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Exploring SCM Awareness in Chinese SOEs: Insights from a Case Study

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Abstract – Supply chain management (SCM) systems have been used by modern enterprises to support and management the links of supply chain from suppliers to customers. This paper aimed to investigate the current situation of SCM adoption in Chinese state-owned enterprises (SOEs), especially in a geographically dispersed SOE group using a case study approach. Questionnaires were selected as the data collection method in the research. The questionnaire findings show although a set of SCM related functional information systems including purchasing systems, manufacturing and production systems, finance and accounting systems have been applied in Chinese SOEs, an integrated enterprise-wide SCM system is currently missing. Therefore, due to the size and national impact of the SOE in question, it is strongly suggested that an integrated and homogeneous approach to SCM should be adopted in order to improve efficiency, productivity and core competitiveness of this type of organization.

Keywords- *SCM; functional information systems; integration; Chinese SOEs*

I. INTRODUCTION

In order to improve organizational performance and gain more competitive advantages in the fierce competition environment nowadays, supply chain management is chosen as one of the main strategies by more and more enterprises to obtain an effective sourcing, production and distribution business process [1, 2]. Supply chain management (SCM) is “the integration of all activities associated with the flow and transformation of goods from new materials, through to the end user, as well as associated information flow, through improved supply chain relationships to achieve a sustainable competitive advantage” [1]. Various business processes from suppliers to consumers are integrated through supply chain management in order to provide better management on different tasks in physical material flow as well as the information flow along with it from sourcing to consumption process [3, 4]. SCM deals with two major flows which are implicit in this definition. Firstly, a flow of materials in supply chain, and secondly, the information flow along with it. SCM

systems are used to manage the information flow [1].

It is well known that a good SCM system can bring efficiency and effectiveness to organizations [2,4]. SCM will help the companies streamline the entire supply chain processes from taking basic raw materials from suppliers to delivering a finished product to the customers [4, 5]. During this process, more accurate information about ordering, producing, storing and delivering is provided by SCM system. Therefore, supply chain costs are reduced through faster order processing, inventory levels reducing and quicker time to markets. Furthermore, sales amount may increase because of better delivery service and also the relationships with suppliers will be improved though SCM systems implementation [5, 6].

Chinese enterprises are now having more and more connections with enterprises worldwide through open-door policies and WTO accession, which make supply chain management more and more important. However, SCM systems are not always effectively implemented in Chinese companies in general and SOEs in particular [2]. This is particularly surprising as in China, SCM system market was RMB 790 million in 2006 based on the report from CMP consultant. From 2005 to 2010, the amount of SCM systems sales was RMB 5.03 billion in total [7]. The business benefits prompt the penetration of SCM implementation in enterprises, especially in China, with large land area and increasingly competitive environment. State owned enterprises (SOEs) are leading economic component in China and were strongly influenced and changed when the Chinese government proposed a merger plan of provincial and other small SOEs into very large national SOEs in the 15th national congress in 1997. This created very large-size distributed enterprises that are still today trying to homogenize and control their information systems. In this type of enterprise, the SCM system is much more significant due to the complexities and difficulties not only inherent to geographical distribution, but also the needs for including and harmonizing all kinds of legacy systems both

technical and organizational. This paper aimed to provide an investigation of SCM system adoption in one such large manufacturing SOE group.

II. LITERATURE REVIEW

The traditional view to study information technology influence in the organization has been to identify how the information system is used in each specific business functions [6]. From a functional perspective, information systems are categorised according to different business functional areas, such as sales and marketing systems, purchasing systems, manufacturing and production systems, finance and accounting system, human resources systems [5]. Sales and marketing information systems take responsibilities for the business processes including identifying customers' demands, planning promotions and so on. Purchasing information systems deal with all the operations and management with suppliers. manufacturing and production information systems is responsible to support the business activities such as developing and maintaining producing equipment, storing producing materials, and scheduling producing activities. The major functions of finance and accounting information systems are to record the financial activities and track the financial assets and fund flows. Human resources information system is responsible for identifying human resources requirements, maintaining employees' records, analyzing recruitment and so on [5]. All of these functional information systems are implemented and operate at different organizational levels, including operational, tactical and strategic levels. Generally, Transaction Processing Systems (TPS) are used for operational control, while Management Information Systems (MIS) and Decision Support Systems (DSS) are applied at tactical level. Executive Information Systems (EIS) are mainly for strategic planning in top strategic level [8]. To be specific, TPS are basic computerized systems which aim to keep record of daily transactions in organizations [5, 8]. Operation information is provide to MIS, which will summarise the reports based on the information in order to monitor and control the performances of organizations by providing reports with vital information to middle managers for assisting tactical decision making [5,8]. DSS are interactive systems which facilitate and support the solutions and decisions for unstructured or semi-structured problems through the way that providing data, tools or models to managers [8]. Decision support systems emphasize to make the decision on the unique and rapid changing problems facing the company using the information brought from both internal resources, such as MIS or TPS and external resources [5]. EIS aim to support the information needs of top management and strategic decisions by producing standard format reports with the most significant data [5, 9].

Although these different types of information systems will support organizations in all the

functional areas from different strategic levels, they are usually not able to communicate or share information with each other, which lead to the low efficient usage of these information systems. As a result, integrated cross-functional information systems are developed to cross the traditional functions boundaries so as to improve the efficiency and effectiveness in all the business processes. SCM system is a typical kind of integrated information systems.

A supply chain is defined as "a set of three or more entities (organizations or individuals) directly involved in the upstream and downstream flows of products, services, finances, and/or information from a source to a customer" [4]. SCM system is "a cross-functional inter-enterprise system that uses information technology to help support and manage the links between some of a company's key business processes and those of its suppliers, customers and business partners", in order to "create a fast, efficient, and low-cost network of business relationships, or supply chain, to get a company's product from concept to market" [6]. SCM system is usually classified as supply chain planning systems which help the organizations forecast the product demand or plan sourcing and manufacturing, and supply chain execution systems which used to manage the distribution flow of the products, to make sure that the materials, warehouse, transportation and financial information are operated in the most efficient way [5].

To be specific, the main functions of supply chain planning systems include [6]:

- Supply chain network design – to make the network of suppliers, branches, and distribution centres optimal.
- Forecast and demand planning – forecast customer demand accurately through collaborating planning, forecasting, replenishment and inventory information on the internet.

The main functions of supply chain execution systems include [6]:

- Fulfilment collaboration – ensure all the raw materials required, stock, product inventory and procurement order information accurate fulfil all the orders on the whole logistics process and then ensure the real-time delivery;
- Manufacturing collaboration – optimize all the plans and schedules during the manufacturing;
- Supply chain performance management – control every stage of the supply chain processes and report the key measures in them.

To sum up, it is clearly from the functions of SCM system discussed above that purchasing,

manufacturing as well as finance and accounting functional information systems are integrated in the SCM system. Furthermore, SCM system not only helps the operation of organizations such as manage materials movement, but also provides further support in tactical and strategic levels such as demand forecasting or production design.

TABLE I. TABLE I SUMMARY OF SCM FUNCTIONS

IS nature	SCM functions	Functional areas
Operational level (TPS)	Fulfilment collaboration	Purchasing & manufacturing areas
Tactical level (MIS & DSS)	Forecast and demand planning, Manufacturing collaboration, Supply chain performance management	Purchasing, manufacturing & accounting areas
Strategic level (EIS)	Supply chain network design	Purchasing, manufacturing & accounting areas

The aim of this research was to test the understanding of SOE middle managers on SCM by testing first if they realise they have an IS to support these processes and second if they can identify IS support in the different functional areas discussed above.

III. METHODOLOGY

As discussed above the efficiency and competitiveness of organizations is highly dependent on the successful implementation of SCM system. However, this implementation will be highly influenced by organizational awareness, culture, structure and business processes. This paper aims at studying organizational awareness of SCM.

Using case study is “the most appropriate research method when the purpose of the research requires holistic, in-depth investigation of a phenomenon or a situation from the perspective of all stakeholders involved” [10]. Therefore, a case study was used to investigate the current awareness of SCM system adoption in the research.

A typical Chinese manufacturing SOE group with more than 208,000 employees in Aluminum industry is selected as the case company. Furthermore, this SOE group is composed of 9 branches and 1 research institute which are dispersed geographically in different provinces in China. Considering this wide geographical distribution, questionnaires were used as the data collection method. The questionnaires were designed according the findings of a systematic literature review and resulted in a very extensive set of questions designed to investigate:

- Whether the enterprises have adopted the SCM;
- Whether the enterprises have adopted IS in purchasing area;
- If so, whether the purchasing systems contain TPS/MIS/DSS/EIS functions;
- Whether the enterprises have adopted IS in manufacturing area’

- If so, whether the manufacturing systems contain TPS/MIS/DSS/EIS functions;
- Whether the enterprises have adopted IS in finance and accounting area;
- If so, whether the finance and accounting systems contain TPS/MIS/DSS/EIS functions.

In this research, managers and middle management systems users in the headquarters and in five branches of the SOE group are set as the research subjects. With supports of CIO in the enterprise, questionnaires are sent out by email to the target respondents, including 1 manager and 4 system users. All the 30 questionnaires are collected and valid for the research.

IV. FINDINGS AND DISCUSSIONS

The questionnaire results show that in total 30 respondents, only 3 of them (10%) agree with SCM systems are used in their enterprises, while for the functional information systems, 19 respondent (63%), 25 respondents (83%) and 29 respondents (97%) considered purchasing, manufacturing and finance and accounting systems are used respectively. These findings indicate that although a set of SCM-related functional systems including purchasing, manufacturing and accounting systems are used in enterprises, there seems not to be the existence (or awareness) of an integrated enterprise-wide SCM system, which can incorporate, coordinate and maximize all these functional applications together.

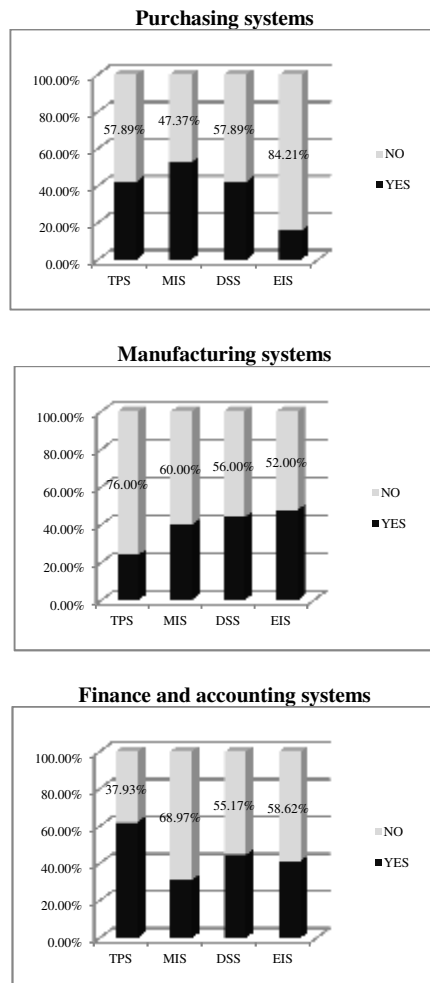
TABLE II IMPLEMENTATION OF SCM AND FUNCTIONAL IS

SCM		Purchasing Systems	
YES	NO	YES	NO
3	27	19	11
Manufacturing Systems		Finance and Accounting Systems	
YES	NO	YES	NO
25	5	29	1

This study aimed at understanding this apparent contradiction, by investigating deeper into the different functional systems, i.e. TPS, MIS, DSS further. The findings show that TPS, MIS, DSS and EIS functions are indeed used in various ways in each of the legacy functional system in use in the different provincial branches, which increase the complexity to integrate the IS across the functional areas. In summary, the situation in the case enterprise is that information systems in different functional business units are used already but they are developed using different software, from different vendors and often with data resources in different formats. This creates severe problems to a top-down integration that would be required by a organization wide SCM approach. This phenomenon creates what is often described as “islands of automation” by [11], which means isolated information systems running separately and they are not able to communicate and share information with each other. This is a common

problem after the merger of previously independent and isolated organizations, and one that has been deemed critical in western mergers and acquisitions.

TABLE II. USE FUNCTIONAL IS IN DIFFERENT SUPPORT LEVELS



The integration of SCM-related ISs will provide a unified business process in enterprise-wide that cross the boundaries of geographies to support entire logistics process. The resources in the supply chain management process (human, financial, organizational and contractual) are optimized through the IS integration. Conversely, isolated use IS software components is not able to facilitate these process, encourage bottom-up information exchange and consequently appropriate planning of the supply chain process. Therefore, the lack of integration in the SCM related business information systems results in difficulties in logistics, purchasing and supply planning and forecasting. Moreover, the maintenance costs of isolated and diverse information systems are very high when compared with the maintenance of a unique SCM systems contracted to a unique vendor [5].

Therefore, the findings show a strong need for the SOE group to actively engage in the homogenization and integration of all the identified isolated SCM related information systems. It is

strongly suggested that a unique enterprise-wide SCM package (or ERP system) should be adopted and enforced top-down.

V. CONCLUSIONS

This paper investigates the SCM adoption in Chinese SOEs through a case study. From the literature review, the researchers identified that SCM systems cover three business areas in the organization, including purchasing area, manufacturing area and accounting area in all the operational, tactical and strategic levels. The findings show that an integrated enterprise-wide SCM system was not adopted in the case SOE group after the merger almost a decade ago. However, a set of SCM related IS applications are in place for the expected purchasing, manufacturing and accounting functional areas. Many of these systems are legacy systems, but many have been acquired after the merger on a branch base. These systems are now very difficult to integrate from both functional and strategic perspectives. However, with the increasing pressure on SOEs to enhance their productivity and competitiveness against both new entrants in the market and foreign groups, we suggest that there is a need for a broader integrative IS strategic planning for enterprise as a whole that must include SCM, but also other core strategic IS systems such as CRM, ERP and EIS. Failing to implement such a plan and a corresponding change management process will result in Chinese SOEs having extreme difficulties in order to successfully compete against both private sector and foreign threats.

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