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DEVELOPMENT OF E-SUPPLY CHAIN COLLABORATION STRATEGY IN THE CHINESE AUTOMOTIVE INDUSTRY: A THEORETICAL COLLABORATION FRAMEWROK

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Abstract

The research intends to investigate into the e-supply chain practices of the Chinese automotive industry. The analysis of the theoretical review has been carried out by using one of the qualitative research techniques, grounded theory, to understand and evaluate all of the relevant influencing factors of the collaboration strategy development. It will begin by looking at how e-business and information technology have influenced supply chain management in the automotive industry in China; what factors have affected the organisations through integrating with the e-supply chain strategy; and what requirements that organisations have to improve the efficiency of the supply chain strategies in order to gain global market advantage. Therefore, the main purpose of this research is to develop a theoretical collaboration framework for helping the Chinese automotive manufacturers to effectively manage their global collaboration supply network. This will further facilitate the integration of information technologies in the supply networks whilst keeping it flexible enough to develop a collaboration strategies framework to formulate the supply chain activities by helping the Chinese auto manufacturers to effectively manage their global supply chain and thus add value to both business and customer.

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1.0 Introduction

Internet technology and e-business provide a virtual network, which enables a number of business processes, partners and locations to be linked as one collaborating entity (Manthou et al, 2004). This virtual supply chain network is a series of value adding processes / stages owned by the interdependent organizations cooperatively working together to control, manage and improve the material and information flows from suppliers to the end consumers (Gek et al, 2000; Martin, 2005). The use of information technologies across the whole supply chain can enhance operational effectiveness through high-level information exchange between business partners in real time (Lancaster et al., 2006). Many companies have followed the full integration strategy working with their alliance partners to deliver better products / services to satisfy customer demands (Eric and Hsiao, 2007). A successful strategic partnership ensures the collaboration will benefit all of the partnership members.

However, most of the previous research, which was based on the inter-firm relationships between automotive company and suppliers, has focused on how the division of labour is organised and how the contractual relationship continues between the core company and its supplier relationship (Sutton, 2006). Nevertheless in the globalisation age, multi-party business collaborations have been widely emphasised in research with active domains such as buyer-supplier relationship management, information visibility and inter-operability as well as issues of trust and risk management. This is due to the sharing of business information to simplify core collaborative processes, structuring co-operative product oriented logistics design and planning, and modifying integrative value-added workflow (Xu, 2007). Hence, in order to take full advantage of the globalisation trends to satisfy the variety market demand, it has become necessary to structure all the participants' roles and performance of integrative collaboration strategy to gain more competitive advantages.

According to the recent supply chain performance with regards to the design and manufacturing contractors, the automotive industry has truly become global (Lefebvre & Lefebvre, 1998), as more and more companies are paying attention to global sourcing strategies for reducing cost, increasing quality, and enhancing competitiveness (Petersen, 2000). Hence, the growth of the networks has created pressures on the organization's ability to manage and control the raw material and information flow from suppliers to the end users. Based on the unutilized of the collaboration system, which involves multi-tier suppliers, clients, customers and empowered by the web-enablement, it might optimise and co-ordinate the production and service at a global level (Palanisway & Frank, 2000). Consequently, research into the features of such a supply network is required (Zheng et al., 2001).

Therefore, the research intends to investigate into the e-supply chain practical theory of the Chinese automotive industry. It begins by looking at how the e-business and information technology have influenced the supply chain management in the automotive industry in China; what factors have affected the organizations through integrating with e-supply chain strategy; and what requirements that organisations have made to improve the efficiency of the supply chain strategies to gain global market advantage. Hence, the aim of this research is to develop a theoretical

collaboration framework to formulate the information-based supply chain activities for helping the Chinese auto manufactures to effectively manage the global supply network.

2.0 Literature Review

E-Supply chain management is defined as tactical and strategic management, which requires the information systems / technologies application to improve the competence and effectiveness of the supply chain performance for delivering unique customer service (Ross, 2003). It has been mainly emphasised as the value-added competitive advantage for managing buyer-supplier relationship, procurement, manufacture and distribution. The global view of the chains in supply, logistics, trading and corporation suggests that with the integration of e-business technologies the global supply chain becomes imperative for cooperate strategy-making and therefore, seriously calling into question any integrative corporation strategies based on the national or regional perspectives of the company (Yin and Li, 2007).

Consequently, with the development of information technologies and the adoption of e-business, it is not surprising that information system have a critical role in supply network, which provides opportunities for business collaboration working together to ensure good supply chain management. Companies are now undergoing a revolution in terms of implementing new operations strategies and technologies in a response to overcome the challenges of providing high quality products with the competitive prices to satisfy market demand. Therefore, it is significant for the original equipment manufacturer (OEM) to re-engineer its business processes and assimilate the competitive strategy to deliver a unique service with rapid respond rates to satisfy the changeable and massive customer demand. Hence, in the academic area, more and more academic researchers have concentrated on researching of supply chain integration and emphasised it as one of the most significant elements in E-supply chain management.

2.1 Collaboration Process and Integration Levels

Business process is defined as the complete and dynamic coordinated set of collaborative and transaction activities that deliver value to customer (Kotzab et al. 2000). Zhen, et al. (2001) confirm that it is possible to gain significant benefits from redesigning business processes to organise the knowledge of existing processes and develop an innovative attitude for the companies. Business process integration, on the other hand, is the actual value driver for collaborating corporations and institutions, which is a necessary value driver behind the physical integration (Cooper et al, 1997; Kalakota, Robinson, 2000; Grieger, 2001). Therefore, the aim of analysing business process collaboration is to understand the business process functionality; identify core collaboration partners, business activities and technique; identify specific responsibility, and differentiate the responsibilities of individuals in the collaboration processes.

The beginning of supply chain integration is defined as cooperation, which provides a low level of information exchange and engages limited suppliers into a long-term contract. However, motivated by the competitive advantage, cooperation strategy is not sufficient enough for supply chain operation (Skjott-Larsen, 1999). Along with the innovation of information technologies and the adoption of e-business, more and more companies are starting to fully follow the coordination stage. Although the coordination process is important, with the complexity of the co-ordination activities, the coordination stage is not sufficient enough to manage supply chain integration. However, based on the previous review, with the help of modelling multi-party business collaboration, the problems of complexity business process can be simplified. Multi-collaboration is viewed as a complexity business process corporation, which requires a number of organisations to collaborate together through the application of networks to understand, recognise, or develop systems to support the cooperation performances by using sophisticated computer applications, which helps to simplify the collaboration activities, specify the materials among the business partners, enhance communication efficiency and enrich information sharing between collaboration partners (Xu, 2007).

Kalakota and Robinson (2001) divide supply chain collaboration into three levels: technical, application, and business integration. The technical integration views as the

technical standard for data integration. The application integration is how companies actually do the physical integration of software and hardware technology. Business integration is also known as business process integration. As discussed in previous sections, since a business process is the complete and dynamically coordinated set of collaborative and transaction activities that deliver value to the customer (Kotzab, 2000), business process integration is therefore a necessary value driver for corporations and institutions. Consequently, Zhen et al. (2001) evaluates that the transition from arm's length negotiations to collaboration requires information interoperability, a high level of trust and the common commitment standard. This differs from the past, where the effective collaboration strategy would require companies to integrate the physical capabilities, knowledge competencies, and technology connectivity with the production line and services to satisfy diverse customer demand with any solutions at any time.

2.2 Supply Network Collaboration Models

In this paper, collaboration is defined as business partners cooperatively working on the same task without being obstructed due to the physical locations (Skjott-Larsen, 1999; Laframboise and Reyes, 2007). Xu (2007) presents a multi-party business collaboration model for monitoring a multi-party business process from three perspectives: structure, commitments and process, which provides a view of how business parties are linked, and emphasises that different links can determine different ways of collaboration. A multi-agent collaborative framework for Third party logistics is proposed by Ying et al. (2005), with the collaboration framework, the 3PL vendor integrated its logistics collaboration processes with partners for constructing a virtual private logistics teamwork, which is suitable for satisfying the customer's requirements. Furthermore, the collaboration framework helps to identify the significant influencing factors of a successful customer relationship management. Also, Chen et al. (2004) presents a joint replenishment coordination program for investing the improvement of the supply chain, which illustrates the challenges of integrating multi-items with multi-echelon production and replenishment. With the program, the supply chain improvement can be achieved through detailed collaboration responsibilities of each partner.

Therefore, Manthou et al. (2004) confirm that a collaboration framework could be used to classify the roles of the cooperation partners in a virtual environment, identifying their core capabilities to construct each collaborative relationship, and evaluate partners' ambitions to collaborate. Also a collaboration-planning model could be used to analyse how e-collaboration tools affect verity different collaboration partners in the supply network, and structuring different collaboration planning according to different levels of collaboration.

Furthermore, the integrative components could be structured by assimilated the collaboration strategy, as Kotzab et al. (2003) evaluate that each of the supply networks provide an integrative approach to managing various collaboration components; therefore, it is capable of remaining visible, flexible and maintainable for further improvement in the e-supply chain sector. Thus, Yin and Li (2006) confirm that e-supply chain collaboration framework is capable of solving large-scale problems, with its functionality of planning and ability to optimise the detailed schedules of various supply chain components without the restriction of a physical location.

However, Guner and Grote (2006) argue that one of the main challenges of supply chain collaboration strategy is the improvement of collaboration planning in supply network while preserving autonomy of each collaboration partners. They pointed out that there is a lack of knowledge about the extent to which supply chain management supporting systems can support collaborative planning processes. Therefore, in order to identify the uncertainty of implementing the collaboration improvement programs, the knowledge-based collaborative supporting system (KBSCM) is required as an alternative strategy for problem-solving in the current collaborative supply chain environment.

Based on the previous research it can be concluded that the application of a collaboration framework in supply chain sector helps to improve the efficiency of supply chain performance, enhance buyer-supplier relationship management, and reduces risk in supply chain operation management. However, with the integration of web services strategy, it is good to capture efficiency information, but adding many different systems results in bringing more complexity in accomplishing the project in

the timescale. It involves different participants, whilst also requiring high levels of commitment; therefore, without rich and accurate information it would fail to fulfil the set objectives. Hence, all of the collaboration partners should view themselves as part of the value chain, using the common communicative standards, as well as providing successful services to satisfy the customer-driven market. Moreover, information about the past performances of participants and online feedback mechanisms should be provided as techniques for building trust, sharing risk and profits (Ross, 2003). Also, decision supporting systems are needed to ensure the full advantage of the corporation strategy, because companies require efficiency response rates to make accurate decisions along with accurate data (Gek et al., 2000). Hence, a high level of co-ordination, communication, and consensus standard is needed. But it might require companies to re-engineering collaboration processes, because with information sharing across diverse business partners, the boundaries even extend globally (Lancaster et al., 2006). However, in terms of the large amount of financial investment and the cost of training participants for undertaking the new system, companies should move their attitude toward s re-engineering the business process since many systems are originally designed to be standalone with little intention for future integration. Hence, it is necessary to define the supply chain collaboration process, information flow, and adjust the internal process problems before companies extend the e-supply chain networks.

3.0 Chinese Automotive Industry

With the increasing growth of its economy, more attention has been paid to China and more and more global organisations have been attracted towards effective long-term global supply chain strategies in and around China. For the automotive industry, impelled by the competitiveness of the global market, more and more companies are searching for new materials, models, and functions to satisfy the various market demands (Oliver, 2007). Hence, the global collaboration strategy has been adopted by most automotive enterprises, in signing up partnerships with automotive enterprises in the developing countries to form a new market share and develop a competitive production line (Cooney, 2006).

Motivated by a need to achieve global integration, the Chinese automotive industry has undergone great transformations in many areas such as: strategically sourcing materials and components worldwide; selecting global locations for key warehouses and distribution centres, and transferring existing logistics technologies to the new markets since the 1990s (Hong et al. 2006).

In China, with the accession to the World Trade Organisation, demands for the passenger car are expected to grow substantially during the coming decades. Therefore, in order to meet the larger amount of the market demand and improve the quality of techniques, most of the Chinese auto manufacturers have established joint ventures with foreign companies. Despite these foreign organisations having helped the Chinese automotive industry to modernise its automotive infrastructure, the installation of high quality technologies for fuel emissions control are still far behind Europe, Japan and U.S.A. Therefore, foreign companies and the Chinese government should share the responsibilities to change this situation and solve problems (Gallaher, 2002).

China has recently become a powerful automotive production and consumption market across Asia (Lee, 2003). Conversely, Chinese automotive companies are facing challenges of improving quality in order to meet international standards. The current standards of supplier quality in China are at, or close to, world class standards (Kathleen, 2003). However, with the lack of capital and techniques to improve the quality, at present the competitive advantage of China's auto parts manufacturers is restricted to low-tech parts manufacturing. However, the main weakness of the supply chain is that the best practice techniques are passing through to second tier suppliers in a very slow and uneven manner within the industry. The price of domestically produced parts is substantially lower than the price of foreign manufactured parts. However, almost 50% of the parts produced domestically are counterfeits of foreign brand products, moreover, the quality of the parts components is lower (Sutton, 2006). Hence, the local auto enterprises have to rely on imported high-tech parts / components such as shock absorbers, car braking systems, airbags and seatbelts (Moavenazdeh, 2006; Fung and Thomson, 2007).

Moreover, China also faces the challenges of meeting the industrial environmental policies, with the increasing domestic market demand and the uncertainty over energy consumption (Gallagher, 2002).

With the increasing domestic market demand, the energy consumption customer services would raise large amounts of uncertainty with regards to energy suppliers and increased environmental problems. Therefore, the key issues for the industry to solve this problem would be to create cost-effective regulatory frameworks for reducing emissions, and improving industry technological innovation to satisfy domestic market demand as well as meet customer requirement; whilst at the same time decreasing the environmental problems (Gan, 2001).

As China becomes a major player in the global market, the Chinese government has designated the automobile industry as one of the pillars with its economic growth and development. But the main barrier for foreign companies entering the Chinese market is the government regulations. Foreign companies require entry permission and corroborate work with the local organisations, which creates more synergy among the elements, thus setting the stage for the most notable of China's automobile industry (Lee and Anderson, 2006). Besides, the local governments also play a crucial role in the successful industrial cluster policy; Sutton (2006) suggested that in order to target industrial clustering and implement cluster policy, the local government should collaborate with the automotive industry to offer more effective structuring policy.

The environmental improvement for the consumers; entrance of the World Trade Organisation (WTO); price reductions, and the increased product range (Zen and Peng, 2003) they have all illustrated that the Chinese automotive industry has made great improvements during the past decades, as the market competition becomes fiercer. Hence, in order to obtain more competitive advantage, it is necessarily for the local automakers to restructure and reorganise business processes, thus integrate with collaboration strategy.

Therefore, the new capabilities, technology and corporate strategy are needed to improve the efficiency of supply chain performance, and competitiveness. In order to achieve the competitive advantage and survive in the global market, it is becoming a

trend for Chinese auto makers to integrate with the global supply networks. Since most of the automotive manufacturers in China have technical and capital partnerships with companies from Japan, America, Germany, France, Italy, Korea, and Taiwan (Chow, 2004). Hence, the traditional business model in which communication exists between business partners can no longer provide suitable strategies for managing such complex supply networks. Therefore, a high level view of the collaboration performance and a deeper understanding of the multi-party collaboration strategy are required (Xu, 2007). Thus, the current research will focus on analysing the challenges and influencing factors; thus identifying the requirements of adopting a collaboration strategy and providing effective and efficient solutions for improving the global supply chain performance in the “E” environment.

Hence, the main research questions of this research project will be:

- “What are the challenges / problems that Chinese automotive companies currently have in the collaboration supply chain sector?”
- “What are the requirements for integrating high quality, relevant and timely information-based supply chain strategy?”
- “How to approach business process re-engineering for integrating new business strategy?”
- “What are the requirements for developing a collaboration framework to formulate the information-based supply chain activities for helping the Chinese auto manufactures to effectively manage the global supply network?”

4.0 Research Methodology

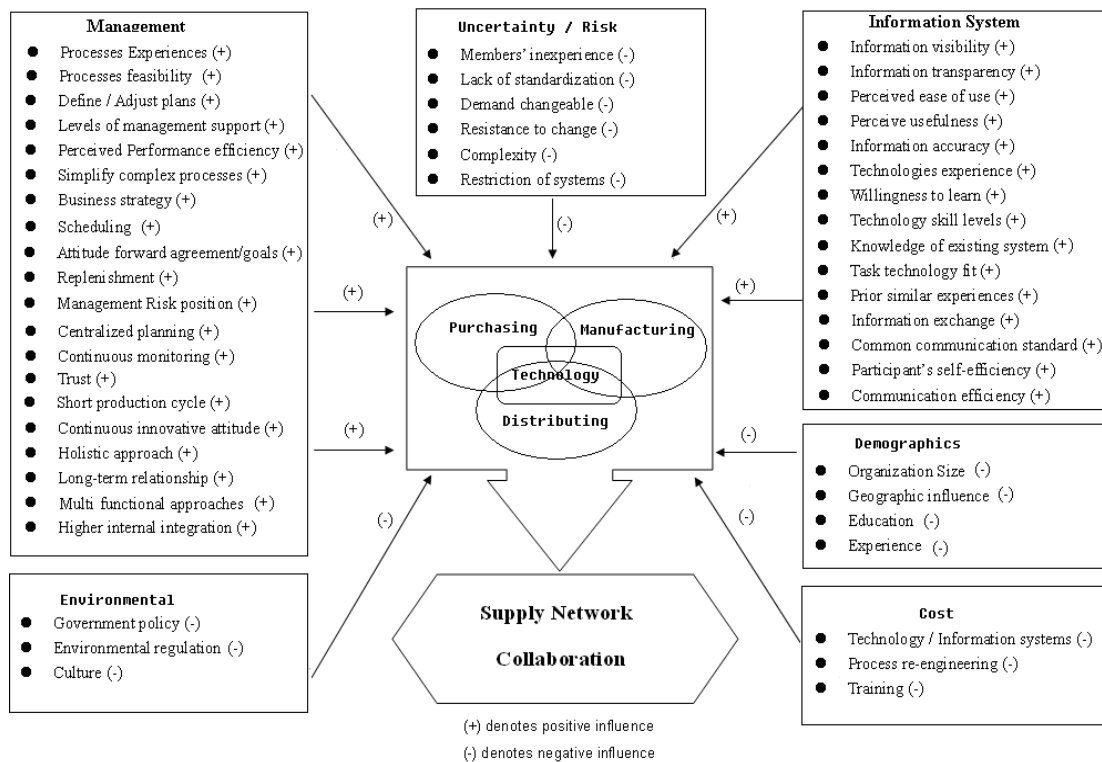
The analysis of the theoretical theory has been carried out by using a qualitative research method called “Grounded Theory” to understand and evaluate the relevant influencing factors and requirements of collaboration strategy development.

Grounded theory (Glaser & Strauss, 1967) is viewed as the best example of the inductive approach, which is defined as the discovery of theory from systematically identifying data where the theory is inductively derived from the study of the phenomenon under consideration. Clarke (2005) suggests that theory emerges as an iterative process throughout the data collection and analysis protocols. Data collection starts without the formation of an initial theoretical framework. Theory is developed from data generated by a series of observations. This data leads to the generation of

predictions that are then tested in further observations which may confirm, or otherwise, the predictions (Strauss et al. 1998).

In previous academic research, grounded theory has been used to examine the supplier relationship of the automotive industry, analyzing the factors related to adoption and implementation of an Internet-based technology, and the development of technology integrated models (Kotzab et al., 2000). As the aim of this particular research project is to develop a collaboration framework for e-supply chain integration, it is appropriate to use grounded theory for understanding a new construct, and the internal relationship with the relative component.

The detailed influencing factors are presented in the theoretical framework (Figure 1). The entire coding are collected from the journals (1991-2007), all of the relevant concepts of the influences factors are categorizes into 7 major influences elements in the theoretical collaboration framework, which consist of 51 proposed interdependent relationships between predictor factors and internalizations.



**Figure 1: Theoretical Framework:
Influencing Factors in Supply Network Collaboration**

Based on the theoretical review and the framework developed above, it can be proposed that a successful collaboration strategy requires an up-to-date IT supporting infrastructure, valuable data, as well as companies to address the performance management aspect of sharing information, communicating with partners, and adopting a new view of doing business with customer and suppliers. The high level of collaboration strategy requires visibility, flexibility, transparency and accuracy of the information systems; also it requires collaboration partners managing trust, the relationship dependence and sharing risk, profits. This is related to the knowledge and experience of the performance management and the commitment standardisation between collaboration partners. Hence, the theoretical collaboration framework is proposed as follows (Figure 2):

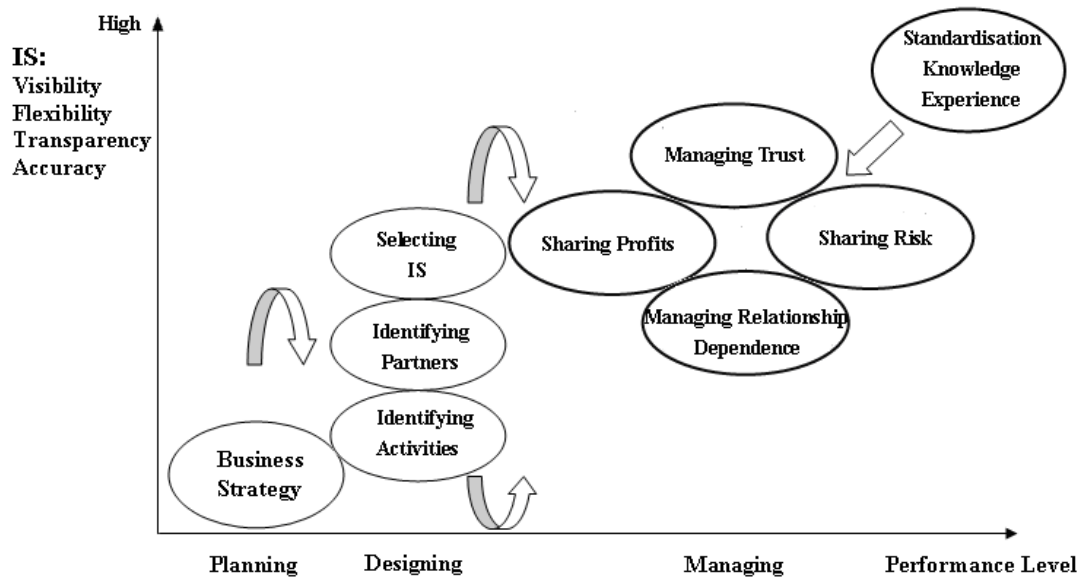


Figure 2: Theoretical Collaboration Framework

Through analysing the available literature, it is revealed that installing a business multi-party collaboration strategy would bring the business partners the following benefits:

- The efficiency and ability to communicate through the business process, which helps to decrease costs and improve customer service. The modelling allows all the business partners to communicate through channels in real-time or at the same time to increase the service levels (Lee and Whang, 2001).

- Long-term relationships that would be built along with the business collaboration process. As companies open themselves, and their information, up to each other they are forced to develop their own strategies and goals. By doing so, supply chains become committed to the end consumer. This long-term relationship also moves to stabilise processes, as companies focus on their individual core competencies, while outsourcing their remaining needs.
- Creating more reliable and efficient performance operations. For example, by sharing information throughout the collaboration business process helps to reduce inventory costs. The system also creates a roadmap for the supply chain workflow, creating more reliable and efficient performance not only in the internal environment but also across business partners.
- Improve dealer and customer relationships by assisting the ability to anticipate, track, and respond to customer demand and reactions. The framework provides the dealer with efficient and rich information about the product's detail, whilst at the same time, providing the auto makers with useful information from the dealer, such as product information and customer requirements. Therefore, it is valuable for the auto maker in product innovation, which could satisfy the changeable market demand (Hausman, 2000).

The main outcome from the research paper is to recommend a collaboration framework to understand the influences factors of adopting collaboration strategy in the supply network. Hence, further efficiency multi party collaboration strategy will be purposed for improving supply chain performance in the Chinese automotive industry. This will facilitate the integration of information technologies in the supply networks whilst keeping it flexible enough to develop a collaboration strategies framework to formulate the supply chain activities helping Chinese auto manufacturers to effectively manage their global supply chain and thus add value to both business and customer.

5.0 Contribution & Future Research

The future research will be focused on developing a collaboration strategy framework to formulate the information-based supply chain activities for helping Chinese automotive manufacturers to effectively manage their global supply chain. Detailed requirements for the framework development will be narrowed down into specify characteristics and requirements of all the business collaboration participants, processes / activities, so that task fit technology can be identified for integration, thus ensuring the efficiency of collaboration networks for the Chinese automotive industry.

Through the development of the supply chain collaboration framework, the proposed contributions from this research include:

- Providing literature review research methods and techniques to analyse and evaluate the requirements of designing the cooperation process and for the redesign of existing business collaboration processes.
- Analysis on influences factors of information technologies applications strategy in supporting supply network collaboration process
- Identifying the responsibilities between the involved collaboration business partners and identify the core business collaboration activities in the Chinese automotive industry
- Providing theoretical collaboration framework for further developing e-supply chain collaboration strategy to improve the efficiency of supply chain performance in the global collaboration “E” environment

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