

Path Analysis of Sustainable Business Models to Realise Triple Value

-- Qualitative Comparative Analysis Based on PPP Projects in Shandong Province

Yufan Hou*

School of Business Administration, Anhui University of Finance and Economics, Bengbu, Anhui 233000, China

* Corresponding author: Yufan Hou (Email: 1549120073@qq.com)

Abstract: Sustainable business models play an important role in the ability of enterprises to achieve sustainable competitive advantage. The formation of sustainable business model needs to integrate the logic of business value and the logic of sustainable development value, and integrate the triple values of economy, society and environment. Taking Shandong Province as the research object, 36 PPP projects in Shandong Province are studied using the clear set qualitative comparative analysis method (csQCA) method to solve the multiple paths leading to high triple value and low triple value of PPP projects, and to explore the characteristics of the paths of sustainable business models to achieve triple value. The study finds that: each key attribute cannot alone constitute a necessary condition for generating the triple value of the PPP project business model; the realisation of the triple value of the PPP project business model is a synergistic effect of multiple complex factors; and there is a mutual substitution relationship between the antecedent and dependent variables under certain circumstances, which provides certain theoretical and managerial insights for sustainable development.

Keywords: PPP projects; sustainable business model; triple value; csQCA.

1. Introduction

Whether in politics, academia, or the business community itself, there is a growing recognition that businesses need to create not only economic value, but also social and environmental value at the same time, such as providing more jobs and creating more green mountains and green water (Díaz-Correa and López-Navarro 2018; Marconatto et al. 2016), and are committed to creating sustainable business models that promote technology for good, capital for good, and business for good. Business model innovation helps to address economic, social and environmental sustainability topics and becomes a key element of a firm's core competence (Boons and Lüdeke-Freund, 2013; Short et al., 2014). Firms implementing sustainable business models define their mission around the SDGs, and reducing negative and increasing positive effects on society and the environment become their daily activities (Schaltegger et al., 2011). Despite the fact that sustainable business models integrate economic, social and environmental values, however, entrepreneurial practices show that sustainable business models are rarely successful (Geissdoerfer et al., 2018), the reason being that sustainable organisations have not yet figured out the difference between 'why they exist' and 'why they thrive' in sustainable business models. The reason for this is that sustainable organisations have not yet clarified the questions of "why they exist" and "why they develop", i.e. what elements a sustainable business model consists of, and how these elements can be combined to realise the high and low triple values, has not been answered in a more complete way.

Meanwhile, since the 21st century, government and social capital cooperation projects have gradually become popular in China. Especially after the 19th Party Congress, in order to highlight the decisive role of the market in economic

development, local governments at all levels have taken the PPP project as a new economic growth and breakthrough point, actively guiding social capital into the value-maximising industry, and striving to realise the common development of economic, social and environmental values. In view of this, this paper applies the csQCA methodology to analyse the necessary conditions and group analysis of PPP projects in Shandong Province, to explore the necessary conditions for triple value, and to solve the multiple paths leading to the realisation of high/low triple value in PPP projects, with the aim of answering the following questions: (1)What kind of competencies should enterprises pay attention to in the process of building sustainable business models? (2)How do companies choose these capabilities to generate high/low performance?

2. Literature Review

2.1. Sustainable Business Models and Triple Value

A sustainable business model is a new unit of analysis and system of activities based on a business model, extended through social stakeholders and the natural environment (Geissdoerfer et al., 2018; Inigo et al., 2017). Stubbs and Cocklin (2008) argue that a sustainable business model should have "sustainable development" rather than profit maximisation as the driver of business decisions and activities, so that dominant economic values are replaced by, rather than complemented by, social and environmental value priorities. Organisations with sustainable business models at their core define their mission around the SDGs, and their day-to-day activities include reducing negative and increasing positive impacts on society and the environment (Schaltegger et al., 2011; Li et al., 2020), and solving sustainability issues for a wider range of stakeholders (Bocken et al., 2014).

Research on sustainable business models is still in an immature period (Lüdeke-Freund and Dembek, 2017), leading to different studies and literature conceptualising sustainable business models based on their own purposes (Brennan and Tennant, 2018; Lüdeke-Freund et al.). Laasch (2018) argues that sustainable business models are heterogeneous institutional logics consisting of market and sustainability systems at the core and governmental, familial, and religious systems as components. Bocken et al. (2014) argue that sustainable business models consist of technological, organisational, and social systems, which provide sustainability to a wider range of stakeholders by working across different system solutions. However, there are widely recognised components of sustainable business models that integrate and implement the goal of 'business sustainability' into the value proposition, value creation and value capture elements of the business model (Short et al., 2014; Press et al., 2020), resulting in new sustainable business models Components: (1) Sustainable value proposition is the consideration of the needs of customers, shareholders, suppliers and partners, as well as the environment and society, allowing for the creation of value for multiple stakeholders, e.g., generating shared value for a network of stakeholders, solving a sustainability problem, and developing a product or service that solves that problem by considering stakeholders (Baldassarre et al., 2017); (2) Sustainable value creation is value creation that integrates social and environmental objectives into a more holistic sense of value, rather than just considering the interests of shareholders (Evans et al., 2017); and (3) sustainable value capture should not just focus on whether cost structures and revenue streams include sustainability, but should also include sustainable systems based on economic, social, and environmental aspects (Barth et al., 2017). Notably, a well-formed business model component is characterised by stability, institutionalisation and externalisation (Stubbs and Cocklin, 2008; Yunus et al., 2010). Among them, stability refers to the complete and stable functional characteristics of the business model component, institutionalisation is manifested as the continuity of the component's functioning, and externalisation refers to the fact that stakeholders can practically feel the stability and institutionalisation presented by the component.

2.2. Triple Value in PPP Projects

PPP project is defined as a new way of supplying public goods/services, where both partners carry out activities such as construction and operation under the premise of shared benefits and risks in accordance with the logical scenarios (e.g., contracts) that are formed, with the goal of creating economic profits for social capital while increasing positive or reducing negative social and environmental impacts. Successful practice has shown that, as in the case of China's first urban transport project-Beijing's Ground Fall Line 4, PPP projects can effectively bring into play the advantages of both the public sector and social capital to improve the level of supply of public goods and services, and are an important way to play the decisive role of the market in economic development. From the perspective of industry characteristics, most of the industries involved in PPP projects are in the public sector (Ke et al., 2010); from the perspective of benefit distribution, the two parties cooperating in a PPP project form a situational logic based on their respective interests (not only economic value) to reach a cooperation to better create value for both parties; from the perspective of collaborative

relationships, partnership is the cornerstone of PPP projects (Nederhand and Klijn 2019) and determines the extent to which the desired goals are achieved. Studying PPP projects from multiple perspectives not only clarifies the relevant concepts, but also helps to explore the value logic of the field.

Guo Wei and Zheng Zilong (2018) argue that PPP projects aim to fully satisfy the people's value demand for public goods and services; Meng Wei and Wu Yue (2019), by examining the relationship between PPP projects and fiscal pressures, find that with the introduction of social capital, the government can mobilise more funds to focus on the cultivation of core and emerging industry capabilities, which is conducive to the further development of the economy; Marques and Geddes (2019) argued that PPP projects need to satisfy the government, private enterprises and the society at large; Yeh et al. (2017) argued that the value of PPP projects includes three elements: public, enterprise and partnership. It can be seen that PPP projects, as a kind of public welfare projects involved in the field of public services, enterprises want to pursue profit maximisation in the implementation of the project, while the government values the environmental and social benefits of the project, so the value composition of the PPP project is expressed as the economic value, social value and environmental value. It is because of the triple value creation nature of PPP projects that the study of their sustainable business models can contribute to the expansion of related research. In accordance with the value component approach, this paper defines the sustainable business model of PPP projects as a system that provides economic, social and environmental value to stakeholders, including public products or service recipients, and social capital needs to build the capacity to collaborate with government departments to create the proposed triple value, and to develop a reproduction mechanism that achieves the optimal scale of the enduring creation of the triple value in order to promote sustainable development.

2.3. Sustainable Business Models and Triple Value for PPP Projects

Government and social capital co-operation (Public Private Partnership, or PPP) projects, as a model for the supply of new public services and products, its goal is to create economic profits for social capital while increasing the positive impact on society and the environment. From the viewpoint of industry characteristics, the scope of industries involved in PPP projects is mainly in the public sector; from the viewpoint of benefit distribution, the two parties of PPP project cooperation reach cooperation based on their respective interests (not only economic value) to form a situational logic, which better creates value for both the government and social capital; from the viewpoint of collaborative relationship, the partnership between the government and the social capital is the cornerstone of the PPP project, which determines the achievement of the expected goal Degree.

PPP projects aim to fully satisfy people's demand for the value of public products and services; Meng Wei and Wu Yue (2019), by studying the relationship between PPP projects and fiscal pressure, found that after the introduction of social capital, the government can mobilise more funds to focus on the cultivation of the core competencies of emerging industries, which is conducive to the further promotion of the economy; at the same time, the PPP project needs to satisfy the government, the enterprise and the community at large. It

can be seen that PPP projects, as a kind of public welfare projects involved in the field of public services, enterprises want to pursue profit maximisation in the implementation of the project, while the government attaches more importance to the environmental and social benefits of the project. In summary, the economic, environmental and social values are the expressions of the value composition of PPP projects. It is because of the triple value creation nature of PPP projects that the study of their sustainable business models can contribute to the expansion of related research.

3. Research Design

3.1. Methodological Options

The QCA approach explores the combination of conditions that work together to cause a particular outcome to occur, and is used to address social issues where multiple and complex factors come together to cause an outcome to occur. Based on the purpose and target audience of the study, csQCA was chosen as the research methodology for the following reasons: (1)The purpose of the study is to explore the causal relationship between the outcome variable (triple values of economy, society and environment) and the grouping of multiple antecedent variables (key attributes, scale, and prototypes), for which the QCA methodology is very suitable. (2)Unlike previous single-case analyses, QCA adopts a cross-case research methodology, which can effectively differentiate the heterogeneity of different cases as well as observe the commonality of different cases. Meanwhile, the study chooses the case of PPP projects in Shandong Province, which is in line with the arithmetic logic of QCA. (3)The number of cases required by csQCA is usually 10 to 80, which also makes csQCA more advantageous in analysing small and medium samples. (4) csQCA is suitable for dealing with research problems where the variables are dichotomously assigned, and this part of the research is to explore the sustainable business model paths that lead to the occurrence of high/low performance. By applying the clear-set qualitative comparative analysis method, it can be confirmed that the key attributes, scale and orientation are not only important antecedents leading to the realisation of triple value of the sustainable business model, but also to obtain the paths of success that can be chosen by the enterprises and the paths of failure that can be circumvented.

3.2. Sample Selection and Data Sources

This study chooses PPP projects in Shandong Province as the research object. The reasons for this are: (1)Shandong Province, as the earliest batch of provinces to carry out PPP projects, has developed more mature projects in different fields, and has a more complete system construction, which is more conducive to PPP projects to fully change the economic, social and environmental impacts; (2)Shandong Province is a TOP 5 province in the ranking of the number of PPP projects in China published by the National Development and Reform Commission (NDRC) in 2021, and among all the provinces, Shandong Province has the highest number of national demonstration projects of 71, ranking first in the country. In view of this, PPP projects in Shandong Province are more characteristic of examples of promotion and implementation; (3) The data of PPP projects in Shandong Province are more complete and data collection is more convenient, which in turn can improve the reliability of empirical research to a certain extent.

The sample data selected for this study comes from the official website of the "Centre for Government-Social Capital Cooperation of the Ministry of Finance" (<http://www.cpppc.org/>), which includes "value-for-money report" and "project implementation plan". Project Implementation Programme". In order to identify the characteristics of specific projects, the study was screened in the project database information disclosure system according to certain conditions, as follows: (1) Open the case database of PPP projects in Shandong Province and sort the projects according to the stage of completion, and a total of 788 cases were found. (2) Filter the cases where the project enters the implementation stage. Projects entering the implementation stage not only means that the project data has been public, but also indicates that the project's pre-preparation and procurement work has been recognised by the relevant government departments, based on which 111 cases are excluded and 677 cases are obtained. (3) In order to ensure the quality of the selected PPP projects, 71 national demonstration projects were screened. (4) Data collection is carried out for each case, 35 projects with incomplete case data are deleted, and finally 36 PPP projects with complete data are retained and numbered A1~A36.

3.3. Variable Measurement and Modelling

3.3.1. Variable Selection

The conditional and outcome variables identified by the study are shown in Table 1, i.e. the conditional variables include structure, organisational culture, resource integration, value co-creation, scalability, scale and sustainable business model orientation, and the outcome variables include economic performance, social performance and environmental performance.

3.3.2. Outcome Variable

The performance of a sustainable business model consists of three parts: economic performance, social performance and environmental performance. (1)Economic performance, measured using PPP "project revenue". (2)Social performance, using some of the indicators of Yang Wansu and Yang Shanlin (2016) in the context of PPP projects, i.e., the responsibility of the enterprise to the government, the responsibility of the enterprise to the customers and the responsibility of the enterprise to the employees. (3)Environmental performance, adopting the study of Yang Dongyun and Xie Yang (2019), i.e., "total cost of inputs used for environmental protection/total revenue from main business) * 100%", which yields that the larger the value indicates the higher the level of environmental performance of the enterprise.

3.3.3. Conditional Variable

Conditional variables include three components: sustainable business model attributes, firm size and sustainable business model orientation. (1)Structure, which is the infrastructure that enables the system of activities in a sustainable business model to operate efficiently and influences how the activities are run and how efficiently they are run (Zott and Amit, 2007; Yanyan Li and Wei Guo, 2017). (2)Organisational culture, a cultural pattern in which social and environmental values are priorities. Based on the project implementation plan, the keywords of the significance of running the PPP project are extracted and ranked, and the "Sort-resp" value of the PPP project is calculated, which represents the level of its organisational culture attributes. (3)Resource integration, refers to the integration effect of

sustainable resources, reflecting the impact of sustainable business models on resource utilisation efficiency (Bocken and Short, 2016). (4) Value co-creation, refers to the level of triple value creation for stakeholders by the sustainable business model, reflecting whether the sustainable business can cause extensive participation of market players. (5) Scalability, refers to the level of replication and expansion of the sustainable business model, which is expressed in the potential of the return mechanism of the sustainable business. (6) Scale, refers to the investment scale of PPP projects. Referring to the study of Wang Ling et al. (2019), it is expressed in terms of total project investment. (7) Sustainable business model orientation, taking the project implementation plan as an object, according to the keywords, such as "maximising energy efficiency" simplified as "efficiency", to obtain the frequency of its occurrence, to a certain extent,

reflecting the actual orientation of sustainable business models, and economic, social and environmental orientation.

3.3.4. Research Framework

Based on theoretical exploration and empirical retrospection, we identify the antecedents and outcomes of the topic under focus, and thus define the condition and outcome variables. Using the five key attributes of structure, organisational culture, resource integration, scalability and value co-creation, together with size and sustainable business model orientation as antecedent variables, and the economic, social and environmental performance of the firm as outcome variables, the study explores the combinations of antecedent conditions that lead to the triple performance using the QCA group analysis approach (shown in Figure 1).

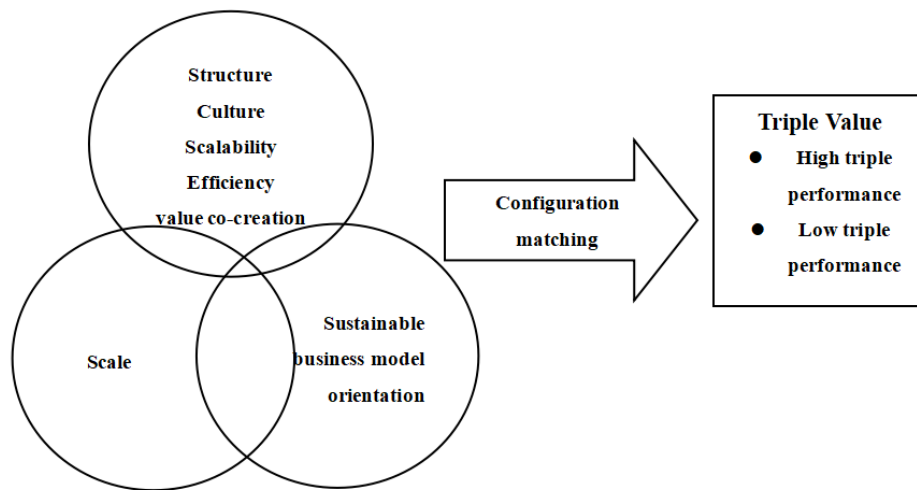


Figure 1. Research framework

3.3.5. Variable Calibration

This study is mainly based on the actual data distribution and relevance, and the variables are assigned dichotomous values, with "1" indicating existence and "0" indicating non-existence.

The specific steps for constructing the truth table are as follows: (1) In order to reduce the intrinsic bias of the data and to ensure that the data of different variables can be discussed at the same level, the formula in econometrics is applied to calibrate all the conditional variables and the outcome variables, which is $X_i^* = (X_i - X_{min}) / (X_{max} - X_{min})$. (2) Dichotomous assignment of the seven antecedent variables. Structure is measured by PPP project operation mode, and the BOT mode is most used in PPP projects, so the BOT mode is assigned as 1 and other modes are assigned as 0. Organisational culture is selected as the dichotomous point with the value of "Sort-resp" of 0.8, which is greater than 0.8 and assigned as 1, and vice versa; Scalability selects the upper quartile as the dichotomous point, and assigns a value of 1 if it is greater than the upper quartile, and 0 if it is not; resource integration selects the upper quartile as the dichotomous point and assigns a value of 1 if it is higher than the upper quartile, and 0 if it is not; value co-creation selects the upper quartile as the dichotomous point and assigns a value of 1 if it is greater than this value, and 0 if it is higher than the upper quartile; the upper quartile assigns a value of 1 if it is greater than the upper quartile, and 1 if it is not. and vice versa is 0. In the study of Ritala et al. (2018), socially and

environmentally oriented prototypes became the choice of more firms, therefore, this study chose the assignment of 1 for socially and environmentally oriented and 0 for economically oriented. (3) Dichotomous assignments were made to the outcome variables. The outcome variable consists of economic value, environmental value and social value and is equally important, so the sum of the three values can get the comprehensive value. The descending order is used to indicate the trend of the value level from high to low, based on this, this paper chooses 25% of the value level as the anchor point, i.e., the top 25% of the projects are assigned a value of 1, which means a high level of comprehensive value, and vice versa, which is assigned a value of 0, which represents a low level of comprehensive value.

4. Empirical results

4.1. Necessity Analysis

Necessary condition analysis in fsQCA is used to check whether individual conditions are likely to be necessary for the outcome to occur. As shown in Table 1 of the analysis results, the antecedent variables constituting high triple value are generally low in the PPP projects in Shandong province, none of them exceeding 0.9, i.e. none of them pass the consistency test, suggesting that any individual variable does not constitute a necessary condition for high triple value, but rather needs to be driven by a composite of the key attributes of the sustainable business model, scale, and the sustainable business model orientated factors. Scalability, on the other

hand, as a necessary condition for low triple value (consistency greater than 0.9), suggests that this condition leading to the realisation of low triple value is always present regardless of the path. This paper builds on this foundation by including all antecedent variables in the study to further explore the groupings that generate high/low triple value.

Table 1. Results of necessity analysis for individual conditions of the fsQCA approach

conditional variable	PPP project in shandong province	
	high triple value	low triple value
structure	0.2424	0.7576
~structure	0.3333	0.6667
culture	0.1429	0.8571
~culture	0.2759	0.7241
scalability	0	1
~scalability	0.3333	0.6667
efficiency	0.5556	0.4444
~efficiency	0.1481	0.8519
value co-creation	0.3333	0.6667
~value co-creation	0.2222	0.7778
scale	0.5556	0.4444
~scale	0.1481	0.8519
Sustainable business model orientation	0.2222	0.7778
~Sustainable business model orientation	0.3333	0.6667

4.2. Configuration Analysis

4.2.1. Paths Leading to High Triple Values

Table 2. Paths to high triple value in sustainable business models for PPP projects

Variant	Resource-efficient		Large Scale Value Co-Creation	
	H1a	H1b	H2a	H2b
Structure		●	●	●
Culture	⊗	⊗	⊗	⊗
Scalability	⊗	⊗	⊗	⊗
Efficiency	●	●	⊗	
Value co-creation	⊗	⊗	●	●
Scale	⊗	⊗	●	●
Sustainable business model orientation	●			●
Consistency rate	1	1	1	1
Original coverage	0.22	0.22	0.22	0.22
Unique coverage	0.11	0.11	0.11	0.11
Path coverage	0.666667			
Path consistency	1			

Note: ● indicates the presence of a core causal condition, ⊗ indicates the absence of a core causal condition, ● indicates the presence of an auxiliary causal condition, ⊗ indicates the absence of an auxiliary causal condition, and "blank" indicates that the condition may or may not be present in the configuration.

As shown in Table 2, there are 4 groupings that achieve high triple value. The consistency of these 4 groupings is 1, which is higher than 0.8, i.e., they have high consistency, which means that the groupings are highly reliable, and these 4 groupings are sufficient conditions for high triple value. The

overall consistency is 1, which means that 100% of all ppp projects that satisfy these 4 conditional groupings show high triple value. The overall coverage is 0.666667, which means that the 4 condition groupings explain 66.6667% of the high triple value cases. Both the overall consistency and overall coverage are higher than the critical value, indicating that the empirical analysis is valid. Based on the conditional groupings, we can further identify the differentiated fitness relationships of structure, organisational culture, scalability, efficiency, value co-creation, scale and sustainable business model orientation to triple value.

(1) Resource-saving. efficiency is the core factor in the two groups of H1a and H1b, and efficiency plays a key role. Efficiency can make the enterprise's core resource utilisation rate increase, the recyclable rate increase, reduce the resource loss cycle, and promote the sustainable development of the enterprise, the enterprise should internally cultivate the staff's awareness of resource conservation, improve the resource utilisation rate, and obtain the maximum economic and social benefits with the minimum resource consumption, which constitutes a sufficient condition for high triple value; the prototype is a fringe factor, playing a supporting role. Sustainable resources play a crucial role in realising the triple value of economy, society and environment, and enterprises should focus on the multiple use of these resources and form the concept of resource conservation. Among them, the prototype in grouping H1a also plays a certain auxiliary role, which plays a certain role for enterprises to achieve high triple value. In grouping H1b, the organisational structure also plays a certain role. The raw and unique coverage of histogram H1a is 0.22 and 0.11 respectively, indicating that this path explains about 22.222% of the high triple value cases. In addition, about 11.111% of the high triple value cases can be explained by this path only. The original and unique coverage of 0.22 and 0.11, respectively, for histogram H1b indicates that about 22.22% of the high triple value cases are explained by this path. In addition, about 11.11% of the high triple value cases can be explained by this path only.

(2) Large-scale value co-creation: In the two groups of H2a and H2b, value co-creation and scale are the core factors, which constitute the sufficient conditions for high triple value and play a key role in high triple value; the activity structure is a marginal factor, which plays a supporting role. Value co-creation reflects the theory of individual-centred value creation by consumers and enterprises, enterprises should adhere to value co-creation, so that they can improve their own service quality, reduce costs, improve efficiency and achieve high triple value; scale reflects to a certain extent the total amount of investment in the project, and plays a non-negligible role in the enterprise's achievement of high triple value, and enterprises should pay attention to this point. The original and unique coverage of configuration H2a are 0.22 and 0.11 respectively, indicating that this path explains about 22.22% of the high triple value cases. In addition, about 11.11% of the high triple-value cases can be explained by this path only. The original and unique coverage of histogram H2b are 0.22 and 0.11, respectively, indicating that about 22.22% of the high triple value cases are explained by this path. In addition, about 11.11% of the high triple value cases can be explained by this path only.

4.2.2. Paths Leading to Low Triple Values

Table 3. Paths to low triple value in sustainable business models for PPP projects

Variant	Small-scale resource-constrained			Culture-deficient type under high scalability		
	L1	L2	L3	L4	L5	L6
Structure	•	•	•	⊗	•	•
Culture	⊗	⊗		⊗	⊗	⊗
Scalability		•	⊗	•	•	•
Efficiency	⊗	⊗	⊗	•	⊗	•
Value co-creation	⊗			⊗	•	⊗
Scale	⊗	⊗	⊗	⊗		•
Sustainable business model orientation			•		•	⊗
Consistency rate	1	1	1	1	1	1
Original coverage	0.41	0.19	0.51	0.07	0.11	0.04
Unique coverage	0.04	0.04	0.22	0.07	0.04	0.04
Path coverage	0.888889					
Path consistency	1					

As shown in Table 3, there are 6 groupings that achieve low triple value. The consistency of these 6 groupings is 1, 1, 1, 1, 1, 1, respectively, which are all higher than 0.8, i.e., they have high consistency, which means that the groupings are highly reliable, and these 6 groupings are a sufficient condition for high triple value. The overall consistency is 1, which means that 100% of all PPP projects that satisfy these 6 conditional groupings show low triple value. The overall coverage is 0.888889, which means that the 6 conditional groupings explain 88.8889% of the lower triple value cases. Both the overall consistency and overall coverage are higher than the critical value, indicating that the empirical analysis is valid. Based on the conditional groupings, we can further identify the differential fitness relationships of structure, organisational culture, scalability, efficiency, value co-creation, scale and sustainable business model orientation to triple value.

There are six paths leading to low triple value. Comprehensively analysing the three groupings of L1, L2 and L3, it can be found that under the conditions of scale deficiency and efficiency insufficiency, structure and sustainable business model orientation are the marginal conditions of low triple value and play a supporting role. These three paths belong to the resource-constrained type under the lack of scale. The core condition of the three groupings of L4, L5 and L6 is scalability, and under the condition of the lack of organisational culture, structure, efficiency, value co-creativity, scale, and sustainable business model orientation constitute the marginal conditions of low triple value, i.e., the organisational culture constrains the realisation of the high triple value of the enterprise. These three paths belong to the culture-deficient type under high scalability.

5. Conclusions and Implications of the Study

5.1. Conclusions of the Study

Based on the PPP projects in Shandong Province,

combined with QCA methodology, we analyse the paths of PPP project business models to achieve high/low triple value from the group perspective and comprehensively analyse them to obtain insights. The main research conclusions are as follows:

First, from a general perspective, none of the seven key attributes of structure, organisational culture, scalability, efficiency, value co-creation, scale and sustainable business model orientation can individually constitute a necessary condition for generating the triple value of PPP project business models, indicating that individual elements do not constitute an obstacle to the realisation of the high/low triple value.

Secondly, the realisation of the triple value of PPP project business model is a synergistic effect of multiple complex factors, and the effective combination of multiple complex factors generates four paths for the triple value of high PPP project business model, which are summarised as resource-saving and large-scale value co-creation. The six paths that generate the triple value of low PPP project business models are summarised as small-scale resource constraints and cultural deficiencies under high scalability.

5.2. Management Insights

Firstly, from the corporate side, companies that want to generate high PPP project business model triple value, on a large scale, with high efficiency and scalability, can achieve triple value not only by strengthening their structure, but also by improving their organisational culture and improving their stakeholder network, or by strengthening the structure of their activities and improving their organisational culture and improving their stakeholder network and focusing on social and environmental value to Improvement. Therefore, based on the key attributes of a sustainable business model, enterprises should allocate their resources appropriately and choose the right course of action.

Secondly, from the government's perspective, the synergistic integration between the factors of corporate structure, organisational culture, efficiency, value co-creation, scalability, scale and sustainable business model orientation should be strengthened in order to provide a good environment for business model innovation in PPP projects. Therefore, each local government should take a holistic perspective and, based on the enterprise's own organisational culture and resources, formulate relevant policies targeted to improve the triple value of the business model of PPP projects in line with its own local realities.

5.3. Research Shortcomings and Prospects

While the empirical design of the triple value realisation of the PPP project business model presents a correlation between intrinsic key values and extrinsic prototypes and scale, there are some shortcomings. Firstly, the use of dummy measurements for activity structures and prototypes may be insufficient, and the dummy variables are not specific enough in the subsequent business model evaluation sessions, and subsequent studies can refine the deficiencies of the dummy variables. Secondly, the choice of antecedent variables of sustainable business models needs to be enriched, due to the limitation of PPP projects as research objects, more consideration needs to be given to their operability, and there may be a lack of cross-industry generality in the extension of the conclusions, and the follow-up study will enrich the choice of antecedent variables. Finally, the comprehensive

value measurement of sustainable business models needs to be improved, and how to set a proportional relationship for economic value, social value and environmental value is an area of concern for subsequent research.

Acknowledgment

Funded by: 2022 Anhui University of Finance and Economics Postgraduate Research Innovation Fund Project «Research on O2O Business Model Innovation Path and Role Mechanism Based on Customer Journey Perspective» (Project No. ACYC2022018).

References

- [1] Cui Zhijuan, Han Fei. Research on the effective path of the operation of government and social capital cooperation (PPP) mode - Based on the analysis of a questionnaire survey[J]. *Friends of Accounting*, 2016(14):54-62.
- [2] Chen Ying, Shi Junguo, Zhang Hui. Frontier review and outlook of sustainable entrepreneurship research[J]. *Research in Science*, 2021, 39(02):274-284.
- [3] DU Songhua, XU Jiahong, LU Zi-chan, et al. Analysis of sustainable business model construction at the bottom of the pyramid - A multi-case study based on Guangdong Northeast[J]. *Management Review*, 2018, 30(9):292-304.
- [4] Guo Wei, Zheng Zilong. Proprietary technology transfer, financing cost differences and optimal equity structure of PPP: an empirical study from developing countries[J]. *World Economic Research*, 2018(12):96-114+134.
- [5] Ji Xuehong, Zhang Simin, Zhao Hong. Research on business model adjustment mechanism of entrepreneurial enterprises: direct motivation, adjustment process and main mode[J]. *Nankai Management Review*, 2019, 22(05):49-63+89.
- [6] Jin Xiaocui. Does Corporate Culture Affect Corporate Social Responsibility? --Empirical Evidence from Chinese Listed Companies in Shanghai [J]. *Accounting Research*, 2017 (02): 56-62+97.
- [7] Ji Lei, Li Huijun. Research on sustainable business model construction of food enterprises[J]. *Research on Business Economy*, 2018(04):110-112.
- [8] Liu Yuxi, Xie Jiaping. Business model innovation of manufacturing enterprises under sustainable development: closed-loop product service system[J]. *Science and Science and Technology Management*, 2015, 36(01):53-62.
- [9] LIU Hongbo, LIU Jie. Empirical analysis of motivational factors of PPP projects to attract social capital participation[J]. *Research on Business Economy*, 2016(03):29-31.
- [10] Luo Tao, Li Xiaopeng, Wang Lunyan, Guo Lei. Qualitative evaluation research on value-for-money of urban water ecology PPP projects[J]. *People's Yellow River*, 2017, 39(01):87-91.
- [11] Li YF, Zhang XL, Zhao Y. Business model quality and high market performance[J]. *Research Management*, 2017, 38 (09):124-131.
- [12] Li Yanyan, Guo Wei. Transaction structure design of urban underground comprehensive pipeline corridor PPP project[J]. *Journal of Underground Space and Engineering*, 2017, 13(05):1150-1156.
- [13] Liang Lingxia, Han Fang, Zhou Fangxin, Zhang Jing. Domestic and international comparison of value-for-money evaluation of PPP projects[J]. *Journal of Civil Engineering and Management*, 2018, 35(04):182-188.
- [14] Li Xiaoguang, Hao Shengyue, Ren Xu. An empirical study on the impact of relationship governance on the control of PPP projects[J]. *Journal of Beijing Institute of Technology (Social Science Edition)*, 2018, 20(03):52-59.
- [15] Liang Qingxue, Hu Hao. Challenges and countermeasures in the application of value-for-money evaluation for infrastructure PPP projects[J]. *Contemporary Economic Management*, 2018, 40(06):54-59.
- [16] Lv Weixia, Ning Jing. The influence of PPP sanitation reform, environmental governance effect on the willingness to pay environmental protection tax - An empirical study based on 1,663 residents in H city[J]. *Journal of Central China Normal University (Humanities and Social Sciences Edition)*, 2019, 58(04):51-62.
- [17] Li Jianfeng, Zhao Jianfeng. Quantitative evaluation of value for money in sponge city PPP projects[J]. *Finance and Accounting Monthly*, 2019(07):101-108.
- [18] Li YF. Qualitative comparative analysis: A group comparison method integrating qualitative and quantitative thinking[J]. *Journal of Guangxi Normal University (Philosophy and Social Science Edition)*, 2020, 56(03):89-110.
- [19] Meng Wei, Wu Yue. Has the PPP model eased the financial pressure of local governments--an empirical study based on the data of prefecture-level cities in China[J]. *Journal of Guizhou University of Finance and Economics*, 2019(01):63-72.
- [20] Jingqin Su, Jingjing Lin, Yanming Zhang. Evolutionary path and mechanism of entrepreneurial firms' resource actions - from patchwork to concertina[J]. *Research in Science*.
- [21] Amit R, Zott C. Value creation in e-business[J]. *Strategic management journal*, 2001, 22 (6-7): 493-520.
- [22] Aversa P, Furnari S, Haefliger S. 2015. Business model configurations and performance: A qualitative comparative analysis in Formula One racing, 2005–2013[J]. *Industrial and Corporate Change*, 2015, 24 (3): 655-676.
- [23] Aguilar-Fernández, María, Otegi-Olaso, José. Firm Size and the Business Model for Sustainable Innovation[J]. *Sustainability*, 2018, 10 (12): 4785-4811.
- [24] Boons F, Lüdeke-Freund F. Business models for sustainable innovation: state-of-the-art and steps towards a research agenda[J]. *Journal of Cleaner production*, 2013, 45: 9-19.
- [25] Baden-Fuller C, Mangematin V. Business models: A challenging agenda [J]. *Strategic Organization*. 2013, 11 (4): 418–427.
- [26] Bocken N M P, Short S W, Rana P, et al. A literature and practice review to develop sustainable business model archetypes[J]. *Journal of cleaner production*, 2014, 65: 42-56.
- [27] Bocken N M P, Short S W. Towards a sufficiency-driven business model: Experiences and opportunities[J]. *Environmental Innovation and Societal Transitions*, 2016, 18: 41-61.
- [28] Baldassarre B, Calabretta G, Bocken N M P, et al. Bridging sustainable business model innovation and user-driven innovation: A process for sustainable value proposition design[J]. *Journal of Cleaner Production*, 2017, 147: 175-186.
- [29] Barth H, Ulvenblad P O, Ulvenblad P. Towards a Conceptual Framework of Sustainable Business Model Innovation in the Agri-Food Sector: A Systematic Literature Review[J]. *Sustainability*, 2017, 9 (9): 1620-1634.
- [30] Brennan G, Tennant M. Sustainable value and trade-offs: Exploring situational logics and power relations in a UK brewery's malt supply network business model[J]. *Business Strategy and the Environment*, 2018, 27 (5): 621-630.
- [31] Best B, Miller K, McAdam R, Moffett S. Mission or margin? Using dynamic capabilities to manage tensions in social purpose organisations' business model innovation[J]. *Journal of Business Research*, 2021, 125: 643-657.

- [32] Chesbrough H, Rosenbloom R S. The role of the business model in capturing value from innovation: Evidence from Xerox Corporation's technology spin-off companies [J]. *Industrial and Corporate Change*, 2002, 11 (3): 529-555.
- [33] Creswell J W. *A concise introduction to mixed methods research*[M]. Sage Publications, 2014.
- [34] Calabrese A, Forte G, Ghiron N L. Fostering sustainability-oriented service innovation (SOSI) through business model renewal: The SOSI tool[J]. *Journal of Cleaner Production*, 2018, 201: 783-791.
- [35] Cosenz F, Rodrigues V P, Rosati F. Dynamic business modeling for sustainability: Exploring a system dynamics perspective to develop sustainable business models[J]. *Business Strategy and the Environment*, 2020, 29 (2): 651-664.
- [36] Díaz-Correa J, López-Navarro M. Managing Sustainable Hybrid Organisations: A Case Study in the Agricultural Sector[J]. *Sustainability*, 2018, 10 (9): 3010.
- [37] Doherty B, Kittipanya-Ngam P. The Role of Social Enterprise Hybrid Business Models in Inclusive Value Chain Development[J]. *Sustainability*, 2021, 13 (2): 499.
- [38] Easterby-Smith M, Thorpe R, Jackson P R. *Management and business research*[M]. Sage, 2015.