Analyzing the Information Sharing Practices and Barriers in Supply Chain of Automotive Industries

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Abstract— Information sharing and technology remain one of the key factors of coordination amongst the parties in a supply chain. Supply chain efficiency is highly important as today's competition is no longer between companies, but between supply chains. Information sharing can increase supply chain efficiency by reducing inventories and smoothing the production. The purpose of this study is to assess the status of the supply chain information sharing practices in Indian automotive industries. This study is focused on identifying the types of information shared, determining the level of information sharing , usage of Information Technology (IT) tools and identifying the barriers of information sharing. Data for this study is collected from the respondents of Original Equipment Manufacturer (OEM), Tier 1, Tier 2 and Tier 3 Indian automobile industries. Frequency analysis is employed to derive the results from the survey.

Keywords—Information sharing; IT tool; Barriers; supply chain

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I. INTRODUCTION

Supply chain management (SCM) is associated with the management of products and information flows among suppliers, manufacturers, distributors, retailers, and customers [1]. By appropriate sharing of data between suppliers and retailers and co-coordinating their replenishment and production decisions under the demand uncertainty, it is possible to reduce costs and improve customer service levels.

During the past one decade, supply chain management and information technology management have attracted much attention from both researchers and practitioners. As information technology evolves, firms tend to become more integrated. Therefore, incorporating effective supply chain practice with effective data sharing becomes critical for improving supply chain performance (SCP). The supply chain practice focuses on material movement [2], while information sharing focuses on information flow [3].

Information sharing is an important element of cooperation in SCM. It can be categorized according to operations areas such as sale, demand forecasting, inventory, order status, and production plan [4]. Looking at the flow direction of information, the production demand plan and inventory related information is a two-way communication within the upstream and downstream industries in the supply chain [5]. The information of sales and demand forecast is flowing from downstream companies to their upstream partners. The information about demand status is provided by upstream organizations to their downstream partners. In addition, information sharing includes the part quality data, details of early completion date and production feasible capacities among the partners. Sharing of information is often affirmed by an electronic data interchange, internet and other communication devices between the supply chain partners [6].

Information shared can be tactical like effective operations scheduling, purchasing, logistics planning or strategic like long-term commercial objectives, client information and marketing. Past studies on the importance of informal and formal information sharing between trading partners has shown that effective information sharing increases visibility and reduces uncertainty [7]. It permits firms to access data across their supply chains, leaving them to collaborate in activities like production, sales and logistics. The range to which information is shared can improve opportunities for firms to influence. The scope of this study is to investigate the effectiveness of information sharing in supply chain management. This study elaborates the profit and barriers of sharing information leading to improved supply chain incorporation among enterprises.

II. RESEARCH FRAMEWORK

The supply chain is a network of interrelated members such as raw material suppliers, manufacturers, distributors, retailers and consumers with a lot of different flows moving through it. Not only products, but also information, money, services and materials move amongst members of a chain. Effective management of these flows in the supply chain is necessary to satisfy the growing demands expected of today's organizations.

Looking at the flow of information, benefits can be achieved by sharing parts of this information flow with the rest of the supply chain and sharing information is regarded as one of the most effective ways of improving supply chain

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performance. The essence of SCM is, through sharing information, to optimize the decision-making of members of the supply chain on activities related to production, inventory, marketing and so on, and it has become imperative to achieve information sharing among members of the supply chain. Based on this background, this study focused on to examine the level of information sharing practices among the Indian automobile industries.

A. Type of information shared

Sharing of information refers to the exchange of critical, often proprietary, information between supply chain members and it is a strategy for achieving cohesion of all functions among the members of the supply chain. There is a wide range of information that could be shared within the firm and across the supply chain. Depending on the need of the organization, information related to market, design, product, process, production, pricing, planning, inventory, logistic, forecasting demand, order, promotion strategies, customer demand, production schedule, distribution operation, technological, manufacturing process and sales forecast can be shared with the supply chain partners [8] and the typical information shared may include inventory and replenishment, sales, demand forecast, order status, production capacity, production schedule, delivery status [9,10]. Researchers have shown that a variety of information needs to be exchanged to improve supply chain coordination, which in turn improves SCP [9, 10]. Table 1 exhibits typical types of information that are usually shared among supply chain partners.

TABLE I.   TYPES OF INFORMATION SHARING

Types of Information
Production plans (PP)
Inventory status (IS)
Order status (OS)
Purchase and sales (P&S)
Quality status (QS)
Delivery schedule (DS)
Product development (PD)
Production/process cost (PPC)
Demand forecast (DF)
Design specifications (DS)
Capacity planning (CP)
Future plans (FP)

B. Information Technology (IT) tools employed

Supply chain members connect through information sharing support tools. Information Sharing technology support includes the hardware and software needed to support information sharing. There are different type of information sharing tools used by industries in an effort to process more accurate information, from more different sources frequently [11]. The increasing attractiveness of e-commerce and Internet use facilitates the creation of global supply chain. Supply chain members are using the different type of IT tools for communication and data transfer. These tools include variety of technologies such as auto identification, EDI, Global

positioning system (GPS), sensors, radio frequency technique, advance planning and scheduling (APS). General accounting system, material planning, enterprise resource planning are found to be more popular among by Indian industries. Other IT tools, namely distribution resource planning, global positioning, SCM module, and customer relationship management software are used to enhance the communication. The major IT tools used in a supply chain are presented in Table 2.

TABLE II.   INFORMATION TECHNOLOGY TOOLS

IT Tools
Accounting system (AS)
Material resource planning (MRP)
Enterprise resource planning (ERP)
Bar coding/automatic identification system
Customer relationship management (CRM)
E-commerce module (EC)
Electronic data interchange (EDI)
E-procurement system (EP)
OEM's own system (OEM)
Supplier relationship management (SRM)

C. Barriers of information sharing

The difficulties involved in the information systems implementation are mainly due to the technologies needed for this purpose and they give rise to barriers, which are termed as technological barriers. The complexity of a technology is a major element that affects the adoption of information sharing and the technology factor can cause the failure of supply chain information sharing so that technological barriers need to be tackled at the earliest in the organization. Information sharing initiatives require essential changes in behavior and process of individuals as well as organizations. Normally the individuals and organizations resist the changes because of structural conflicts and managerial practices of different organization in the supply chain.

Barriers that arise due to the cost and investment related to implementation of information sharing systems are categorized as fiscal barriers. Effective information sharing depends on the advanced information and technology systems. It requires more investment because without this efficient sharing of information cannot take place in a supply chain. Financial constraints are key barriers to information sharing in a supply chain. Cost considerations are the prime challenges to support the IT infrastructure and skilled manpower requirements. Initial investment for the infrastructure, training and running maintenance cost of an information system in a supply chain needs the high investment required to set up the system. Lack of experience, training and low literacy about the new technology are also considered as some of the barriers of information sharing.

The barriers that provide hindrance in supply chains are identified from a detailed literature survey and thereby a total of 36 only 10 are presented. such barriers are identified [12] and the top 10 most important barriers, as identified in this study, are presented in Table 3.

TABLE III.   BARRIERS OF INFORMATION SHARING

Barriers	
Shared vision between supply chain partners	B1
Different organizational culture	B2
Cost of maintenance and specialized man power & training	B3
Lack of willingness and spirit among employees	B4
Lack of employee education and training/knowledge	B5
Lack of clear alliance guidelines	B6
Lack of top management commitment or support	B7
Integration with suppliers and customer's system	B8
Mismatched data structures	B9
Lack of leadership and managerial direction	B10

The type of information sharing used, usage of IT tools and barriers of information sharing in the automotive industries located in India are analysed by the frequency analysis.

III.   CASE STUDY

A.   Focus on Automotive sector in India

Indian auto component manufacturers have successfully managed to cut down costs, apart from improving upon quality. At the same time, many overseas firms are setting up export bases in India because of the growing demand potential. True, Indian automotive industries have gone through a steep learning curve and are all set to make an impact on the global scenario.

B.   Objectives

The main objective of this study is to develop a comprehensive report on information sharing practices, utilization of IT tools and barriers of information sharing on supply chain in automotive industries in Indian context.

C.   Data collection

Data for this study are collected through questionnaire based cross sectional survey method. The target population of the survey was the respondents who are serving as the middle and top level executives in OEM, tier1, tier2 and tier3 automotive industries in India. The senior-level and middle-level managers of the target organizations from different departments working as a supply chain manager, logistics manager, and purchase manager, who, thereby, are responsible for the organization's supply chain activities were selected for the administration of the questionnaire. The questionnaire was developed based on related literature and through interaction with academics and industrial practitioners. A pilot survey was conducted and the questionnaire was modified. The revised questionnaire consisted of questions that elicited the response of the managers in regard to information sharing practices. The respondents were taken to indicate their perception, on a 5-point Likert scale ranging from 1 (= Poor) to 5 (= Excellent). The survey questionnaire was sent to 350 industrial respondents of automotive industries. From the collection of response, 158 usable responses were considered giving a net useful response rate of 45% and the remaining were discarded.

In this case, the sample size is found to be adequate following the Evan's rule [13]. These 158 questionnaires include 8 from OEM, 49 from Tier 1, 70 from Tier 2 and 31 from Tier 3 industries, which are analysed.

IV.   RESULTS AND DISCUSSION

A.   Types of information sharing

Figure 1 shows the pictorial view of survey results with regard to importance of types of information sharing. The results showed that the Production planning (PP) is the most widely shared information followed by iinventory status (IS), order status (OS) and purchase and sales information (P&S). Information regarding Quality status (QS) and delivery status (DS) are the next most widely shared information, between the customer and suppliers. From the results, it is also found that the information related to factors such as new product development status (PD), production process cost (PPC), demand forecast (DF) and design sophistication (DS) are not so frequently shared among the automotive industries.
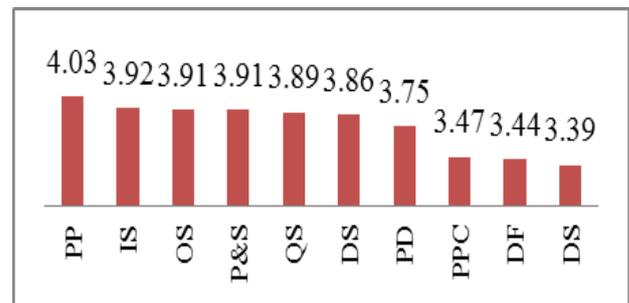

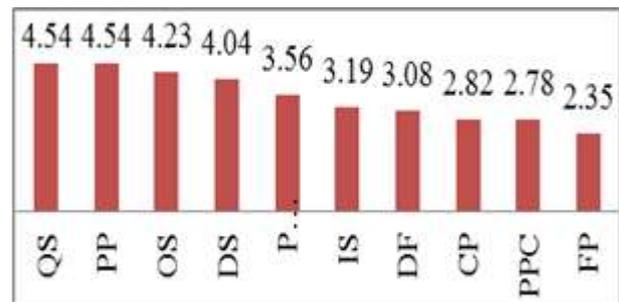Fig. 1. Priority of types of information shared

Fig. 2 Frequency of using the variuos types of information

Figure 2 shows the frequency of sharing the various types of information sharing among the supply chain partners. Results showed that the quality information sharing (QS) is the most frequently used type of information followed by production planning (PP), order status (OS) and delivery status (DS). Purchase and sales detail and inventor status are sharing lesser frequency than quality status. Furthermore, Demand forecast (DF) and capacity planning (CP), production planning (PPC) and future planning (FP) are shared only between the supply chain members.

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B. Usage of IT tools

The pictorial representation of the findings is shown in Figure 3. From the results, it is revealed that most of the respondents indicated that the "accounting system" (AS) is the most widely used IT tool in automotive industries followed by material requirement planning (MRP) and Enterprises resource planning (ERP). Usage of other IT tools such as auto identification (AI) of product tracking, customer relationship (CRM), E-commerce (EC), Electronic Data Interchange (EDI) and E-Procurement (EP) are observed to be among the next most widely used IT tools among the supply chain entities. It is found that the most of the Tier-1 industries are using the OEM's own software for direct communication. On the other hand, only a few industries use supplier relationship management (SRM) as IT tool. This may be due to the fact that the organizations have not upgraded their usage of IT tools.
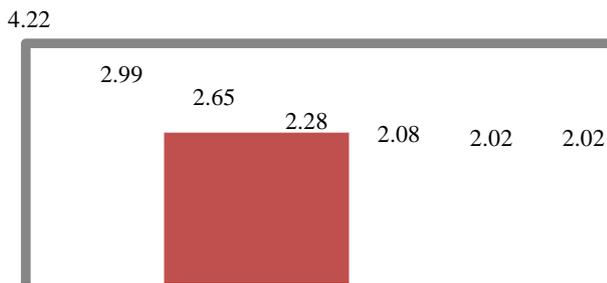

Fig. 3 Frequency of using IT tools

C. Barriers of information sharing

There exist many barriers that act as hindrances to the process of information sharing in supply chains and the study has ranked these barriers in the context of Indian automotive industries, out of which the ten topmost important barriers are shown in Figure 4. As shown in Figure 4, lack of sharing vision among the supply chain partners (B1) is observed to top the list of barriers followed by different organization culture (B2), the cost of specialized training to operator and maintenance (B3). For the effective information sharing, employee support and involvement (B4) is very essential and lack of such a support is found to be the next most important barrier in the select case industry the survey has brought forward the finding that the lack of employee education (B5) and lack of guidelines (B6) act as the next most impotsant barriers. The support from the top management is plays a crucial role in implementing information sharing practices in an organization and lack of top management support (B7) and supplier and customer integration (B8) are observed to occupy the next two positions. Mis-matched data structure (B9) slow down the supply chain process and thus leads to creation of conflicts among the supply chain partners. mis-managed data structure (B9) and lack of managerial and leadership direction (B10) are found to be the barriers that are considered to be the next most important barriers in information sharing.
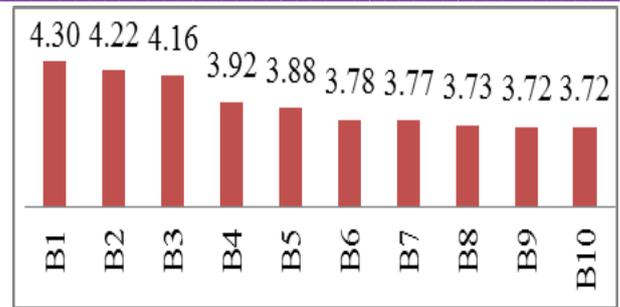

Fig. 4 Barriers of information sharing

V. CONCLUSION

This study is an attempt to assess the ststus of information sharing practices among automotive industries in Indian context. The types of information shared among the partners of automotive supply chains alongwith the frequency of sharing of information are anlysed. It is found that information regarding production planning is considered to be the most dominant one among the entities of the supply chain. The usage of IT tools by the members of the supply chain is also analyzed and the results revealed that the accounting system is most widely used IT tool. It seems that there is a lack of specialized training and maintenance of IT tools. There is a need for the top management support in training and motivation of employee which will increase the supply chain performance of case companies. The results also indicated that the type of information shared and the use of support tools differed between the supply chain members due to variation in the level of information technology employed. The top management of case companies has to pay more attention in upgradation of information technology for enhancing the use of information sharing practices.

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