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The Influence of Logistics Capability on Supply Chain Integration: Study of Bio-Pharmaceutical Companies in China

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Abstract

There is a lack of relevant studies in this area. In recent years, competition in the global market has intensified. various customer needs development and support of information technologies Competition between organizations is gradually transforming into competition between supply chains. Therefore, more and more companies are considering the implementation of supply chain management as a fundamental strategy aimed at improving efficiency and increasing market competitiveness. Supply chain integration is considered by companies to be the key to creating value in the supply chain. Although many companies have benefited from the practice of supply chain integration, there is relatively little research among scholars on the factors that influence supply chain integration and how these factors affect supply chain integration. Based on the above situation, this study builds a conceptual model of partners by combining the results of academic theoretical research with transaction cost theory, social exchange theory, and resource-based theory from the perspective of supply chain management. situation. , logistics capacity and supply chain integration.

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INTRODUCTION

In 2020, there were about six policies related to the biomedical industry. At the same time, the pilot provinces of comprehensive medical reform have implemented the " two invoice policy" throughout the province, encouraging the pilot cities of comprehensive medical reform in public hospitals to implement the "two invoice policy", encouraging hospitals and drug production enterprises to directly settle drug payment, and drug production enterprises and distribution enterprises to settle distribution expenses. As of December 30, 2021, a total of 11 companies on the market capitalization list of listed companies in China's pharmaceutical and biological industry exceeded 100 billion yuan, and two companies had a market capitalization of 500 billion yuan or more. The top 10 enterprises in market capitalization are: Aier Eye Hospital Group, Zhifei Biological, CCHN, Pien Tze Huang, Yunnan Baiyao, Tigermed Consulting, Kangtai Biological. Compared with chemical drugs, biological drugs have higher efficacy and safety, and less side effects and toxicity. Due to their structural diversity, their ability to selectively bind to targets and to better interact with proteins and other molecules, biopharmaceuticals can be used to treat a variety of medical conditions that lack available therapies. With the remarkable development of biotechnology, the continuous increase of R & D investment, the economic development and the improvement of people's living standards, the demand of China's medical market has increased significantly. Under the guidance of the policy of encouraging innovation and adjusting the industrial structure, the biopharmaceutical industry will continue to develop rapidly (Zhan et al. 2021; Liu et al. 2020). Under these new opportunities and challenges, the competition between enterprises has gradually changed into the competition between supply chains. Therefore, strengthening supply chain management has gradually become an important strategy for enterprises to obtain competitive advantages and improve their competitiveness, and promoting supply chain integration is the core and key to successful supply chain management (Srinivasan and Swink, 2015). In recent years, supply chain integration has attracted more and more entrepreneurs and scholars' attention (Flynn et al., 2010; Zhao et al., 2013; Srinivasan and Swink, 2015; Xu et al., 2015). Academic research shows that enterprises can increase their market competitiveness and improve their performance through supply chain integration (Flynn et al., 2010; Zhao, et al.) Practical experience also shows that enterprises can improve flexibility through supply chain integration, and then can better meet customer differentiation and customization and needs. China's Haier Group, Japan's Toyota company and the United States' Boeing Company and other well-known enterprises have let customers or suppliers participate in their production process, and all have achieved success. However, although many enterprises benefit from the practice of supply chain integration, there are still few studies on the factors affecting supply chain integration in the academic world (Huo, 2013; Srinivasan and Swink, 2015), and research conclusions on individual influencing factors are inconsistent, such as partner relationship. Most scholars believe that close partner relationship is an effective means to improve supply chain integration (Li, 2009; Pan, 2007; Zeng and Ma, 2010; Zhao et al., 2011; Huo, 2013; Ye et al., 2011; Zeng, 2014; Chen and Wu, 2014; Pan and Liu, 2015).

Problem Statement

Handfield and Nichols (1999) argue that logistics and information flow in the supply chain are successful if there is an effective inter-enterprise relationship at the bottom. This shows that the close relationship between companies and supply chain partners helps support improved logistics efficiency. At the same time, in the supply chain integration process, partnerships provide only sources of information and platforms for exchange, and the ability to use external information resources to the company's own advantage also requires the support of information exchange and technology from the company. Pan, 2012; Zhan et al. 2021; Liu et al. 2020).

Research Question

This theoretical model is necessary to complement the relationship between partner relationships and supply chain integration and provides a specific benchmark for the quantitative analysis of future partner relationships and supply chain integration relationships. In addition, from the perspective of supply chain management, we will develop a conceptual model of the relationship between logistics services capabilities and supply chain integration, and empirically test the above conceptual model using the equation model's structural and survey data on manufacturing companies. The findings will add to and improve the findings of empirical supply chain management research. The main research questions of this article are the following:

What is the impact of the relationship between association, logistics capacity and supply chain integration?

Research Objective

This research develops a conceptual model of the relationship between partner relationships, logistic capabilities, and supply chain integration, as well as pathways and mechanisms for the impact of partner relationships on logistic capabilities and supply chain integration, as well as theories about corporate collaboration's precursors. Enrich your research, scientists have been discussing partner relationships and supply chain integration for over a decade, but there is still no consensus. Some scholars believe that close partnerships are a powerful way to improve supply chain integration.

Theoretical significance

Existing association studies and supply chain integration research systems get fresh insights from this investigation. Although several scholars conducted analogous experimental research on the link between partnership and supply chain integration, they only looked at the direct causal relationship between them in the current study, and hence came to different results. Based on this study builds a model with three variables: partnership, logistics capabilities, and supply chain integration, with partnership as the prior variable and logistics capacity as the intermediate variable, on this foundation. The research results, which were based on a sample of manufacturing companies in Guangdong Province, not only add to the existing relevant theoretical results in the field of supply chain management, but also provide reliable guidance for the supply chain development in Chinese manufacturing companies.

LITERATURE REVIEW

Supply Chain Integration

The next sections will sort out the definitions and dimensions of supply chain integration, as well as define "supply chain integration" on this basis, laying the groundwork for the smooth progression of this paper's follow-up study. Supply chain integration, according to Levary (2000), is the effective movement of services, cash, information, and goods through the collaborative management of business processes by organizations and partners both inside and outside the firm. Mentzer (2000) defines supply chain integration as "internal and external supply chain node enterprise cooperation and coordination," which includes "internal process integration, relationship integration with external companies, cooperation and coordination, sharing of rewards and risks, information integration, and process integration." Frohlich and Westbrook (2001) point out that supply chain integration involves not only the coordination and integration of backward information flows from customers to enterprises to suppliers, but also the integration of forward delivery logistics from suppliers to enterprises to customers. Stank et al. (2001) divides supply chain integration into six dimensions: relationship

integration, measurement integration, technology and planning, supplier integration, internal integration and customer integration. Narasimhan and Kim (2002) think that supply chain integration mainly includes external integration and internal integration, and external integration includes customer integration and supplier integration (Zhan et al. 2021; Liu et al. 2020).

Logistics Capability

Daugherty and Pittman (1995) regard logistics capability as a kind of resource of an enterprise, which has value in itself and can contribute to improving the efficiency of an enterprise like other resources owned by an enterprise. From the perspective of logistics operation process, Ma and Chen (2004) believe that logistics capability is composed of dynamic capability, static capability and comprehensive control capability of dynamic and static capability, in which dynamic capability refers to the ability of an enterprise to plan, organize, control and implement the whole logistics activity, while static capability includes the elements of an enterprise, such as capital, manpower, equipment and facilities. Wang and Feng (2002) define logistics capability as the ability of an enterprise to plan, organize, implement and control the whole logistics activity in the process of meeting customer needs and providing logistics services for customers.

METHODOLOGY

Research design

Based on the review of related theories and literatures, this paper proposes the research framework, constructs the conceptual model, and puts forward the related research hypotheses. Then the questionnaire is designed and the questionnaire is adjusted and modified by pre-test. After the formal questionnaire is formed, a large-scale questionnaire survey is conducted, and SPSS17.0 and AMOS17.0 statistical analysis software are used to analyze and test the relevant hypotheses proposed in this study. Then the results of hypothesis testing are discussed in depth, and finally the conclusion of this paper is drawn.

Population / Sampling / Unit of Analysis

In this paper, Shenzhen, Guangzhou, Dongguan and Foshan are selected as the test areas, which can reflect the characteristics of Guangdong to a large extent and have good regional representativeness. 2) The selection of the types of the tested enterprises. In view of the influence of the characteristics of the enterprises on the study, in order to ensure the comprehensiveness of the study, the investigated enterprises are all in the biomedical industry, and have different employee sizes and belong to different ownership types. 3) Selection of subjects: this paper selects the middle and senior managers who are familiar with supply chain management as the survey objects, mainly including supply chain managers, CEOs or chairmen, vice chairmen or directors, senior managers, supply chain management experts and senior managers of procurement or sales departments.

Reliability test

Reliability is used to measure the reliability, consistency and stability of the scale (Chen et al., 2008). The American Psychological Association (1985) defines reliability as "the degree to which the measurement results are free from error". Cronbach' α coefficient and CITC are usually used to evaluate the reliability of the scale. According to Wu (2010), a high-quality scale should preferably have a Cronbach's alpha coefficient of 0.70 or higher. scales with a Cronbach's alpha coefficient between 0.60 and 0.70 can be used. If these criteria are not met, the addition or deletion of question items should be considered. In addition, if the deletion of a question item can increase the Cronbach's alpha coefficient of the scale a lot, it means that the

homogeneity of the question item with other items is not high, and its deletion or correction can be considered. There are different opinions among scholars on the criteria of CITC. Ebel and Fresbie (1991) summarized these criteria as follows: Above 0.40 is excellent; 0.30-0.39 is acceptable; 0.20-0.29 is barely usable; and below 0.20 should be deleted.

Validity test

Referring to the research ideas of scholars (Zhao et al., 2008; Zhao et al., 2011; Flynn, et al., 2010; Jiang, 2008), this study tested the content validity and construct validity of the scale, in which the structure validity can be divided into convergent validity and discriminant validity. Content validity refers to whether the items designed in the questionnaire can fully represent the subject or content to be measured in advance. The purpose of content validity is to test the representativeness and appropriateness of the questionnaire content. In order to ensure the content validity of the questionnaire, most of the original measurement items of variables in this paper are basically from the maturity scale of authoritative journals in relevant fields. By consulting experts in the field of operation management and interviewing middle and senior managers in manufacturing enterprises, the questionnaire is pre-tested and modified to ensure the validity and rationality of the questionnaire, so it can be considered that the questionnaire in this study has good content validity.

FINDINGS & DISCUSSIONS

Profile of Respondents

The data formally studied in this paper are collected in two ways: 1) To distribute questionnaires to enterprises in Guangzhou, Shenzhen, Foshan, Dongguan and other places that have cooperative relations with the research group by door-to-door distribution, e-mail or mail; 2) To distribute questionnaires to respondents of in-service training courses such as DBA and MBA at ASIA metropolitan university. The survey is conducted directly in the classroom, and we entrust the teacher of the class to briefly introduce the purpose of the survey and then ask the eligible students to fill in the questionnaire and collect it on the spot. Since each enterprise only is distributed several questionnaires and most of the students come from different enterprises, it can be approximately considered that each scale can represent the basic situation of a certain enterprise. A total of 800 questionnaires were distributed and 626 questionnaires were collected in this survey, with an effective completion rate of 78.3%. In this paper, invalid questionnaires were eliminated according to the following criteria: 1. questionnaires with large vacancies; 2. questionnaires with unique answers filled in several consecutive questions; 3. questionnaires with obvious contradictory responses in the same dimension. There were 436 valid questionnaires, and the effective rate was 69.6%. Among them, 280 questionnaires were distributed through door-to-door investigation, mailing and e-mail, 430 were recovered, and 308 were valid. The completion rate of the questionnaire was 76.8% and the effective rate was 71.6%. 240 questionnaires were distributed to DBA and MBA students, 196 were recovered, and 128 were valid. The completion rate of the questionnaire was 81.7%, and the effective rate was 65.3%.

Table 0-1 Descriptive statistics of the main variables of this study

	Partner Relationship	Information Capability	Basic Operational Capability	Supplier Integration	Customer Integration	Internal Integration
Partner Relationship	1					
Information Capability	0.649**	1				
Basic Operational Capability	0.674**	0.615**	1**			
Supplier Integration	0.656**	0.656**	0.673**	1**		
Customer Integration	0.648**	0.636**	0.697	0.612	1	
Internal Integration	0.665**	0.629**	0.671**	0.689**	0.626**	1

Note: ** indicates $p < 0.01$, Pearson correlation coefficient is tested by using two-tailed test.

Research objective 1 (R.O.1): impact of logistic capability on supply chain integration

In order to ensure the validity and reliability of the measurement instrument, the initial questionnaire was obtained by using the scale which has been used in the existing literature at home and abroad as far as possible and through the standard process of questionnaire design such as bidirectional translation. Before the formal survey of the questionnaire, we selected supply chain managers, CEOs or chairmen, vice chairmen or directors, senior managers and supply chain management experts from 30 manufacturing enterprises in Guangzhou to conduct a pre-test, and then carried out project analysis and factor analysis on the results of the pre-test, and the remaining questionnaire items were semantically revised and expressed concisely, thus forming the final formal questionnaire. The measurement index of logistics service capability mainly adopts the research of Yeung et al. (2012). The basic logistics service capability is measured by four items such as timeliness, reliability, service awareness and commitment of logistics service, while the value-added logistics capability is measured by four items such as developing logistics solutions, helping customers to improve operation efficiency, providing one-stop packaging service, and providing automation and information technology support. All questions on logistics service capability are measured by 7-point Likert scale, with 1-7 indicating “completely inconsistent" and "completely consistent" respectively. The measurement index of supply chain integration mainly adopts the research of Flynn et al. (2010). Internal integration is mainly measured from the aspects of data integration, information and process integration, and supplier integration and customer integration are mainly measured from the aspects of communication and cooperation. All questions on supply chain integration are measured by 7-point Likert scale, with 1-7 indicating "completely inconsistent" and "completely consistent" respectively.

Table 0-2 Measurement items of the logistics service capability and supply chain integration

Structural Variables	Indicators Code	Measurement question items
Basic Service Capability	BC1	Third party logistics providers can provide timely and reliable delivery.
	BC2	Third-party logistics providers can respond to problems in a timely and accurate manner.
	BC3	Third party logistics providers can solve service problems completely and satisfactorily.
	BC4	Third-party logistics providers can reliably and accurately perform the promised services.
Value-added service capability	AC1	Third party logistics providers can explore and provide creative solutions.
	AC2	Third-party logistics suppliers can help customers improve operational efficiency.
	AC3	Third-party logistics suppliers can provide overall one-stop packaging services.
	AC4	Third-party logistics providers can provide automation and advanced information technology services.

First, the single dimension of the measurement indices is verified by exploratory factor analysis (EFA). The results show that all the measurement indices have higher loading on the structural variables they should measure, and lower loading on the structural variables they should not measure. The internal consistency is then checked by calculating the Cronbach’s α coefficient for each structural variable. The Cronbach’s alpha coefficient is generally considered to be at a minimum of 0.6. The Cronbach’s α coefficient results in Table 4-5 show that the measurements of all structural variables in this study are credible. In addition, the corrected item-total correlation (CITC) is calculated for reliability test. Table 4-5 shows that all CITC values are greater than 0.50, which is higher than the minimum acceptable value of 0.30. Based on the Cronbach’s α coefficient and the CITC value, this study can conclude that: All of these measurements of structural variables are reliable.

Research objective 2 (R.O.2): impact of partner relationship on supply chain integration

In this paper, the impact of partner relationship and logistics capability on supply chain integration is discussed, but demographic variables will also have an impact on the study. Therefore, this paper uses One-way ANOVA to test the impact of several key control variables on partner relationship, logistics capability and supply chain integration. The results are shown in Table 4-9, Table 4-10 and Table 4-11. As can be seen from Table 4-9, the impact of enterprise nature on partner relationship, basic logistics operation ability, logistics information ability, supplier integration, internal integration and customer integration is not significant. This shows that no matter whether state-owned enterprises, collective enterprises, private enterprises, joint ventures or foreign-funded enterprises, there is no obvious difference in partner relationship, logistics capability and supply chain integration practice.

Table 0-3 One-way ANOVA of Enterprise Nature

Item	F-value	P-value	Is it significant
Partner Relationship	1.118	0.352	Not
Basic Operational Capability	1.219	0.301	Not
Information Capability	0.380	0.862	Not
Supplier Integration	1.217	0.302	Not
Internal Integration	0.825	0.533	Not
Customer Integration	0.896	0.485	Not

As can be seen from Table 4-10, the influence of operating years on partner relationship, basic logistics operation ability, logistics information ability, supplier integration, internal integration and customer integration is not significant. That is to say, the operating years have no obvious impact on the practical level of enterprise partner relationship, logistics capability and supply chain integration.

CONCLUSION

The first link of green supply chain is green design, so this link will directly affect the development of subsequent processes, green design should be paid attention to by biomedical enterprises first. Because of its particularity, pharmaceutical enterprises often need to produce more than one product, so their supply chain has the characteristics of wide range and many links. Biopharmaceutical enterprises should incorporate all relevant links of pharmaceutical products, such as raw material procurement, production and R&D, storage and transportation, and final consumption, into the design of green supply chain, make use of the "bullwhip effect" of the supply chain, and gradually enlarge the initial advantage through the transmission effect of the supply chain in order to expand the initial degree of greening, and effectively realize green supply chain management to increase the competitiveness of enterprises in the future (Zhan et al. 2021; Liu et al. 2020).

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