most manufacturing companies and has attracted strong interest in the management literature [1-2]. A business model describes how a firm creates, delivers, and captures value [3]. However, navigating the process of redefining value creation, value capture, and shifting relational roles and responsibilities can be a challenging endeavor. This task often clashes with the established modus operandi of traditional business-to-business relationships, adding to the complexity and difficulty of the project [4]. The challenges, needs, and requirements associated with redefining value creation and value capture can evolve as business models develop. Previous studies have emphasized the importance of understanding the processual nature of BMI and have advocated for additional research in this area. This highlights the ongoing need to study and understand the dynamic nature of BMI and its implications for companies [2, 5].

Recently, many studies have focused on BMI, producing quite rich results, with breakthroughs mainly focused on two areas. On the one hand, BMI is viewed as a process of organizational change [6], emphasizing adjustments in organizational capabilities [1], senior management cognition [7], and learning mechanisms during the change process [8]. On the other hand, studying successful BMI in companies and standardizing them as typical business models to improve company performance [9-10]. However, many existing theoretical contributions are conceptual rather than theoretical and descriptive rather than explanatory. One of the reasons that hinders further development in research on BMI is the lack of decomposition of this complex process.

For the company as a whole, the business model is a rather complex system and BMI is influenced by the interaction of multiple factors [11-12]. Without a systemic view, BMI based on linear thinking is tantamount to a blind man touching an elephant. Investigating the BMI of manufacturing companies from a holistic and dynamic interaction perspective is crucial. This approach can help identify the core processes involved in the transformation and upgrading of traditional manufacturing companies more effectively, while also enriching the BMI theory. By examining the intricate interactions and interdependencies within the business model, researchers can gain deeper insights into the mechanisms driving innovation and evolution in the manufacturing sector. This study aims to contribute to a more comprehensive understanding of BMI and provide valuable guidance for companies looking to adapt and thrive in a rapidly changing business landscape. BMI is a critical branch of research in business models, and consequently, the BMI process view has received increasing attention [2]. Among the existing studies, those with theoretical contributions mainly emphasize the core elements of building the BMI process [13-14]. However, it is difficult to achieve the organic combination of internal and external factors, and the mechanism of the BMI process is still, to a large extent, vague. Without opening the black box of the BMI process, it is challenging to transform and upgrade manufacturing companies in the digital economy era, and it is even harder to understand the value of BMI to companies and the entire socioeconomic system. Therefore, the BMI process is a critical and crucial direction to study.

Although some theoretical models have proposed applying a process perspective [15-16], to date, little empirical research has been conducted on this topic. Given that differences in perception of value creation may be due to distinctions in companies' collaboration factors, the synergistic effects of the factors depend on the company's integration. BMI is a complex and dynamic process that involves many conditions. The different configurations of these conditions, which are interdependent, determine the emergence of BMI results. As a consequence, a single qualitative analysis and model construction based on an outcome view is not enough to comprehensively explore the complex mechanism behind it. Qualitative Comparative Analysis (QCA) can go beyond traditional quantitative and qualitative approaches [17]. QCA is rooted in holism and offers a unique capability to handle large samples and analyze complex configuration problems in management. Previous studies have adopted a fuzzy-set approach by conducting fsQCA to explore the configurations of digital innovation attributes and IT infrastructure capabilities that lead to different levels of BMI [18]. This study also adopts the fsQCA method to investigate the BMI process of manufacturing companies, which has a unique and crucial theoretical and practical value.

Considering China's position as the largest manufacturer in the current global economy, it is instructive to apply data from China's manufacturing companies to identify causal "recipes" [19] that produce high levels of BMI. This study summarizes the critical factors of the BMI process to analyze the configurations of these factors for high BMI levels. When it comes to offering both theoretical insights and practical implications, this study contributes in two critical ways. At first, identifying the critical factors associated with the BMI process provides a more inclusive understanding of how BMI is achieved. Second, drawing on the configurational theory, facilitates the theoretical comprehension of BMI by providing particular configuration strategies that can be exploited to promote companies' business innovation efforts. Furthermore, the current study paves the way for future investigations into how managers can improve business innovation by adjusting the factors, which is also valuable for extending BMI-related theoretical frameworks in the digital economy.

II. THEORETICAL DEVELOPMENT

After the launch of business model research in [20], many studies have been conducted on this topic. However, due to the differences in the research perspectives and theoretical foundations, the research on BMI is lagging. This study aims to accomplish two main goals: to explore the connotation and elements of BMI and to investigate its evolutionary process. However, the definition of BMI as a concept remains ambiguous, and the discussion of the evolutionary process needs to be increasingly comprehensive [21].

From a process perspective, BMI involves the identification of entrepreneurial opportunities, the creation of new value logic, and the design of innovative activity systems [6, 22]. The former is a dynamic, continuously evolving, complex, and variable process. BMI is a highly creative exploration process that operates in an open, non-equilibrium environment, characterized by the rise and fall of a complex, non-linear system [8]. Under the joint action of internal and external factors, companies continuously experiment, adjust, and optimize through the integration and reorganization of resources in a gradual organizational change procedure [23]. BMI can only have a significant impact if it is sustained over a long time. Therefore, this study agrees with the process-based approach to BMI [2].

Linear thinking refers to a mode of thought characterized by linear, step-by-step, and unidirectional reasoning, typically following a specific logical sequence or set of steps for inference and analysis. In linear thinking, problems are simplified into a series of steps, each building upon the previous one, ultimately leading to a single solution or conclusion [24]. The design of the BMI process based on linear thinking focuses on the control and decision-making of entrepreneurs or management teams. Generally, the BMI process is divided into a linear time. In [25], the BMI process was divided into four stages: business model formation, business mode promotion, business model improvement, and business model completion. Interactive thinking is a non-linear mode of cognition that emphasizes the interplay and feedback among various elements within complex systems. Interactive thinking emphasizes systemic and holistic approaches, thus better addressing complex and uncertain situations [18]. Research on the interactive thinking-based BMI process believes that it is a learning process, a continuous iteration of cognition, behavior, and results. Research of this kind largely argues that the subprocesses of BMI have no chronological order and are dynamic, interactive, and spiral. In [26], it was stated that companies will continuously identify, optimize, modify, and reshape new business models with the shocks of the external environment, and such a reciprocating trial and error process is the BMI process. In [27], the BMI process was divided into four stages, business model adjustment, adoption, improvement, and redesign, which means that BMI is a "self-inspection and self-correction" process.

In general, BMI is a complex and dynamic process. In this procedure, perceiving the complex environment and achieving the matching between the environment and the business model through dynamic iterations is extremely challenging. From a dynamic perspective, BMI is viewed as a process of optimizing and reorganizing complex resources. Companies need to undergo a continuous trial-and-error procedure to eventually achieve BMI. Based on this, the current study argues that research on the driving mechanisms of BMI should not merely focus statically on key elements but should explore the overall BMI process achieved through the interaction of various driving factors. Thus, in addition to the existing internal and external driving factors of BMI, it is necessary to delve into the driving elements in the process of realizing BMI. Specifically, considering the significant differences in environmental and resource conditions among different types of manufacturing companies, effectively identifying the multiple driving factors and diversified driving paths that influence BMI, is crucial for the transformation of Chinese manufacturing companies in the digital economy era. Consequently, it is necessary to develop the whole thinking and further explore the BMI process in light of the whole process.

III. CONSTRUCTION OF BMI PROCESS MODEL

BMI is a process-driven and behavior-oriented concept that places creative ideas at the core of innovation, guiding the entire procedure [28-29]. At the heart of this creative vision is the entrepreneurial individual who assumes the role of a decision-maker in shaping the idea, commonly referred to as the BMI architect. Drawing on existing cognitive schemas, the BMI architect engages in a complex mental process that involves assimilating environmental information and generating innovative business model ideas [30]. Overcoming inertia and fostering constant and open interaction is essential for BMI architects as they strive to build new business models [11].

In the BMI process, it is crucial for novel and innovative ideas to intersect with user needs, giving rise to a unique value proposition [31]. This value proposition serves as a central element throughout the design of the business model [32]. By establishing a new value proposition on the market, manufacturing companies can disrupt the competitive position of industries with product-focused strategies and compel other competitors to adapt [33]. From a value perspective, research suggests that the value proposition serves as the starting point for BMI [34]. Furthermore, the learning perspective argues that the value proposition should be developed through iterative trial-and-error processes [7]. This study proposes that the initial idea of the value proposition is an integral part of the BMI concept. Through trial-and-error iterations, the value proposition becomes clearer, enabling a more precise articulation of the quantitative value of the product or service and facilitating customer interaction. This iterative process establishes a mutually beneficial relationship between the value proposition and the transaction structure.

Another important term, i.e., transaction structure, refers to the network among stakeholders in the company activity system, including the subjects involved in transactions and how they are carried out [35]. For a BMI idea to be further developed and expanded, it has to be supported by the majority of people within the value network. Otherwise, it will face the hazards of inertia, conflict, and environment within the company that restrict the latter from carrying out BMI, and stakeholders will perceive the alienation of the transaction structure [36]. At the same time, as industry boundaries continue to blur and customer value often points to multiple domains, it is demanding for companies to realize their customer value proposition on their own. They additionally need to open up to the outside world to aggregate new knowledge and resources and reshape the transaction structure. In essence, a business model transformation is the adjustment of the transaction structure between different subjects [37].

Creative ideas need to be explored in terms of profitability before they can be agreed on in a reconstructed transaction structure [38]. In a multi-factor business activity system, the profit model is both a means of capturing value for the company undertaking the BMI and a channel for distributing the benefits to the stakeholders in the activity system. The profit model comprises profit sources, points, interconnected business activities, and the corresponding organizational management. The profit points are combined with the value proposition by exploring the profit model. Only when the profit model is recognized by the various actors in the transaction structure does the transaction structure have legitimacy and can effectively withstand the impact of external competition and environmental turbulence [39].

Along with the BMI process, the company's resource position is in constant dynamic accumulation as well. In [40], it was pointed out that the competitive advantage of companies is seen to rest on distinctive processes (coordination and combining ways), shaped by the company's specific asset positions (e.g., the company's portfolio of difficult-to-trade knowledge assets and complementary assets), and the evolution path(s) it has adopted or inherited. The position represents the resource situation of a company in the business ecosystem.

Collaboration and interaction play a vital role in constructing a transaction structure, as they facilitate the emergence of innovative ideas and drive the business model forward. The organizational learning in the process is an essential factor in BMI that cannot be ignored [41]. The greater innovation a company experiences, the more it can resist business model inertia, so the dynamic nature of potential accumulation is emphasized.

In conjunction with the foregoing, BMI is a continuous "stretching" process in business operations. This road has no end as the firm grows, but only constant breakthroughs. This path is not a time series of BMI, not a linear process of back and forth, but a complex iterative process of interaction between organizations and people. On this basis, this study constructs a theoretical model as shown in Figure 1.

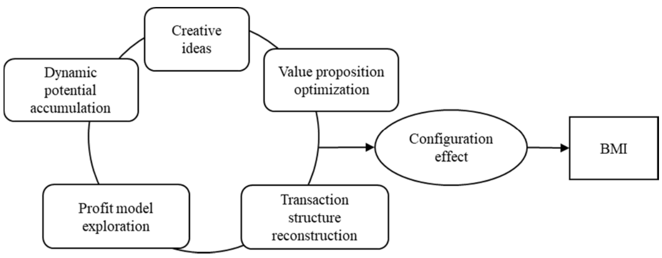

Fig. 1. Configuration effect of BMI.

IV. RESEARCH DESIGN

A. Data Collection

China is the largest manufacturer in the current global economy. Along with the booming of digital technology, manufacturing companies are facing the challenge of digital transformation as well [42]. Therefore, a considerable number of Chinese manufacturing companies innovate their business models, providing a rich context for BMI. Accordingly, this study focused on Chinese manufacturing companies. The target respondents of this research were senior managers and R&D managers of such companies. Data were collected through online and offline questionnaire surveys in manufacturing industrial zones, including Qingdao Haier Industrial Park, Shenzhen Industrial Park, and Beijing Zhongguancun Science Park. To ensure validity, a pretest was conducted and the initial questionnaire was sent to 20 managers. Using their feedback, the content, clarity, and phraseology of the survey items were clarified. Then, 600 questionnaires were distributed and 255 were received back. After removing 17 questionnaires with severe data loss and non-compliance with requirements, 238 of the collected questionnaires were marked valid, which represents an effective response rate of 39.67%. Table I presents the final sample descriptions.

TABLE I. DESCRIPTIVE STATISTICS OF SAMPLES

Variable	Items	Frequency	Percentage
Gender	Female	90	36%
	Male	148	64%
Respondent position	Senior managers	135	58%
	R&D managers	103	42%
Firm size (employees)	20 and 99	41	17%
	100 and 299	77	34%
	300 and 499	61	26%
	500 and 999	38	15%
	More than 1000	21	8%
Industry	New energy vehicles	29	11%
	Electric equipment	55	23%
	Home appliance	63	27%
	New materials	22	8%
	Other industries	69	31%
Ownership type	State-owned	52	22%
	Private-owned	102	45%
	Wholly owned foreign	70	30%
	Other types	14	3%

B. Measurement

These constructs were measured by composing the conceptual model using scales that have already been tested and validated in previous studies. These items were measured deploying a 7-point Likert scale (from strongly disagree to strongly agree). The result is BMI. The BMI measurements were adopted from [10], including four items, such as "When necessary, we can carry out massive internal reconfigurations to enhance our overall value proposition to our customers". Creative ideas were based on the scale presented in [43], with a total of six items, such as "our employees will come up with innovative and creative ideas at work". Value proposition optimization was measured by five items, such as "Our company optimizes customer relationships" [9]. Transaction structure reconstruction was measured by four items, for instance, "Our company reconstructs or creates new trading structures, and transaction rules, thus leading the market behavior" [35]. Profit model exploration was measured using six items, like "Our company optimizes cost structures, transforms traditional profit models, and enables new value distribution and acquisitions" [44]. Dynamic potential accumulation was measured by six items, such as "Company's technological assets, complementary assets, financial assets, reputational assets, institutional assets, and market assets" [45].

This study selected five conditional variables of utmost importance, namely: Creative Ideas (CI), Value Proposition Optimization (VPO), Transaction Structure Reconstruction (TSR), Profit Model Exploration (PME), Dynamic Potential Accumulation (DPA), and the result variable of BMI. No additional variables are introduced, as an increase in conditions could easily lead to the number of histories exceeding the number of observed cases, thus raising the problem of limited diversity of cases. Typically, studies with medium-sized samples should have from four to seven conditions, while studies with larger samples can have more. Still, it should be noted that increasing requirements will lead to an exponential increase in the number of configurations [19]. With 238 cases in this study, which is a large sample for the QCA method, five condition variables were selected to meet the requirements.

C. Reliability and Validity

To ensure the reliability and validity of the constructs and estimate the measurement model, a Confirmatory Factor Analysis (CFA) was performed using covariance-based Structured Equation Modeling (SEM), following [46]. The CFA model utilized a confirmatory factor structure, where 33 items were assigned to four factors: BMI (6 items), CI (6 items), VPO (5 items), TSR (4 items), PME (6 items), and DPA (6 items). The model had an acceptable fit to the data, as indicated by the following fit indices: $\chi2/df$ = 1.534, GFI = 0.845, CFI = 0.942, NFI = 0.850, TLI = 0.936, SRMR = 0.000, RMSEA = 0.047, IFI = 0.942, and $P < 0.001$ [47]. As observed in Table II, the convergent validity of all items was evaluated by examining their factor loadings, which were higher than 0.50 in relevant factors, indicating good convergent validity. Employing the factor loading, the Average Variances Extracted (AVE) of all constructs (BMI, CI, VPO, TSR, PME, DPA) were calculated, which were 0.579, 0.581, 0.526, 0.593, 0.474, and 0.573, respectively, all above the recommended threshold of 0.50. Additionally, the composite reliability of the constructs was evaluated. The former were 0.892, 0.893, 0.847, 0.853, 0.843, and 0.889, respectively, all above the recommended threshold of 0.8. Additionally, Cronbach's alpha for all constructs was above 0.8, indicating good reliability.

TABLE II. FACTOR LOADINGS FROM RELIABILITIES

Construct	Items	Factor Loading	Cronbach's Alpha	CR	AVE
Business model innovation (BMI)	BMI 1	0.716	0.892	0.892	0.579
	BMI 2	0.719			
	BMI 3	0.764			
	BMI 4	0.792			
	BMI 5	0.788			
	BMI 6	0.782			
Creative Ideas (CI)	CI 1	0.762	0.892	0.893	0.581
	CI 2	0.751			
	CI 3	0.755			
	CI 4	0.753			
	CI 5	0.785			
	CI 6	0.767			
Value Proposition Optimization (VPO)	VPO 1	0.728	0.846	0.847	0.526
	VPO 2	0.697			
	VPO 3	0.675			
	VPO 4	0.715			
	VPO 5	0.806			
Transaction Structure Reconstruction (TSR)	TSR 1	0.742	0.846	0.853	0.593
	TSR 2	0.687			
	TSR 3	0.851			
	TSR 4	0.792			
Profit Model Exploration (PME)	PME 1	0.733	0.842	0.843	0.474
	PME 2	0.737			
	PME 3	0.734			
	PME 4	0.635			
	PME 5	0.588			
	PME 6	0.688			
Dynamic Potential Accumulation (DPA)	DPA 1	0.788	0.889	0.889	0.573
	DPA 1	0.752			
	DPA 2	0.749			
	DPA 3	0.786			
	DPA 4	0.764			
	DPA 5	0.7			

Table III presents the correlation matrix of the main variables. The discriminant validity of this sample was evaluated by comparing the square roots of the AVE (ranging from 0.73 to 0.77) with the correlation coefficients among them. The results demonstrated good discriminant validity of this sample, following the approach outlined in [48]. Harman's single-factor test was used to test whether there was common method bias in this study. The first factor accounted for only 12.099% of the total variance, which was less than the recommended threshold of 50%, indicating that this study had no common method bias.

TABLE III. CORRELATION MATRIX OF MAIN VARIABLES

Variables	BMI	CI	VPO	TSR	PME	DPA
BMI	**0.76**					
CI	0.711**	**0.76**				
VPO	0.615**	0.651**	**0.73**			
TSR	0.660**	0.719**	0.640**	**0.77**		
PME	0.641**	0.546*	0.212*	0.02	**0.69**	
DPA	0.580**	0.701**	0.573**	0.662**	0.129*	**0.76**
Mean	5.47	5.45	5.58	5.46	5.75	5.29
SD	0.95	0.95	0.81	0.93	0.86	1.11

*p < 0.05, **p < 0.01, *** p < 0.001 (2-tailed test); Entry on the diagonal with bold is the square roots of Average Variances Extracted (AVE). SD = Standard Deviation.

D. Research Method

QCA is a configurational approach based on set theory and fuzzy algebra [19] and is suitable for studying complex causality and multiple interactions [49]. This approach has recently attracted much attention in the field of BMI. In addition, the causes of BMI in manufacturing companies are not a simple linear relationship between various factors, which requires an overall perspective and configuration examination. QCA is a valuable tool for analyzing causal complexity and can be used for cross-case comparative analysis from a holistic perspective. Moreover, this approach applies to both small case studies (less than 15 cases), medium samples (10-50 cases), and large samples with more than 100 cases [17, 19]. For this investigation, which consists of 238 cases, the sample size is consistent with the requirements of QCA. Furthermore, QCA incorporates the fuzzy set Comparative Analysis Method (fsQCA). Unlike the crispy-set QCA and the multivalued QCA, fsQCA deploys membership degree assignment and enhances research quality as it is more case-specific. It also allows for a more detailed elucidation of causal factors. Therefore, fsQCA was utilized to achieve accurate findings.

V. EMPIRICAL RESULTS AND ANALYSIS

A. Calibration

In configuration analysis, each antecedent and outcome variable are considered a set, and the cases represented by each dataset have membership scores in these sets. The process of assigning a set membership score to a case is called calibration [19]. To convert the data into a fuzzy set membership score, this study employs a direct calibration method, consistent with [49], and the membership of the transformed set is between 0 and 1. According to [50], the three anchor points (fully in, crossover point, and fully out) depend on the upper four quantiles, the mean of the upper and lower four quantiles, and the lower four quantiles of the sample data, respectively [51].

Table IV diaplays the calibration anchor points for each variable.

TABLE IV. CALIBRATION

		Fully in	Crossover point	Fully out
Antecedent	CI	2	1.875	1.75
	VPO	2.333	1.917	1.5
	PME	3	2.5	2
	TSR	3	2.5	2
	DPA	3	2.5	2
Outcome	High BMI	3	2.5	2
	Not-High BMI	2	2.5	3

B. Necessity Conditions Analysis

Before the configuration analysis, it is useful to examine whether any single condition is necessary for BMI. If the consistency coefficient exceeds 0.9, the antecedent can generally be regarded as a necessary condition for the result [52]. Table V presents the analysis results of fsQCA on the necessity of high levels of BMI and not-high levels of BMI. The consistency coefficient of all single-condition variables is below 0.9, indicating that no single condition is necessary for BMI [19, 53]. Thus, taking a configurational perspective is essential.

TABLE V. NECESSITY TEST OF SINGLE CONDITIONS

Conditional variables	Result variables	
	High BMI	**Not-High BMI**
CI	0.693	0.404
~CI	0.349	0.637
VPO	0.795	0.476
~VPO	0.248	0.565
PME	0.721	0.325
~PME	0.3259	0.736
TSR	0.766	0.284
~TSR	0.302	0.781
DPA	0.696	0.324
~DPA	0.371	0.740

~indicates that conditions are absent.

C. Sufficient Solutions

The fsQCA 3.0 software was implemented to analyze standardized data, adhering to established research standards. Specifically, a minimum case frequency benchmark greater than 1 and a raw consistency benchmark greater than 0.8 were used. Moreover, Proportional Reduction in Inconsistency (PRI) was applied to further filter the truth table rows that are reliably linked to the outcome. Through these comprehensive standards, truth table rows that meet the requirements and derived configuration paths were obtained by running the data. Table VI showcases the results. This analysis identified four pathways leading to high levels of BMI, capturing 65% of such cases. The overall solution consistency is 0.85, which explains the significance level of all configurations as a whole. Additionally, two pathways were identified to lead to not-high levels of BMI, with an overall solution consistency of 0.91 and coverage of 0.55. To further summarize the six pathways from a theoretical perspective, the logic scheme proposed in [19] was employed. This analysis suggests that there are three distinct types of high BMI, each with its core characteristics: those oriented to CI and DPO, to PME and TSR, and to TSR and DPA. Additionally, two types of non-high levels of BMI were proposed.

TABLE VI. CONFIGURATIONS STRONGLY RELATED TO BMI

	High BMI				Not-High BMI	
	H1a	**H1b**	**H2**	**H3**	**NH1**	**NH2**
CI	●	●		⊗		
VPO	•	•	•	⊗		⊗
PME		•	●	⊗	⨂	⊗
TSR	•		●	●	⨂	⨂
DPA	●	●		●	⊗	⊗
Consistency	0.90	0.89	0.85	0.84	0.86	0.82
Raw coverage	0.41	0.39	0.52	0.06	0.51	0.17
Unique coverage	0.05	0.03	0.16	0.03	0.29	0.05
Overall consistency	0.85				0.91	
Overall coverage	0.65				0.55	

●= core causal condition (present); • = peripheral causal condition (present); ⨂ =core causal condition (absent); ⊗ = peripheral causal condition (absent); blank spaces indicate "do not care"

D. Configurations for High Levels of BMI

Four configurations (H1a, H1b, H2, H3) generate high levels of BMI. Among these configurations, H1a and H1b are equivalent, as they share the same core conditions [49]. The following analyzes each configuration that affects high levels of BMI in detail and names the configuration according to the configuration theorization process [54].

1) Creative Ideas - Dynamic Potential Accumulation Led

Configuration H1a, CI×VPO×TSR×DPA, indicates that regardless of whether the company's profit model can be perceived or not, it can achieve high levels of BMI as long as it has a clear creative idea and realizes the value proposition with stakeholders in an open and integrated transaction structure, accompanied by thick dynamic potential accumulation. Configuration H1b, CI×VPO×PME×DPA, reveals that a company can achieve high BMI levels with clear creative ideas and value propositions, a perceptible profit model, and thick dynamic potential accumulation through interactive learning with the external environment, regardless of whether it has an open and integrated transaction structure or not. These configurations demonstrate that in defiance of the starting point of BMI, creative conception is an indispensable part of the BMI process [2]. The value proposition constitutes the core element of the business model, and a clear and perfect value proposition is the continuous driving force of BMI [55]. Since the inception of a company, a path has been established from the value proposition to value creation and subsequently to value acquisition. The profit model is a mechanism for companies to obtain value through BMI. The profit point is integrated with the value proposition by exploring the profit model. Only when all the subjects involved in the transaction structure acknowledge the profit model can the transaction structure be deemed legitimate. Simultaneously, companies can achieve potential accumulation and transition through the combination of organizational learning, discontinuous innovation, a policy-oriented market, and other factors [56], thus contributing to the success of BMI.

For companies represented by configuration H1a, the profit model may not be precise enough. Still, companies cannot fight alone, as the industrial boundary continues to blur and resource capabilities are scattered among different stakeholders. Consequently, they should introduce stakeholders into the value network, reshape the open and integrated transaction structure, and shape it into a specific business model [57]. This type of BMI is a systemic innovation that reflects people-to-people and organization-to-organization interactions. Companies represented by configuration H1b may lack an open and integrated transaction structure but have a perceptible profit model. This profit model is rooted in the innovative concept of the business model and is actively explored by the company through constant internal and external interactions after obtaining internal legitimacy through internal construction [58]. When examining the profit model, short-term profit and the expectation of obtaining value are the driving forces that motivate the decision-making team and participants to continue moving forward to achieve a high level of BMI.

2) Profit Model - Transaction Structure Led

Configuration H2, VPO×PME×TSR, suggests that high levels of BMI can be achieved as long as there is an innovative value proposition, a perceived profit model, and an open and integrated transaction structure, even in the absence of a novel idea or a thick dynamic potential accumulation. The value proposition, which is the fundamental element of the business model, serves as the starting point of business model design [5]. In the case of existing manufacturing companies, BMI is mainly introduced through value proposition innovation, which requires a trial-and-error iteration to be completed. Through this process, the interactive value between products or services and customers can be clearly expressed, leading to a more acute perception of the profit model. Business models can be classified into two categories: innovative and efficient [20]. The former focuses more on creating new value based on the creative transaction structure relationship. On the contrary, the latter approach places greater emphasis on generating novel value by enhancing the existing transaction structure system, thereby reducing the associated transaction cost. Innovation is no longer confined to the company but rather relies on the profit model, connecting stakeholders within the company value network and fostering open innovation with mutual benefits and risk sharing [59]. Company value creation depends on the extent to which the resources and capabilities of stakeholders can be connected and leveraged by companies through the restructuring of transactional frameworks, thus continuously improving innovation capabilities and competitive advantages and achieving high levels of BMI.

3) Transaction Structure - Dynamic Potential Accumulation Led

Configuration H3, ~CI×~VPO×~PME×TSR×DPA shows that when a company lacks a new innovative idea, a clear value proposition, and a perceptible profit model, it can still achieve high levels of BMI by introducing stakeholders into the value network and reshaping the transaction structure based on their needs. Each business has a transaction structure at a certain point in time, which can be summarized as a static business model through static analysis. However, multiple dynamic transaction structures coexist in a company's activity system. Analyzing a company's business model from a dynamic perspective can abstract the outline of a company-level transaction structure, which also presents an explicit form of BMI. In building the transaction structure, through cooperation with stakeholders, companies can emerge more innovations, promote BMI, and advance [60]. Learning, collaboration, and dynamic adjustment in moving forward can accumulate potential. In realizing BMI, better business model adjustment can be promoted if more opportunities are perceived. The position of companies also drives the innovation and diffusion of business models. With the expansion of the scope of distribution, market competition encourages companies to constantly improve BMI and seize a position that is difficult to imitate. Higher potential can provide the driving force and foundation for companies to strengthen the existing business model and carry out the next BMI. In the process of BMI and diffusion, companies are imitated by other companies as a benchmark, which will raise their position. If competitors copy, companies will explore new business models under competitive pressure [3], possibly new value propositions, transaction structures, or profit models, thus accumulating potential in a new round of innovation. To some extent, this approach can help companies retain a favorable position in fierce competition.

E. Configurations for Not-High Levels of BMI

The QCA method posits an asymmetric relationship between cause and effect. The configurations of reasons leading to high BMI levels differ from those leading to not-high levels of BMI. Therefore, to comprehensively explore the BMI process mechanism, it is necessary to further analyze the configuration that leads to not-high levels of BMI.

The configuration NH1, ~PME×~TSR×~DPA, indicates that regardless of the existence of innovative ideas and value propositions, BMI will be inhibited as long as the company lacks learning ability, is unable to carry out potential accumulation, and has no profit model suitable for company development and transaction structure with stakeholders. A possible reason is that once the profit pattern is perceived and unable to reshape the open trading structure of integration, the company is challenged to determine the development direction of further, more difficult to work with stakeholders to realize value proposition innovation. If learning has difficulty with the outside world, it is intricate to accumulate dynamic potential and BMI will be restricted [36]. On the contrary, even if there are novel innovative ideas and value propositions, the lack of matching profit models and transaction structures will make the hard-won innovation opportunities fleeting. If organizational learning and potential accumulation are not carried out in time, the innovation of business models will be further inhibited.

The NH2 configuration, ~VPO×~PME×~TSR×~DPA shows that no matter whether the company has a novel BMI idea or not, once it lacks an open and integrated transaction structure, the value proposition and profit model are not clear, the organizational learning ability is weak, and it is not easy to carry out potential accumulation, the innovative business model cannot be produced. Creative ideas are the source of BMI, but it is not enough to only have innovative ideas. In BMI practice, companies must carry out complex interaction processes among organizations and people. This is a continuous process as well as a process of interaction among a variety of factors. A single element makes it difficult to promote the results of BMI [22]. Only by maintaining an open perception in the process and constantly colliding with the environment can provide the opportunity to achieve BMI.

VI. CONCLUSION AND IMPLICATIONS

A. Research Conclusion

This research has yielded several conclusions regarding the mechanism of the process of achieving high levels of BMI. First, four paths were identified to lead to high levels of BMI: creative ideas - dynamic potential accumulation led (H1a and H1b), profit model - transaction structure led (H2), and transaction structure - dynamic potential accumulation led (H3). Second, this study indicates that the profit model - transaction structure led path (H2) is particularly effective in creating high levels of BMI, especially when it is characterized by an innovative value proposition. The connection between the perceived profit model and the open and integrated transaction structure contributes to achieving a high level of BMI. Third, the findings reveal that creative ideas and thick dynamic potential accumulation associated with innovative ideas dominated by potential accumulation (H1a and H1b) play a complementary role in explaining BMI. However, the open integration transaction structure and the perceptible profit model serve as substitutes. In other words, if a company possesses new innovative ideas, substantial potential accumulation, and a clear value proposition, it can attain a high level of BMI by reshaping the transaction structure through open integration or exploring a perceptible profit model. Lastly, two paths were identified to not achieve high levels of BMI, and these paths exhibit an asymmetric relationship with the process mechanism of high levels of BMI. In general, this study provides valuable insights into the process mechanisms that drive high levels of BMI, highlighting the importance of creative ideas, dynamic potential accumulation, profit models, and transaction structures.

B. Theoretical Implications

This study adopts configuration thinking and the fsQCA method to delve into the process mechanism of BMI and uncover the "black box" of BMI. At first, it enriches the understanding of the BMI process by conducting a comprehensive analysis of its process mechanism and identifying four pathways that lead to high BMI levels. The research highlights that BMI is not driven by a single factor but rather by the interaction of multiple factors. Specifically, four combinations were identified to reveal the BMI process: (1) creative ideas, value proposition optimization, and transaction structure reconstruction combined with dynamic potential accumulation; (2) creative ideas, value proposition optimization, and profit model exploration combined with dynamic potential accumulation; (3) value proposition optimization, and profit model exploration combined with transaction structure reconstruction; (4) transaction structure reconstruction combined with dynamic potential accumulation. The four modes do not play the same role as it pertains to BMI. Second, the study disclosed the complementary and substitution effects of the elements within the configuration that influence BMI. When comparing the configurations that lead to high BMI, it was observed that creative ideas and dynamic potential accumulation are complementary to each other. Meanwhile, the open and integrated transaction structure and the perceptible profit model, which are involved in these two paths, play an alternative role in explaining BMI. This suggests that these two conditions can lead to results together with the remaining four conditions in these two configurations, without requiring their simultaneous existence. Suppose a company has a novel, innovative idea and a thick accumulation of dynamic potential, along with a clear value proposition. In that case, it can achieve a high level of BMI by reshaping an open and integrated transaction structure or exploring a perceptible profit model. This demonstrates the advantages of using the fsQCA method to explore the relationships among various elements within the configuration and provides a methodological reference for studying more complex BMI in the future. The current study indicates that, based on the Chinese context, there is a clear substitution relationship among the various factors that affect the BMI process of manufacturing companies, rather than just a complementary relationship, thus deepening the interactive relationship between multiple theoretical explanatory perspectives. Third, the study identifies the causal asymmetry of BMI. The path of the process leading to high levels of BMI is not simply the opposite of the one leading to not achieving high levels of BMI. In other words, the causes of not achieving high levels of BMI cannot be deduced from the opposite of the process path that leads to high levels of BMI. Overall, this study contributes to understanding the BMI process mechanism, shedding light on the complex interplay of factors and providing insights into how different elements within a configuration can influence BMI.

C. Managerial Inspirations

This study also has practical importance for BMI in manufacturing companies. First, it is crucial to strengthen the cultivation of innovative ideas and culture. Managers should lead by example, actively support and engage in innovative activities, and demonstrate the importance of innovation to employees. Moreover, continually optimizing the company's value proposition is essential. Managers should employ design thinking methods, understand user needs and pain points deeply from their perspective, and design more innovative and practical products and solutions accordingly. Furthermore, the construction of open and intelligent transaction structures is important. Utilizing technologies, such as the Internet of Things, big data, and artificial intelligence enables digital management and intelligent optimization of production, supply chain, and sales processes. In addition, accumulating dynamic capabilities is nonnegligible. Managers should establish flat organizational structures, emphasize rapid decision-making and execution capabilities, and reduce lengthy hierarchies and processes. Exploring novel revenue models is crucial. Managers should diversify revenue sources through after-sales services, leasing, customization, etc., beyond relying solely on product sales. In addition, leveraging digital technologies to provide online services, virtual products, etc., expands new revenue models.

D. Limitations and Future Research Directions

Although this study addresses some of the literature gaps, it also has several limitations that may inspire future research in this area. First, the samples in this study are only from Chinese manufacturing companies, confining the ability to generalize the findings. The authors encourage researchers to replicate this study in other countries and different industries in future research. Second, the data came from self-rated performance measures. Adopting more objective measures in future research can overcome self-report bias. Third, this study examined five factors that influence the process of BMI. Future studies can also consider other contextual factors, namely industry type, regulatory environment, leadership style, and organizational culture, as new research avenues.

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