

# A study on the mechanism of the impact of entrepreneurship opportunity collaboration on opportunity innovation: The mediating effect of resource patchwork

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## ABSTRACT

**Purpose:** This article explores the impact of opportunity collaboration on opportunity innovation based on the identification, acquisition, sharing and exchange of resources and elements among entrepreneurial entities through collaborative and interactive behaviors to explore the influence mechanism of entrepreneurial opportunity collaboration on the formation of innovativeness of opportunities and the mediating role of resource patchwork.

**Design/Methodology/Approach:** The research conducted an empirical analysis on the impact of opportunity collaboration on opportunity innovation based on the data of 207 entrepreneurial enterprises from Beijing, Guangdong and Henan with a high entrepreneurial vitality index and vital data availability. Resource patchwork's mediation effect is discussed and empirically tested from the patchwork theory perspective.

**Findings:** Entrepreneurial opportunity collaboration significantly positively affects opportunity innovation and resource patchwork plays an intermediary role between them.

**Conclusion:** Innovation is an important attribute to distinguish the heterogeneity of entrepreneurial opportunities and is also the key to entrepreneurial success. Interaction among various entrepreneurial elements should be strengthened to achieve efficient and high-quality resource patchwork to obtain a significant "synergistic effect" and ultimately improve innovation in entrepreneurial opportunities.

**Practical Implications:** This study not only helps to theoretically understand the impact of entrepreneurial opportunity collaboration on opportunity innovation differentiation but also has outstanding practical reference significance for the government's targeted policy measures to support innovative entrepreneurial activities and for entrepreneurs to identify or create innovative opportunities.

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**Keywords:** *Entrepreneurial opportunity collaboration, Innovativeness of opportunities, Resource patchwork.*

## 1. INTRODUCTION

According to relevant data from the Global Entrepreneurship Observation Report in recent years, most of China's entrepreneurship is replication entrepreneurship with fewer innovative entrepreneurs and low innovation value. It needs to improve competitiveness in industries where existence is challenging due to inadequate earnings and intense competition. This is also the reason for China's high entrepreneurship failure rate (Bi & Zhang, 2012). Some scholars have explored the factors affecting entrepreneurial performance from different perspectives, including entrepreneurs' factors, gender differences, geographical location, corporate financing, social network, labor cost, lifestyle, government factors etc. in order to help entrepreneurs find the reasons for entrepreneurial failure (Li, Mei, & Xu, 2020). Different conclusions have been reached from such studies. On the one hand, this is also due to the different research emphasis. On the other hand, it also shows that the influence mechanisms of various factors on entrepreneurial performance are still unclear. Most of them only have a "direct influence" between the verification variables. There is a lack of empirical research to explore the entrepreneurial

process affecting the problem's explanatory power. On this basis, some scholars began to pay attention to the behavioral rules of the entrepreneurial process. [Timmons, Rob, and Stephen \(1999\)](#) proposed in the book "The Founding of New Enterprises: Entrepreneurship in the 21st Century" that the actual entrepreneurial process begins with the formation of entrepreneurial opportunities which are the core elements of the entrepreneurial process. [Shane and Venkataraman \(2000\)](#) further pointed out that entrepreneurial opportunities as the core elements have different attributes and replicative entrepreneurial opportunities generated through imitation lack innovation which quickly leads to the failure of new enterprises. However, those breakthrough, disruptive and creative opportunities can generate high-value creation potential. Such opportunities have a certain degree of innovation ([Zhu, 2021](#)). Innovative entrepreneurial opportunities can bring profitable opportunities or models in the early stages of entrepreneurship so enterprises can quickly eliminate the defects existing early ([He, 2022](#)). According to [Bi and Zhang \(2012\)](#), the innovation of opportunities is the critical variable affecting the success of entrepreneurship. At present, the type of entrepreneurship in China is mainly imitation and replication with a low gold content of innovation and a lack of competitiveness in the industry with meager profits and fierce competition, so it is difficult to survive. Therefore, entrepreneurial enterprises want to avoid low-level entrepreneurship, "think differently" and improve the innovation of opportunities which has become a critical problem to be solved.

So, how can we improve opportunity and innovation? The existing literature only considers the interaction between the two factors while neglecting that entrepreneurship is essentially a process of complex interactions between entrepreneurial entities and the entrepreneurial environment ([Guopeng, 2016](#)). The strength of opportunity innovation is the result of mutual promotion, coordination and cooperation among multiple factors. [Haken \(1978\)](#) referred to the "synergistic effect" in his theory of synergetic which states that "when elements cooperate well in interaction, multiple forces can aggregate into a total force, forming a new function that greatly exceeds the total of their original functions. The formation of opportunities in the entrepreneurial process requires multiple factors to generate "synergistic effects" to achieve a quantitative-to-qualitative innovation process, thereby improving the innovation of opportunities. This process is called "opportunity collaboration". The result of "opportunity collaboration" is the degree of innovation in opportunities.

What is the process of opportunity collaboration and what kind of collaboration can generate a "synergistic effect" to enhance the innovation of opportunities? The paper aims to shed light on the relationship between entrepreneurial opportunity collaboration and opportunity innovation by focusing on its dynamic process and laws. It illustrates the theoretical logic and intermediary process of the impact of entrepreneurial opportunity collaboration on opportunity innovation, thereby defining the impact mechanism.

## 2. REVIEW OF RELATED RESEARCH

This article has sorted out the relevant literature collected based on research methods, theoretical perspectives, subjects of opportunity discovery or creation, production processes and main viewpoints to explore the theoretical basis for the collaboration of entrepreneurial opportunities (see [Table 1](#)).

**Table 1.** Literature review of entrepreneurial opportunity collaboration.

Author (year )	Research method	Theoretical perspective	Subject	Generation process	Contribution to the perspective of co-creation and interaction
Busenitz et al. (2003)	Literature review	—	Individuals, opportunities, organizations, and environment	—	Research should focus on the interactions between individuals, opportunities, organizations, models and the environment.
Dutta and Crossan (2005)	Theoretical analysis	Organizational learning theory	Entrepreneurs and other entrepreneurs	Opportunity is a complex multi-step learning process.	Opportunities are formed through the collective participation of individuals, teams and organizations through intuition, interpretation, integration and institutionalized learning processes.
Vandekerckhove and Dentchev (2005)	Theoretical analysis	Network perspective	Entrepreneurs and stakeholders	Entrepreneurs can identify opportunities with sufficient information.	A high-concentration and optimal-density entrepreneurial network is conducive to promoting stakeholder management and discovering opportunities for entrepreneurs.
Dimov (2007a)	Theoretical analysis	Creative theory	Individual and environment	Opportunities arise from the continuous shaping and development of original ideas.	Opportunities are created by specific individuals and constantly influenced and shaped by the direct environment and social environment.
Dimov (2007b)	Empirical analysis	Demand and supply perspectives	Individual and environment	Opportunity development is a learning process.	Entrepreneurship actions not only depend on an individual's prior knowledge but also on whether their learning style matches their environment.
Hill and Birkinshaw (2010)	Theoretical analysis	Creative collection perspective	Between creativity	The antecedents and processes that lead to opportunities are the results of creative collections.	The creative collection includes novelty, capacity, content, development stage, strategic value logic and comprehensive knowledge allocation.
Davidsson (2015)	Theoretical analysis	Perspective of conceptual proposition	Individuals, creativity, and external drivers	Opportunity is a process formed by the interconnection of elements between performers and nonperformers.	Redefining entrepreneurial opportunities using external drivers, new ideas and confidence in opportunities explains the correlation between external conditions and subjective perception.
Chandra, Styles, and Wilkinson	Case-study	Creative set theory	The combination of opportunities	The combination of opportunities includes	Propose a new concept of opportunity combination for international

Author (year )	Research method	Theoretical perspective	Subject	Generation process	Contribution to the perspective of co-creation and interaction
(2015)				discovering, creating, prototyping, pruning and expanding the set of opportunities.	entrepreneurship that measures capacity, turnover rate, novelty, amplitude and geographical scope.
Kohlbacher, Herstatt, and Levsen (2015)	Multiple case studies	Market demand perspective	Internal organization and external stakeholders	Opportunities arise when existing solutions cannot meet market demand.	Opportunity identification and development not only rely on the internal thinking process of entrepreneurs but also depend on external trends and changes in the environment.
Best (2015)	Industry case study	Ecosystem theory	Regional ecosystem members	Entrepreneurial opportunities arise from the mutual adaptation of various participating entities.	Regional ecosystems provide a systematic process of opportunity creation and execution for industry innovation.
Alvarez, Young, and Woolley (2015)	Historical case study	Institutional and industry evolution	Industry standards and entrepreneurs	Entrepreneurs and industry standards jointly create opportunities.	Propose that the interaction between institutions and entrepreneurs creates entrepreneurial opportunities.
Sun and Im (2015)	Mathematical empirical analysis	Stakeholder theory	Loan institutions, their managers and employees, loan groups and governments	Opportunity is a collaborative process in which multiple stakeholders jointly define and solve social problems.	Using opportunity co-creation as a theoretical perspective, analyze the influencing factors of small loan interest rates by considering the joint effects of stakeholders on opportunities.
McKelvey, Zaring, and Ljungberg (2015)	Theoretical and case analysis	Evolutionary economics theory	Large or small businesses, universities and individuals	Innovation opportunities are an uncertain process involving individuals, organizations and the external environment.	The generation and selection pressure of novelty and diversity are the keys to generating innovation opportunities and the process of generating opportunities in research cooperation between large and small enterprises varies.
Overholm (2015)	Multiple case studies	Ecosystem theory	Between entrepreneurs	Entrepreneurs can jointly create opportunities or discover opportunities created by others.	Entrepreneurs in the industrial ecosystem jointly shape opportunities, and value is transmitted between them.
Peng (2019)	Theoretical and empirical analysis	Knowledge perspective	Industrial cluster and entrepreneurial system	The synergistic development relationship between industrial clusters and regional entrepreneurship systems is	Entrepreneurial knowledge spillover and knowledge collaboration effect are subject interaction and innovation promotion processes.

Author (year )	Research method	Theoretical perspective	Subject	Generation process	Contribution to the perspective of co-creation and interaction
				mainly reflected in the fact that industrial clusters promote the occurrence of knowledge spillover entrepreneurship systems and knowledge spill entrepreneurship promotes the improvement of industrial cluster performance.	
Xiang (2020)	Case study	Organizational learning theory	Industry and university	Integrating production and education will promote the two-way flow of resources and knowledge and produce a synergistic effect.	The flow of resources and knowledge promotes organizational learning resulting in new ideas from production-teaching collaboration.
Lun and Jizhen (2020)	Experience sampling method	Social identity theory	Entrepreneurial team	The characteristics of an entrepreneurial team's feedback tendencies promote the generation of synergies between entrepreneurial teams.	The characteristics of feedback tendency among entrepreneurial teams make entrepreneurial teams with a high degree of identification, broader scope and a higher degree of collaboration and are more likely to generate entrepreneurial opportunities
Wang (2023)	Mathematical empirical analysis	Entrepreneurial ecosystem theory	Innovation leader and follower	Leading companies are collaborating on vital technological breakthroughs and digital transformations.	The cooperation process between the innovation leader and follower is a dynamic evolutionary process with a synergistic effect under the strategies of both sides.

The main findings are as follows through comparative analysis: Although there is abundant research on entrepreneurial opportunities, there is very little research on the collaboration of entrepreneurial opportunities. There is not much exploration of the overall laws and characteristics of entrepreneurial opportunity collaboration. Existing studies have overly emphasized collaborative behavior between different types of subjects while neglecting the overall characteristics of collaboration among multiple subjects from the perspective of research content.

Firstly, there may be an overall law of interaction between entrepreneurs and stakeholders (Yao & Li, 2022) enabling enterprises and stakeholders to establish a strong relationship network and mutual community of destiny. The influence of co-creation between them on opportunity and innovation has not yet been explored. Grasping this law helps entrepreneurs identify or create more innovative entrepreneurial opportunities (Hao, 2021).

Secondly, there are differences in the collaborative behavior of entrepreneurial opportunities in terms of subjects and the interactive relationships in these collaborative processes which may have similar correlations. For example, the way, type and depth of interaction between the subjects of entrepreneurial opportunities as well as the follow-up performance of co-creation, etc. have not been appropriately explored (Mai, 2023). However, these studies have yet to explore as much as they should. Entrepreneurial opportunities undergo complex interactive behaviors and processes between entrepreneurs, organizations and the external environment from the perspective of the entrepreneurial ecosystem (Best, 2015; Overholm, 2015). According to Hongjia (2022), in terms of entrepreneurial entities, existing research on the synergistic interaction of entrepreneurial opportunities involves complex and diverse subjects ranging from small concepts to large scales from homogeneity to heterogeneity, including the constituent units of entrepreneurial opportunities, creative sets (Hill & Birkinshaw, 2010), combinations of opportunities (Chandra et al., 2015), interactions between entrepreneurs (Dutta & Crossan, 2005), complex interactions between different entities (McKelvey et al., 2015) and the interaction between entrepreneurs and institutions (Alvarez et al., 2015). In addition, the level and method of subject participation in the cooperative process of entrepreneurial prospects may potentially show possible patterns and traits. These findings require further study.

Research on the innovation of entrepreneurial opportunities can be sorted and summarized from two perspectives: static and dynamic. Scholars with a static perspective believe that entrepreneurial opportunities are a combination of potential or undiscovered resources or abilities that can promote new products or services and meet new market demands (Kirzner, 1997; Mark, 2006). These combinations include environmental factors or conditions conducive to obtaining market value through the formation of new products or service and they also include some ideas that entrepreneurs can market (Hongdong, 2021). The dynamic explanation of entrepreneurial opportunities suggests that entrepreneurial opportunities continuously integrate, adjust and optimize resources to generate new products or services and create new market value (Zhang, 2021). This viewpoint emphasizes that the formation of entrepreneurial opportunities is a dynamic adjustment process where resources, environment and capabilities constantly change and various entrepreneurial elements are constantly interacting and being created (Pengcheng & Fangming, 2009; Yu, 2021). Therefore, the analysis of opportunity innovation can be conducted from static and dynamic perspectives.

Opportunity innovation refers to a new combination of resources, capabilities, factors and conditions from a static perspective (Sun, 2022). Innovation in opportunities refers to a new combination of resources, capabilities, factors and conditions. The degree of innovation can be measured based on the market value brought by these new combinations. The greater the potential or actual market value generated in the later stage, the higher the degree of innovation in the opportunity. Innovation in opportunities not only includes new combinations of the content but also the interaction between various resources, elements and subject relationships in the process of generating new combinations, the interaction between various resources, elements and subject relationships from a dynamic perspective (Yao & Li, 2022) and even the latter's impact on the level of innovation is more critical. These scholars argue that resource factors and other conditions objectively exist but how to discover and continuously integrate them into opportunities that can generate market value depends on the interactive effects of various entities in the process of opportunity formation. However, how to find and continuously incubate and integrate into opportunities that can generate market value depends on the interaction effect of various subjects in the process of opportunity formation (Xu, 2022). In the interaction process, each participant's abilities, qualities,

experiences and beliefs have a decisive impact on the level of innovation in the final formed opportunities. Each participating entity's has different performances (contributions) in the interaction process form entrepreneurial opportunities with different levels of innovation and the resulting market value also varies under the same objective conditions (resource endowments, environmental factors, etc.). The reason why imitation (or replication) entrepreneurship lacks innovation or has a low level of innovation is precisely that the participating entities only integrate and use the same objective resources according to the old model and market them without reflecting the differences in abilities, experiences and other aspects of the entities. Therefore, such entrepreneurship often needs more motivation for sustainable development, obvious competitive advantages and a high probability of failure.

In a nutshell, the collaboration of entrepreneurial opportunities is an important determining factor for the success of entrepreneurship. Different synergistic behaviors and entrepreneurial opportunities may lead to different entrepreneurial outcomes. However, existing studies do not understand the impact of entrepreneurial opportunities especially the innovation of entrepreneurial opportunities. Opportunity innovation has typical characteristics and is of essential significance in understanding the differences in collaborative behavior of entrepreneurial opportunities (Bi & Zhang, 2012). However, existing research needs to pay attention to the innovative differences in entrepreneurial opportunities that restrict the understanding of collaborative behavior results. Furthermore, although various phenomena and research conclusions indicate a relationship between entrepreneurial opportunity collaboration behavior and opportunity innovation, what is the theoretical logic behind their interaction? Further research is needed on how collaborative entrepreneurial opportunity behavior affects opportunity innovation and the contingency factors constraining it.

### **3. RESEARCH ASSUMPTIONS AND THEORETICAL MODELS**

#### *3.1. Related Assumptions*

This article explores the relationship between entrepreneurial opportunity collaboration and opportunity innovation, deduces the theoretical mechanism and impact mechanism of the impact between the two and proposes relevant research hypotheses based on existing research.

##### *3.1.1. Collaboration of Entrepreneurial Opportunities and Innovation of Opportunities*

Innovative entrepreneurial opportunities have great practical significance and application value but entrepreneurial enterprises cannot predict their entrepreneurial outcomes when faced with highly uncertain environments and resource constraints. Innovative entrepreneurial opportunities are created by entrepreneurial behavior that creates new markets when both the means and purpose are unclear (Saravathy, 2003). Entrepreneurs must engage in interactive activities with stakeholders to achieve innovative entrepreneurial opportunities (Chen, 2021; Ma, 2022). Firstly, entrepreneurs need to use stakeholders' knowledge and experience to clarify the enterprise's action path to cope with the ambiguity brought by high uncertainty. Secondly, entrepreneurial enterprises often face a shortage of financial, human and network resources which requires stakeholders to provide corresponding resource support to ensure the implementation of entrepreneurial actions. Thirdly, creating new markets requires understanding the needs of stakeholders and obtaining their support for entrepreneurs' initial ideas. Fourthly, innovative entrepreneurial opportunities result from a creative process of continuously shaping and developing initial ideas which requires the participation of stakeholders in evaluating, optimizing and revising ideas to generate high-quality entrepreneurial opportunities. In addition, some studies have also revealed the potential relationship between co-creative interactive behavior and opportunity innovation to some extent. For example, Yang and Zhang (2007) argue that innovative entrepreneurial opportunities are more dependent on the entrepreneurs' broad range of interactions and high-quality contacts in their daily lives. Wang and Wei (2020) pay attention to the impact of entrepreneurs' ability on the interaction effect and believe that team human resources will ultimately affect the innovation of entrepreneurship by influencing entrepreneurial interaction. Hsieh and Kelley (2016) believe that cognitive level and information acquisition are crucial elements in identifying innovative entrepreneurial opportunities and co-creative interactive behavior is an effective way to enhance cognitive level and information acquisition. The first research hypothesis of this article is proposed as follows:

*H<sub>1</sub>: The collaboration of entrepreneurial opportunities positively impacts the innovation of opportunities.*

### 3.1.2. Collaboration of Entrepreneurial Opportunities and Resource Patchwork

Entrepreneurship research often considers opportunities and resources as two independent concepts studying the roles of opportunity discovery and resource development in the entrepreneurial process. [Yu, Li, and Tao \(2017\)](#) argues that cobblers do not view opportunities as subjective recognition or discovery, nor do they view resources as external entities independent of opportunities. Instead, they view discovering or creating opportunities and resource development as organic ([Li & Cheng, 2022](#)). This study suggests that opportunities can be understood as an integrated resource in the entrepreneurial process. According to the perspective of patchwork theory, on the one hand, the resources at hand for resource patchwork and utilization can be understood as the process of entrepreneurs identifying existing opportunities and more opportunities as much as possible are helpful for subsequent creative combination opportunities ([Cheng & Cheng, 2020](#)). Although the patchwork theory emphasizes the resources at hand rather than searching for them, it cannot deny the critical role of collaborative behavior in entrepreneurs' access to opportunities ([Duymedjian & Ruling, 2010](#)). On the other hand, resource patching requires examining the resources at hand from different perspectives and reconsidering their utilization, which is a "creative reengineering" behavior ([Perkmann & Spicer, 2014](#)). This behavior is essentially the process of recombining identified opportunities to generate new combinations of opportunities. Therefore, collaborative behaviors such as interaction, cooperation, sharing and communication among entrepreneurial entities can help entrepreneurs better assemble resources. The second research hypothesis of this article is as follows:

*H<sub>2</sub>: The collaborative use of entrepreneurial opportunities positively impacts resource patchwork.*

### 3.1.3. Resource Patchwork and Opportunity Innovation

Existing empirical research mainly examines the impact of resource patchwork on entrepreneurial performance ([Feng, 2020](#); [Zhu & Li, 2014](#)), technological innovation ([Senyard, Baker, Steffens, & Davidsson, 2014](#)), new product development ([Wu, Liu, & Zhang, 2017](#)) and business model innovation ([Guo, Su, & Ahlstrom, 2016](#)). The research methods have gradually shifted from qualitative research to quantitative research. For example, [Baker and Nelson \(2005\)](#) analyzed 29 case companies. He proposed that due to the heterogeneity of the abilities entrepreneurs possess, there are significant differences in the impact they bring to the enterprise through resource patchwork. Entrepreneurs with advantages in inspiration, resource integration, relationship network construction and attitude towards setbacks are more likely to bring new development opportunities to the enterprise through entrepreneurial pooling. The research results of [Garud and Karnøe's \(2003\)](#) support the view that resource patchwork positively impacts enterprise innovation ([Wei, 2022](#)). [Senyard, Baker, and Steffens \(2010\)](#) also reached a similar conclusion. When a company's resource base is limited during the startup phase, resource patchwork is an essential strategy to accomplish development. [Gundry, Kickul, Griffiths, and Bacq \(2011\)](#) also believe that resource patchwork significantly impacts the development of new products and markets and new startups' cost advantages. [Xifeng and Hai \(2018\)](#) mentioned the impact of resource patchwork on the innovation of entrepreneurial opportunities. On the one hand, resource patchwork can help enterprises integrate into resource scales and advantages greater than their limitations. On the other hand, it can promote new startups to discover innovative opportunities in the process of opportunity identification. Therefore, this article assumes that:

*H<sub>3</sub>: Resource patchwork has a positive impact on opportunity innovation.*

### 3.1.4. The Mediating Effect of Resource Patchwork

This article considers the mediating effect of resource patchwork when analyzing the impact of opportunity collaboration on innovation. Resource patchwork is beneficial for explaining the mechanism of opportunity recognition behavior in entrepreneurial action and has been widely applied to explore the process of generating entrepreneurial opportunities. [Zhenduo \(2015\)](#) explored the mediating effect of resource patchwork in the relationship between entrepreneurial orientation and new enterprise performance. Similarly, [Guo et al. \(2016\)](#) empirically tested the mediating effect of resource patchwork on the relationship between entrepreneurial orientation and business model innovation. The collaboration of entrepreneurial opportunities positively impacts entrepreneurial patchwork ([Li & Liu, 2021](#)). Resource patchwork requires entrepreneurs to use the resources at hand and the collaboration of entrepreneurial opportunities helps entrepreneurs obtain as many resources as possible for entrepreneurship ([Garud & Karnøe, 2003](#); [Stinchfield, Nelson, & Wood, 2013](#)). Resource patchwork is beneficial for improving the innovation of entrepreneurial opportunities through the experimental process of



acquiring, restructuring and reconstructing existing resources. Innovative entrepreneurial opportunities require entrepreneurs to exhibit creative behavior and resource patching is a form of "creative reengineering" behavior that involves rethinking the way resources are used (Baker & Nelson, 2005). Resource patchwork is essential for collaborative and interactive behavior to obtain innovative entrepreneurial opportunities. Entrepreneurial opportunity collaboration is the preparation for identifying entrepreneurial opportunities to acquire innovative opportunities. At the same time, resource patchwork is crucial in recombining entrepreneurial opportunities to achieve innovative opportunities (Chandra et al., 2015). Therefore, this article proposes the following research hypotheses:

*H4: Entrepreneurial patchwork has a mediating effect on the relationship between entrepreneurial opportunity collaboration and opportunity innovation and plays a positive role.*

### 3.2. Theoretical Model

Resource patchwork has a mediating effect on the relationship between entrepreneurial opportunity collaboration and opportunity innovation mainly due to the following three reasons: Firstly, the collaboration of entrepreneurial opportunities positively impacts resource patchwork. Resource patchwork requires entrepreneurs to use the resources at hand and the collaboration of entrepreneurial opportunities helps entrepreneurs obtain as many resources as possible for entrepreneurship (Garud & Karnøe, 2003; Stinchfield et al., 2013). Secondly, resource patchwork is beneficial for improving the innovation of entrepreneurial opportunities through the experimental process of manipulating, restructuring and reconstructing existing resources. Innovative entrepreneurial opportunities require entrepreneurs to exhibit creative behavior and resource patching is a form of "creative reengineering" behavior that involves rethinking the way resources are used (Baker & Nelson, 2005). Thirdly, resource patchwork is essential for collaborative and interactive behavior to obtain innovative entrepreneurial opportunities. As mentioned earlier, entrepreneurial opportunity collaboration is the process of identifying entrepreneurial opportunities to acquire innovative opportunities. At the same time, resource patchwork is crucial in recombining entrepreneurial opportunities to achieve innovative opportunities (Chandra et al., 2015). Figure 1 demonstrates how the cooperation of entrepreneurial opportunities influences the effectiveness and impact of resource patching which influences opportunity combination and identification and finally influences opportunity innovation.

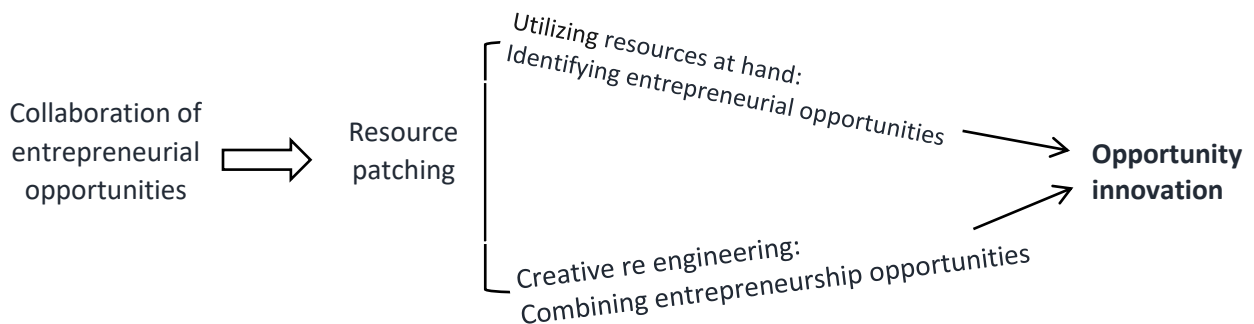


Figure 1. Theoretical model of the impact of entrepreneurial opportunity collaboration on opportunity innovation.

## 4. VARIABLE MEASUREMENT AND QUESTIONNAIRE DESIGN

### 4.1. Research Methods

This paper aims to identify the influence mechanism of entrepreneurial opportunity collaboration on opportunity innovation. The specific research method first identifies the measurement items of opportunity collaboration, opportunity innovation, resource patchwork and other variables based on the mature scale of existing studies and formulates the corresponding measurement scale. Secondly, the corresponding questionnaire structure and content were designed according to the contents of the questionnaire items. Then, a questionnaire survey was conducted in Beijing, Guangdong and Henan Providence, an important entrepreneurial activity area in central China with high entrepreneurial vitality and relatively concentrated new enterprises. The survey respondents were

297 new enterprises within eight years of establishment. According to the results of the analysis, the influence of opportunity collaboration on opportunity innovation is discussed.

The measurement of opportunistic collaboration was revised in this paper in contrast to previous studies into three aspects: repeated interaction behaviour, resource acquisition and integration through interaction behaviour and innovation effect achieved based on the connotation of opportunistic collaboration. The revised scale was developed using specific items that corresponded to the existing mature scale. The results of the measured data can better represent the variable of opportunity for collaboration.

#### 4.2. Variable Measurement

Opportunity collaboration: The existing research on the accuracy description scale of this variable has not yet been found. Although the measurement scale of collaboration in the entrepreneurial ecosystem and collaborative innovation theory have a specific reference value, the targeted description of entrepreneurial opportunity collaboration is not strong. Therefore, this article develops the scale based on the previous explanation of the connotation of opportunity coordination. Further pre-research was conducted to ensure rigor and scientificity after soliciting and revising opinions from experts in the field. Further modifications were made to form the final scale on opportunity coordination.

Opportunity Innovation is based on the reliability and validity of the measurement items. According to Samuelsson's (2004) approach, opportunity innovation measures the innovation of entrepreneurial opportunities in four dimensions: priority of R and D investment, degree of patent importance, uniqueness of products or services and level of competitive pressure.

Table 2. Scale of variable measurement.

Variable	Measurement items (Using the Likert level 5 scoring method)
Opportunity coordination	A1 and partners jointly diagnose the problems faced in their respective development and propose solutions.
	A2 has effective communication with partners.
	Mutual trust between A3 and partners.
	A4 : Sharing resource with stakeholders.
	Resource complementarity between A5 partners.
	A6 has obtained a large amount of resources through partners.
	Sharing risks among A7 partners.
	In cases of conflicts between A8 partners, friendly negotiations shall be conducted to resolve them.
	A9 resources obtained from partners promote enterprise development.
Opportunity innovation	B1 company invests most of its funds in research and development activities.
	B2 actively applies for patents, trademarks or property protection.
	B3 enterprises provide unique products or services.
	B3 enterprises provide unique products or services.
Resource patching	When facing new challenges, C1 is confident in using the enterprise's existing resources to find feasible solutions.
	C2 can use existing resources to address more challenges compared to other enterprises.
	C3 makes good use of existing resources to address new problems or opportunities in entrepreneurship.
	C4 addresses new challenges by integrating the enterprise's existing and affordable resources.
	When facing new problems or opportunities, assume that feasible solutions can be found and action taken.
	C6 can successfully address any new challenges by integrating existing enterprise resources.
	C7 combines existing enterprise resources into feasible solutions when facing new challenges.
	C8 successfully addresses new challenges by integrating resources not initially intended for this program.

Resource patching refers to mediators. Senyard, Baker, and Davidsson (2009) developed a resource piecing scale that has been widely adopted since then Wu et al. (2017), Zhenduo (2015) and Zhu and Li (2014). This article intends to continue using this scale. The scale consists of eight items: ① When facing new challenges have confidence in using the existing resources of the enterprise to find feasible solutions as shown in Table 2.

Selection and measurement of control variables. Existing research has shown that some factors that reflect the characteristics of entrepreneurs, business characteristics and industry and regional characteristics can have an impact on the innovative development of enterprises (Li et al., 2020; Ye, 2017). This article refers to the approach of existing literature (Chen & Wang, 2012; Cheng & Cheng, 2020; Lu, 2017), selecting enterprise age, enterprise size, entrepreneurial experience, education level and industry nature as the control variables to improve the accuracy of research. The age of the enterprise is measured by the years of registration of the enterprise. The size of the enterprise is represented by the number of employees owned by the enterprise. Entrepreneurial experience is a dummy variable with entrepreneurial experience marked as 1 and 0 indicating no entrepreneurial experience. Education levels ranging from 1 to 4 indicate high school or below, associate's degree, undergraduate degree, master's degree or above respectively. The nature of enterprises can be divided into state or collective ownership, private enterprises, sino foreign joint ventures wholly foreign-owned enterprises and others.

#### 4.3. Questionnaire Design

The survey questionnaire in this article mainly includes three parts:

Firstly, it is about outlining the questionnaire and providing the respondents with a brief explanation of the purpose and confidentiality of the data as well as the researcher's background, goals and problems that require collaboration. The second part is the basic information about the interviewee and the interviewed unit including the interviewee's age, position, gender, work experience, entrepreneurial experience, size, nature and registration period. The third part is the question items corresponding to variable opportunity collaboration, opportunity innovation and resource patching. The corresponding options of the question items are measured using the Likert 5-level scale with values 1 to 5 indicating an increasing degree.

Experts were invited to make modifications during its initial formation followed by a small-scale preliminary test and finally officially distributed to all respondents from the surveyed enterprises to ensure the rigor and scientificity of the questionnaire.

This paper obtains the relevant data information required for the research through the questionnaire survey method. The main research subjects are technology-based enterprises established within eight years based on the definition of new startups in existing research and the needs of this paper. The research areas selected include Beijing and Guangdong which have a high entrepreneurial vitality index and Henan which has substantial data availability. The survey first communicated with enterprises that meet the survey requirements through the Henan Provincial Department of Science and Technology and the Henan Provincial Small and Medium-sized Enterprise Service Bureau. A formal survey was conducted after obtaining the consent of the surveyed enterprises. The research methods were mainly online and transmitted to the respondents through links, QR codes, QQ, email, WeChat and other means such as questionnaire stars due to the pandemic's impact. In the end, 178 questionnaires were distributed in the Henan region with 162 recovered and 148 valid questionnaires for an effective rate of 83.14%. A total of 63 questionnaires were distributed in the Beijing area of which 31 were collected and 29 were valid for an effective rate of 46.03%. A total of 56 questionnaires were distributed in Guangdong of which 38 were collected. Among them, 30 were valid with an effective rate of 53.57%. A total of 297 questionnaires were distributed during the entire survey of which 231 were collected and 207 were valid. The effective rate of the questionnaire was 69.70%.

#### 4.4. Reliability and Validity Test

It is necessary to conduct a reliability test on the questionnaire in order to test the reliability, consistency and stability of the questionnaire. Currently, scholars generally use Cronbach's alpha. The coefficient serves as the inspection standard. The coefficient value between 0.7 and 0.8 indicates that the questionnaire is reliable and acceptable. When the coefficient value ranges from 0.8 to 0.9, it indicates that the questionnaire's reliability is very high. When the coefficient value is above 0.9, it indicates that the questionnaire reliability is highly reliable. The stability and consistency within the scale are very high.

The test results are shown in Table 3 which shows Cronbach's opportunistic collaboration alpha of 0.904 and innovative opportunities alpha of 0.891. Cronbach's resource patching alpha is 0.874 and the coefficients of all variables are more significant than 0.8. The coefficient of opportunity for collaboration is greater than 0.9 indicating that the scale is reliable and has high internal stability and consistency. This article conducted a validity

test on the questionnaire used through exploratory factor analysis in order to test the effectiveness and accuracy of the questionnaire design and the rationality of the item design in the measurement questionnaire. Researchers generally believe that when the factor load is more significant than 0.4, the cumulative explanatory variance of each variable is greater than 50%. The AVE (Average Variance Extracted) value of the average variance extraction of the variable is greater than 0.5. The CR (Composite Reliability) value of the combined reliability is greater than 0.7 and the scale's validity is higher.

It can be seen that the factor load of the opportunity collaboration items is between 0.701 and 0.902 with an AVE value of 0.649 from the test results of factor analysis in Table 3. The CR value is 0.977. The factor load of opportunity innovation is between 0.756 and 0.809 with AVE values of 0.708 and CR values of 0.886. The factor load for resource patching ranges from 0.721 to 0.891 with an AVE value of 0.603 and a CR value of 0.899. The AVE value of each variable is above 0.6 which is greater than the critical value requirement of 0.5. The CR value of each variable is above 0.8 greater than the critical value requirement of 0.7 and the cumulative explanatory variance of each variable is above 60% greater than 50% of the test standard. This indicates that the scale has good validity, the validity and accuracy of the questionnaire design are good and the item design in the measurement questionnaire is relatively reasonable (see Table 3).

Reliability and validity testing of the scale is shown in Table 3.

**Table 3.** Reliability and validity test.

Variable	Measurement indicators	Factor loading	Cronbach'S A	Ave	Cr	Cumulative variance
Opportunity collaboration	A1	0.901	0.904	0.649	0.977	66.89%
	A2	0.809				
	A3	0.798				
	A4	0.764				
	A5	0.701				
	A6	0.899				
	A7	0.902				
	A8	0.799				
	A9	0.867				
Opportunity innovation	B1	0.807	0.891	0.708	0.886	67.05%
	B2	0.756				
	B3	0.786				
	B4	0.809				
Resource patching	C1	0.763	0.874	0.603	0.899	65.30%
	C2	0.721				
	C3	0.801				
	C4	0.824				
	C5	0.731				
	C6	0.891				
	C7	0.754				
	C8	0.828				
	E2	0.821				
	E3	0.712				
	E4	0.708				
E5	0.752					

#### 4.5. Empirical Analysis

This section conducts descriptive statistics and analysis on 207 valid questionnaires divided into basic information statistics and analysis of entrepreneurs and basic information statistics and analysis of surveyed enterprises (see Table 4).

**Table 4.** Descriptive statistical analysis of variables.

Content	Category	Frequency	Percentage (%)	Cumulative percentage
Entrepreneurial gender	Male	127	61.35	61.35
	Female	80	38.65	100
Entrepreneurial age	18-30	63	30.43	30.43
	31-40	84	40.58	71.01
	41-50	43	20.77	91.78
	51 and above	17	8.21	100
The education level of entrepreneurs	High school or below	56	27.05	27.05
	Junior college	87	42.02	69.07
	Undergraduate course	49	23.67	92.74
	Master's degree or above	15	7.25	100
Entrepreneurial experience	Exist	136	65.70	65.70
	Absent	71	34.30	100
Enterprise nature	State or collective ownership	87	42.03	42.03
	Private enterprise	79	38.16	80.19
	Sino-foreign joint venture	28	13.53	93.72
	Wholly foreign-owned enterprise	7	3.38	97.10
	Else	6	2.90	100
Enterprise size	Less than 20 people	117	56.52	56.52
	21-100 people	57	27.54	84.06
	101-200 people	21	10.14	94.2
	201-500 people	7	3.38	97.58
	501 people and above	5	2.42	100
Registration period	Less than two years (Excluding two years)	77	37.20	37.20
	2-4 years (Excluding four years)	68	32.85	70.15
	4-6 years (Excluding six years)	43	20.77	90.82
	6-8 years (Including eight years)	19	9.18	100

It can be seen that in the valid questionnaire, the proportion of male entrepreneurs is higher than that of female entrepreneurs. Entrepreneurs aged 31 to 40 are the most common with a cumulative entrepreneurship rate of 71% before age 40. There are not many entrepreneurs aged 50 or above indicating that their entrepreneurial willingness and passion are not high after age 50. Nearly 70% of entrepreneurs have an education level of college or below. 92% have accumulated a bachelor's degree or below and only 7.25% have started a business with a master's degree or above because there are more job opportunities as their education level increases and they are more likely to find satisfactory jobs resulting in lower entrepreneurial willingness. In terms of entrepreneurial experience, out of 207 valid questionnaires, 65.70% of entrepreneurs had entrepreneurial experience while 34.30% had no entrepreneurial experience.

Table 5. Correlation coefficients between variables.

Variable	Opportunity collaboration	Opportunity innovation	Entrepreneurial patchwork	Enterprise age	Enterprise size	Entrepreneurial experience	The education level of entrepreneurs	Industry nature
Opportunity collaboration	1							
Opportunity innovation	0.641	1						
Entrepreneurial patchwork	0.532	0.601	1					
Enterprise age	0.189**	-0.03	0.190	1				
Enterprise size	0.009	-0.009	0.108	0.342**	1			
Entrepreneurial experience	0.031	0.150*	0.392	0.084	0.171	1		
The education level of entrepreneurs	0.054*	0.290	0.201	0.001	0.219	0.162	1	
Industry nature	-0.009	-0.153	-0.067	0.201	-0.235**	-0.160**	-0.021	1

Note: \* Indicates P<0.05, \*\*indicates P<0.01.

Among the surveyed enterprises, 42.03% belong to state-owned or collectively-owned enterprises. In contrast, the proportion of Sino foreign joint ventures and wholly foreign-owned enterprises is relatively small accounting for 16.9%. This may be related to the fact that the research conducted in this article was introduced through government departments ( the Henan Provincial Department of Science and Technology and the Small and Medium-sized Enterprise Service Bureau). In the valid questionnaire, more than half (56.52%) of enterprises have 20 or fewer employees in the start-up enterprise category. Not many enterprises have over 200 employees accounting for only 5.8%. 90.8% of enterprises have a registration period of less than four years, most of which belong to those with a registration period of less than two years or less. It can be seen that the proportion of newly established enterprises is relatively high which is consistent with the analysis of enterprise size.

#### 4.5.1. Correlation Analysis

Table 5 shows the results of analysis of the correlation between various variables. There is a significant correlation between the main variables which is consistent with the theoretical hypothesis of this article as indicated by the correlation coefficients between each variable. The specific results can be seen in the table below.

#### 4.5.2. Regression Analysis and Hypothesis Testing

This section will empirically analyze the impact of entrepreneurial opportunity collaboration on opportunity innovation and the mediating effect of resource patchwork. The following models will be used:

$$IEO = \alpha + \beta_1 EOC + ControlVariables + \varepsilon \quad (Model\ 1)$$

$$Mediators = \alpha + \beta_2 EOC + ControlVariables + \varepsilon \quad (Model\ 2)$$

$$IEO = \alpha + \beta_3 EOC + \beta_4 Mediators + ControlVariables + \varepsilon \quad (Model\ 3)$$

Conduct empirical analysis where REO represents opportunity innovation, EOC represents entrepreneurial opportunity coordination, mediators represent resource patching and control variables include characteristic variables such as enterprise age and size. The analysis results are shown in Table 6.

Model 1 is the fundamental model between the control variable, opportunity collaboration and opportunity innovation. The results show a significant positive correlation between opportunity collaboration and innovation ( $\beta_1 = 0.597$ ,  $P < 0.1$ ,  $\Delta R^2 = 0.785$ ) consistent with the research hypothesis proposed in this article. Existing studies have only revealed the potential relationship between entrepreneurial collaboration and opportunity innovation to a certain extent (Hsieh & Kelley, 2016; Yang & Zhang, 2008). The analysis results of this paper further affirm the positive influence relationship between the two.

Introduce resource patchwork as a mediator variable in the model. Model 2 is the relationship model between opportunity collaboration and resource patching. Model 3 results from the impact of resource patching, opportunity collaboration and control variables on opportunity innovation. From the results, it can be seen that in model 2, there is a significant positive correlation between opportunity collaboration and resource patching ( $\beta_2 = 0.409$ ,  $\Delta R^2 = 0.587$ ). In model 3, there is a positive correlation between opportunity collaboration and opportunity innovation. There is also a positive correlation between resource patching and opportunity innovation ( $\beta_4 = 0.643$ ,  $\beta_3 = 0.286$ ). This illustrates that after adding the intermediary variable resource patching, opportunity collaboration still significantly impacts opportunity innovation but its significance is lower than the impact level in Model 1. Therefore, the hypothesis of this article that "entrepreneurial patchwork has a mediating effect in the relationship between entrepreneurial opportunity collaboration and opportunity innovation plays a positive role" is supported. The conclusions of this paper are a supplement to the research content in comparison to earlier studies. The impact of these resource patchwork behaviours on entrepreneurial activities has been discussed in previous studies but not from the perspective of entrepreneurial opportunity collaboration which is the focus of this study.

**Table 6.** Regression analysis results of the model.

Dependent variable	Opportunity innovation		Resource patchwork
	Model 1	Model 3	Model 2
Independent variable			
Opportunity coordination (EOC)	0.597*	0.286**	0.409
Resource patching (Mediators )		0.643**	
Control variables			
Age of the enterprise	0.040	0.021	0.021
Size of the enterprise	0.105	0.209	0.008
Entrepreneur experience	0.201	0.177	0.106
The education level of the entrepreneur	0.301	0.276	0.007
Nature of the industry	-0.013	-0.016	-0.029
R <sup>2</sup>	0.761	0.884	0.602
AdjustedR <sup>2</sup>	0.751	0.881	0.587
ΔR <sup>2</sup>	0.785	0.869	0.587
F-number	200.209*	398.824**	92.084

Note: \*indicates P<0.1 and \*\*indicates P<0.05.

## 5. RESEARCH CONCLUSION AND PROSPECTS

### 5.1. Conclusions

This article first provides a theoretical analysis, summary and induction of the relationship and mechanism between opportunity collaboration and innovation. Then, it further explores the mediating role of resource patching from a theoretical perspective and the impact mechanism of entrepreneurial opportunity collaboration on opportunity innovation from the perspective of theoretical logic and the mediating process. Finally, this article's theoretical derivation results and research hypotheses were verified through empirical analysis. The research results indicate that collaboration significantly impacts opportunity and innovation which continue to strengthen with increased coordination. Resource patching has a mediating effect on the relationship between opportunity collaboration and opportunity innovation.

### 5.2. Research Limitations and Future Suggestions

This article explores the impact of opportunity collaboration on innovation through resource patchwork providing a systematic theoretical framework and impact mechanism model for generating innovative opportunities, key entry points and new solutions for generating innovative entrepreneurial opportunities. In the future, further in-depth research will be conducted on the generation mechanism of innovative opportunities, the evolutionary path of interaction and collaboration between entrepreneurial entities, the process and results of resource patching, and the relationship between opportunity innovation.

However, the research objects of this paper are only Beijing, Guangdong, and Henan, and the data information is limited to some extent due to the differences in data availability and statistical caliber. The conclusions are representative but the acquisition is not of universal significance. In addition, since there is no mature theory for defining and measuring entrepreneurial opportunities, this paper measures entrepreneurial opportunities from the perspective of interaction and the source. This method still needs more research to verify whether there are any shortcomings which is also a limitation of this paper. In the future, the scope of data acquisition will be expanded based on existing research.

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### INSTITUTIONAL REVIEW BOARD STATEMENT

The Ethical Committee of the International College, Krirk University, Thailand has granted approval for this study (Ref. No. 2024A1502).



## TRANSPARENCY

The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.

## COMPETING INTERESTS

The author declares that there are no conflicts of interests regarding the publication of this paper.

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