Value Creation of E-commerce Platform Firms in Competitive Dynamics: From a Resource Orchestration Perspective

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Abstract: This study examines the rules of resource combination for e-commerce platform firms value creation in competitive dynamics. Based on the resource orchestration view and competitive dynamics theory, we suggest a configurational analytic framework that departs from the standard linear paradigm to examine how configurations of digital strategic action formed by digital resources creates value through the effect that competitors hard to respond to. In line with this approach, we use fuzzy-set qualitative comparative analysis (fsQCA) to news data from Chinese online tourism industry. Our findings suggest equifinal pathways to gain the effect that is hard to be responded and the specific boundary conditions of our propositions that determine what way digital technologies and partnership resources orchestrate in e-commerce platform firms' creating value. We discuss implications for theory and practice.

Keywords: resource orchestrate, business value of IT, competitive dynamics, digital strategic action.

1. INTRODUCTION

In recent years, digital technologies, such as big data, mobile computing, platform architecture, have facilitated product/service and business model innovation, new digital strategic actions (DSAs) have been formed, providing e-commerce platform firms unprecedented opportunities to create value.

However, the value creation through application of digital innovation is influenced by competition among e-commerce platform firms due to the hyper-competitive and the increasingly transparent digital environment[1]. DSAs initiated by e-commerce platform firms could be easily imitated or responded by competitors, making value creation not only depend on their own innovative DSAs, but also the responses of competitors. Correspondingly, it is a new challenge for value creation of e-commerce platforms, which should understand how to construct and initiate DSAs effectively so as to cope with competitive interaction.

The literature on business value of IT has mainly considered that the value comes from the exclusive resources of firms, or the abilities transformed from them[2]. However, today's digital environment has greater openness catalyzed by digital technologies that make the resources e-commerce platform owned highly similar, making it inevitable to be imitated or countered by competitors[3], and it needs more effective portfolios of internal and external resources to improve the difficulty of imitation. In fact, the researches of IT business value studied in such static perspective have ignored complex and dynamic interaction among firms' resources[4]. Moreover, in competitive dynamics, the creation of IT business value also depends on the competitors' responses. Prior studies only pointed out that value creation needs to adapt to the dynamic market (such as technology updating, demand's change, etc.) , but they did not consider the dynamic responses from competitors[5]. Thus, it is difficult to explain the mechanism of value creation of e-commerce platform in the competitive dynamics.

Therefore, in this paper, our motivation is to explore the value creation of e-commerce platform firms in

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competitive dynamics. Specifically, our research taking DSA as the analysis unit, which encodes the digital technologies, partnership resources and responses of competitors through structural content analysis. Furthermore, the fuzzy-set qualitative comparative analysis (fsQCA) is used to explore the rules of combination of digital resources to create business value[6].

The primary objectives of this study are as follows:

• *To find the digital resources configurations of DSAs launched by e-commerce platform firms.*

• *To explore the rules of value creation based on digital resources configurations.*

This paper is organized as follows. Section 2 presents the literature reviews of competitive dynamics and resource orchestration and proposes the research framework. Section 3 introduces the process of data collection and data coding. The results of set-theoretic configurational analysis are stated in Section 4. The propositions as well as discussions of theoretic and practice significance of this paper are presented in Section 5 and Section 6.

2. THEORETICAL BACKGROUND AND RESEARCH FRAMEWORK

2.1 Competitive dynamics

Research of competitive dynamics originates from the strategic management field, and focuses on competitive actions, specifically on the series of competitive actions firms initiate to enhance their competitive position and improve performance. This theory believes that firms can only seek temporary advantages in the competitive interaction, and the performance of firms depends not only on the static strength between rivals, but more on the competitive interaction, and the effect of competitive strategy depends on the reaction of rivals.

Five distinct research themes have emerged among competitive dynamics scholars over the years, each of which has contributed to our understanding of firm strategy and the behavioral dynamics of competition: competitive interaction (action-level studies); strategic competitive behavior and repertoire (business-level studies); multimarket and multi-business competition (corporate-level studies); integrative competitor analysis; and competitive perception[7]. Among them, competitive interaction and strategic competitive behavior and repertoire are closely related to this study and are the most core and basic part of competitive dynamics. The former focuses on the "action-response dyad" generated by competitive interaction among firms, and explores how do the action characteristics (e.g., attack visibility and centrality) as predictors of competitive responses (e.g., the number and the speed of responses)[7]. The latter studies the organizational factors (e.g., TMT characteristics, technology resources, firm governance, etc.) affecting the competitive actions repertoire of firms (e.g., complexity, intensity, diversity) and the performance brought by actions.

Recently scholars in the information systems (IS) field have begun to study the relationships between IT and competitive actions from the competitive dynamics, and considered that IT has played a positive role in developing competitive actions[8]. Current research has focused on the impact of functional IT support on the static attributes (e.g., quantity, diversity, etc.) and the performance at the combinatorial level of competitive actions initiated by the enterprise. Current research focuses on the functional support of IT for static attributes (e.g., quantity, diversity, etc.) of the portfolio of competitive actions initiated by the firms[9].

From the above, current research has limited IT support for firms' competitive action to the functional level. However, in the digital environment, the supporting role of digital technologies for e-commerce platform firms is enhanced from the functional level to the strategic level, digital technologies are deeply embedded in the products and services of e-commerce platform firms[10]. The ubiquity of digital technologies also makes the actions initiated by e-commerce platform firms are bound to be responded by competitors (imitation and counterattack). Therefore, it is necessary to explore the complex characteristics of resources utilization and the effect of external markets when e-commerce platform firms initiate DSAs from a more fine-grained level.

2.2 Resource orchestration

In recent years, resource orchestration theory has attracted increasing attention from scholars in the field of strategic management. On the basis of RBV, this theory explores a more granular logical links between the leverage of firms' resources and the competitive advantages, it believes that it is necessary to effectively orchestrate resources according to the responses of competitors and the changes of market demand rather than merely looking at the resources a firm possesses. In 2007, Sirmon et al. proposed a conceptual framework based on the resource orchestration theory, which defined resource management as the comprehensive process of structuring, bundling, and leveraging the firm's resources with the purpose of creating value for customers and competitive advantages for the firm[11, 12].

Subsequently, scholars have studied on how specific resource orchestration actions proposed in the resource orchestration theory can bring value to enterprises in different research scenarios (e.g., competitive sports, manufacturing, and supply chain). Besides, several studies have begun to link the resource orchestration theory which focuses on the internal resource combination behavior of the firms in the competitive dynamics theory which focuses on the characteristics of competitive action in the external competitive market of the enterprises, forming a complete logic chain of value creation[13]. Based on this, it studies how the allocation of internal resources of enterprises affect the formulation and initiation of competitive actions, and how to gain competitive advantages in external markets.

Based on resource orchestration theory, scholars in the field of IS have studied the impact of IT resource orchestration actions on enterprise innovation behavior and performance in the context of enterprise innovation, e-supply chain and e-commerce adoption[14]. The logic emphasizes that firms need to statically occupy IT resources, more importantly, they need to continuously initiate resource orchestration actions to effectively apply IT resources to achieve their goals.

In general, although scholars in the field of IS have gradually realized that in the dynamic environment, the application of digital technologies are highly transparent, and the internal resources need to be effectively orchestrated to form heterogeneous resource combinations, which is the real source of enterprise competitiveness. However, there are no studies on how to use resource combinations to build resource barriers that are difficult to imitate in a highly competitive dynamic environment, so as to gain competitive advantage for focal enterprises.

2.3 Digital technology and partnership resource as the necessary resources to initiate DSAs

E-commerce platform firms deeply rely on digital technologies to innovation[15], and use the external partner resources (such as suppliers, partners, etc.) absorbed by the platform network effect to continuously launch new products and services to the market[16]. However, due to the openness and commoditization of digital technology, coupled with the fact that the external partner resources absorbed by e-commerce platform companies in the same industry are also very similar, the resource differences between enterprises have almost disappeared. Therefore, the logic that enterprises rely purely on acquiring and occupying heterogeneous resources and obtain value by creating resource barriers that competitors are difficult to imitate, is no longer applicable. In fact, in competitive dynamics, the business value of e-commerce platform enterprises comes from more effective internal and external resource orchestration, forming heterogeneous resource combinations, which can build competition barriers, improve the imitation difficulty of competitors[17].

Based on the above point of view, this study identifies two kinds of advantageous resources, namely, the digital technologies owned by the e-commerce platform enterprises and the partnership resources attached to the platform. When emerging digital technologies becomes the core advantage resource, enterprises can use the network effect to gather a large number of heterogeneous partnership resources (such as strategic investment resources, shopping-unit and inter-industry resources) to launch various digital innovation actions. This

combination of resources can support enterprises to launch a large number of DSAs.

Different from the traditional competitive actions, the DSAs initiated by e-commerce platform firms are distributed innovation driven by competitive actions based on emerging digital technologies with a large number of heterogeneous partner resources[18]. The unique characteristics of digital technologies (such as reprogrammability and data homogenization) make the innovation present the characteristics of convergence, which means digital innovation converges the past scattered industries and products. For example, Alipay which is a typical digital innovation product integrates more than 70 products and services (such as payment, insurance, wealth management, taxi, movie tickets, etc.). Meanwhile, the convergence of digital technologies has greatly increased the number and heterogeneity of participants in innovation, which enables e-commerce platform enterprises use a large number of heterogeneous partner resources when initiating DSAs[18-21]. For example, Alipay can continuously converge various services and products to build its ecosystem, and provide these services and products with support from external partner resources, such as banks, insurance and financial companies, etc. The more the services and products converged, the greater the amount and heterogeneity of partner resources needed.

Therefore, in order to present the combination characteristics of digital technologies resources and partnership resources that constitute the DSAs more comprehensively, this study deconstructs the two types of digital resources from the breadth and depth of digital technologies, the number, diversity and relationship strength of partnership resources.

2.3.1 Digital technology

Digital technology based on the von Neumann architecture is an electronic technology that generates, stores and processes data in binary code[19]. *The breadth of digital technology refers to the number of technical modules that constitute a DSA. The depth of digital technology refers to the maturity of the technical modules that constitute a DSA.* The number and maturity of digital technical modules are key indicators for e-commerce platform firms, which aims to effectively integrate and use digital technologies to respond quickly to market demand and thus gain competitive advantages[19, 22].

Modularity is one of the salient features of digital technology. In the modular architecture, specific functions are encapsulated into independent modules, and the modules are connected through standardized interfaces. The breadth of digital technology represents the richness of digital technology modules of e-commerce enterprises. In the digital environment, there is a mapping relationship between the modules and business functions of e-commerce platform firms. E-commerce platform firms will divide technology systems according to their own business functions, and assign specific business functions to modules[22]. Therefore, the combination and recombination of technical modules will bring totally different products and services to e-commerce platform firms. For example, Trip services launched by Airbnb aim to expand the single accommodation booking function to the more extensive destination tourism service function. To initiate this DSA, firms need to integrate multiple technical modules that support short-term family rent, destination guide, catering, car rental and other businesses.

The depth of the digital technology represents the maturity of the digital technical module of the e-commerce platform firms. The higher the maturity, the better the function of the module and the better the cooperation between the modules. Digital technology has a high degree of scalability. After the technical module is designed, it can continuously upgrade and improve the function of the module and the matching degree between modules by means of repeated programming, delayed loading, code reuse, etc., so that the e-commerce platform firms can mix and match the technical modules more flexibly and agilely to quickly respond to market opportunities[23]. For example, Uber continuously adjusts and optimizes the algorithm of driver's order receiving rules, which enables the order allocation module to realize the real-time order allocation function according to

the passenger position, and enhances the user experience.

2.3.2 Partnership resource

The definition of partner resources in this paper is the external complementary resources obtained by e-commerce platform enterprises through network effect[24]. This article measures the use of partner resources by e-commerce platform firms from three dimensions: partner quantity, relationship strength, and partner diversity. *Partner quantity refers to the specific number of partners that constitute a DSA. Relationship strength refers to the closeness of the partnership between the partners that constitute a DSA and the e-commerce platform firms. Partner diversity refers to the number of partner types that constitute a DSA*.

The number of partners represents the scale of partner resources owned by e-commerce platform companies. The greater the number of partners is, the greater the endowment of external resources (such as suppliers, etc.) available to e-commerce platform firms tend to be. A large number of partners connected by e-commerce platform firms through digital technologies ensure the stability of the source of product and service innovation in DSAs. As the number of partners in DSAs increases, the utility of consumers through DSAs also gradually increases, which will be likely to attract more consumers. For example, Eleme, a take-away platform, quickly grabbed the market by collecting a large number of catering partners and providing consumers with a variety of online ordering services.

Partnership strength and partner diversity represent the degree of heterogeneity of partner resources owned by e-commerce platform firms[24]. On the one hand, the strength of partnerships makes it easier for focal firm to obtain the core resources of partners, and the close cooperation of all parties allows resources to flow and match more effectively between the partners, in this case DSAs based on this have more innovative characteristics. On the other hand, diverse partner resources provide the foundation for e-commerce platform firms to build diversified products and services, and the combination of more types of partner resources has increased the difficulty of imitation.

2.4 The responses of DSAs

In the digital environment, as the visibility of innovative sources of products and services launched by e-commerce platform firms increases, competitors can quickly imitate and surpass, resulting in frequent competitive interaction. It can be seen that the DSAs initiated by e-commerce platform firms and the response actions of competitors have jointly determined the degree of value creation. Therefore, this study draws on relevant research in the field of competitive dynamics, and measures the effect of a DSA from the number of competitors' response actions and the response action delay time. Among them, *the number of response actions refers to the number of competitors ' actions responding to a DSA*, and *the lag time of response actions refers to the average response delay time of competitors' responses to a DSA*.

The number of competitors' response actions reflects how often DSAs is imitated. The smaller the number of response actions, the smaller the share of competitive advantage eroded by competitors, and the greater the value that companies gain through DSAs. The lag time of response actions reflects the speed at which competitors are mimicking DSAs. The slower the competitors can imitate DSAs, the more focal firms can increase the duration of the first-mover competitive advantage. For example, Ctrip launched business travel services due to the slow response of competitors, Ctrip has successfully become the leader in Chinese business travel market.

2.5 Research framework and approach

Based on the above, this paper proposes a research framework as shown in Figure 1.

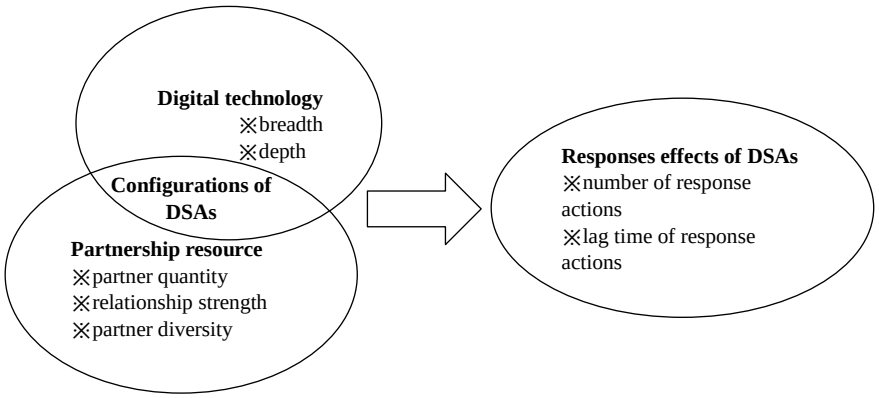

Figure 1. Research framework

Due to the support of digital technology, in addition to the convergence characteristics of DSAs, they also show unprecedented levels of generativity[18], which means that the boundaries of innovation are highly blurred. This feature allows e-commerce platform firms to dynamically orchestrate digital technologies and partner resources to initiate DSAs based on changes in market demand. It can be seen that the support of digital technologies and partnership resources for DSAs is not a simple linear relationship, but a complex causal relationship that dynamically adapts to each other.

Specifically, on the one hand, the digital technology advantages of e-commerce platform firms can provide partners with quality services such as reconfiguring the supply chain and building brand advantages. Therefore, it attracts a large number of partners to continuously participate in cooperation. On the other hand, a large number of heterogeneous partner resources will in turn promote the breadth and depth of digital technologies. For example, the digital marketing tools provided by Taobao (such as business staff, etc.) continue to increase the stickiness of cooperative merchants. When Taobao has gathered more cooperative merchants and consumers, it has continued to introduce high-quality digital tools in a targeted manner (such as smart recommendation, single product treasure, etc.). Digital technology and partner resources complement each other and adapt dynamically to each other.

The method based on variance theory is difficult to solve the complex relationship of causal asymmetry, while the fsQCA method based on set theory can study the complex interaction between factors through configuration[25]. The fsQCA method identifies the combination of causes that can produce outcomes of interests based on Boolean operations, that is, the configuration. Through the counterfactual analysis, it further reveals the differences in the importance of the causes in the configuration, that is, the core and periphery causes[25]. When e-commerce platform firms initial DSAs, due to the mutual causality between digital technologies and partnership resources, the combinations of digital resources are complex and changeable, so it is difficult to show this complex relationship by using the traditional variance methods. Therefore, this paper uses fsQCA method to explore the DSAs' configurations which can bring expected business value.

3. RESEARCH DESIGN

3.1 Sample selection and data collection

3.1.1 Sample industry and enterprises selection

This study selects Chinese online tourism industry as the research scenario. The reasons are as follows: First, the online travel tourism is an emerging industry driven by digital technology in recent years. Most of the competitive actions in this industry are enabled or triggered by digital technology. Second, the online travel firm is the e-commerce platform, which needs to use digital technologies to converge partner resources to initiate

various competitive actions in order to gain a competitive advantage. This feature provides an investigative opportunity for the DSAs' configuration formed by the complex interaction between digital technologies and partner resources. Third, competition in online tourism industry is fierce. In order to expand the market share, the competition between enterprises is very frequent, and they constantly launch DSAs. Therefore, it is very suitable to analyze the competitive situation of this industry from competitive dynamics.

This study further focuses on 9 online tourism enterprises (including Ctrip, eLong, Qunar, Tuniu, LYCOM, lvmama, Mango, Kuxun and Alitrip) that occupy more than 80% of the market share of China's online tourism market, and selects the DSAs initiated by these enterprises during the most competitive period from January 2012 to December 2014 as research samples.

3.1.2 Data collection

Based on the research paradigm of competitive dynamics, this research used structural content analysis to identify DSAs from public news reports, as well as archives of digital technologies and partnership resources. On the one hand, this study selected the comprehensive database Factiva and CNKI as the main data sources, and on the other hand authoritative industrial medias, such as TravelDaily, ctcnn and ebrun, were used as supplementary data sources. In addition, in order to carefully examined the development and application of digital technology in the industry, this study extended the data collection period to the year 2000 when China's online tourism industry was born, and to the year 2015 when Ctrip, eLong and Qunar merged.

As a result, 15170 news reports were collected in this study. Then, this study used NVIVO to clean the data, and made a preliminary classification (including: competitive action, financial statements, entrepreneurs' speeches, the change of personnel, etc.), which was prepared for data coding.

3.2 Coding

Coding work mainly included: identification and classification of DSAs, coding of digital resource elements (including digital technologies and partnership resources), and pairing of DSAs.

3.2.1 Identifying and classifying of DSAs

Due to many sub-businesses of the online tourism industry, this study needed to classify DSAs according to the same sub-businesses.

First, six trained students of this research organization read the news in the news database and extracted the most relevant keywords of DSAs from the news content, and then formulated the coding agreement for DSAs.

Secondly, according to the coding rules and the research period (January 2012 to December 2014), this article identified 599 DSAs from the news database (including: the time when the action was launched, the specific content of the action, etc.).

Third, with further analysis and discussions by trained students, a classification rule has been developed for the DSAs. This classification rule divided 17 types of DSAs according to the businesses involved in DSAs (including: cruise, WIFI, car rental, scenic spots tickets, hotels, air tickets, destination information services, tourism route, train tickets, multi-service portfolios, cooperatively attract traffic, Internet finance, car tickets, tourism catering, visa services, tourism shopping, customer service). Furthermore, in order to verify the effectiveness of DSAs' classification rule, a pre-test was adopted, and the inter-rater reliability reached 95%, which indicated that the classification rule had strong robustness.

3.2.2 Coding of digital technologies resource and partnership resource

This part was divided into three interrelated sub steps: first, coding rule for digital technologies; then, coding rule for partner resources; finally, identifying the digital technologies and partner resources contained in each DSA in the sample according to the coding rules.

(1) Coding of digital technologies

Referring to the previous method[26], the coding process of digital technologies protocol is as follows:

First, organized trained students to read the news in the news library and identify the digital technologies required by the sample firms to carry out specific business activities. For example, reading the news (titled "LYCOM Layout for Offline Travel Sights and Promote Smart Box Office System"), it could be inferred that "Smart Box Office System" is the digital technology required for ticket business on the LYCOM.

Then, use search engine, this study further enriched the relevant information of the digital technologies, and formed the digital technologies coding protocol of each sample firm (including the relationship between the digital technologies of the sample firm and the business activities carried out by the firm, as well as the information such as the first use time and update of the digital technologies).

(2) Coding of partnership resource

The process of formulating the partnership resources coding rules for this study was as follows:

First of all, the study organized the trained students to read the news about the sample actions and identify the key information of the partners, which was included in the DSAs (such as partner name, number, type, relationship strength, etc.).

Then, based on the identified information and combined with the suggestions of industry experts, this study identified five levels of partnership strength, from weak to strong: in order: ordinary cooperation, ordinary cooperation mentioning specific partner names, strategic cooperation, investment, holding or strategic investment, subsidiaries. At the same time, the types of partners were divided into 16 types, including cruise company, bank, tourism line, car rental firm, Internet platform, scenic spot, third-party payment, hotel, non-profit organization, tourism administration, travel agency, software firm, media firm, traditional manufacturing firm, highway transportation firm, catering firm, etc.

3.2.3 DSAs' pairing

The "action-response dual" pairing of DSAs in this section aims to obtain the action effects (including the number of response actions and the delay time of response actions) generated by the DSAs initiated by firms at the level of competitive action.

Competitive dynamics methodology proposes two ways of identifying competitive responses, both approaches are used in this study. The original method proposed by Chen et al. relies on an explicit reference to an earlier action in the press article[7]. However, not all articles actually make such references because at the time of their publication, the original action may have been quite evident to readers and so required no additional mention. Therefore, an alternative coding approach is to focus on finding competitive moves that are similar to earlier actions[27].

This study drew on the above two pairing methods, and based on the established DSAs classification, the pairing was performed in the same action type. In addition, due to the seasonal nature of the online travel industry[28], three months are defined as the time frame within which we expected a response to occur if it was going to occur. Then, after repeated discussions and modifications, the final DSAs pairing rule was prepared, including three main criteria:

First, matched according to the same business category, similar market and similar solar terms.

Second, if the action explicitly mentions the contents of the rivalry between competitors, matched them according to the description.

Third, for DSAs that do not explicitly mention the content of rivalry, matched them in a three-month window (sliding window), which was the default time window to measure the DSAs' effect. Meanwhile, matched DSAs in an iterative way, which meant DSAs could be used as a response action in an action-response chain, as well as an initiation actions, calculated in another action-response chain.

Based on the above rules, this study identified 409 competitive actions and 1383 competitive responses.

3.2.4 Construct Measures

According to the coding rules, the variables included in the research framework were quantified to provide the basis for the subsequent fsQCA.

(1) Measuring of digital technologies and partnership resources

In the research framework, the elements that made up the DSAs' configurations included digital technologies and partner resources, corresponding to five variables (including technology breadth, technology depth, number of partners, strength of partnerships, and diversity of partners). According to the established coding rules of digital technologies and partner resources, the qualitative data related to the causal variables were translated into quantitative data. The measurement method of each causal variable is shown in table 1.

Table 1. Measurement of digital technologies and partnership resources

Causal variable	Measurement
Technology breadth	The number of digital technologies (including technologies, systems, etc.) invoked by DSAs.
Technology depth	The average days during which the digital technologies had been put into use in the firm up to the initiation of DSAs.
Partner quantity	The number of partners involved in DSAs. In addition, if the number of partners was particularly large, logarithmic conversion was performed with a base of 10 before counting.
Relationship strength	Quantified the strength of partners in DSAs. Specifically, "1" for general cooperation, "1.5" for general cooperation referring to partner name, "2" for strategic cooperation, "3" for investment but not holding partner, "4" for holding or strategic investment partner, and "5" for subsidiary.
Partner diversity	According to 16 types of partner in coding rule, quantified the number of partner types in DSAs.

(2) Measuring of DSAs' effects

The DSAs' effects that this study focused on was reflected in the two dimensions of the number of response actions and the delay of response actions caused by competitors caused by DSAs initiated by focal firms.

The measurement methods of each outcome variable representing the DSAs' effects are shown in table 2 below.

Table 2. Measurement of DSAs' effects

Outcome variable	Measurement
Number of response actions	Total number of competitive response actions elicited by a DSA.
Lag time of response actions	The average of delay days for all competitive response actions elicited by a DSA.

4. SET-THEORETIC CONFIGURATIONAL ANALYSIS RESULTS

Based on the configurational perspective, this study explained the relationship between the complex interaction combination of multiple causal variables and the outcome variables, and used fsQCA to analyze how digital technologies and partner resources form "causal recipe", which made the competitors hard to respond.

4.1 Calibration

Table 3 presents descriptive statistics and correlations for all variables.

Table 3. Means, standard deviations, and correlations

Variable	Means	s.d.	1	2	3	4	5	6
Breadth	4.86	2.93						
Depth	1720.59	950.43	-0.35					

Partner quantity	2.17	2.58	0.12*	0.00				
Relationship strength	1.17	0.92	0.04	-0.03	0.21**			
Partner diversity	1.24	1.16	0.32**	-0.04	0.51**	0.37**		
Number of response actions	3.38	2.54	-0.11*	0.10*	-0.14**	-0.19**	-0.16**	
Lag time of response actions	52.48	43.66	-0.00	-0.11*	0.07	0.22**	0.07	-0.46**

**p<0.01，*p<0.05.

Using fsQCA requires one to calibrate the causal attributes and outcomes into set-membership scores. Calibration defines the extent to which a given case has membership in the set of, for example. Ragin's direct methods of calibration are based on three qualitative anchors: full membership, full non-membership, and the crossover point of maximum ambiguity regarding membership of a case in the set of interest[29]. We used Ragin's direct method of calibration implemented in the fsQCA 2.5 software package, which transforms a variable into a fuzzy set using the metric of the distance of the variable value from the crossover point with the values of full membership and full non-membership as the upper and lower bounds. The resulting fuzzy membership score is between 0 and 1: 0 indicates a full non-membership and 1 indicates full membership.

With reference to the calibration method of Campbell et al. and Fiss[25, 30], this study defined these three anchors based on empirical and theoretical knowledge of the context and cases. The three anchors of the causal variable were located at the 90th percentile, mean, and 10th percentile of the sample, and the three reference values of the outcome variable are located at the 75th, median, and 25th percentile of the sample. The values are shown in the following table.

Table 4. The anchors' values of variables

variables		Full membership	Crossover point	Full non-membership
Causal variables	Breadth	9	4.86	2
	Depth	3000	1700	600
	Partner quantity	4.70	2.17	0
	Partner quantity	2	1.17	0
	Partner diversity	3	1.24	0
Outcome variables	Number of response actions	1	3	5
	Lag time of response actions	63	40	26

After calibration, to use fsQCA, one next needed to apply the truth-table algorithm that identifies combinations of elements that produce the outcome of interest. A truth table includes all logically possible combinations of the elements, and each row corresponds to one combination.

In the truth-table algorithm, fsQCA can simplify the configurations through "easy" and "difficult" counterfactual analysis, and obtain "parsimonious solution" and "intermediate solution", so as to judge whether the causal condition in the configuration is the core condition or the peripheral condition. Therefore, our work used "parsimonious solution" and "intermediate solution" obtained by fsQCA to explain whether the causal variables are the core or the peripheral causes.

4.2 Results

According to Ragin's recommendation, in the truth-table, the consistency threshold was set as 0.75. Moreover, the frequency threshold was set to 5 to ensure that the analysis included more than 90% of the samples. After truth-table analyzing, we found that five types of configurations bring great responses effects of

DSAs, including three configurations with a small number of response actions (HPN1, HPN2, HPN3) and two configurations with a long responses delay (HPT1, HPT2), as shown in table 5 below.

Table 5. The configurations for achieving high responses effects

	Response effect with a small number of response actions				Response effect with a long responses delay	
	HPN1	HPN2	HPN3		HPT1	HPT2
			HPN3a	HPN3b		
Digital technology						
breath	●	●	●	●	●	●
depth		●		⊗	●	⊗
Partnership resource						
Partner quantity	●		●	●	⊗	●
Relationship strength	⊗	⊗	●	●	●	●
Partner diversity	⊗	●	●		⊗	⊗
Consistency	0.80	0.77	0.77	0.77	0.77	0.76
Row coverage	0.20	0.21	0.30	0.27	0.18	0.18
Unique coverage	0.02	0.02	0.01	0.01	0.06	0.06
Overall solution consistency			0.75		0.76	
Overall solution coverage			0.36		0.24	
Frequency cut-off ●			5	⊗	5	

Notes: Black circles (“ ”) indicate the presence of a condition, and open circles (“ ”) indicate its absence. Blank spaces indicate “don’t care”; that is, the condition is not relevant to that particular configuration. Large circles suggest “core” or central conditions, while small circles indicate contributing conditions.

The solution table shows that the fuzzy set analysis results in five solutions exhibiting acceptable consistency (≥0.75) and furthermore indicates the presence of both core and peripheral conditions. Solution HPN1 indicates the core importance of digital technology breadth and partner quantity, and partner diversity and relationship strength are the causal conditions that must be absent. Solution HPN2 shows that breadth and depth of digital technology as well as the partner diversity are the core elements that must appear, while the strength of the partnership is a core element that cannot occur. In addition, the presence of the partner quantity has no bearing on this configuration. Solution HPN3 contains two neutral permutations, which means these two solutions share central conditions and only differ in their contributing conditions[25]. Comparing solutions HPN3a and HPN3b thus indicates that high diversity of partner and the absence of digital technology depth can be treated as substitutes. Furthermore, both HPN3a and HPN3b show the breadth of digital technology, the partner quantity, and the partner diversity the core conditions to orchestrate these types of configurations.

In terms of response effect with a long response delay, there are two solutions. Configuration HPT1 shows that the breadth of digital technology, the depth of digital technology and the strength of partnership are the core conditions that need to appear, while the partner diversity is the core element that cannot appear. Moreover, the partner quantity is the peripheral element that cannot appear. Configuration HPT2 shows that in the absence of the technology depth and partner diversity, the number of partners and the strength of partnership should be high。In addition, the digital technology breadth exists in this configuration as a peripheral condition.

5. THEORETICAL CONFIGURATIONAL PROPOSITIONS

The results reflect the "equifinality" of the configuration, which helps to summarize a variety of digital resource combinations that can reduce or prevent the response of competitors (high responses effect). This study draws on previous research paradigms, extracts propositions from the results, and makes a comparative analysis of the cases in the results. Specifically, combines the "awareness-motivation-capability" framework of competitive dynamics[7] and the basic logic of it enabled competitive advantage sustainability[17], this study proposes three propositions that can trigger the high responses effects of DSAs.

5.1 Types of digital technologies bundling a large number of partners

Configuration HPN1 is a DSAs' resource portfolio with fewer responses from competitors, as shown in Table 6. The characteristics of resource orchestration presented by this configuration can be summarized as follows: under the condition of less mature digital technology module and weak tie with the partners, the DSAs initiated by abundant digital technology module and a large number of single type partners can effectively reduce the number of competitors' responses.

Table 6. Summary of proposition 1

Configuration	Core causal conditions	Peripheral causal condition	Successful case
HPN1	Breadth Partner quantity ~Partner diversity	~Relationship strength	In October 2012, LYCOM used the technical system related to ticket business to aggregate the information of more than 8000 scenic spots in China, and launched real-time comfort services for tourists.
Characteristics	Under the condition of less mature digital technology module and weak tie with the partners, the DSAs initiated by abundant digital technology module and a large number of single type partners can effectively reduce the number of competitors' responses.		

Notes: "~" indicate absence of causal condition.

AMC framework is a classical theoretical framework for analyzing and predicting competitive behavior in the field of dynamic competition[7]. As precursors to competitive behaviors, awareness indicates that competitors perceive the competitive actions initiated by the focal firms, and motivation and capability respectively indicate whether competitors have motivation and ability to respond to competitive actions. Among them, awareness and motivation are related to the degree of market overlap of competitors and focal firms. The higher the degree of market overlap, the more the competitors may perceive the competitive actions of the focal firms. The capability is related to the resource endowments of firms. On the basis of the competitors' awareness and motivation to respond to the competitive actions initiated by the focal firms, the resources they own become the key factor of whether they can respond. At the same time, the researches on the sustainability of IT enabled competitive advantage hold that the key to reduce competitors' responses to the IT enabled competitive actions is to use the competitive IT resources to combine with the complementary resources to improve imitation barriers[17].

Thus, there are two main reasons why configuration HPN1 can effectively reduce the number of competitors responses. First of all, use rich digital technology components to combine with a large number of partners to provide consumers with real-time information services, competitors have less motivation to respond. Although in the digital environment, competitors can easily perceive the DSAs initiated by e-commerce platform firms, but because the main purpose of such actions to provide real-time information services is usually to improve the after-sales experience and increase user stickiness, the time and size of the effect are difficult to estimate, so the competitors may have little motivation to respond. Second, the integration with a large number

of partners' systems improves the ambiguity of the combination of digital technologies and partner resources, further limits the response ability of competitors. If the competitors want to respond to the DSA, they need to have the same digital technology resources and partner resources as the focal firms, and clarify the mechanisms of resource allocation, which are very difficult.

Based on the above discussion, this study proposes the following proposition:

P1: using the rich and newly developed digital technology components to combine with a large number of single types trading partners to obtain information data and product resources of partners and launch DSAs, can effectively reduce the number of competitors' responses, and gain higher responses effects.

5.2 Types of flexible allocation of partner resources led by digital technologies

Configuration HPN2 is the resource combination that can trigger DSAs with fewer response actions, and configuration HPT1 is the resource combination that can trigger DSAs with longer response delay time. As shown in table 7 below, whether in configuration hpn2 or in configuration hpt1, the breadth and depth of digital technology are the core causal conditions for the high responses' effects of DSAs. Interestingly, the two types of configurations show different characteristics in partner resources deployment.

Table 7. Summary of proposition 2

Configuration	Core causal conditions	Peripheral causal condition	Successful case
HPN2	●Breadth ●Depth ●Partner diversity ~Relationship strength		In September 2014, Qunar used the technical systems related to the airlines and the hotels, gathered a variety of external cooperation resources such as hotels and airlines, and launched a promotional activity of cash back on products purchased.
HPT1	●Breadth ●Depth ●Relationship strength ~Partner diversity	~Partner quantity	In January 2014, Ctrip united its strategic investment partner, Yidao, launched the "shuttle" service by using the technical system of car rental and airline.
Characteristics	DSAs initiated by a large number of mature digital technology modules combined with various types of partners can effectively reduce the number of responses from competitors, while DSAs initiated by a single type of well-connected partners can effectively delay the response time of competitors.		

Notes: "~" indicate absence of causal condition.

The main reason why HPN2 configuration can reduce the number of competitors' responses would be that the rich and mature technology components can combine with multiple types of partners, which improves the difficulty of competitors' responses. Specifically, after gathering a large number of heterogeneous partners, e-commerce platform firms usually deploy a variety of partner resources based on the existing technologies to launch regular marketing activities to attract consumers. In addition, due to the high heterogeneity of partners participating in the actions, different business departments are usually required to coordinate, which not only involves the cooperation of business departments within the e-commerce platform firm, but also involves the negotiation of various matters with heterogeneous partners, such as marketing strength, promotion process, etc., which puts forward higher requirements for the resource orchestrated ability of competitors. For example, Alibaba launched its first "double 11" promotion in 2009. Because this type of DSAs need to be based on a rich and mature technology systems and a variety of partner resources, which were not prepared by major e-commerce platform firms including jd.com and Dangdang at that time, until 2012, the responses to the

"double 11" initiative were weak.

When e-commerce platform firms pay more attention to deep cooperation with a single partner, they can connect closely related partners through a large number of mature digital technology components to obtain unique product resources (configuration HPN1). Strategic partnership and competitive product resources improve the barriers of competitors' response, thus delaying the response time of competitors. For example, in 2014, Ctrip integrated its subsidiary, HHtravel, with rich and skilled digital technologies, top-level tourism products have been launched and attracted a large number of high-end consumers. As competitors needed to build strategic partners to provide them with high-quality line products, response time was greatly delayed.

Based on the above discussion, this study proposes the following propositions:

P2a: using the rich and mature digital technology components to combine with diverse trading partners to launch DSAs can effectively reduce the number of competitors' responses, and gain higher responses effects.

P2b: using the rich and mature digital technology components to connect with a small number of partner technologies closely related to a single type of cooperation, so as to obtain high-quality product resources and relationship resources, launch DSAs, which can effectively delay the responses time of competitors, and gain higher responses effect.

5.3 Types of strong partnerships

Configuration HPN3 is the resource combination that can trigger DSAs with fewer response actions, and configuration HPT2 is the resource combination that can trigger DSAs with longer response delay time.

Table 8. Summary of proposition 3

Configuration	Core causal conditions	Peripheral causal condition	Successful case
HPN3	⊷Breadth ⊷Partner quantity ⊷Relationship strength	⊷Partner diversity ~Depth	In December 2013, Ctrip strategically invested in 8 different types of international car rental firms, using its own vehicle business technology system to connect with partner technology system, and launched overseas self-driving service.
HPT2	⊷Partner quantity ⊷Relationship strength ~Depth ~Partner diversity	⊷Breadth	In April 2014, Tuniu, in close cooperation with hundreds of tourism product suppliers, launched a special-sale channel, which can quickly reduce stock according to the supplier's own situation and market demand.
Characteristics	With a large number of closely related partner resources, DSAs initiated by rich and immature digital technology modules can effectively reduce the number of responses from competitors and delay the response time of competitors as well.		

Notes: "~" indicate absence of causal condition.

The main reason why configuration HPN3 can reduce the number of competitors' responses is that it uses rich and newly developed digital technology components to connect with a large number of good partners to gain various product resources of partners, and enter new markets to launch new products. Competitors will be difficult to respond due to lack of domain knowledge and related resource endowment. Specifically, on the one hand, due to the lack of understanding of the new market and unclear benefits of the emerging product market, competitors have little motivation to respond. On the other hand, because of lacking of domain knowledge necessary for the new market, competitors are also difficult to understand how to imitate the focal firms.

Similar to HPN3, in the absence of mature digital components, e-commerce platform firms have a large

number of strong relationship partners who can use a variety of technical functions to find niche markets and establish new business models (configuration HPT2). At this time, although competitors have high motivation to respond, they need to invest a lot of time in advance to find a large number of close partners resources. The resource combination of DSAs represented by configuration HPT2 mostly occurs when the e-commerce platform firms have been deeply involved in some industries for a long time, and have built a very good relationship with the upstream and downstream partners of the industry, and have fully estimated the development trend and potential profit point of the industry. In this case, competitors will have strong response motivation for the emerging business model launched by focal firms. However, it is difficult for competitors to establish similar close relationships in the short term, thus delaying the response time.

Based on the above statements, this study proposes the following proposition:

P3: using rich and newly developed digital technology components to connect with a large number of closely related partner technologies, acquiring a large number of high-quality product resources of partners to launch digital strategic actions, can effectively reduce and delay the number and response time of competitors, and gain a higher competitive advantage.

6. DISCUSSION

Based on the resource orchestration view and competitive dynamics theory, this study uses the research configurational paradigm to explore digital resources combinations which create value of e-commerce platform firms, and proposes theoretical propositions. Specifically, this research has several contributes for business value of IT:

Firstly, in view of the characteristics of the complex interaction of digital technologies and partner resources in e-commerce platform firms, this study explores the relationship between the dynamic combinations of two types of advantage resources and different types of DSAs based on the configurational approach, and clarifies that in competitive dynamics, the value of e-commerce platform firms comes from the dynamic combinations of advantage resources. This finding breaks through the limitation of thinking that taking possession of resources as the source of value in the previous research, and provides new evidence for exploring the resource orchestration mechanism of DSA in competitive dynamics.

Secondly, this study introduces the research paradigm of competitive interaction in competitive dynamics into the business value of IT. On the one hand, the logical chain of value creation of e-commerce platform firms is built completely from resources to actions to responses' effects; on the other hand, the internal mechanism of gaining advantages through competitive interaction among e-commerce platform firms is examined in more fine-grained way, which lays a solid foundation for the research of business value of IT in digital environment.

Thirdly, e-commerce platform firms need to pay attention to embedding their digital technologies into external partner resources to form innovative products and services that are difficult to imitate, so as to gain competitive advantages. At the same time, in the competitive dynamics, digital technologies and partner resources interact with each other in a complex way, that is to say, different resource combination patterns can help firms gain competitive advantage in a specific competitive situation. With the change of the situation, the former resource combination patterns that play an effective role may lose their effectiveness. Therefore, e-commerce platform firms should not blindly cultivate the fixed resource combination, but should learn the integration mode of digital technologies and partner resources in an all-round way, and make use of them in time according to the environment.

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