Interorganisational systems in an automotive supply network: the Indian case of Maruti Udyog

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Abstract: This paper reports a case study of Interorganisational Systems (IOS) at Maruti Udyog Limited (MUL), which is a major player in the Indian automotive industry. This paper suggests an approach to IOS planning for the automotive industry. It provides new insights into the existing literature on Critical Success Factors (CSFs) in the IOS domain. The paper examines two specific IOS initiatives in the MUL value and supply networks and presents a differentiated analysis of design elements (*e.g.*, relationships, processes, Information Systems (IS) and change issues). It is also a best-practice case of how IOS initiatives can add value to the focal company and its business partners and provides support to the business relevance of interorganisational investments. The research is based on interviews with senior managers, heads of departments, employees and business partners of MUL who have been directly affected in their work. Other sources of information are company documents and publicly available background information.

Keywords: supply chain; interorganisational systems; IOS; critical success factors; CSFs; automotive industry; India.

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1 Introduction

As organisations rely more on collaboration with partners to enhance their position in business, they look beyond their traditional Information System (IS) boundaries. Many organisations use Information Technology (IT)-based interorganisational information systems as a strategic tool to link partners in the supply chain. Maruti Udyog Limited

(MUL) is such a case from the automotive sector in India. MUL has successfully implemented a number of IT initiatives such as the Oracle E-business Suite, a scheduling system with suppliers called E-Nagare, a Dealer Management System (DMS), Product Lifecycle Management (PLM), a Warehouse Management System (WMS), Customer Relationship Management (CRM), *etc.* This paper is based on a discussion of two IT-led interorganisational initiatives: the E-Nagare Scheduling System and the DMS. The paper discusses the drivers for planning, methodology and the CSFs for these Interorganisational System (IOS) initiatives. It is hoped that the findings would provide insights for other organisations that are planning to implement IOS in their supply chain networks.

Little formal thought is given to the planning of IOS processes (Finnegan *et al.*, 2003; Kaushik, 2005). As there is a move towards systems that have a greater impact on organisational processes, especially across a number of organisations, the planning needs to be inter- rather than intra-organisational (Finnegan *et al*., 2003). Kumar and van Dissel (1996) recognised that the interorganisational structures, design, implementation and operation of IOS are interdependent. This means that IOS development is affected by more factors besides technology. Of these factors, planning is regarded as the most important factor in influencing the success of IOS (Finnegan *et al.*, 1999). It is important to carefully plan for and architect these systems, understanding that the nature of these systems is quite different from planning at an organisational level. There are concerns on the amount and nature of information to be shared between organisations, trust between partners, security concerns, the roles and responsibilities of people across organisations, infrastructure requirements, technology platforms and modelling of interorganisational processes. The management of a process across the organisation in itself adds to the complexity. The cultures across organisations are different; therefore, there is a need for cultural alignment in integrating processes across organisations. However, not much work has been done in the area of IOS planning. This study discusses the drivers and IOS planning issues for MUL.

The MUL study also discusses the CSFs which may be important in the IOS domain. CSFs occupy a prominent place in the IS research field. Rockart (1979) defines CSFs as those few key areas of activity in which favourable results are absolutely necessary for a particular company to reach its goals. For obvious reasons, the CSFs are areas of activity that must receive due attention from management. CSFs have been one of the earliest and most actively researched topics in the IS field. As a result of such research efforts, we know a number of factors which influence an IS's successful implementation, *e.g.*, commitment of top management and adequate funding. These factors are applicable to IOS, since it is also a sort of IS. However, IOS are more complex and multifaceted than traditional IS in terms of their technological and management issues. The MUL case study brings out certain CSFs that may need to be addressed for successful IOS implementation and adds new insights to the existing literature in the IOS domain.

2 Literature review

Supply chain collaboration has been strongly advocated by consultants and academics since the mid-1990s under the banner of concepts such as Vendor Managed Inventory (VMI), Collaborative Planning Forecasting and Replenishment (CPFR) and Continuous

Replenishment (CR). It is widely accepted that creating a seamless, synchronised supply chain leads to increased responsiveness and lower inventory costs. Several seminal studies have identified the problems caused by lack of coordination and to what extent competitive advantage can be gained from a seamless supply chain (Lee *et al.*, 1997; Chen *et al.*, 2000).

These systems are enabled by different IOS. IOS are Information Communication and Technology (ICT)-based systems that transcend legal enterprise boundaries (Bakos, 1991; Konsynski, 1993). The boundary-spanning aspect implies a level of cooperation and coordination well beyond that of the traditional arm's-length relationship that exists between organisations acting as free agents in the market.

IOS exist to support and implement cooperation and strategic alliances between two or more organisations (Jaiswal and Kaushik, 2005). Kumar and van Dissel (1996) define IOS as the software and system manifestation of interorganisational relationships. IOS represent a pattern of interdependent relationships between the activities of a given firm and those of other firms (Kambil and Short, 1994). IOS affect organisations at many levels (Sumoi, 1994) and these systems go beyond mere electronic data interconnection and deal with people, policies and procedures (Konsynski, 1992), as well as power relationships (Webster, 1995).

Johnston and Vitale (1988) define an IOS as an automated IS shared by two or more companies to facilitate the creation, storage, transformation and transmission of information. An IOS differs from an internal distributed IS by allowing information to be sent across organisational boundaries through communication technology. The strategic value of IOS has been well recognised for its real-time interaction, higher transaction accuracy, more efficient and quicker payments (Hendon and Nath, 1994), rapid response, reduced search costs, reduction in inventory and tighter links to customers (Johnston and Vitale, 1988). These benefits enable all parties to have high operational efficiency and capability (Angeles *et al.*, 2001), and more and more corporations tend to adopt IOS in order to gain competitive advantages. The above definition of an IOS encompasses many systems such as extranets, *Electronic Data Interchange* (EDI), internet EDI, Business-to-Business (B2B) e-commerce and e-Supply Chain Management (e-SCM). What they differ on are just the technologies used, the scope of application, stakeholders and so on (Grossman, 2004).

The current IOS literature focuses on describing the role of IT in enabling the transition from interfirm competition to cooperation (Kumar and van Dissel, 1996). As organisations move towards closer, more collaborative economic relationships, IT and IOS play an enabling role in making this transition feasible. There are a number of reasons for the formation of interfirm collaborations (Guglan and Dunning, 1993), such as economies of scale, specialisation, rationalisation and in some cases the motive of neutralising the competition (Kumar and van Dissel, 1996). Further, increasing the return on investment by a geographically wider diffusion of the firm's products and services and thereby increasing the product life cycle expectancy may also play an important role.

Perhaps a good starting point to study whether there are IOS-specific CSFs is to look at the special characteristics of IOS. Sprague and McNulin (1993) identified the following six characteristics of IOS compared with internal IS:

1 They require partners which are willing, able and ready to cooperate.

2 There is a key role for standards (*e.g.*, data communications protocols, company policies).

3 Third parties are often involved.

4 The work must be synchronised among partners.

5 Technical aspects are less important than the new electronic relationships involved.

6 Efforts often cannot be secretive, *i.e.*, IOS require more openness, especially when industry standards are adopted.

By virtue of these special characteristics, an IOS may have its own CSFs besides those of general IS. The most obvious and distinctive feature of IOS is that they involve two or more parties being electronically linked up for the purpose of conducting their business activities. So, issues related to working partnerships are likely to feature prominently. Indeed, McKinney and Gerloff (1997) assert that trust is the most critical factor for sustained business relationships and that it needs to be nurtured between partners for a successful IOS implementation. This point has broad conceptual underpinnings drawn from organisational literature and has enjoyed empirical confirmation (Hart and Saunders, 1997; Ibbott and O'Keefe, 2004). There are additional considerations like risks (Sherer and Alter, 2004), control (Gallivan and Depledge, 2003), scope, switching costs, confidentiality, security, consensus and understanding the different levels of interest between partners. Unless two companies feel that their relations are so interdependent that there are operational savings and benefits from the IOS, they are unlikely to bear the cost of implementing an IOS (Riggins and Mukhopadhyay, 1994).

Given that the success of electronic cooperation depends on the actual use of IOS by its partners, the more dominant company tends to exercise power to influence its trading partners towards its IOS-related preferences (Iacovou *et al*., 1995; Knudson *et al*., 1994; Teo *et al*., 2003). Thus, a firm's commitment to IOS depends on the firm's strategic position in the channel as well as its strategic goals. The importance of a firm's strategic goals leads to the decision to commit resources for payback (Angeles *et al.*, 2001). The shared vision of the IOS between the two sides is a vital element for IOS success (Poon and Wagner, 2001; Feeny *et al*., 1992; Lu *et al*., 2006).

The picture becomes more complex when the IOS is an international one that has to consider the cultural differences in thinking and operational methods. The differences in opinion, management style and process, if not well handled, have the potential to destroy collaboration in e-business (Kwok *et al.*, 2001). A comprehensive set of CSFs of IOS has been offered by Allen *et al.* (2000):

- effective communications
- trust
- operational uncertainty
- different objectives

- changes in business processes
- information, data standards and protocol
- power relations and politics
- cross-cultural issues
- disparate expectation levels
- relationship management.

In another study, Angeles *et al.* (2001) give additional CSFs in EDI implementation, namely the commitment and ownership of a cross-functional EDI team and Business Process Reengineering (BPR). The goal of refining and reengineering business processes has been a consistent theme in businesses over the past few decades. Successful IOS implementation requires the reengineering of business processes by partner organisations to achieve seamless integration of key processes (Lauer, 2000). At a minimum, this requires the partners to establish a smooth exchange of data and information between themselves. To that end, it may be necessary to modify the current IS applications to interface with the IOS and to establish procedures and adjustments in interorganisational process details with trading partners (Clark and Hammond, 1997). While IOS provide the possibility of exchanging data, the objective of doing so is to better utilise these data. So, the potential value of IOS is realised only when it is fully integrated with the other internal IS (Premkumar, 2000). The capability of the legacy systems and IT infrastructure affects the difficulty of implementing IOS and reaping the benefits of using the system to a significant extent. Firms that possess the necessary legacy IS capability experience less risk and derive more benefits from IOS (Premkumar and Ramamurthy, 1995). Dailey (1994) asserts that trading partners must organise cross-functional IOS teams as they move towards deeper and more meaningful business relationships. Moreover, both parties need to make a commitment to change or streamline business processes to achieve optimal benefits and even strategic advantage in the marketplace. Interorganisational BPR is an indispensable part of IOS which asks for openness and standardisation of two corporations' internal business processes in order to connect them. Though this is an easy statement to make, corporations find it extremely excruciating in real life to have to divulge information, particularly if the operations involve proprietary materials (Pitts, 1994). We look for the CSFs through a case study research method, because CSFs have been heavily used by IS research, but mainly in intraorganisational IS (Poon and Wagner, 2001; Carl and Michael, 1996).

3 Interorganisational systems in the automotive industry

Due to its deep forward and backward linkages with several key segments of the economy, the automotive industry has a strong multiplier effect and is capable of being the driver of economic growth. It is one of the largest industries in India and has been witnessing impressive growth during the last two decades. The abolition of licensing

in 1991, permitting the automatic approval and successive liberalisation of the sector over the years, has led to the all-round development of this industry. The freeing of the industry from a restrictive environment has helped it to restructure, absorb newer technologies, align itself to global developments and realise its potential. IT has played a crucial role in fuelling growth in the automobile sector. IT has a dual role to play in the smooth functioning of the auto sector: it is not only the business applications that are dependent on IT, but the core processes of an automobile vendor, starting from the concept design of a car to complete vehicle integration real time, also rests on it. Unlike other enterprises in the manufacturing sector, for automotive companies, unless the integrated change between engineering and IT is managed, there can be huge problems.

This study is based on the IOS in an automotive supply chain. The choice is because "automotive is seen as a flagship sector frequently regarded as a barometer measuring current wealth of the economy" (Childerhouse *et al.*, 2003). In another review paper, Helper (1991) states that the "auto industry traditionally provides important lessons for firms in other sectors". Lei *et al.* (2008) investigate issues inherent in IOS-intensive coopetition networks using an automotive network. The study supports systematic associations between IOS use, competition action and network structure. The study discusses the role of IOS in achieving firm competitiveness.

Researchers in IOS have developed a variety of theoretical arguments to explain the formation and structure of IOS-enabled alliances between organisations. These arguments are usually derived by adapting and extending existing theories of the organisation, from intra- to interfirm behaviour. Bensaou and Venkatraman (1996) examine different theories for interfirm cooperation. Webster (1995) examines the role of EDI systems used by automobile manufacturers in the manufacturing supply chain to integrate with suppliers. The IOS in a vertically integrated supply chain has sequential dependency, *i.e.*, the output of one unit becomes the input of the other unit (Kumar and van Dissel, 1996). For example, the marketing plan becomes the input to production and/or purchasing plans. With sequential interdependence, there is a direct, directional dependence between the units (Robey and Sales, 1994).

4 Methodology

Due to the complexity of the IOS planning process and the uniqueness of each supply chain network, it is difficult to suggest a single best method for the planning of IOS. For example, there is no best approach in integrating the external supply chain with internal production and inventory management processes. In such a situation, the case study research method is often employed (Eisenhardt, 1989; Benbasat *et al.*, 1987). Case study research is particularly suited to situations where current theories seem inadequate (Eisenhardt, 1989; Yin, 1989). It gives the possibility to be close to the studied object (the firm), enabling inductive and rich description. Case study research is also a strong method in the study of processes, as it allows the study of contextual factors and process elements in a real-life situation. The case study has been recommended as a suitable approach for the study of networks (Halinen and Tornroos, 2005).

This paper is based on a case study of MUL, which is a leading automobile company in India. MUL was selected for the case study for two reasons:

1 MUL is the largest player in the automotive industry in India.

2 It has successfully formulated and implemented an IOS strategy for its supply chain and realised significant benefits for all partners in the network.

The case discusses two IOS initiatives taken up at MUL recently to integrate the marketing efforts with production, purchasing and after-sales service. The initiatives are the DMS and the E-Nagare System. Both of these initiatives play a major role in improving visibility, efficiency and collaboration at the level of MUL's value/supply chain. E-Nagare is a scheduling and automatic replenishment system that integrates with the company's production planning system for the daily line production plan, along with the model sequence on that line. The DMS helps to streamline collaboration with their dealers across the country and to share up-to-date information on customers, inventory, orders and parts.

To get a thorough description of the case, several informants who had good access to the study issues and the case network were taken. The primary data for the study were collected in 2006–2007 and were later updated. In this study the first set of data about the case company's structure and business performance was collected from its published documents and website. The secondary data were also collected from various industry publications, industry reports, magazines, *etc*. The second set of data about the supply chain initiatives was collected through interviews and discussions with its Chief Information Officer (CIO) and heads of department, senior managers, employees and business partners of MUL who have been directly affected in their work. Apart from those, interactive sessions were planned across the functional areas where the senior executives explained their processes end to end. Interviews and qualitative insights were also obtained from the dealers and suppliers of MUL. Interviews were conducted in the National Capital Region, where the MUL manufacturing facility is located. About four suppliers and five dealers were contacted for the purpose of this case study. The third set of data on the post-implementation scenario was collected from various published documents and industry analysis reports,[1] as also interviews and discussions with senior executives at MUL. Specifically, the post-implementation information was collected from the IT head and senior managers in the production, marketing and purchase departments.

5 Case background

MUL was established in February 1981 through an Act of Parliament, to meet the growing demand for a personal mode of transport in India caused by the lack of an efficient public transport system. Suzuki Motor Company (now Suzuki Motor Corporation of Japan) was chosen from seven prospective partners worldwide. A licence and a Joint Venture (JV) agreement were signed between the government of India and Suzuki Motor Company in October 1982.

MUL has been the leader of the Indian car market for about two decades now, with a more than 50% market share in FY 2005–2006. The company has a wide geographical presence throughout the country. On the customer side, MUL has a

large and diverse business network with more than 750 dealers. It has continued to focus on network expansion to maximise its reach across the country. MUL has about 220 suppliers located across the country that meet the entire requirement of local components. The company has its headquarters in New Delhi, with an existing production plant in Gurgaon and two plants in Manesar, Haryana. The company sold 561 819 vehicles in the domestic and export markets during 2005–2006. Of this, the share from exports was approximately 6% of the total units. The gross sales revenue of the company in FY 2005–2006 was INR 147,043 million (US$3,268 million) as against INR 132,914 million (US$2,954 million) in the previous year, showing an impressive growth of 10.6%.

The company's main line of business is the production of passenger cars and multi-utility and utility vehicles. In addition, the company is involved in related lines of business, including motor insurance and financing, spare parts and accessories supply, fleet management, pre-owned cars and a driving school. The company is listed on both the National Stock Exchange of India (NSE: MARUTI) and the Bombay Stock Exchange. MUL has a portfolio of 11 car brands. These 11 brands constitute 11 base platforms and give rise to 300 variants, and are exported to 100 destinations. MUL's contribution as an engine of growth for the Indian automotive industry, and its impact on the lifestyle and psyche of an entire generation of the Indian middle class, is widely acknowledged.

MUL is exposed to a variety of market and other risks, including the effects of demand dynamics, commodity prices, product obsolescence, supply uncertainty, currency exchange rates, interest rates and risks associated with financial issues and hazard events. In addition to mitigating a number of these risks through using the instrument of insurance, the company consciously addresses the more important business and operational risks through initiatives to meet its strategic business objectives. These objectives include integrating and connecting its entire value ecosystem. For example, to improve productivity and better control costs, MUL has implemented the *Maruti Production System* (MPS) on the shop floor. Derived from the Suzuki Production System, MPS enables a systematic way to identify and eliminate waste in operations, such as unnecessary movement of people and materials. The company has also worked with suppliers to increase productivity and reduce costs at their end. It extended and replicated the MPS to many of its suppliers, with a total direct savings from various implemented projects accruing to more than 2500 man-hours per day by the end of 2005.

When it comes to its operations and supply chain, MUL's key challenges include achieving a lean supply chain, achieving efficient use of materials and other resources, and enabling MUL suppliers and dealers to constantly adapt their strategies, processes and systems to meet dynamic market needs. IT continues to be an integral part of MUL's business strategy and plays a crucial role in the company's quest to meet many of the challenges mentioned above. Cost management, quality management and customer/demand management continue to be priorities driving the operational and supply chain improvement initiatives in the company. The internal application infrastructure caters to the business requirements of all the business areas in MUL, *viz.* materials, production, sales, finance, HR, marketing and spares. For other application areas, such as a scheduling system and DMS, MUL runs integrated homegrown business applications using Oracle as the platform. In developing these applications internally,

MUL has leveraged the availability of internal expertise (MUL also has a huge IS department consisting of more than 100 IS professionals) and familiarity with Oracle as the platform. MUL's key IT initiatives undertaken in recent periods include:

- the Oracle E-Business Suite in the areas of finance, human resource and procurement
- the PLM system as the backbone for the company's product development processes
- a comprehensive WMS that better manages and streamlines the imported components inventory within the factory
- the E-Nagare system, an online system built in-house on Oracle technologies to schedule and order materials for just-in-time inventory
- the DMS, a centrally hosted system connecting all dealers and providing important information on the operations and performance of the dealers.

Besides focusing on initiatives that improve its internal operational efficiency, MUL's IT function has also looked to enhance the value across the supply chain. Both the E-Nagare scheduling system and the DMS are key initiatives that play major roles in improving visibility, efficiency and collaboration at the level of MUL's external supply chain.

5.1 Interorganisational information systems at MUL

The automotive industry is characterised by high-technology, high-value products and depends heavily on suppliers that provide components and materials. The component and raw material cost constitutes a significant portion of the total cost of operations and, therefore, MUL planned an IOS initiative with suppliers first. The IT team at MUL planned the E-Nagare scheduling solution to coordinate business processes with key suppliers and make them more effective. The DMS solution was planned subsequently.

5.1.1 E-Nagare scheduling system

MUL has about 220 suppliers located across the country that meet the entire requirement of local components. About 70% of its suppliers (by number) are located within a 100 km radius, meeting more than 80% of its requirement (by value). On the imported portion, MUL procures components and other supplies from many countries. However, the bulk of the imported components are from Suzuki Motor Corporation, Japan.

The management of the upstream supply chain is extremely important, as the component and raw material cost constitutes a very significant portion of the total cost of operations. Hence the management of incoming supplies is not just a back-end mundane activity for MUL, but a source for delivering the cutting edge to achieve the stiff target of delivering maximum value to the customer.

MUL implemented the E-Nagare scheduling system in 2003–2004. The initial requirement for this system came from the production department and was incorporated in the annual IS plan by the IT department. It went though the approval process with top management. Prior to implementation of the E-Nagare system, MUL gave tentative monthly schedules to vendors every month for the next three months on a rolling basis. Subsequently, a Delivery Instruction (DI) system was implemented for giving the firm's daily schedules on a fortnightly basis to vendors. However, the above system had the following constraints:

- DI schedules did not take into account production changes/shortfall; hence inventory would rise in the case of such shortfalls.
- The receipt process was not streamlined.
- Monitoring of deliveries was weak.

The E-Nagare system was implemented in 2003. It helps to overcome these shortcomings. Besides the monthly and fortnightly schedules, a new process to provide hourly schedules to the vendors was formulated with the following objectives:

- minimising process wastages and increasing operational efficiency
- minimising inventory cost
- taking care of production fluctuations from one period to the next
- streamlining material flow in line with the actual production and production plan.
- streamlining the receipt process.

The E-Nagare system is essentially a replenishment-based system. Under this system, the schedules are sent to vendors on a daily basis, based on the previous day's actual production and the next day's production sequence. The salient points of this new system are as follows:

- Production shortfalls are automatically accounted for by the system.
- The excess stock due to less production is adjusted on a daily basis to ensure that inventory does not increase.
- The schedules are given linewise and itemwise and in multiples of lot sizes.
- It is able to handle multisource items.
- The share of business is always maintained while generating schedules.
- The line rejections are automatically accounted for by the system.

The application integrates with the production planning system for the daywise, linewise production plan along with the model sequence on that line. The daily production plan over the day is divided into blocks. A block refers to the minimum period for which supplies will be regulated. At present the block is considered equivalent to two hours and hence the whole day is divided into eight blocks, considering two shifts. The application computes the material requirement for a block based on the Bill of Material (BOM) of that vehicle, the share of business (vendor/item) and lot sizes.

The schedules (item, line, supply time, date, quantity, unload location, *etc.*) are available on the vendor extranet which is accessible to vendors all over the country over an IPsec VPN. The vendors are given specified timings for supply so as to avoid congestion at the time of material receipt. Receipt details are available online on the company intranet portal and are monitored continuously to ensure that there are no delays.

The IT solution selection process

The IT team at MUL carried out an analysis of the various off-the-shelf product solutions available to evaluate the functional fit. However, it was found that none of the existing product solutions could meet this requirement adequately. Hence MUL created a cross-functional team consisting of members from the business and IT department for the in-house development of the application. The system was developed on Oracle technologies. The implementation was divided into three phases (see Table 1 for details).

Based on experience, process improvements were introduced wherein some extra blocks worth of vendor supplies (safety stock) were ordered when the vendor supply time was after the start of a shift to avoid any exigencies. Any excess due to safety stock or lot size was adjusted in the next production schedule.

Table 1 E-Nagare scheduling system project implementation details

Scope	*Scheduling supplies/replenishment system*
Implementation strategy/approach	In-house developed, production system The implementation was divided into three phases: Phase 1: This was undertaken in 2003–2004. About 250 components were taken up for implementation. These components were selected based on the criticality, proximity of the vendor and vendor capabilities. Phase 2: This was carried out in 2004–2005; 5000 components were brought under E-Nagare. Phase 3: The remaining components were covered in this phase. By September 2005 all components were brought under E-Nagare.
Timeline	Four months
Resources and team structure	Two members from IT and four members from the various business functions.
Description of solution components and suppliers of the different components	The solution was developed in-house on Oracle technologies. The database is Oracle, while the business logic was developed using a combination of Oracle forms, reports and PL/SQL. The application follows a typical client-server architecture.
IT investment amount	In-house developed

Business benefits from the E-Nagare scheduling system

The E-Nagare system helps in the monitoring of vendor supplies to ensure consistency in the delivery process. The implementation of E-Nagare has helped streamline the receipt process. MUL has extended the E-Nagare system to two new locations in Manesar. The business benefits of the E-Nagare scheduling system include the following:

- The inventory cycle was reduced from 1.10 days in FY 2003–2004 to 0.76 days by FY 2005–2006.
- Timely deliveries of material were made due to improved monitoring.
- Truck turnaround time was reduced from 10 to 5 min due to streamlining of the receipt process.

5.1.2 The DMS

MUL has the largest dealership and service network in the Indian automotive industry, servicing more than 5 000 000 customers. The network is spread across the country and encompasses over 750 retail sites (inclusive of service outlets) throughout 227 cities. MUL's sales and service network has been a source of competitive advantage, both for its size and quality. In recent years, the company has made focused efforts to improve the quality of the network. In addition to strategically expanding its dealership and service network to keep pace with its growth plans, MUL began to leverage IT to enable and support these critical portions of its business operations.

MUL began evaluating the 'as-is' and 'to-be' processes associated with managing their dealers as early as 2002. It started planning for a DMS in 2003. According to its CIO Rajesh Uppal, the company, through its DMS, wants to "provide a world-class standardized process for dealership management and bring about long-term value to the Maruti family (including the dealers and end customers)". In other words, *the key objective of the DMS process blueprint is to streamline and standardise processes at all its dealerships* in order to provide a uniform and enriching experience to end customers.

Before the implementation of DMS, MUL did not have an integrated and consistent means to collaborate and communicate with its large dealer base. While it depended heavily on the company's extranet and e-mail system in working with dealers, inefficiencies arose due to nonstandardised and inconsistent processes/systems, particularly at the dealers' end. All of these led to late, incomplete and 'difficult to verify' information at the dealers' end of the operations. As a result of the inconsistent and nonuniform processes and experiences across the entire dealership network, visibility in the distribution network was poor and customer satisfaction levels took a beating.

Overall, there was less visibility in the distribution network. In the earlier system, each of the dealers had a different system at its end. This meant that the standardisation of processes across dealers was not possible. Therefore, when MUL started the DMS initiative, *the main objective was standardisation*. MUL wanted to generate a real-time scenario of the distribution across the entire country which would enable it to react instantaneously to trends and requirements. An integrated DMS would also ensure dealer collaboration for higher productivity and on-demand, current and verifiable information from dealers.

The IT solution selection process

MUL involved an external consultant at the scope definition stage. In 2002, MUL enlisted Cap Gemini to study the existing processes (as-is) at various dealerships all over the country. Subsequently these processes were benchmarked against the best practices. The final outcome of the study was the to-be process blueprint for the dealer-end processes. To IT-enable the process blueprint, proposals were invited from leading solution vendors such as Wipro, IBM, Oracle, TCS and HP. The major evaluation parameters to select the solution partner were:

- the vendor's understanding of MUL's requirement with respect to the current set-up, the project objective, business needs and opportunities
- capability of the vendor and its partners

- functional fit with MUL requirements in terms of various dealer-end processes like presales, inquiry management, sales, service, inventory management and CRM
- completeness of proposal in terms of technical architecture, applications, infrastructure, networking, *etc*.
- project management and change management approach
- postimplementation support including helpdesk support, service level agreements, training, *etc*.

After a detailed evaluation of all vendors, MUL selected Wipro as its partner for the project management of the development and implementation of the DMS. Wipro fared well on all the above parameters, especially with respect to its understanding of MUL requirements, completeness of ITS proposal, postimplementation support and project management methodology.

Implementation of DMS

The DMS implementation kicked off in December 2003 and involved two key phases (see Table 2 for details). The DMS is a centralised Application Service Provider (ASP)-based application which caters to all the dealer locations in India. The application supports all the dealer processes pertaining to different functional areas such as presales, planning, sales, inventory management, service management and financial management. It supports integration with MUL applications, implementation of CRM, Management Information System (MIS) reports and decision support systems.

MUL considered a centralised application architecture for the DMS. As with a distributed architecture, the maintenance of the application at the dealer end was a challenge. This was especially relevant in view of the poor connectivity and lack of trained IT staff at the dealer end. Under this system, the dealer invoice is shared with MUL in real time through the extranet. The requirements of the dealer are met on a First In First Out (FIFO) basis. The Proof of Delivery (PoD) is sent back to MUL after the physical delivery of vehicles.

The DMS is an ASP-based solution. The ASP maintains a centralised database for all dealers. The PDC is located in Bangalore, India. The dealers connect to the PDC through a leased line/VSAT with ISDN/dialup as backup. The dealers are routed to the disaster site if the PDC is not available. The disaster site maintains a backup of the data. Monitoring of the entire network is done from a central location (the Network Operating Centre).

Business impact of the DMS

The implementation of the DMS has yielded significant benefits for MUL and its channel partners. To start with, it has helped MUL to achieve the objective of standardisation of processes across its dealer network. The prices for vehicles and spares can now be controlled centrally by MUL and there are minimum discrepancies. Earlier, at the time of receipt of a car, the dealer had to punch in the car data. Now, the moment the car is invoiced, the data is shared with the dealer. Therefore, the cars can be booked even in transit. The implementation of the DMS has enabled MUL to track customer history and

vehicle history and would help in the execution of CRM processes. The DMS would also help in tracking the processes of presales, complaints, warranty, spares details, *etc.*, in real time from all the dealer sites. The details of benefits to different stakeholders, *viz.* MUL, dealers and end customers, are discussed separately in the Appendix.

Table 2 DMS project implementation details

Scope	• The project covers sales and value-added service processes at all dealership locations. • This includes 750 sites with more than 5000 users of the DMS.
Implementation strategy/approach	The entire project was divided into two phases (with the initial pilot done at a Bangalore site). The implementation strategy was as follows: Phase 1: Project conceptualisation started in December 2003. MUL extended this system to a single location in September 2004 in Bangalore. By March 2006, MUL had extended this system to 250 dealer locations. Phase 2: By December 2007, had MUL extended the coverage of DMS to the remaining (500) dealers, bringing a total of 750 sites under this system. Wipro was the primary implementer for this ASP-based solution. As part of the solution, dealers connect to the Primary Data Centre (PDC) located in Bangalore, through leased line/VSAT with ISDN/dialup as backup.
Timeline	Total project duration: approximately three years
Resources and team structure	Internal: IT + business functions = 5 people (2 from IT and 3 functional managers) External: Wipro project team = 70–80 people (including the project manager)
Description of solution components and suppliers of the different components	Hardware: Servers consist primarily of IBM hardware running Linux or AIX Software: Multitier Oracle-based applications running on Oracle 10 g Services: Wipro (primary implementer)
IT investment amount	Total investment: INR 598.5 million (US$13.3 million). The hardware infrastructure accounted for approximately 50% of the total costs.

6 Critical success factors in the implementation of interorganisational systems at MUL

This section does not cover the CSF for traditional IS such as top management support, communication, training, *etc*. The insights obtained in the process of implementation of the IOS, the interview findings and the literature review are combined to list some of the CSFs in the implementation of IOS at MUL. These include a shared vision, change management, a cross-organisational project team, interorganisational BPR, process ownership and strong project management:

- *shared vision*: Before the launch of the IOS project, it is important that the company and its business partners share a common vision for the IOS. It is important to communicate the blueprint and the objectives of the IOS with the business partners

to reach a consensus on the vision. The business partners should be asked to give their feedback, which should be incorporated where possible. The shared vision of the IOS among all stakeholders would reduce the divergence of opinion in the implementation process and in turn lower the risk and shorten the implementation period of the IOS project.

- *change management*: This is a critical issue in planning IS in the interorganisational domain. A proactive change management requires companies to address the right structure, policy, processes and performance measures with all the entities affected by the change. Companies are handling change management and project management issues by ensuring regular and focused communication and by organising training for partners. The implementations are essentially phased so that the new system is introduced gradually and the change can be managed. The project management team needs to have committed people with strong project and change management skills to manage change across the external value chain. It is also important to identify and involve strong and key partners in the pilot phase. The success with the initial implementations plays a significant role in extending the system to other partners.

  Change management was an important issue in the successful implementation of the IOS at MUL. The project was as much a change management project as a technology project. Implementing a DMS was a complex undertaking as it involved managing expectations and changes not just within the four walls of MUL, but also at the level of its entire dealer network. The deployment of the DMS saw some resistance from the dealers initially, with a number of them showing concerns and apprehension over data privacy and the disruption the project would cause in their operations. Many of these issues were overcome through a mix of tighter communication and widespread training and education programmes organised by MUL and Wipro (the implementation partner of MUL).

  For the E-Nagare scheduling system, the vendors had to be convinced to adapt their systems and processes to align with the hourly scheduling system. Also, the new system had to be introduced gradually so that the changes could be managed.

- *process ownership*: It is important for processes that cut across various functions to have an identified process owner, who takes complete ownership in defining business requirements in the interorganisational domain. Also, active involvement of all affected functions should be ensured. The process owner plays an active role in defining requirements and functions and also helps in the resolution of issues in different stages of IOS planning. In addition to helping define business requirements and craft to-be processes, the process owner needs to proactively preempt problems and play an active role in the resolution of issues. MUL identified dedicated process owners for all the important processes of the DMS. Additionally, it bore the entire cost for both of the IOS initiatives.

- *cross-organisational project team*: The project should include representation from management, the business team, the technical team and the business partners. In the case of MUL, both IOS initiatives had clear representation from IT and functional areas.

- *interorganisational BPR*: The IOS BPR in this case study included the elimination of non-value-added activities. For example, the dealer invoice was shared with MUL in real time and, therefore, MUL did not need to check the Purchase Order (PO) status from any of the dealers after the IOS implementation. For the dealers, it helped in tracking the delivery status from MUL in real time. The other aspect of the BPR was new avenues of cooperation between MUL and its business partners because of real-time information sharing. This improved the uniformity and quality of customer experience across the dealer networks.
- *project management*: Projects of this nature which impact the entire supply chain require strong project management to ensure minimum impact on business operations. The key point here is to ensure that people with strong project and change management skills are enlisted as part of the core project team. MUL ensured that committed people with strong project and change management skills were part of the core project team. A project of this nature, which spans the external value chain, requires strong project management skills to ensure optimal project planning and execution, as well as to minimise any adverse impact on the continuity of important business operations.

7 Conclusion

This research uses a case study method to examine the IOS between MUL and its business partners. It discusses the planning issues for two major IOS at MUL (with suppliers and dealers). MUL has borne the entire cost of both of the IT initiatives, *i.e.*, E-Nagare and DMS, in view of the long-term relationship with the business partners. In developing these applications internally, MUL has leveraged the availability of internal expertise and familiarity with the existing IT platform. As regards the implementation strategy, MUL followed a 'pilot and phased approach' in the case of its IOS initiative with dealers. For suppliers, it followed a phased approach based on the criticality of components. Phased implementations help to introduce the system gradually so that change can be managed. The implementation strategy needs to be designed carefully in order to ensure the success of the IOS plan. Prioritisation of initiatives based on the nature of the industry is important. MUL integrated its suppliers through the E-Nagare system and followed it up with the DMS. It is observed that the companies find it difficult to support and integrate different programmes for channel partners such as distributors and suppliers. Therefore, one major objective of the IOS plan was the standardisation of the application and processes with the channel partners.

The research confirms the benefits of IOS already discussed in the literature, such as increased coordination, shorter sales and production turnabout time, and greater monitoring capability. It identifies CSFs for organisations which want to adopt an IOS with their business partners. These CSFs include a shared vision, change management, a cross-organisational project team, interorganisational BPR, a clear process owner for the IOS processes and strong project management skills.

The limitation of this research is that, though the author did a detailed study to identify the CSFs for IOS implementation, these factors may not be complete since it is based on a single case study. Also, the study may be more biased towards the automotive

sector and may have missed some of the more general CSFs in the IOS domain. It is believed that, with some more IOS studies, the list of factors can be modified. Also, different countries have different cultures and business practices. It needs to be tested whether the CSFs and planning issues in respect of an automotive company in India are applicable to companies operating in other industries and countries.

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Note

1 see www.indiainfoline.com; www.marutiudyog.com.

Appendix

The benefits for the different stakeholders are given here.

Benefits for Maruti Udyog Limited (MUL)

1 allows for better and more centralised control of the prices of vehicle and spare parts, with lower levels of information discrepancies

2 allows for a more accurate, timely and transparent data acquisition from all dealership sites, enabling better feedback and quicker response to the market

3 provides a good mechanism to enforce and roll out policies, communications and best practices across the network

4 provides a wholesome view of a particular dealer at any point in time, in addition to views (such as customer base, vehicle histories, inventory statuses) across multiple dealers

5 enables online dealer business performance monitoring and management (including dealers' balanced scorecards). For instance, some of the parameters which are monitored include:

- a service load (labour per vehicle, spares per vehicle), which is now monitored because robust data are available from the dealer sites enabled by the DMS
- Maruti Genuine Accessories (MGA) per user – if a dealer is recording more MGA and buying less from MUL, it needs to be checked to help monitor the buying of spare parts from MUL versus local buying
- The enquiry conversion ratio, which refers to how many enquiries for new cars are converted into actual sales

6 provides an integrated platform enabling more efficient product recalls

7 allows MUL to recommend dealers to access parts and accessories from nearby dealers, thereby satisfying market demand faster

8 provides customer profiling and market feedback to marketing and business planning, including retention and loyalty programmes

9 enables online tracking of the Sales Satisfaction Index (SSI) and the Customer Satisfaction Index (CSI).

Benefits for dealers

- provides an integrated platform that enables consistency and efficiency in various dealers' business processes
- provides accurate and timely information that supports better local business decision making
- enables better joint (MUL and dealers) decision making, including problem resolutions through more effective collaboration
- allows dealers to 'advertise' slow-moving inventory and provides an opportunity to implement inventory risk pooling in the dealer network
- allows easier MIS reporting across multiple sites.

Benefits for end customers

- increases customer satisfaction through better service quality and processes at dealers, who are enabled by higher-quality, more accurate and timely information through the system
- improves the uniformity and quality of customer experience across the dealer network from better collaboration among dealers and between MUL and dealers
- improves sales efficiency (for example, through enhanced order-status tracking) and after-sales support (for example, through enhanced service and warranty management processes).

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