

Value co-creation model based on IS application capabilities

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Abstract: To illustrate how firms and customers co-create value in business to business (B2B) e-commerce, an integrated value co-creation model is proposed based on information systems (IS) application capabilities from the relational view. IS application capabilities, relational assets, customer agility and relational value are constructed and tested by empirical analysis. The empirical research tests and verifies the mediating effect of customer agility, and the interactions of IS application capabilities and relational assets, as well as their effect on relational value. This model expands the research framework of value co-creation in service dominant logic, and reveals the mechanism of how firms and customers co-create value in B2B e-commerce based on IS application capabilities, which provides the basis for further theory development and a practice guide.

Key words: information systems (IS) application capabilities; customer agility; relational view; service dominant logic; value co-creation

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The relationship between firms and customers has changed significantly within the economic globalization and information technology (IT) context. Meanwhile, the service-dominant (S-D) theory has emerged, focusing on value co-creation^[1] between firms and customers. S-D logic broadens the value creation framework that all social and economic actors (firms, customers etc.) are service-providing and value-creating organizations. All exchanges are considered B2B^[2] according to the framework. Moreover, IS innovative applications are crossing traditional firm boundaries in e-commerce. They affect the resources and capabilities between firms and customers, and governance their relationship effectively^[3]. Accordingly, IS applications and value co-creation have become important topics in the IS field^[4].

However, many firms find it difficult to gain relational advantage^[5] with their customers in practice. How to

evaluate the co-created value? What is the basis of value co-creation? Do mediating factors exist? These issues remain to be resolved. In this paper, we expand the value creation model in S-D logic, revealing the mechanism how relational value is generated between firms and customers. This will help firms to understand the value co-creation process with customers, and facilitate their IS application to strengthen the relational advantage.

In this paper, we first build a value co-creation model from the relational view. Then, the constructs in our research model are defined. Theoretical hypotheses are also proposed in this part. Finally, we use the data collected from China to test our theory empirically. Major findings and implications are analyzed in the conclusion.

1 Theoretical Foundations

1.1 Service-dominant logic

Tangible resources and transactions are vital to economic growth in the industrial era. But in the current knowledge economy, intangible resources such as knowledge and skills have become fundamental for economic development. Constantin and Lusch^[6] classified resources into two kinds of operand and operant. Operand resources refer to goods and other natural or tangible resources, while operant resources represent knowledge, skills and other intangible resources that play driving roles in production. Vargo and Lusch proposed S-D logic based on the two kinds of resources^[1]. They redefined the concepts of goods, service and value creation, indicated operant resources as a source of competitive advantage, and defined service as the application of operant resources, which is the basis for exchanges^[7]. Therefore, knowledge and skills become the reason for advantage in S-D logic, which explore and exploit the value of operand resources. Overall, S-D logic has emerged with the development of the strategy theory and inspires related theory and practice.

1.2 Value co-creation

Prahalad and Ramaswamy^[8] stressed the value co-creation perspective, indicating that value creation transforms from product-centric to experience-centric, which emphasized the importance of cooperation between firms and customers to achieve high-quality interactions and co-created value. Zwass^[9] first introduced co-creation to the IS field. He suggested that co-creation was the significantly

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growing productive force in e-commerce. Meanwhile, the turbulent development of e-commerce means that the co-creation framework needs to be revised with a new context and theory. S-D logic expands the framework of value co-creation in e-commerce. It focuses on value in-use being different from exchange-value in good-dominant (G-D) logic. Roles of customers and the integrated processes between firms and customers are underlined in this process. The comparison of value creation between G-D and S-D logic are shown in Tab. 1.

Tab. 1 Value creation in G-D and S-D logic^[1,7]

Items	G-D logic	S-D logic
Value forms	Exchange-value	Value in-use
Value creator	Firm investment	Firms, customers and other partners
Value creation process	Value is embedded in goods or services provided by firms.	Value results from beneficial application of operant resources.
Main purpose	Increase firm wealth.	Enhance firms and customers relationships.
Measurement	Value in exchange reflected by prices	The loyalty of their relationships.
Basic resource	Operand resources	Operant resources
Description tool	Value chain	Cooperative relationships
Role of goods	Goods are operand resources and ultimate products.	Goods are transmitters of operant resources and intermediate products.
Role of firm	Firms determine and distribute the value.	Firms only make value propositions.
Role of customer	The customer is the recipient of goods, and is an operand resource.	The customer is a co-producer of service, and is primarily an operant resource.
Firm-customer interaction	Marketers penetrate, distribute and promote goods to customers. Customers are encouraged to interact with resources.	Marketing is a process of interactions with customer. Customers are active participants in relational exchanges and coproduction.

In the framework of S-D logic value co-creation, a mutually beneficial relationship is crucial for firms and their customers. It prompts firms and customers to cooperate. The capability of value co-creation with customers will become a core advantage of firms in the future.

2 Research Model and Hypotheses

In this paper, we study value co-creation between firms and customers from the perspective of the relational view. The relational value is considered as the metrics of value co-creation, relational assets combined with IS application capabilities are the basis of value creation. Customer agility is the mediating factor in this process, which reveals the mechanism of value co-creation. The research framework is shown in Fig. 1.

The relational view was first proposed by Dyer and Singh^[10], which explained how relationships created value in their cooperative strategy. It suggests that resources are embedded in inter-firm interactions. Four potential sources of relational advantage are identified, which are relation specific assets, knowledge sharing routines, complementary resources or capabilities, and effective governance. The relational view deepens the understanding of firms' strategic behavior. They cooperate to obtain necessary resources and capabilities for development in economic globalization. Firms tend to select cooperative strategies to share knowledge and skills, create complementary advantages and to undertake benefit and risk mutually. The relational view provides a normative paradigm for the firm-level strategies.

2.1 Customer agility and relational value

Agility is the ability to detect and seize market opportunities with speed^[11]. In the globalization and time-to-customer contexts, firms have to integrate their assets to seize

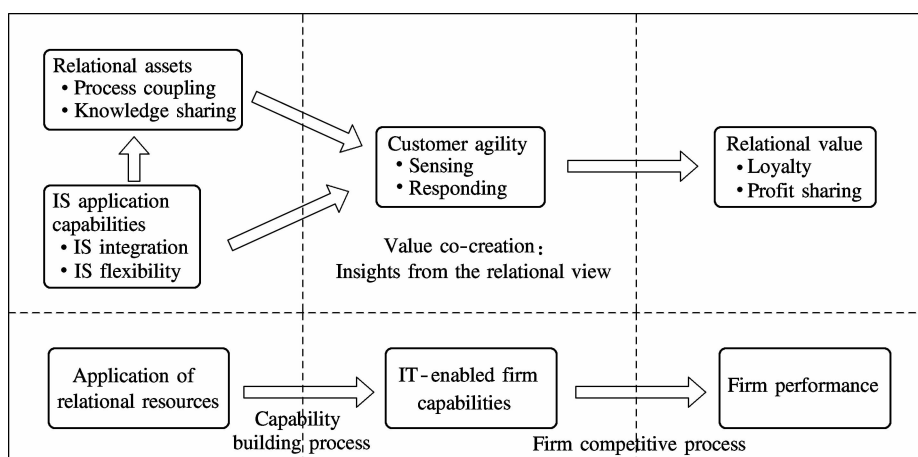


Fig. 1 Research framework

the opportunities for competitive action. In this paper, we define customer agility as the capability of firms which are able to sense and respond quickly to customer-specific

opportunities for innovative performance^[12]. Customer agility determines firm success in enhancing the value creation process. First, customer agility is the firm-level ca-

pability containing sets of organizational processes to produce specific outputs. Secondly, customer agility emphasizes sensing and responding to environmental changes which are critical for firm success in turbulent environments. Thirdly, customer agility can be considered as a specific domain for firm advantage.

The relationship between firms and customers is the analytical basis according to the relational view. It focuses on joint capabilities and collaborative advantages between partners^[13]. Relational value implies that the success of cooperation ensures the achievement of value co-creation. It means that the value appropriation for partners at behavioral and strategic levels are beyond the cost and benefit value^[14]. Relational value is socially constructed from the interactions between firms and customers. Loyalty and profit sharing are proposed to evaluate relational value from social and economic perspectives. Loyalty captures

the commitment between firms and customers to maintain cooperation, while profit sharing reflects the percentage of profit appropriated to the partners^[15].

Customer agility is directly related to innovative opportunities by sensing and responding to customers’ needs quickly. It effectively improves the firm’s performance and maintains loyalty between firms and customers. Therefore, we propose hypothesis 1: Customer agility is positively related to relational value.

2.2 Relational assets

From the relational view, relational assets are interactions between complementary resources inter firms. The heterogeneous resources and capabilities are functioned through inter combination. In this paper, relational assets are classified into two levels of process coupling and knowledge sharing as shown in Tab. 2.

Tab. 2 Relational assets

Dimension	Levels	Definition	Function	Reference
Process coupling	Operational level	Integration of partners’ process at operational level across firm boundaries.	Firms strengthen cooperative specialization through process coupling of joint actions and quick support for business. So firms respond to customer needs timely, which will enhance customer satisfaction and loyalty.	Ref. [16]
Knowledge sharing	Strategic level	Transmission, combinations and creation of specific knowledge between firms and their partners.	Knowledge embedded in relationships helps firms acquire new opportunities from their partners, resulting in improved performance through better and faster response to customer demands.	Ref. [17]

From Tab. 2, it can be seen that relational assets support value co-creation by exploring potential opportunities for firms^[18]. Process coupling brings firms customer-specific advantages which cannot be imitated or substituted due to their path-dependent nature. Knowledge sharing promotes new solutions and skills for firms to cooperate with customers. Firms sense and respond to customer needs quickly by process coupling and knowledge sharing. Both levels of relational assets significantly affect customer agility. Accordingly, we present hypothesis 2: Relational assets have direct positive impacts on customer agility.

2.3 IS application capabilities

According to Ref. [19], IS application capabilities are a set of organizational variables reflecting the outcomes of IS management processes. They are divided into integration and flexibility, which represent efficiency and effectiveness respectively and are conceptually considered to be distinct from each other. Both are essential since IS flexibility and IS integration together balance firms’ need to keep adaptable electronic links with multiple partners, and at the same time, maintain sufficient wealth so as to support the value creation of relational assets. Previous studies show that IS application capabilities positively affect process coupling and knowledge sharing. Therefore, we propose hypothesis 3: IS application capabilities are

positively related to relational assets.

IS integration is defined as the IS application of a firm working in conjunction with its partners. External IS integration between firms and customers can be achieved currently with a large number of IT components supports which supply varieties of functional features^[20]. It includes not only technical compatibility but also IT skills that render a higher degree of IS integration at functional levels. Thus, the definition of IS integration refers to the combination of technological and functional approaches. IS flexibility is recognized as an important aspect of how to configure IS applications. In this paper, IS flexibility is defined as the ability to quickly and economically adapt IS applications to changing business requirements. IS flexibility enables firms to withstand the fluctuations of their customer demand and respond to the changes in processes or partners^[21]. In summary, IS application capabilities enable firms to maintain adaptable and rich links with their customers, strengthening customer sensing and responding capabilities. Hence, we expect hypothesis 4: IS application capabilities are positively related to customer agility.

3 Empirical Studies

3.1 Data and measures

We collected data from Chinese firms in 2013 through

survey questionnaires. The survey was distributed to university alumni by email or letter. We required them to bring the questionnaire to the department leaders in their firms. A total of 260 questionnaires were distributed, and 197 were received excluding unqualified ones which were incomplete or with the same rating for all the items. We chose questionnaires from firms that have implemented IS applications for cooperation, and finally obtained a sample of 176 for data analysis. The effective response rate is 67.7%.

We use 7-point Likert scale (7 means strongly agree, 4 means neutral, 1 means strongly disagree) to the design measurement items. The items in our constructs were adapted from previous scales, in which the validity and reliability were tested and verified. We use the standard scale development process developed by Hinkin^[22] to modify our scale to match the Chinese context. First, an expert panel of two IS professors, two IS researchers, three IS or business executives examined the scale for content validity of the measurement items. Secondly, the measurement instrument was pilot tested using a sample of MBAs in a pre-formal survey. Constructs are presented as follows, and scale items are not listed individually for length restriction.

Relational assets We measure relational assets according to Refs. [16–17]. It captures two aspects of process coupling and knowledge sharing. There are eight items for this construct.

IS application capabilities In this study, IS application capabilities are measured using the scale of Saraf et al.^[19], which focus on the measurement of IS integration and IS flexibility, and this construct includes seven measure items.

Customer agility We refer to Roberts and Grover's scale^[13] to measure the construct of customer agility. It has two aspects: customer-sensing and customer-responding; and each aspect has six items for measurement respectively.

Relational value This scale was developed based on the study of Rai et al.^[23]. It contains two aspects for the co-created value measurement: loyalty and profit sharing. Each aspect is measured by four items whose reliability and validity are tested.

3.2 Measurement instrument

In this part, we test the reliability and validity of the measurement instrument. The load of each item for its construct is above 0.5 and Cronbach's α lies in the range of 0.80 to 0.96. The composite reliability (CR) of each construct is above 0.8 showing acceptable reliability. We assess the validity of these constructs, for example, the loads of the eight items to relational assets are all above 0.5, and they are significant at the p -level of 0.001, showing the acceptable convergent validity. The average variance extracted (AVE) value is 0.53 showing that the eight items are well identified, which indicates the discriminant validity of this construct. The measurement instrument has acceptable reliability and validity, and it can measure the model accurately in our research.

The mean, standard deviation (SD) and correlation between the variables are recorded in Tab. 3. As shown in Tab. 3, variables are positively related to each other. For example, relational assets are positively related with IS application capabilities ($r = 0.82$; $p < 0.01$), which was discussed in our previous section (r presents the correlation).

Tab. 3 Mean, standard deviation and correlation

Constructs	Mean	SD	Cronbach α	CR	RA	IS	CA	RV
Relational assets (RA)	4.83	0.94	0.82	0.87	1			
IS application (IS)	5.10	1.08	0.88	0.91	0.82 **	1		
Customer agility (CA)	4.52	1.03	0.86	0.90	0.78 **	0.89 **	1	
Relational value (RV)	4.64	1.16	0.90	0.93	0.52	0.60	0.85 **	1

Notes: ** $p < 0.01$. Correlation is significant at the 0.01 level (2-tailed).

3.3 Hypotheses test

We use smartPLS to calculate the path coefficients based on the partial least squares method. PLS is tolerant to the distribution and scale of the sample compared with the structure model method based on the covariance matrix. The Bootstrapping algorithm ($N = 1000$) is used to test the significance of the path coefficient. We calculate GoF^[24] to evaluate model fitting. The GoF of our model is 0.59 which is much higher than the threshold value of 0.36. The path coefficient and R^2 are shown as follows:

R^2 indicates the explanatory power of the model which represents the variances of latent variables. As shown in

Fig. 2, the relational value R^2 reaches 51.3%, which explains 51.3% of the variance of relational value. The 63.7% of customer agility variance is explained by its latent variables, and R^2 of relational asset explains 46.2% of its variance. Each construct is explained sufficiently with reliability of the research model. Path coefficients and their significances are tested using Bootstrapping ($N = 1000$). Tab. 4 reports the testing results.

From Tab. 4, the path coefficient between customer agility and relational value is 0.81, significant at a level of $p < 0.05$, showing the strong positive linkage from customer agility to relational value. H1 is supported by the empirical test. Similarly, the path coefficients of 0.37,

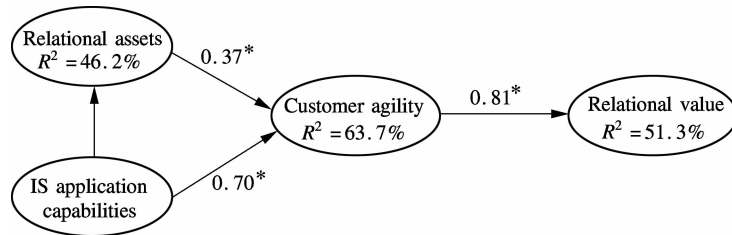


Fig. 2 Path coefficients and R² (Notes: * $p < 0.05$; ** $p < 0.001$)

Tab. 4 Path coefficient and test results

Hypotheses	Path	Coefficient	p-level	Test results
H1	Customer agility → Relational value	0.81 *	0.030	Support
H2	Relational assets → Relational value	0.37 * *	<0.001	Support
H3	IS application capabilities → Relational assets	0.56 * *	<0.001	Support
H4	IS application capabilities → Customer agility	0.70 * *	<0.001	Support

Notes: * $p < 0.05$; ** $p < 0.001$.

0.56 and 0.70 ($p < 0.001$) indicate the strong positive relations between the constructs, significantly supporting H2, H3 and H4, respectively.

4 Conclusion

The main findings are analyzed from the empirical research. First, customer agility is strongly related to relational value with the path coefficient of 0.81. It demonstrates the significant impact of customer agility on value co-creation. This finding is aligned with our theoretical research that firms rely on relationships with customers to co-create value. Customer agility can significantly coordinate the relationships between firms and customers to generate value in e-commerce.

Secondly, although relational assets are important factors in value co-creation process, they cannot generate value directly for their com-modification in an e-commerce environment. It is difficult for relational assets to overcome the prior investment inertia due to path dependency. Therefore, relational assets are related to customer agility with a significant path coefficient of 0.37, but not the direct source of relational value.

Thirdly, IS application capabilities are important in complementary with relational assets and the effect on customer agility. H3 and H4 of 0.56 and 0.70 indicate the significant impact of IS application capabilities on relational assets and customer agility. Firms improve their relationships with customers through IS application, as IS integration and IS flexibility support knowledge sharing and process coupling of relational assets during the value co-creation process.

In this paper, an integrated model of value co-creation based on IS application capabilities and the four theoretical hypotheses are proposed. Data collected from 176 Chinese firms are analyzed for empirical research. The reliability and validity of our theory model are verified with acceptable significance. Main findings and implications are derived from the value co-creation model, which pro-

vides guidance for further theory and practice development of co-creation value between firms and their customers.

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基于 IS 应用能力的价值共同创造模型

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摘要:为研究电子商务背景下企业和顾客之间的价值创造,从关系观的理论视角构建基于 IS 应用能力的价值共同创造模型,分析 IS 应用能力、关系资产、顾客敏捷性和关系价值的构念和维度,应用实证方法验证理论假设. 实证研究验证了顾客敏捷性在价值创造的中介作用、IS 应用能力对关系资产的互补作用及其对关系价值产生的影响. 基于 IS 应用能力的价值共同创造模型拓展了服务主导逻辑下的价值创造框架,新的理论模型和实证结论解释了电子商务环境下企业通过 IS 应用能力与顾客进行价值共同创造的机理,为进一步的理论发展和企业实践提供指导.

关键词:IS 应用能力; 顾客敏捷性; 关系观; 服务主导逻辑; 价值共同创造

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