A Novel Business Model Innovation Method for Tobacco Industry: from the Perspective of Innovative Genetics

Peng Liu, Lecturer
Yongzheng Wang, PhD. Student
Mi Zou, Lecturer
Ke Zhang, PhD. Student
Jinfeng Wang, Professor
Lijie Feng, Professor

Peng Liu, Lecturer in Industry-university-research innovation and Business model innovation, Deparment of Management Engineering, Zhengzhou University; Henan Engineering Research Center of Innovation Method. Yongzheng Wang, PhD. Student in Technological innovation and Entrepreneurial management, Deparment of Management, Jilin University. Mi Zou, Lecturer in Industry-university-research innovation and Business model innovation, Deparment of Teacher Education Nanyang Institute of Technology. Ke Zhang, PhD. Student in Business model innovation, Deparment of Management Engineering, Zhengzhou University; Henan Engineering Research Center of Innovation Method. Jinfeng Wang, Professor in Technological innovation, Deparment of Management Engineering, Zhengzhou University; Henan Engineering Research Center of Innovation Method; Free Trade Zone Supply Chain Reaearch Institute, Shanghai Maritime University. Lijie Feng, Professor in Technological innovation, Deparment of Management Engineering, Zhengzhou University; Henan Engineering Research Center of Innovation Method; Free Trade Zone Supply Chain Reaearch Institute, Shanghai Maritime University. Correspondence author: Peng Liu; liupeng@zzu.edu.cn; Yongzheng Wang; yongzheng20@jlu.edu.cn; Mi Zou; zouminyist@163.com

Abstract: The existing concept of business model innovation is not clear yet, and a feasible research model have not been established. The research of business model innovation is urgently needs methodological breakthrough. Therefore, this article introduced the theory of innovative genetics into the exploration of business model innovation. And this article carried out a more in-depth analysis of the business model innovative genetics in the tobacco industry through the methodology of multi-case exploratory research. As a result, a set of applicable tobacco industry business model innovation solutions were explored. It shows that the innovative genetic method of the business model is novel, highly visible and operability, and can provides new ideas for the tobacco industry's business model innovation.

INTRODUCTION

Traditional strategic theory acknowledges that Technological innovation is a key factor. With the advent of digital economy, Internet, artificial intelligence and big data Technological have been widely applied. Business model innovation has increasingly become a critical element in promoting enterprise economic development. In reality, many start-up enterprises have achieved leap-

forward development by using business model innovation under high resource constraints and environmental dynamics. Some of them even subvert the original pattern of industrial competition. Much attention has been paid to business model innovation in practical activities, but academic studies on this subject are relatively less. Nicolai [1] found that in recent years, although the literature on business model innovation has grown rapidly, the definition of business model innovation in academia is still not clear and a

feasible research model has not been established. As a critical element that determines the survival and development of enterprises, business model innovation is currently inefficient. The important means for start-up enterprises to accelerate transformation and upgrading and achieve rapid catch-up is to apply business model innovation to enhance their value creation ability [2]. Therefore, the research on business model innovation urgently needs to improve methods.

The existing research on business model innovation still has the following limitations. Firstly, the essence of business model innovation is to optimize the system of enterprise value creation activities to form resource advantages. Most of the existing research mainly focus on the three aspects of the content, elements and conditions and forms of business model innovation, but ignores the research on innovation methods. The innovative method of business model is regarded as a relatively broad concept and the academia has not reached a consensus on the definition of this concept. It is generally concluded that the innovation method of business model is a summary of the rules of business model innovation activities and successful experience, and is also a general term for business model scientific thinking, methods and tools. The sources of business model innovation methods can be divided into the following two aspects. The one is the application of classical management tools, such as SWOT analysis, SCP model. The other one is the application of some existing innovation methods, such as TRIZ, USIT. Since the tools and methods in these two aspects promote business model innovation, this paper regards them as the research content of business model innovation methods. Secondly, many scholars consider that business model innovation process is quite abstract and difficult to understand. Therefore, the research on business model innovation methods remains in the phase of framework construction.

Business model innovation has become a critical research direction that needs to be explored urgently in academia and practice. Technological innovation is an important factor to promote business model innovation, and innovative genetics is a kind of Technological innovation method suitable for multiple fields. The essence of innovative genetics is that innovation in different fields is the product of the interaction between

innovation factors and innovation environment [3]. Therefore, this paper applies the idea of innovation genetics to business model innovation. Based on this, this paper takes the tobacco industry as an empirical study and introduces the theory of innovative genetics based on the systematic review of relevant literature and theoretical analysis. excavates the general laws of business model innovative genetics, and aims to explore the business that is applicable to the tobacco industry to solve this problem of separation between theory and practice.

RELATED THEORIES AND LITERATURE REVIEW

Business Model Innovation

The term "business model" first appeared in the 1950s, but it was not until the gradual rise of Internet technology and e-commerce in the 1990s that it received widespread attention from academia and practice circles. Therefore, there is no consistency on the definition of business model so far. Scholars also have the same problem in the understanding of business model innovation because of the ambiguity of the concept of it. The existing research mainly focuses on three aspects: the innovative content of business model, the driving factors of innovation and the evolution of innovative forms.

(1) The research on the innovative content of the business model mainly considers which elements should be innovated. Spieth[4] pointed out that the focus of business model innovation is to identify the basic elements of the value chain and their interaction methods by conducting research on 200 companies in Germany based on the perspective of value chain; Huaring[5] pointed out that the business model innovation model should include two aspects of concept and finance. The conceptual model is composed of four elements: innovation content, market positioning, value source and resource integration. The financial model includes cost, revenue and profit.

(2) The research on the driving factors of business model innovation mainly includes two contexts: External driving factors and Internal driving factors. The external driving factors include technological innovation, market demand, industry competition pressure, etc. [6-7] And the internal driving factors include entrepreneurs'

cognition, corporate resources and capabilities, corporate organization and business activities, etc. [8-9].

(3) The research on the evolution of business model innovation forms mainly focuses on organizational learning, strategy and other different perspectives. Sosna[10] conducts research from the perspective of organizational learning, she believes that business model innovation has successively experienced four stages: initial design, model development, reconstruction and commissioning, and continued corporate growth.

In summary, business model innovation is based on the demands of target customer groups and market demand as the value proposition. All stakeholders embeded their core capabilities or resources into the value network, and design a reasonable cost structure and profit model. Realize value co-creation and sharing by designing a reasonable cost structure and profit model as well as its own technological iteration.

Innovation Genetics

Feng 3 pointed out that innovation is a kind of behavior that can reconstruct functions, structures, and even mechanisms in a specific environment and obtain social and economic benefits. It is related to the gene function expression and structural reorganization involved in the formation of life. The formation processes of other biological entities have great similarities, and these are the collection, pretreatment and processing processes of information or energy. Therefore, Feng merged innovation theory and bio-genomics theory to construct a theoretical model of innovation genetics, and provided specific innovative ideas and methods for technological innovation. The theory of innovative genetics mainly includes three concepts: innovative genetics, innovative chromosomes, and innovative rules, as shown in Figure 1.
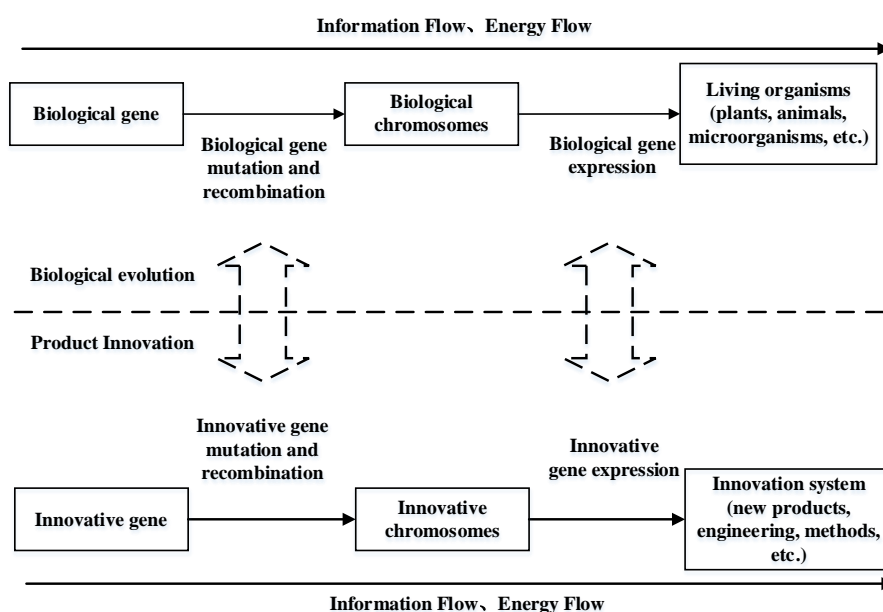

Figure 1 An analogy diagram of the innovation process and the formation process of life

(1) As the direct carrier of regulation in the innovation process, innovation genes exist in every link in the product or technological innovation process, control the most subdivided parts of the innovation process, and determine the structure, materials, and functions of the innovation product. In the innovative genetics theory, the 38 engineering parameters in the TRIZ theory are clustered and analyzed, and combined with materials, chemical engineering, new energy and other technologies and technological innovation elements involved in multiple fields, the space and environment are condensed and summarized, Structure, function, mechanism, material, power system, timing, human-machine relationship nine genes.

(2) Innovative chromosome: the innovative gene that has a strong correlation with the system to be

innovated is screened out, and then the innovative gene undergoes mutation or recombination to form an innovative chromosome.

(3) The law of innovation: the law of innovation refers to the method used to process the innovation gene in the process of innovation. Innovative genetics is a cluster analysis of 40 invention principles and 76 standard solutions of TRIZ theory, combined with SIT, USIT, checklist, morphology matrix, and in-depth innovation results, invention patents and industry experience in various fields. After digging and analyzing, 9 kinds of innovation rules were formed, which are decomposition and removal, partial optimization, combination and integration, substitution, dynamics, self-service, friendliness, flexibility and intelligence.

In conclusion, the innovation gene is the innovation element in the system to be innovated, and the innovation law is the innovation mechanism in the system. The complete innovation system is composed of innovation elements and innovation mechanisms. That is, the optimization of the target system should focus on exploring the interaction between innovation genes and innovation laws.

Literature Review

In view of the fact that the extension of technological innovation often means changes in business models, and business model innovation will also drive the development of technological innovation. The two are mutually causal and jointly build a complete enterprise innovation system. Based on this, this article believes that the core ideas of innovative genetics theory can be applied to business model innovation, that is, the innovative genes of the business model can be classified and screened out according to the innovation rules of the business model that are strongly related to the system to be innovated, and then form the innovative chromosome of the business model.

In view of this, the paper is based on previous studies, with the help of related theories and case analysis methods, while enriching and perfecting the existing related theoretical systems, and at the same time discovering the general laws of business model innovation genetics, aiming to explore a set of business model innovation methods

applicable to the tobacco industry, and provide universality for the specific development of business models Theoretical support and decision-making guidance.

RESEARCH DESIGN

Research Methodology

This paper adopts exploratory multi-case studies to reveal the general laws and internal mechanisms of business model innovation in the tobacco industry. The research methods mainly include the following three aspects: firstly, the case studies, which widely used in social science research[11], constructed new theories or improved existing theories by using a series of standardized and scientific analysis based on the basis of management practice in specific scenarios[12]. Because of this article aims to unearth the innovative genes and innovation rules of the business model, so as to form an innovative chromosome to reveal the general laws and internal mechanisms of business model innovation in the tobacco industry. This case study method is suitable for solving such problems of "how". Secondly, there are few related studies, which shows that this issue is still a new issue that needs to be further explored. Therefore, the exploratory case is suitable for the current research situation with weak theoretical foundation [13]. Thirdly, compared with a single case study, multiple case studies are more helpful to enhancing the internal and external validity and reliability of the research, and conducting multiple case studies makes it easier to fully explore the internal mechanism behind the business model innovation phenomenon, thereby helping to improve the universality and objectivity of research conclusions 12.

Case Selection

After many in-depth discussions by the team, this article selects Henan Tobacco Industry Enterprise (China), Henan Tobacco Enterprise, and X Tobacco Commercial Enterprise based on theoretical sampling principles as the research objects of this article. The reasons are as follows:

(1) Case extensiveness: in order to further understand the general laws and internal mechanisms of business model innovation, the

basis for multi-case selection based on theory should include repeatability, theoretical expansion, etc. [14].

(2) Corporate representativeness: Henan Tobacco Industry Enterprise (China), Henan Tobacco Enterprise, and X Tobacco Commercial Enterprise are three companies as this research case. Because Henan Tobacco Industry Enterprise (China) is mainly engaged in cigarette production, that is, responsible for tobacco production. It is a production-oriented enterprise, and it is very representative of the research on the cost structure, organizational form and income-generating mechanism of the tobacco industry. Henan Tobacco Company is mainly responsible for tobacco monopoly, tobacco planting and purchasing, and cigarette sales. The tobacco industry chain from production to sales is very representative of the research on production, sales, and market opportunities in the business model of the tobacco industry. X Tobacco Business Enterprise is responsible for tobacco sales, but its business is not limited to the tobacco business, and it is very representative of the research on the customer needs of the business model of the tobacco industry and the income-generating mechanism.

Data Collection and Processing

In view of the fact that this case study aims to fully explore the internal mechanism behind the business model innovation phenomenon, which inevitably involves the extraction and induction of key influencing factors. Second-hand data refers to data derived from investigations and scientific experiments by others (commercial and government agencies, marketing research companies, computer databases, etc.), including documents, archive records and physical evidence, which are more conducive to restoring the development process of the enterprise, and can be more objective and accurate the description of the entire business model innovation process [15]. Therefore, the data source of this article are mainly public second-hand data, as shown in Table 1. In order to maintain the reliability and validity of the research, firstly, collect data from the official website of the company, the company's annual report, media reports, and published dissertations and journal documents in cnki.net, Baidu Academics, and Google Academics, etc., and source data from multiple sources. It can effectively promote the triangular verification and improve the validity of the case study of this article[16]; secondly, this paper divides the researchers into two groups. The members of the two groups simultaneously verify and supplement the collected data from different sources for the same phenomenon to ensure the authenticity of the data; then, a flexible coding principle was adopted, comprehensive use of multiple coding techniques such as event-by-event, paragraph-by-paragraph, sentence-by-sentence, and line-by-line. This paper circulates between data, existing theories, and emerging constructs to obtain the interrelationship between different constructs and a higher "theoretical saturation" [17]; Finally, if there is an inconsistency in the coding results within the group, the group should discuss and modify it, and after many iterations and corrections, until an agreement is reached, the mutual relationship between the final constructs is obtained.

	Table 1 Case and Data Overview		
Company Name	**Henan Tobacco Industry Enterprise (China)**	**Henan Provincial Tobacco Enterprise**	**Tobacco Commercial Enterprise**
Founded time	2003	1983	2012
Main business	Cigarette production	Tobacco Monopoly、 Planting and purchasing	Tobacco Monopoly
File information	Development history（8）	Development history（6）	Development history（4）
Second-hand	Company annual report（17） literature（40）	Company annual report（27） literature（38）	Company annual report（27） literature（5）
Information	Media reports（12） Interview（2）	Media reports（16） Interview（3）	Media reports（3） Interview（5）

CASE STUDY

This paper will carry out exploratory research with the general logic of innovation genetics, including three stages: business model innovation gene extraction, business model innovation rule determination, and business model innovation chromosome formation.

Extraction of Business Model Innovation Genes

First of all, this research analyzes three representative cases, and intends to extract relevant information about its business model innovation genes from the code. After in-depth analysis, it was discovered that the business model innovation genes can be divided into content genes, structural genes, and governance genes.

Among them, the content genes focus on the value attributes created by the business model and the value-related activity attributes. The innovation of business model content can start from the three sub-genes of market opportunities, customer needs, and value activities. Structural genes are concerned with changes in the attributes of trading partners, interaction methods, internal organizational forms, and rules and regulations in the business model value creation, and it includes seven sub-genes such as partners, competitors, channel paths, organizational forms, rules and regulations, business systems, and revenue-generating mechanisms. The governance gene emphasizes the transaction mechanism between partners in value creation, including three sub-genes: transaction methods, transaction contents, and transaction processes, as shown in Table 2.

Table 2
Examples of Innovative Gene Coding

Third level coding	Second level coding	First level coding (Typical construct/Examples of evidence)
Content genes	Market opportunities	In recent years, the national tobacco control policy have gradually tightened. And electronic cigarettes are less harmful and have a changeable taste, which caters to the needs of the market. Therefore, a new development opportunity is ushered in.
	Customer demand	For cigarettes, the most important thing is the experience and taste of smoking.
	Value activity	The value activities of cigarettes include research and development, production, sales, transportation, etc.
Structural genes	Partners	Tobacco companies establish strategic cooperation with Tobacco Monopoly Bureau, Industrial Bank, Kingdee Software and other companies.
	Competitors	The Tobacco Bureau wholesales cigarettes to a large number of individual retailers or tobacco commercial enterprises, and then buys them into the hands of consumers. There is also a competitive relationship between retailers.
	Channel paths	When formulating brand marketing strategies, large shopping malls, chain supermarkets and special places can be used as the key cultivation objects for upscale and high-end brands
	Organizational form	The tobacco company has institutes such as research institutes, sub-stations of the bureau, training colleges, and Nanxian.
	Rule and regulations	Tobacco companies have strict job responsibilities for all types of employees, and internal reward and punishment systems.
	Business system	The business system of tobacco companies can be divided into cigarette marketing systems, integrated logistics management and control

		platforms, audit management information systems, business terminal assessment systems, etc.
	Revenue-generating mechanisms	China's tobacco industry relies heavily on imported tobacco products. Thanks to the tobacco monopoly system, the export of tobacco products is still picking up despite the weak demand for tobacco products in the international market, increased production costs, and rising freight rates.
	Transaction methods	Tobacco can be purchased through offline physical stores and online.
	Transaction contents	Cigarettes can be divided into categories such as cigarettes and electronic cigarettes.
Governance genes	Transaction processes	Tobacco is produced by cigarette factories in various places. Tobacco factories can only sell finished products to monopoly bureaus, and then the monopoly bureaus sell them to wholesalers, thus forming a huge production and sales network.

Determination of business Model Innovation Rules

Secondly, through the analysis of five cases, this study intends to extract the relevant information of the business model innovation rules from the codes, as illustrated in Table 3. Specially, the innovation algorithm refers to the basic algorithm of innovation problem. After the case analysis, nine principles are extracted: decomposition and removal, local optimization, combination and integration, substitution, dynamic, self-service, friendly, flexibility and intelligence. The detailed definition of innovation rules is shown in Table 4.

Table 3
The Examples of Innovation Rules Codes

Three-level coding	Secondary coding	Primary coding (Typical constructs/examples)
	Demand breakdown	Divided into three types of products: high-end, mid-range and bottom-end products.
	Business breakdown	Divided into heating non-combustion cigarettes and steam electronic cigarettes.
	Process breakdown	The manufacturing process of cigarettes can be divided into three main processes: silk making (raw material processing), crimping (roll forming), and packaging (packaged finished products).
Decomposition and removal	Value activity decomposition	The value activities of tobacco can be divided into four links: research and development, production, transportation, and sales.
	Channel removal	The tobacco commercial enterprises sales products by online rather than the agents, so customers can buy products directly on the online mall.
	Buddy removal	The X enterprises continue to select the best partners and actively seek high-quality partners in the tobacco field with the intention of cooperation in order to optimize the cost structure and control the quality of tobacco products.
	.....	.....
.	Demand mixing	The rapid popularity of the electronic atomized cigarettes is not only

		related to young people's pursuit of health, but also to a certain degree of fashion and entertainment.
	Channel mixing	The tobacco enterprises combine offline physical stores and online marketing such as Tmall and Taobao.
Combination and integration	Business portfolio	The paper used in the tobacco industry is mainly divided into cigarette paper, filter rod forming paper, cigarette tipping paper base paper, and cigarette lining base paper.
	Organizational combination	The number of cigarette factories and cigarette brands has been greatly reduced since 2002, and the provincial China Tobacco Company has merged and integrated which has promoted the increase in industry concentration.
	Business integration	The logistics distribution center of the cigarette factory has set up areas such as storage area, outbound code scanning area, sorting area, delivery temporary storage area, etc., built digital storage and multi-layer shelf facilities, and introduced automatic cigarette sorting lines and electric rolls Gate.
	Demand integration	The user's demand for cigarette shelves integrates various needs such as cigarette search, price inquiry, shelf height and comfort
	Value activity integration	Cigarette retail customers who support and use the "cloud pos" scan code sales platform and implement full product scan code sales, have the corresponding equipment and facilities, and can play the integration of information collection, scan code sales and data sharing value functions.
	.....	.....
	Demand local optimization	With the increase in the disposable income of Chinese residents, the pursuit of cigarette quality and taste is getting higher and higher.
Local optimization	Channel local optimization	The tobacco companies optimize distribution routes, integrate logistics resources, and conduct overall route planning with the method of segmented distribution, breaking the administrative area setting, and dividing the entire distribution area into five distribution days per cycle.
	......	.....
	Value activity substitution	The tobacco enterprises want to create a professional, efficient, practical, and concise e-commerce operation platform to replace the original value activities, so that existing retail customers and consumers can log in to the platform to purchase at any time according to their wishes.
Substitution	Partner substitution	The tobacco commercial companies claim that their partners (convenience stores and mom-and-pop stores) are profit-oriented on single products, and those with high profit margins focus on recommending to customers, so their key partners are at risk of being replaced at any time.
	Process substitution	The tobacco companies use digital systems (such as ERP, SMES) to replace the traditional production process, visualize the data management of the production process, establish a forecasting mechanism and an abnormal improvement process.

	.....	.....
Dynamic	Dynamic revenue generation mechanism	Many tobacco enterprises carry out non-cigarette circulation business by relying on the current terminal resources, using efficient logistics network coverage, and through platform construction, platform operation, and platform drainage to provide cigarette retailers with a variety of varieties, high quality, and price concessions. Of non-tobacco fast-moving goods, providing more choices for the terminal market in multi-commodity operations.
	Dynamic trading	The cigarettes can be sold in shopping malls, supermarkets, convenience stores, tobacco and alcohol specialty stores, grocery stores, and mom-and-pop stores.
	Dynamic demand	In recent years, due to changes in consumer perceptions, tobacco companies have begun to develop new, harm-reducing alternative tobacco products.
	.....	
	Self-service	The tobacco companies establish a visual recognition system for smart retail terminals and use facial recognition technology to identify consumers.
Self-service	Automated activities	The tobacco companies build an APP interactive system based on smart tobacco retail shelves, which can facilitate users to check inventory and online replenishment in time, and can modify cigarette prices through APP according to market changes.
	.....	.....
	Participatory marketing	The smart tobacco retail shelves improve the evaluation system of retail customers and cigarette brands by promoting offline experience transactions, and promote cigarette consumption experiential marketing.
Friendly	Win-win situation	Tobacco companies have formed a value co-creation situation with Industrial Bank and Huawei Technologies.
	Co-opetition relationship	The competition and cooperation of tobacco commercial enterprises are the main driving force of supplier management. The organic combination of the two can promote the gradual improvement and development of the entire tobacco industry supplier management system.
	.....	.....
	Flexible trading methods	For tobacco retail stores, Smart Tobacco Retail Acquisition can provide users with a variety of alternative payment methods at the sales end, thereby improving consumers' shopping comfort.
Flexibility	Flexible distribution	Implement flexible delivery to achieve stable output under dynamically changing customer demand, order structure, and route conditions, and deliver cigarettes to retail customers on time, quality and quantity.
	Flexible system	The flexible welfare system of tobacco companies can be adjusted according to the level of economic benefits, increase the richness and

		flexibility of welfare project management, and the welfare system reform to strengthen the employee incentive system as a whole.
	.....	.....
Intelligence	Enhance the sense of experience	Through smart devices, users can improve shopping efficiency and shopping experience on the demand side, and the supply side can be customized according to the needs of the store, which improves the flexibility of the tobacco retail model.
	Optimization of trading methods	Customers can purchase tobacco online through Alipay, WeChat and other payment methods.
	Channel improvement	According to the principle of "same direction distribution", big data technology is used to adjust the retail customers' visit sales cycle according to relevant factors such as the number of distributions, the mileage of distribution, the number of distribution households, etc.
	.....	.....

Table 4
Business Model Innovation Rules Definition

No.	Rules	Definition
1	**Decomposition and removal**	Starting with the sub-gene elements involved in the content, governance and structure of the business model, and achieving the purpose of streamlining the business model by decomposing, separating, extracting, and removing them.
2	**Combination and integration**	Combination refers to the integration of individual elements with the same or different properties to form a whole; integration refers to the interconnected whole formed by some isolated elements or elements that have changed the original scattered state in some way and gathered together. Through the combination and integration of the sub-gene elements involved in the content, governance and structure of the business model, complementary matching and exclusivity are formed to enhance customer value and market competitiveness.
3	**Local optimization**	Through the relationship between the content, governance and structure of the business model involving the sub-gene elements, Partial adjustment and optimization of the form, focusing on adjustment and optimization, not essential changes, the business model can be changed through optimization technology.
4	**Substitution**	Taking the content, governance and structure of the business model involving sub-gene elements as the research object, learning, imitating, replacing or replacing its dominant gene elements.
5	**Dynamic**	The content, governance and structure given to the business model involve the ability of sub-gene elements to change with time, space, environment, and conditions, including continuous actions to maintain the beneficial effects of innovation.
6	**Self-service**	By changing the content, governance and structure of the business model involving the internal logic of sub-gene elements (such as value activity automation, self-service transaction methods, etc.), the business form of the

		enterprise can be formed into a self-service model.
7	**Friendly**	By changing the content, governance and structure of the business model involving the relationship between the sub-gene innovation elements, the company can achieve coordination and friendship with network partners and the external environment.
8	**Flexibility**	The content, governance, and structure that constitute the business model involve the flexibility and pacification of sub-gene innovation elements (such as flexible manufacturing, flexible systems, etc.).
9	**Intelligence**	By means of communication technology, computer technology, data technology, artificial intelligence technology, etc., change the content, governance and structure of the business model involving the presentation of sub-gene elements to make value activities more efficien.

Formation of Business Model Innovation Chromosome

From the above analysis, the business model consists of three innovation genes and nine innovation rules, each innovation gene can be divided into several sub-elements. Similarly, the innovation rule can also be divided into several sub-principles. If business model innovation is carried out: Firstly, carry out innovative gene extraction. Collect relevant data on the elements of innovative genes, analyze their current status and development trends for gene expression and determination; secondly, choose innovation rules. Combining the attributes and characteristics of the innovation genes, analyze the mechanism of each element of the genes to be innovated, and then identify the internal connections between the genes to be innovated and between the genes to be innovated and the innovation rules, so as to construct the innovation rules corresponding to the attributes and characteristics of the genes to be innovated; Finally, by coupling the extracted innovation genes with the selected innovation rules, it is possible to obtain one or more innovation chromosomes of the business model, that is, one or more business model innovation ideas. Systematization of ideas can derive specific the innovation plan is to guide the business model innovation practice of the enterprise, and the specific coupling process is shown in Figure 2.
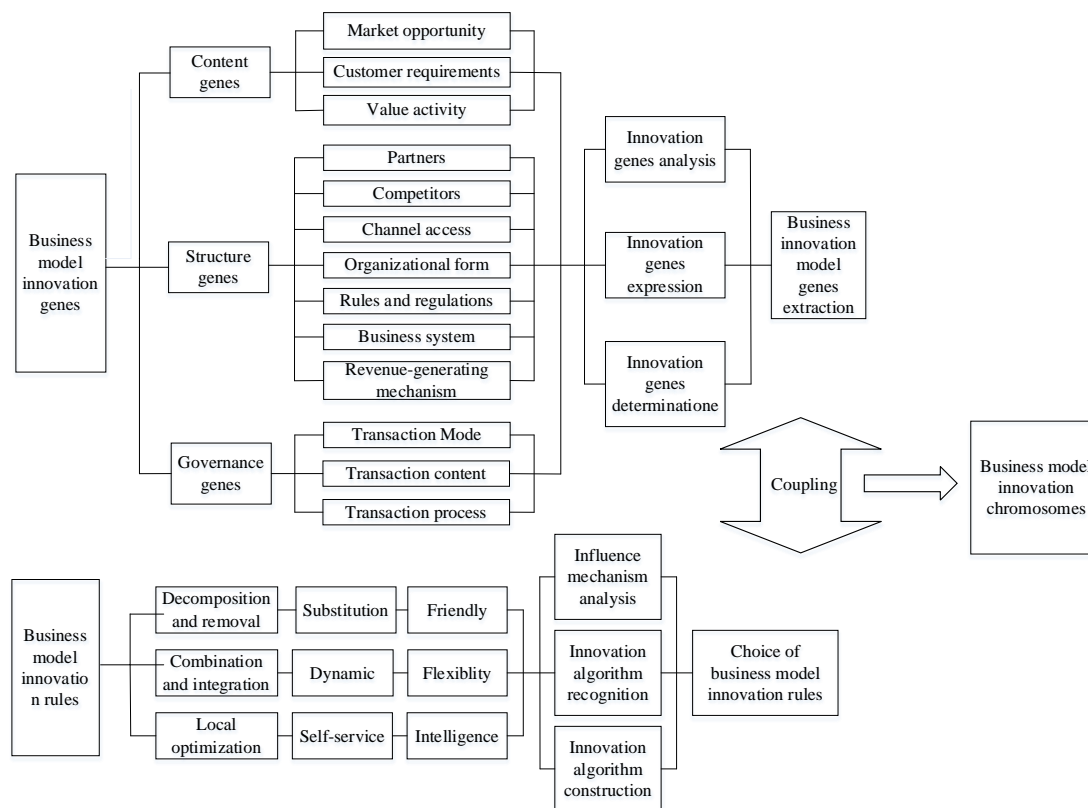
Figure.2. Business model innovation chromosome map

DISCUSSION AND CONCLUSIONS

Conclusion

After analyzing three cases of business model innovation, this paper finds that the essence of business model innovation can be understood as coupling the extracted innovation genes with the corresponding innovation rules to obtain the concrete innovation plan, which can guide the enterprise innovation practice. A business model innovation process model based on innovation genetics and a coupled relationship map can be established. The innovation process model is shown in Figure. 3.
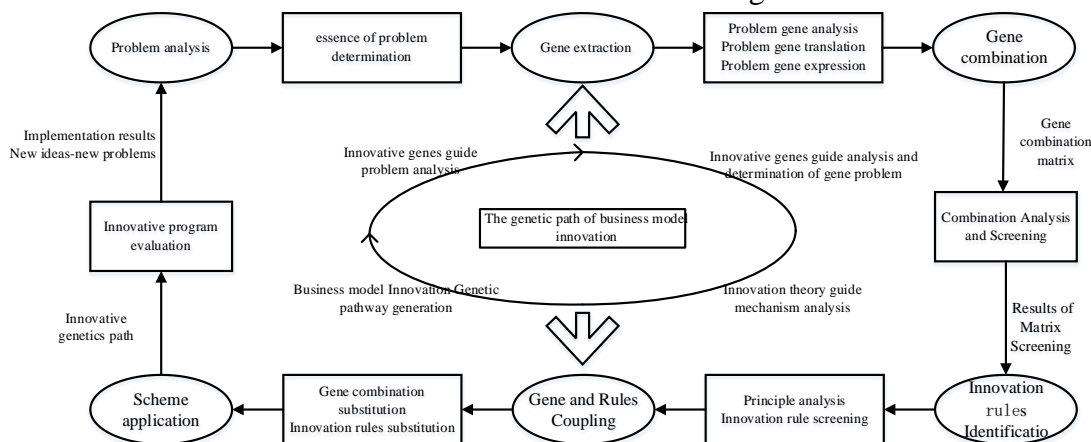

Figure. 3 Business Model Innovation Process Model Based on Innovation Genetics

(1) Problem analysis：By analyzing the problem to reveal its essence, and then using this business model innovation method, which can fundamentally solve some business model innovation problems. At this stage, the innovation genomics guidance method of business model can be used to enable enterprises to sort out the substances and resources that may be involved in

business model innovation, so as to effectively help enterprises to quickly and accurately identify the nature of the problem.

(2) Gene extraction : On the basis of determining the nature of business model innovation problems, gene extraction needs to comprehensive analyze the attributes involved and the overall development and change of enterprises, and take the secondary sub-gene of innovation gene as the main body to translate and express the essential attributes of innovation problems. Then determine the gene elements involved in business model innovation problems. The subdivision of some secondary genes is shown in Figure. 4.
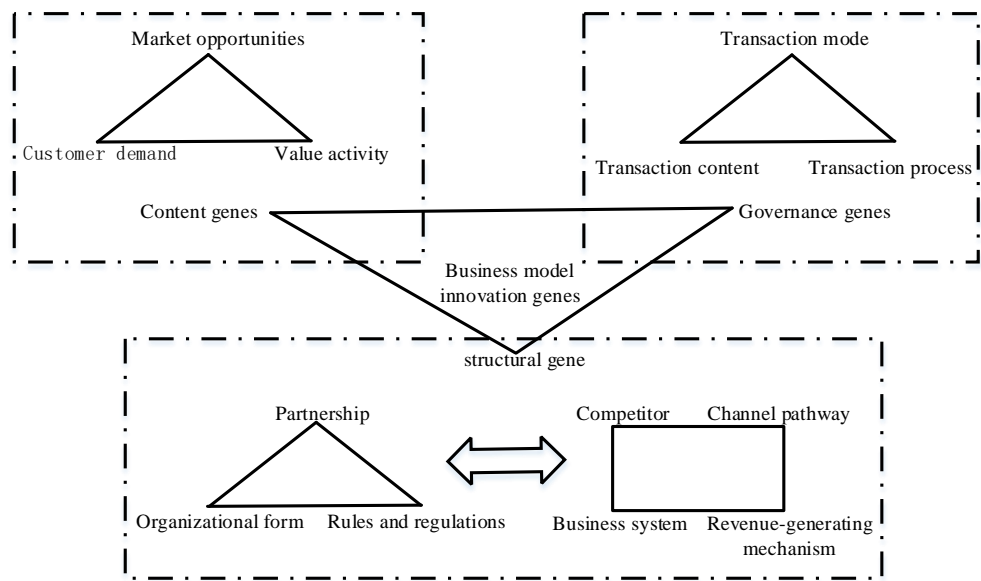

Figure. 4 Subdivision of innovation genes

(3) Gene combination and analysis: The contents of this stage include: ①Using the permutation and combination matrixto subdivide the three innovation genes extracted from the above business model innovation problems into relatedfield sub-gene elements of related fields and restructured. Each combination is systematically analyzed to form a gene combination matrix. ②Combined literature and relevant practical experienceto conduct a comprehensive analysis of each combination and the gene combinations that were most in line with the problems to be innovated were screened out, which provided a basis for the selection of innovation rules in the next step. The screening results of gene combination matrix are shown in Table 5.

<table>
<tr><td colspan="4">**Table 5**
Results of Gene Combination Matrix Screening</td></tr>
<tr><td>**Primary gene 2**</td><td>the secondary sub-gene 1</td><td>the secondary sub-gene 2 .....</td><td>the secondary sub-gene X</td></tr>
<tr><td>the secondary sub-gene 1</td><td>√</td><td>×</td><td>×</td></tr>
<tr><td>the secondary sub-gene2</td><td>×</td><td>√</td><td>×</td></tr>
<tr><td>.....</td><td></td><td></td><td>×</td></tr>
<tr><td>the secondary sub-gene X</td><td>×</td><td>×</td><td>×</td></tr>
<tr><td>Note.</td><td></td><td></td><td></td></tr>
</table>

In Table 4, "X" represents the number of gene segments corresponding to specific innovation problems;
"√"represents the scheme adopted; "×"scheme abandoned.

(4) Innovation rules Identification: Identifying innovation rules has a phased effect on the coupling of subsequent innovation genes and rules. In order to select feasible and effective innovation rules and lay the foundation for the coupling of subsequent genes and rules，this stage will take nine kinds of innovation rules as the core, combined with nine kinds of innovation rules to analyze the principle of gene combination of business model innovation problems. The detailed selection process is shown in table 6.

Table 6
Table of Innovation Rule Screening Process

The way of gene combination	Innovation rules	Combination effect analysis	Selection of Innovation rules
	Decomposition and removal		×
	Combination and integration		×
	Local optimization		×
	Substitution	Analysis of gene combination one by one based on problems to be innovated and algorithm characteristics	×
Gene A & gene B	Dynamic		×
	Self-service		×
	Friendliness		√
	Flexibility		×
	Wisdomization		×

(5) Gene and Rules Coupling: By coupling the screened business model innovation genes and innovation rules, one or more new business model innovation ideas can be formed. Systematically, one or more business model innovation schemes can be derived to guide the specific practice of business model innovation.

(6) Scheme application: The business model innovation scheme formed by the coupling of innovation genes and innovation rules is comprehensively used to realize the visualization and standardization of the whole process of business model innovation. With the rapid development of science and technology, the external environment of enterprises is also undergoing dynamic changes. In the process of implementation, real-time feedback and evaluation of the implementation effect should be carried out according to the problems at any time. Long-term use is possible if the new programme is effective. If the effect of the new scheme is generally or new ideas are generated in the path implementation process, the above business model innovation process should be repeated and the business model should be dynamically improved to help the enterprise to improve the efficiency and flexibility of the business model and adapt to the dynamic changes of customer needs and external markets in a timely manner.

Limitations

As an exploratory case study paper, this paper still has the following limitations:

(1) The limitations of the research sample: the future research on case selection can further consider the multi-industry attributes and characteristics of the case object. More representative enterprises are introduced as samples to further explore the universality relationship between business model innovation genes and innovation rules, and further confirm and expand the research conclusions.

(2) Inactivity of coding: The general coding analysis method, which is embarrassed by case studies, has alienated a large number of original qualitative data and other information into different types of coding, and has lost the unique activity characteristics of qualitative research.

Therefore, future research should focus on preserving the fresh background information of the original qualitative data.

Conflicts of Interest Disclosure Statement

Acknowledgement

References

1 Nicolai JF, Tina S. Fifteen years of research on business model innovation. *Journal of Management*, 2017, 43(1):220-227.

2 Pedersen E, Gwozdz W, Hvass KK. Exploring the relationship between business model innovation, corporate sustainability, and organisational values within the fashion industry. *Journal of Business Ethics*, 2018, 149(2):267-284.

3 Feng LJ, Zhai XQ, Yue, JJ, Wang JF. Innovation genetics: concept and theoretical model. *Science & Technology Progress and Policy*, 2015, 32(13):1-5.

4 Spieth P, Schneider S. Business model innovativeness: designing a formative measure for business model innovation. *Journal of Business Economics*, 2016, 86(6):671-696.

5 Huarng, KH. A two-tier business model and its realization for entrepreneurship. *Journal of Business Research*, 2013, 66(10):2102-2105.

6 Chander V. Business model innovation and third-party alliance on the survival of new firms. *Technovation,* 2015, 35:1-11.

7 Afonso F, Maria TLF. Local enablers of business models: The experience of Brazilian multinationals acquiring in North America. *Journal of Business Research*, 2014, 67(4):516-526.

8 Sérgio C, Peter K, John U. Business model dynamics and innovation: (re)establishing the missing linkages. *Management Decision*, 2011, 49(8):1327-1342.

9 Florian M. Toward a capability-based conceptualization of business model innovation: insights from an explorative study. *R&D Management*, 2014, 44(5):429-449.

10 Sosna M, Rosa NTR, Velamuri SR. Business model innovation through trial-and-error learning: the naturhouse case. *Long Range Planning*, 2010, 43(2-3):400-407.

11 Eisenhardt KM. Building theories from case study research. *The Academy of Management Review,* 1989, 14(4): 532-550.

12 Shan LP, Barney T. Demystifying case research: A structured–pragmatic–situational (SPS) approach to conducting case studies. *Information and Organization,* 2011, 21(3):161-176.

13 Andrew M. Pettigrew. Longitudinal Field Research on Change: T*heory and Practice. Organization Science,* 1990, 1(3):267-292.

14 Hox JJ, Boeije HR. Data Collection, Primary vs. Secondary. *Encyclopedia of Social Measurement,* 2005, 1:593-599.

15 Eisenhardt KM, Melissa E.G. Theory Building from Cases: Opportunities and Challenges. The Academy of Management Journal, 2007, 50(1):25-32.

16 Daniel A, Cherly A. Disclaimer mannerisms of students: How to avoid being labelled as cheaters. *Canadian Review of Sociology,* 1993, 30(4):451-467.

17 Strauss A. Corbin J. Basics of Qualitative Research: Grounded Theory Procedures and Techniques. *Thousand Oaks: Sage,* 1990.