Determinants of Supply Chain Success: Evidence from Chinese Automobile Industry

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ABSTRACT

The goal of this study is to build an experiential model to test the factors that that affect supply chain partnerships in China's automotive industry. The work is focused on both the primary and secondary knowledge. The primary data was collected from both automobile manufacturers and suppliers using a specially developed questionnaire — the total numbers of respondents were 128 managers from the companies sampled. The survey was analyzed using two statistical tools, which are Regression and T — tests. The results of survey proved that the level of supply chain technologies usage is still very low and it indicated that there are eight factors influence the supply chain partnerships in auto industry in China, which include "trust", "commitment", "culture", "human involvement", "training and education", as well as "stability of demand", "problem specific capability" and "adequate measurement of IT infrastructure". The further improvement of IT infrastructure of supply chain and interaction partnerships should be considered in order to keep the long — term relationship among partners.

Keywords: automobile industry, supply chain partnerships, trust, commitment.

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INTRODUCTION

With rapidly changing technologies and global competition, there are more and more advanced techniques to implement to supply chain process, such as Enterprise Resource Planning (ERP) and Radio Frequency Identification (RFID). However, these new technologies cannot independently make supply chain successful without the integration of information system and collaboration among partners. Moreover, the human factor and the relationship among people are more important. Therefore, this study seeks to build an experiential model to test the factors which can influence the supply chain partnerships in the automobile industry in China (Kumar & Rahman, 2016; De Silva et al., 2018a; De Silva et al., 2018b; Nikhashemi et al., 2013).

Collaboration, on the other hand, is a dynamic process which does not always bring success. Only in situations where such efforts are justified, is a collaborative approach appropriate. Even then success is not guaranteed. Collaboration is most effective when it is highly nuanced and interdependent with the question or opportunity presented. SCM's rapid growth as a new medium raises intriguing questions for research in academia. To date, most scholars have concentrated on the functions of supply chain relationships and others have been looking at supply chain acceptance and practice. Much of the latter field, though, is essentially conceptual in nature. Khan & Qianli, 2017; Dewi et al., 2019; Pambreni et al., 2019; Tarofder et al., 2017; there appears to be very little empirical work coming from China on the issues related to factors that can influence and hinder the successful supply chain partnerships that can help in implementing the practical model to improve the performance of suppliers and buyers in reality.

LITERATURE REVIEW

Innovations in this area help companies gain considerable advantages over their global competitors. Many businesses have already begun to see the creation of a sustainable supply chain as a requirement, a matter of survival rather than preference, according to Han, Huang, and Macbeth (2018). They also conclude that supply chain management is not a fast fix, nor is it the optimal method for each situation (Liu, Blome, Sanderson, & Paulraj, 2018; Doa et al., 2019; Maghfuriyah et al., 2019; Nguyen et al., 2019).

According to the statistics of China Association of Automobile Manufacturers, currently, there are 355 automobiles brand in China, which including 69 percent local brand and 30 percent international brand. In 2004, the production of Automobiles is 5,070,000 and increase 14.11 percent compare with 2003. The Association also forecast that the production of Auto will get 5.6 million and increase 12 percent in 2005. Shanghai Volkswagen ranked the number one of Auto sale and behind it are Faw – Volkswagen, Shanghai General Motors, Guangzhou Handa and Beijing Hyundai In 2001 China identified automotive manufacturing as one of the Chinese economy's seven "pillar industries". Most industry analysts agree that the market will continue to grow annually for years within the 15 percent range come (Liu et al., 2018).

The main reasons which explain such boom are the following:

- 1) Strong development of Chinese economy and enrichment of Chinese population.
- 2) Significant price decrease in nearly every segment
- 3) Pent-up demand (related to entry into World Trade Organization, since December 2001)
- 4) Strong introduction of new products.
- 5) Better access to vehicle financing.
- 6) Relative improvements in infrastructure and traffic management
- 7) Change in the commuting movements among large cities.

The increasing importance of suppliers is affecting their structure in the automotive industry. Studies in the International Motor Vehicle Program (IMVP) and other

external analyzes suggest a new configuration that will likely involve a division along the lines below. This arrangement divided suppliers into four groups, which are suppliers of raw materials, standardizes, specialists in components and integrators.

- Integrator of the program. Suppliers able to design and assemble parts, subassemblies and systems into modules which are delivered or installed directly by the suppliers in the assembly plants of the automakers.
- Regional (system manufacturer) standardizer. Company that is internationally stressing the norm for a product or device. These firms are capable of directly or indirectly designing, creating and manufacturing complex device manufacturers through device integrators.

Luthra, Garg, and Haleem (2016) state that "successful partnerships are about radically redesigning a business relationship, and partnership creates new value that cannot be achieved within the existing vendor / customer roles." Partnerships are available to both suppliers and manufacturers, and the automotive industry has led the development. Car manufacturers are also believed to be operating almost exclusively with their suppliers now (Gopal & Thakkar, 2016; Pathiratne et al., 2018; Rachmawati et al., 2019; Seneviratne et al., 2019; Sudari et al., 2019; Tarofder et al., 2019).

We also note that partnerships are the cornerstone upon which to create a successful supply chain. To arrive at a better understanding of supplier – distributor relationships, it is important to research the relation between the two parties. The dyadic viewpoint is therefore a rational point of view to adopt. These are ambiguous and seldom contain steps (to the degree to collaborations that may assist in the idea being operational lased.

The definition of re – linking was established by Yu, Chavez and Feng (2017). The supply chain is round in form, which is extremely dynamic unlike the structures of the past.



Figure 1: The outer circle of partnerships

The enticing context for more research on partnership and cooperation offered by the automotive and component industries is strengthened by the developments that have been checked over the past decade, stressing the value of partnership between carmakers and suppliers (Han et al., 2018).

Supply chain partnerships go beyond mere information exchange and integration between suppliers and their customers and involve tactical joint decision-making between partners (Hussain, Mosa, & Omran, 2017; Nikhashemi et al., 2017; Tarofder et al., 2019; Ulfah et al., 2019; Tarofder et al., 2016; Udriyah et al., 2019).

In addition to these major financial benefits, the following are several non-financial benefits that flow from collaboration:

- Speed of new products to market faster
- Focusing further on core competences
- · Strengthened public reputation

- Wider confidence and interdependence
- Increased knowledge, ideas and technology sharing;

The degree of confidence will decide to what extent automotive suppliers are willing and able to communicate with each other (Hussain, Musa & Omran 2018). Trust within supply chains is about organizations' reputations while "trustworthiness" is an individual characteristic that facilitates community-level interaction (Hussain, Musa, & Omran, 2019).

It is clear that there can be no real collaboration without meaningful trust in the supply chain relationships (Nawaz, Afzal, & Shehzadi, 2013). In the automobile industry, while a powerful corporation may be able to influence a less powerful organization's actions, the behavioral shift may be temporary and inevitably entered. Research has also shown that consistent use of coercion by one organization ultimately leads vulnerable companies to seek alternative relationships in the supply chain. Furthermore, the underlying principle of collaborative partnerships is that supply chain management allows companies to work more closely to find ways to maximize end-customer value (Nawaz, Azam, & Bhatti, 2019). Good performance in the supply chain is focused on high confidence rates and strong commitment among supply chain partners. One study reported a failure of one third of supply chain partnerships due to a lack of trust among trading partners (Nawaz et al., 2019).

Since effective sharing of information is heavily dependent on trust beginning within the company and ending up extending to supply chain partners" (Nawaz & Hassan, 2016). It was argued that "trust and risk issues in supply chain relationships can be significantly more important, because supply chain relationships often involve a higher degree of interdependence between competitors.' If information is available but the partners can't share, its value degrades exponentially. Yu et al. (2017), argued that "when both commitment and trust-not just one or the other-are present, they produce results that promote efficiency, productivity and effectiveness" (Gunasekaran, Subrama). Many studies say that if supply chain partners freely exchange knowledge and have a long-term partnership perspective, they can also seek to minimize opportunistic behaviors (Shi, Zhang, Arthanari, Liu, & Cheng, 2016). Under conditions of less than transparent faith, decision-makers frequently spend their time assessing the reputation, efficiency and trustworthiness of their trading partner, rather than maximizing their operations.

Expectation is the belief about (or mental picture of) the future. The same expectation is a critical factor for supply chain partnerships. Suppliers and customers need to understand what is expected of them and the others in the relationship. The same expectation should accept by all members of supply chain so that they can pursuer the same direction and motivate thinking and action. Suppliers can achieve coordination by acting on their concordant expectations about each other's actions. Expectation hence constrains supplier's interactions. According to Lewis (2004), mutual expectation is a combination of common knowledge and mutual belief between suppliers and buyers. Suppliers can base on the expectation to desired behaviors that they observed.

Another factor suppliers must carefully consider for supply chain partnerships in the Chinese market is guanxi (relational marketing). China has gained much attention and gained automotive investment from major multinational corporations. But the distinctive practices they encounter in China have often frustrated and disappointed westerners. It is difficult for Westerners to identify effective strategies for leveraging the China market and adjusting to the marketing climate. In particular, a barrier to the development of western automobile companies is the traditional practice of relationship marketing in the Chinese business community known as guanxi. Mr Lee et al. Don-Lin Lee et al. (2001) discussed the managerial and theoretical implication of guanxi. When international automobile suppliers tend to develop market in China, they have to pay keen attention to guanxi with Chinese partner. Firstly, understanding the expectations of Chinese partners is necessary, because those expectations often go beyond traditional role expectations, especially under high uncertainty. Secondly, attitude and affective commitment are important for western marketers to enhance the relationship. It benefits to establish and develops guanxi. Thirdly, western companies should avoid their opportunistic behaviors because it will violate of the social norms in guanxi and damage the reputation and have the negative effect for long-term business. Finally, good relationship is required international suppliers share more similarities with Chinese partners, such as common interests and mutual understanding. The finding of this study emphasizes the importance of developing interpersonal relationships and mutual understanding for business success (Kim & Chai, 2017). Once guanxi is established, it has the positive effect on business performance and help international marketers to build and develop the effective market strategy in China.

Zaid, Jaaron, and Bon (2018) have identified the similar concept of guanxi, so call: Network connections. Network connections, according to this study, include formal and informal networks outside the dyad of buyers and sellers (Hong, Zhang, & Ding, 2018). Networks are powerful instruments of organizational learning and adaptive adaptability in complex environments (Zhang, Ma, & Qu, 2018).

Hypothesis I:

- : Long term relationship is not one of the key factors to influence business performance of supply chain.
- : Long term relationship is one of the key factors to influence business performance of supply chain. Hypothesis II:
- : A successful supply chain is not dependent on whether suppliers can meet clients' needs.
- : A successful supply chain is dependent on whether suppliers can meet clients' needs.

Hypothesis III:

- : Implementation of advance technology and software of supply chain is not a competitive advantage for the automobile companies.
- : Implementation of advance technology and software of supply chain is a competitive advantage for the automobile companies.

Hypothesis IV:

- : Automobile suppliers are not helping manufacturers and are not involved in new accessories design.
- : Automobile suppliers are helping manufacturers and are involved in new accessories design.

Hypothesis V:

- : A successful supply chain company cannot always meet its performance target.
- : A successful supply chain company can always meet its performance target.

METHODS

The primary data is collected from four kind of automobile companies, which are Automobile Manufacture, Original Equipment Supplier, Automobile Dealer and Automobile Accessory Wholesaler. The secondary data is used to support the study and to give background information of the study. A total of 27 questions were included in the two section questionnaire. Section A is the background information. The main purpose of this section is to get some general demographic characteristic information of the survey companies being surveyed, which include the category and history of the companies. The answer to the first question can be used to classify automobile manufacturers, suppliers, dealers and wholesaler of the companies surveyed. The third question can be used to identify the level of technology used by of these companies and what kinds of supply chain techniques they have adopted before.

ANALYSIS

Based on the hypothesis design in Chapter 3, there are 5 hypotheses for this study. Firstly, the relationship among of 17 factors of the independent variables and the first factor of business performance, namely, long – term relationship will be determined.

Table 2. Model Summary.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.958	.918	.905	.23007

The determination coefficient, namely R square, is 91.8 per cent based on Table 2. Thus, the 17 independent variables will describe 91.8 per cent of the long-term relationship. This R square shows a clear positive relationship between the independent and dependent variables and other factors can explain just 8 per cent of the variation in the long-term relationship.

Table 3. ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
	Regression	n 65.052	17	3.827		
1	Residual	5.823	110	.053	72.289	.000
	Total	70.875	127			

As Table 3 shows, the regression row displays information about the variation accounted for by the research model. The residual row shows details on variance which the model does not account for. Square regression sums are 65.1 and residual is just 5.8, suggesting that the model describes about 93 per cent of the variance in the long-term relationship. If a meaning amount of 0.05 is chosen the F distribution's critical value is 1.72. Because F is 72.28, which is higher than 1.72, it can be inferred that the independent variables are substantially related to the long-term relationship.

Table 4. Coeffi	Unstandardiz		Standardiz		
	ed Coefficients		ed Coefficients	t	Sig
	В	Std. Erro r	Beta		
(Constant)	4.406	.020		216.67 3	.00
Trust	.497	.091	.665	5.461	.00
Effective communicati on	198	.103	264	-1.914	.05 8
Same expectation	185	.087	248	-2.123	.03 6
Commitment	.460	.097	.616	4.736	.00
Guan Xi	-2.490E-02	.060	033	417	.67 7
Product design	418	.109	560	-3.827	.00
Culture	.151	.088	.202	1.724	.08 8
Reward and motivation system	2.322E-02	.093	.031	.250	.80
Human involvement	.262	.070	.351	3.737	.00
Training and education	-2.557E-02	.098	034	262	.79 4
Stability of demand	.175	.065	.234	2.669	.00
Problem specific capability	.178	.091	.238	1.957	.05
Information system integration	-4.737E-03	.087	006	054	.95 7
Adopt software	5.928E-02	.082	.079	.720	.47 3
IT infrastructure	.129	.091	.173	1.421	.15 8
IT investment and sourcing decision	275	.126	368	-2.189	.03

Measurement -8.168E-02 .114 -.109 -.714 7

From Table 4 analysis, it shows the coefficients of the regression line, which can determine which independent variables have a linear relationship with long – term relationship. Referring to the Coefficients column, the multiple regression equation is

Using the 0.05 level of significance, the critical value of the T distribution is 1.979. According to T – test column, the result of trust achieved: 5.461. As 5.461 is greater than 1.979, is rejected. This supports the finding of Gardner and Cooper (1988) that if supply chain partners share information openly and come to have a long-term perspective on the relationship, they may even attempt to reduce opportunistic behaviors. Next, the analysis determined that T value of commitment is: 4.736 > 1.979, therefore, is rejected. This means commitment and long term relationship have a linear relationship. As most respondents agreed, the greater the stability of the suppliers' contractual duration, the more they are to reduce cost and to increase the delivery frequency. The T value of human involvement is 3.737, which is also greater than 1.979. Therefore is rejected. It implies that employees have to sufficiently know about the process, method or techniques of supply chain. As the factor of stability of demand, the T value is 2.669 > 1.979. Therefore is rejected as well.

As the literature review indicated, it can be proven that if the demand is stable and the product is routine, suppliers and automakers will have the opportunity to reduce cost. The significance values of these four factors (trust, commitment, human involvement, and stability of demand) are less than 0.05, which mean that these four factors have linear relationship with long - term relationship. Compared with the T value of other factors, they are less than the critical value which is 1.979. Therefore, is accepted. It indicates that these factors do not have significance relationship with dependent variable. To conclude, trust, commitment, human involvement, and stability of demand, these fours factors will affect the long - term relationship of suppliers and buyers. In order to build long - term relationship, auto suppliers and manufacturers should consider these four factors so as to achieve the target business performance.

Table 5. Model Summary

Model	R	R Square	e Adjusted S R Square	td. Error of the Estimate
1	.968	.937	.927	.26006

Table 5 indicates that 96.8% of the variability of the dependent variable can be explained by the 17 independent variables, because it is shown that R square is 96.8 percent. This R square indicates a strong positive linear relationship between the factor of meeting clients' needs and independent variables and only less than 4 percent of the variability in the dependent variable can be explained by other factors.

Table 6. ANOVA

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Model Sum of df Mean F Sig.	Stability of demand	.107	.074	.111	1.443 .15 2
Dyunes Dyune	Problem	.291	.103	.303	2.834 .00
1 Regression 110.060 17 6.474 95.725 .000	specific capability				5
Residual 7.440 110 .068	Information system	.101	.098	.105	1.023 .30 9
Total 117.500 127	integration				
The analysis depicted in Table 6 shows that the regression sums of squares are 110.06 and residual is only 7.44. It	Adopt software	.153	.093	.159	1.646 .10 3
indicates that the variation of the dependent variable can be explained by the model. The deviation of this model is only 7.44 or 6.3 percent. Using the significance of 0.05, it is	IT infrastructure	186	.103	193	-1.810 .07 3
found that the critical value of the F distribution is 1.72. As F statistic is 95.73, which is greater than 1.72, it can be concluded that the independent variables are significantly related to meeting clients' needs. The significance value of	IT investment and sourcing	3.880E-02	.142	.040	.273 .78 5

decision

Table 7. Coefficients							
	Unstandardiz	Z	Standardiz	t	Sig.		
	ed		ed				
	Coefficients		Coefficients				
	В	Std.	Beta				
		Erro					
		r					
(Constant)	4.187	.023		182.17 2	.00		
Trust	.693	.103	.721	6.746	.00		
Effective communicati on	5.317E-02	.117	.055	.456	.65 0		
Same expectation	-2.132E-02	.099	022	216	.82 9		
Commitment	.179	.110	.186	1.632	.10 6		
Guan Xi	175	.067	182	-2.589	.01 1		
Product design	240	.123	250	-1.944	.05 4		
Culture	2.544E-02	.099	.026	.257	.79 8		
Reward and motivation system	5.742E-02	.105	.060	.546	.58 6		
Human involvement	3.202E-02	.079	.033	.404	.68 7		
Training and education	115	.110	120	-1.043	.29 9		

the F statistic is less than 0.05, which means that the variation explained by the model is not due to chance.

> It can be seen from Table 5.13 that the multiple regression equation is

Measurement -5.119E-02 .129

-.053

-.396 .69

3

The analysis from the T - test column shows that the T value of trust achieved 6.746, which is well above the 0.05 level of significance which is 1.979 Since 5.461 is greater than 1.979, therefore, is rejected. It indicates that there is a significant relationship between trust and meeting clients' needs. This supports the notion that trust building is an important factor affecting supply chain partnerships. The analysis determined that T value of problem specific capability is 2.834, which is greater than critical value of 1.979. Therefore, is rejected. This means problem specific capability and meeting clients' needs have a linear relationship. This supports the finding of Nancy Nix (2004) which showed that companies with high levels of problem specific capability and highly intense collaboration has a high improvement in task performance. The significance values of these two factors (trust, and problem specific capability) are less than 0.05, which mean that these two factors have significant relationship with meeting clients' needs. However, the T values of the other 15 factors are less than the critical value which is 1.979. Therefore, is accepted. It indicates that these factors do not have a significant relationship with the dependent variable. In short, there are only two factors have a linear relationship with meeting clients' needs. If suppliers want to meet clients' needs, they should have good reputation in terms of trust and the capabilities to deal with problems.

DISCUSSION

Indeed, as the newest player in the global landscape, China's automotive industry is emerging, following the trail blazed by the US, Europe, Japan, and South Korea. The exponential growth peaked in 2003, when passenger car sales grew 65 percent over 2002, further driven by increased private consumption. The market had grown to include all the toughest global competitors, including today's global "blue chip" OEMs such as Toyota, Nissan, Honda and Hyundai as well as the big players like GM, Ford and VW. By introducing the low-cost, independent Chinese OEMs to this mix, the industry has become a battlefield. China's automotive industry has an evolving supply side to it. In 2003, China exported just 0.1 per cent of its shorebuilt vehicles. Now the market is experiencing a period of transformation into an export platform for the car industry. The government has developed a long-term target of exporting 40% of the output of China. Providers are consolidating to set the stage for exports in an attempt to reduce prices and boost global competitiveness. The government imposes regulations on OEMs which allow a majority stake in Chinese joint ventures for export-only purposes for foreign companies and thus stimulates local production and local sourcing. In terms of Western norms, quality and emission norms are rising and Chinese joint ventures and independent Chinese OEMs are expanding to a global scale.

CONCLUSIONS

The first goal of this study is to evaluate the level of supply chain practice in China's automotive industry and examine the key issues affecting supply chain partnerships. Supply chains are only in infancy in China. Some automotive manufacturers have a history of just 1-5 years. Using new information technology-based automotive services in China is still at a low level. The modern techniques such as EDI and RFID have only begun to be implemented by few businesses. Fortunately, most of the respondents in this study thought the investment in modern information technology was underused.

Objective 2 is to examine main factors that will influence a success of supply chain partnerships in Automobile industry in China. The result from the testing of hypotheses showed that the factors of trust, commitment, and human involvement, stability of demand and problem specific capability will affect the long term relationship of partners. According to hypothesis II, trust and problem specific capability are critical factors to meet client's need. For the third criterion of business performance, namely, advance technology and software, the factors of culture. human involvement, training and education, and problem specific capability will influent it. There are three factors affect the criterion of accessories design, which is trust, stability of demand and problem specific capability. Finally, the factors of effective communication and stability of demand is considered important to meet the performance targets. Thus, there are 8 factors have been identified as having relationship with the successful supply chain partnerships.

Limitations and Future Directions

The relevant future research direction would be to arrive at the relative impact of the various factors considered in this study. It is possible that the relative role of the factors will depend on the different kinds of suppliers' characteristics within the auto industry. For example, manufacturers and wholesalers have different measurements of IT infrastructure and the expectation between upstream suppliers and downstream suppliers are in different direction. The future research may focus on the various factors which are implemented in different kinds of suppliers.

A second future research direction is to develop a normative model for organizational decision making to facilitate supply chain partnerships. This will allow certain

questions to be answered, such as, "What levels of various factors are needed to achieve optimal performance in supply chin relationships?" and "What is the quantitative impact of changing an organizational decision variable on supply chain?" These and other important questions must await further conceptual development and empirical research.

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