

Chapter 2

Electronic Procurement Systems in India: Importance and Impact on Supply Chain Operations

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Abstract Electronic Procurement Systems (EPS) are being acknowledged by researchers as promising technological enablers for achieving a responsive supply chain, and thereby, for gaining a competitive advantage in today's global marketplace. A number of empirical studies have focused on the adoption of EPS in different countries. There is, however, a scarcity of work related to EPS adoption in India, even though information technology and the Internet play a significant role in that country. To fill this gap, we first discuss the potential supply chain benefits of EPS, especially as they relate to large multinational companies. Then, we specifically consider the Indian context. We highlight several firms whose innovative logistics operations permit the respective supply chains to function, uniquely blending Indian customs with modern business practices. We report on an empirical survey, as well as three case-studies relating to the importance and impact of EPS adoption in India.

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2.1 Introduction

Effective supply chains are crucial for a firm to remain competitive in today's market. This effectiveness is driven by striving for proper synchronization and coordination of all activities across the entire supply-chain network, ranging from end-customers to suppliers. As a result, once-relegated functions such as procurement, a primary determinant for the organization's relationship with suppliers, become important.

With the growth of electronic commerce (Carter et al. 2000), procurement processes have also evolved by being enabled electronically. Perhaps, the first step toward that evolution has come in the form of enterprise resource planning (ERP) systems, aimed primarily at integrating the internal value chain of an organization. With its roots in traditional manufacturing systems such as MRP II, ERP systems have now metamorphosed into information technologies that seek to manage the extended enterprise as well (i.e., the entire supply chain). Thus, conceptually, these new-generation ERP systems (also sometimes known as ERP II) encompass not only the core intra-organizational features but have expanded into a number of domains such as supplier-management, customer management etc. Today, owing to advances in software technology, the implementation of ERP II has often involved a core ERP system such as SAP together with a number of specialized "best-of-breed" systems (Soh et al. 2000; Poba-Nzaou et al. 2008) that seamlessly integrate with one another using open-systems architecture. This chapter pertains to one such genre of systems, known as electronic procurement systems (EPS). Perceptions of managers in India are brought out regarding the importance and impact of EPS on the supply-chain.

Research looking into EPS adoption has been conducted across various geographies and industries/sectors, such as construction, manufacturing, healthcare and government. For example, Hawking et al. (2004) consider the barriers against the adoption of EPS in Australia. Gunasekaran and Ngai (2008) study the EPS adoption in Hong Kong, as applicable to medium-size enterprises, while the research of Gunasekaran et al. (2009) is based on small industries in the southern coast of United States (US). Reddick (2004) discusses how US state governments are utilizing EPS. Results based in Singapore are given by Kheng and Al-Hawamdeh (2002), while Tatsis et al. (2006) describe the benefits of EPS for the Greek food-chain industry.

In the Indian situation, however, awareness and adoption of EPS, and studies on its adoption are scarce, although information technology and the Internet play a significant role in the Indian economy. Aiming to fill this gap, we define an EPS and provide a framework of how such systems work in an organization. §§2 and 3 provide the background materials pertaining to supply chains and EPS, respectively. In §4, the supply chain benefits of an EPS are described and illustrated by cases of well-known successful EPS implementations in the US. This sets the stage for us to survey the perceptions of Indian managers about EPS, based on past studies (Lee et al. 2001; Percy and Giunipero 2008; Soares-Aguiar and Palma

dos-Rois 2008). The results of this survey are then followed by three case-studies (§5). Implications for Indian supply chains are contained in §6.

2.2 Supply Chains in India

To provide the context for EPS in India, we briefly compare supply chains in that country with those in North America.

As compared to North American countries, India is a complex diverse country. Even though India is the fifth largest country in terms of gross national product, the 2010 report from the World Economic Forum places India at the 51st position (WEF 2010). This ranking is in part due to the infrastructure deficiencies, in terms of roads, ports and electricity. For example, even though India has one of the world's largest road networks, only 47 % is paved and only 20 % of the paved roads are in good usable condition (Sundar et al. 2009). A sizeable proportion (as much as 95 %) of India's labor force belongs to the unorganized sector (Chopra et al. 2010). The Indian middle class is 350 million strong, but is not a homogeneous lot either.

This diversity poses peculiar challenges for supply chain design. Thus, transplantation of pure North American models of retailing and supply chain management can result in failure. One well-known example is that of Subiksha, a chain of supermarkets that was supposed to be set up in every nook and corner of metropolitan cities. After expanding to set up over 1600 stores in two years, the chain faced a cash-crunch and eventually closed down. Other examples of companies that pulled out or re-oriented their operations include UK companies Argos, and Marks and Spencer (Chopra et al. 2010).

The following cases illustrate how some companies have dealt with the challenges pertaining to Indian supply chains.

Example 1 (Jaipur Rugs, Jaipur, India). Jaipur Rugs (JR) is a company that sells exclusive rugs to customers in over twenty countries. JR focuses on connoisseurs of ancient classical hand-woven rugs. A key challenge facing the company is to bridge the unorganized weaver community with customers primarily from developed nations such as US, Australia and Canada.

JR employs a two-pronged supply chain design (Chopra et al. 2010; Jaipur 2011). To maintain its exclusivity, JR uses CAD software to develop innovative carpet designs, which are then communicated to its sourcing, production and distribution operations through an Enterprise Resource Planning (ERP) software. Quality is maintained by adhering to ISO 9001 standards throughout its operations.

While such technologies and processes are important to the success of JR, what is different herein is the behavioral element of the supply chain. Realizing that its success hinges on its artisans, JR assumed responsibility for the social and economic development of its 35,000 weaver community, by improving their standard of living, by reducing social injustices and wage-inequities, and providing skills-training. This cultivated an "extended familial relationship", thereby

winning the confidence of the weavers and eliminating middlemen. JR is now able to deal directly with the weavers who work on 7,000 looms spread across remote Indian villages, yet are connected with one another through ERP software.

Example 2 (Gopaljee Milks, Noida, India). Gopaljee, a 20 year-old company that initially started with products like biscuits, is now a household name for dairy products in the northern part of India. The company's vision is to use clean milk sourced from villages, and produce safe and pure dairy products such as ghee (clarified butter), milk powder and long-life milk. Gopaljee's strategy to support this vision lies in its interaction with its suppliers.

With the cooperation from the government, Gopaljee set up 4,000 village societies to collect milk from 125,000 farmers (Gopaljee 2011). The company further helped the farmers with subsidized veterinary medicines and vaccines, materials for testing milk quality, high-quality seeds and cattle feed. It also provided training on farming methods. Finally, farmers were given prompt payment. These measures facilitated Gopaljee to have a symbiotic relationship with its suppliers.

The company's supply chain begins with milk collected directly from farmers. Within three hours of milking, the milk is chilled and transported to a milk-plant, wherein it is processed and sent by refrigerated truck to sale depot and stores. Clearly, all these require advanced technologies and processes, in order to work successfully.

To summarize, at this juncture, Indian organizations must contend with a fragmented supply chain, as opposed to that in North America wherein both suppliers and customers are well-connected. Both JR and Gopaljee given above (as well as other successful companies), seem to have realized this issue, and thus, have merged modern supply chain concepts with traditional ways of people-engagement that are rooted in Indian ethos and socioeconomic realities.

2.3 E-Procurement Systems

The supply chains outlined above can be made more efficient by implementing technologies such as EPS. The purpose of this section is to briefly define an EPS and describe its features.

Definition

The literature has seen varied definitions of what constitutes an EPS. For example, Davila et al. (2003) define EPS "as any technology designed to facilitate the acquisition of goods by a commercial or a government organization over the Internet. E-procurement technologies [...] are focused on automating workflows, consolidating and leveraging organizational spending power, and identifying new sourcing opportunities through the Internet". Raghavan and Prabhu (2004) expand this definition somewhat: EPS is "the electronic acquisition of goods and services including all processes from the identification of a need to purchase of products,

to the payment for these purchases, including post-contract/payment activities such as contract management, supplier management and development”.

Examples of EPS include Ariba, as well as IBM's and SAP's E-procurement system. These packages provide an environment for buyers and supplier to collaborate with each other. SAP's system is integrated with the company's ERP system, while other packages can be stand-alone systems. EPS facilitates supplier discovery, sourcing, supplier management, requisitioning, procurement, order receiving, and contract management. A comparison of the focus of each package is in Rodovilsky (2010).

Framework and Features

Perhaps the varied definitions given above stem from distinct conceptualizations of an EPS. First, since the procurement process inherently involves multiple organizations, Johnston and Vitale (1988) have provided a framework that classifies an EPS on a *continuum* involving the extent to which it can link organizations together. This classification also mirrors the classification of organizational relationships between buyers and suppliers. On the one hand, there are EPSs providing support for transactional activities such as online searches and order entry. Once an order is placed, it is processed by the systems that are exclusively operable only by the supplier. In the other end of the continuum, not only can the EPS perform order-entry activities, but it is also linked to the supplier's database, and can therefore transmit the order directly into the manufacturing/operations processes of that supplier.

While the preceding classification is used in the literature (see, for example, Wu et al. 2007), it does not include details that relate to the functionality of an EPS. In this functional view (Subramaniam 2004; Soares-Aguira and Palma-dos-Reis 2008), buyers/suppliers use an electronic gateway to interact with the system's processes consisting of: (1) procurement management entailing web-support for user interaction, product cataloging etc. (2) transactional support in the form of searches and other order-management activities; and (3) features such as auctions/negotiation. Of these three levels, levels (1) and (2) are the most visible and prevalent parts of EPS technologies, while level (3) relates to advanced functionality (see shaded parts of Fig. 2.1) for which models are beginning to be proposed (e.g., Talluri et al. 2007; Sundarraj and Mok 2010).

Based on this functional view, a detailed range of EPS features can be shown, as in Table 2.1.

2.4 EPS Impact on Supply Chain and Logistics

Irani and Love (2002) discuss general issues in evaluating investments in Information Technology. However, Section 2.3 brings out the fact that an EPS is more complex than classical information systems. Hence, its benefits have been classified in a variety of ways, including organizational, IS and financial perspectives (see, for example, Piotrowicz and Irani 2010).

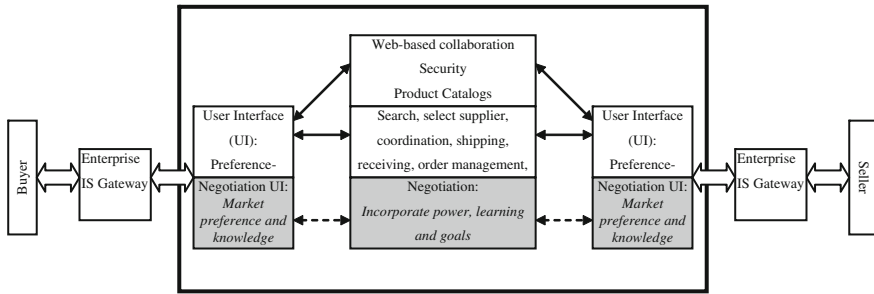


Fig. 2.1 Framework of an electronic procurement system. *Source* adapted from Soares-Aguiar and Palma-dos-Reis (2008)

Table 2.1 Collection of features of an electronic procurement system

Feature	Explanation
eCatalog	Database of supplier's products/services
Punch-out	Access to supplier's website directly from buyer's system
E-request for quotes	Buyer's invitation to suppliers for quotes
Approval workflow	Automatic routing of orders to financial/business authorizers
Order dispatch	Creating purchase order automatically and sending to suppliers
E-goods receipt	Record product/service deliveries in the system
E-invoice matching	Store invoices electronically/Generate payments automatically
E-marketplace	Third party marketplace where buyers and suppliers transact and/or exchange information
E-tendering	Manage tendering process online
E-auction/negotiation	Suppliers posting competitive bids; buyers/suppliers negotiating online
E-evaluation	Tender evaluation against pre-agreed criteria
E-collaboration	Establish, manage, monitor, renew contracts and collate histories of suppliers

Also serves as the basis for the questions on perceived importance of EPS feature

An EPS is important from the viewpoint of commercial transactions, but more so in the transformation of internal systems, leading to subsequent influences in terms of cost, productivity and supply chain performance (Chopra et al. 2010). At the strategic level, the benefits of EPS are in the realm of the subjective and intangible, while at the operational level, benefits tend to be tangible. The following is a short list of the benefits that EPS provides, according to the literature (e.g., Bakos 1997; Croom 2000; Barua et al. 2001; Boer et al. 2001; Subramaniam 2004; Puschmann and Alt 2005; Gunasekaran and Ngai 2008; Soares-Aguiar and Palma-dos-Rois 2008; Gunasekaran et al. 2009; Chopra et al. 2010; Pietrowicz and Irani 2010).

Operational SCM Benefits

- Acquisition-cost reduction. Research reveals that the use of EPS significantly reduces the cost to acquire goods and services (Croom 2000; Boer et al. 2001). These reductions can be to the tune of 50–80 % (Puschmann and Alt 2005).
- Shorter purchasing cycle time. The Internet reduces the time to search for a proper supplier (Bakos 1997). As well, orders placed are instantly received at the supplier, thus lowering purchase time.
- Order-cost reduction. It is acknowledged by a number of authors that the Internet provides access to large volumes of information at lower costs. Thus, the use of EPS can help with the lowering of order cost.
- Reduced inventory costs. Since EPS reduces the fixed ordering cost, and since lot size is often proportional to the square root of the order cost, the optimal order size will be lower. This and other features given below lower the cycle inventory costs.

Strategic SCM Benefits

- Design Collaboration with suppliers. With an EPS, organizations can synchronize their design efforts with those of their suppliers. This can be an advantage, since about 80 % of the part's cost is fixed during the design stage (Chopra et al. 2010). Thus, collaboration with one's supplier in finding existing parts/designs can help with integrating the supply chain and in keeping costs low.
- Faster response to changes. Organizations can use an EPS to share their production plans with their suppliers. Thus, collaborative planning forecasting and replenishment can be easily done, and in turn, this can reduce information uncertainty and the amount of inventory.
- Consolidation of purchasing activities. In many organizations, especially large ones, a certain product is likely to be ordered by multiple departments. An EPS could consolidate such purchases, and avoid duplication of efforts. In addition, pricing discounts can be availed.
- Elimination of unnecessary activities. EPS implementation is sometimes seen as an enabler for making process changes. Organizations could, for example, simplify the authorization of orders, and the returning of parts (Pierson 2002).
- Use of marketplaces. By using the catalog management of EPS, companies can drive their procurement strategy by taking advantage of external multivendor catalogs. This strategy has been pursued by Bayer and SAP (Raisch 2001).
- Other intangible benefits. EPSs also offer other intangible benefits such as process decentralization, improved transparency of process, and improved relationships with suppliers.

One example of successful EPS implementation is the oft-cited integration of Daimler Chrysler with Johnson Controls, and extending in turn to Johnson's suppliers themselves. Several hundred times each day, Johnson received its orders from Chrysler in regards to various combinations of colors and other attributes. These orders were then passed on to the 35 suppliers of Johnson for assembly and delivery of the finished module to Chrysler (Peirson 2002). Johnson used

Commerce One (Commerce One 2011) as its EPS and integrated it with their existing Oracle ERP system, resulting in a listing of more than one million catalog items, 10,000 purchase orders and \$25 million in annual purchases.

Cisco uses a combination of Ariba, and Oracle (Cisco 2010). The company provides a punchout solution to its customers, whereby complex orders are configured, integrated, and automated through the use of reusable configurations and order templates. At the other end of the supply chain, Cisco also integrates almost 2,000 of its suppliers, distributors and contract manufacturers through its trading network (see also Grosvenor and Austin 2001).

Such success stories have prompted other companies, such as Rockwell International and Walt Disney, to follow suit and benchmark their procurement performance as well (Piotrowicz and Irani 2010).

2.5 Survey and Case-Study in India

One question stemming from the above discussion is the extent to which the lessons from Cisco and Johnson apply to India, given its supply chain realities. We use an empirical survey and three case-studies to answer this question. Implications of the results are brought out in §6.

2.5.1 Empirical Survey

This section summarizes the results of a survey of Indian managers, as pertinent to the goals of this chapter. Details concerning survey administration and analysis will be forthcoming in a fuller report.

Our survey consists of: (1) basic queries about the respondent; (2) perception questions about the importance of EPS features (listed in Table 2.1); and (3) items on firm-specific characteristics such as size, financial position, top-management support and customer-orientation (for more details on these terms, as well as the questionnaire for measuring them, see, for example, Lee et al. 2001; Percy and Giunipero 2008; Soares-Aguiar and Palma dos-Rois 2008). The survey was administered to managers working in different sectors of Indian industry. Overall, 101 responses were received. Some of them had nonsensical values, while with a number of other responses, the participants were from the same organization. Hence, the data from all such participants did not essentially differ on variables such as firm size. To handle this difficulty, response data coming from the same company were averaged out. This gave us a total of 66 responses for further analysis. The major findings are as follows.

- Most respondents accord a high level of importance to EPS features. For example, 48 % of respondents view an e-catalog to be *very important*, and 38 %

consider this feature to be *important*. Likewise, 88 % of people view *Request for quotes* to be very important or important. Despite this, only about 10 % of the companies have adopted an EPS system.

- Participants view the EPS features to consist of four categories: e-catalog and electronic request for quotes (Stage 1); workflow approval, order dispatch, electronic good receipt and invoicing (Stage 2); items such as auctions and market places (Stage 3); and e-collaboration and e-contracts (Stage 4). Roughly speaking, this categorization appears to be according to the degree of sophistication of the application; for example, auctions and contracts are more sophisticated uses of an EPS than catalog searches.
- Perception of the importance of Stage 2 features differs based on firm-size and the level of top-management support available at the firm; importance of Stage 3 features differs based on top-management support and customer orientation of the company.

2.5.2 Case Studies in India

The survey results summarized above reveal that even though participants saw different stages of EPS functions and felt that those features are important for organizations in general, actual adoption of a system is still low; the importance of EPS features is not explicable by the various organizational characteristics. To understand this result, we study three Indian companies, by using a structured interview process for one and secondary sources for the other two.

Medium Company

The first case is based on XYZ Group.¹ Having a combined turnover of US\$ 4 billion, XYZ group comprises over 25 companies and has a total of 25,000 employees on its payroll. Since its founding in early the 1900s, XYZ has followed a steady path of expansion and diversification. It now operates in such areas as automotive, finance, and electronics. A common thread with the entire group is the importance given to quality and customer service. As such, several companies of this group have won the coveted Deming award.

The particular firm chosen for our study is the electronics business. Considered medium-sized in the Indian context, this business was founded about 25 years ago and faces companies such as Epson India as its competitors. XYZ electronics focuses on various types of input-output computer peripherals such as keyboards, POS terminals and printers, as well as consumable parts needed for such devices. Put together, these products have a demand of tens of thousand per month.

¹ XYZ is a pseudo-name.

Table 2.2 Structure of interview questions

<i>Questions related to context:</i>
1. What is your company structure?
2. What products are marketed by your company?
3. What is your position within the structure and hierarchy?
4. Has your company adopted an e-procurement system? Why or why not?
<i>Importance of features:</i>
5. What are the different features of EPS?
6. What is the importance of each of these features?
<i>Supply chain benefits:</i>
7. What are the strategic benefits of EPS to SCM?
8. What are the tactical benefits?
9. What are the operational benefits?

The person we talked to is a senior manager, with about 2 years of experience in the company and over a decade in the industry. He is familiar with EPS and its features. Table 2.2 lists the set of questions asked by the interviewer.

In terms of IS implementations, XYZ has the SAP system that links orders from customers with the manufacturing activities of the plants. However, XYZ does not have an EPS, nor does it have any plans for such an implementation, as indicated by the respondent’s comments below:

Activity through web-based [ordering] will not be helpful

At this point of time, we do not need such a system

When asked about the reason for the above statement, the respondent analyzed it from multiple perspectives. First, in terms of demand, product variety at XYZ is small. Also, components are designed to be modular and can therefore be used in multiple product-lines with only minor modifications. Moreover, variations within a product-line involve only a small number of parts. Therefore, the respondent felt that product demands can be forecast with a fair degree of accuracy, especially because large orders get sufficient lead time. Second, from the supply perspective, most of the sub-assemblies are ordered through tier-1 suppliers, who in turn order components from tier-2 vendors that are pre-qualified by XYZ, thus reducing the need for an EPS. Thirdly, at this point in time, suppliers are not familiar with an EPS and may not be ready in terms of the infrastructure needed to implement such a system. Thus, for these reasons, the utility of EPS is somewhat low.

The procurement process followed by XYZ is to periodically collect customer-orders from SAP, and then batch its purchases by email to one among the few pre-qualified suppliers. Finished goods are then delivered by using milk-runs from the factory to the various customers.

Following these questions about his own company, the respondent was asked to extrapolate his experiences for the industry. His comments indicate that notwithstanding India’s growing economy, the volumes at which Indian organizations operate are still low by global standards; therefore, EPS functionalities such as

auctions/negotiations do not have as much utility as one might expect for a large multinational company.

This raised the natural question as to how XYZ and other such companies could gain internal acceptance for a significantly more expensive ERP system without the added functionality of an EPS. The following interview-transcript aptly contextualizes the problem of EPS with respect to the justification that XYZ might have undertaken for an ERP system.

Interviewer:

How long have you had SAP?

Respondent:

Maybe about two years now.

Interviewer:

Were there some arguments posed against the implementation of SAP, at some point in time?

Respondent:

No ..., and yes, maybe it was there when Baan was introduced—we had Baan before [SAP].

Over a period of time, every industry is looking at the other industry and see the benefits they get ... whereas the e-procurement is still at a very raw stage now.

Very large-scale industry may have implemented, but all others are in a wait-and-watch mode right now.

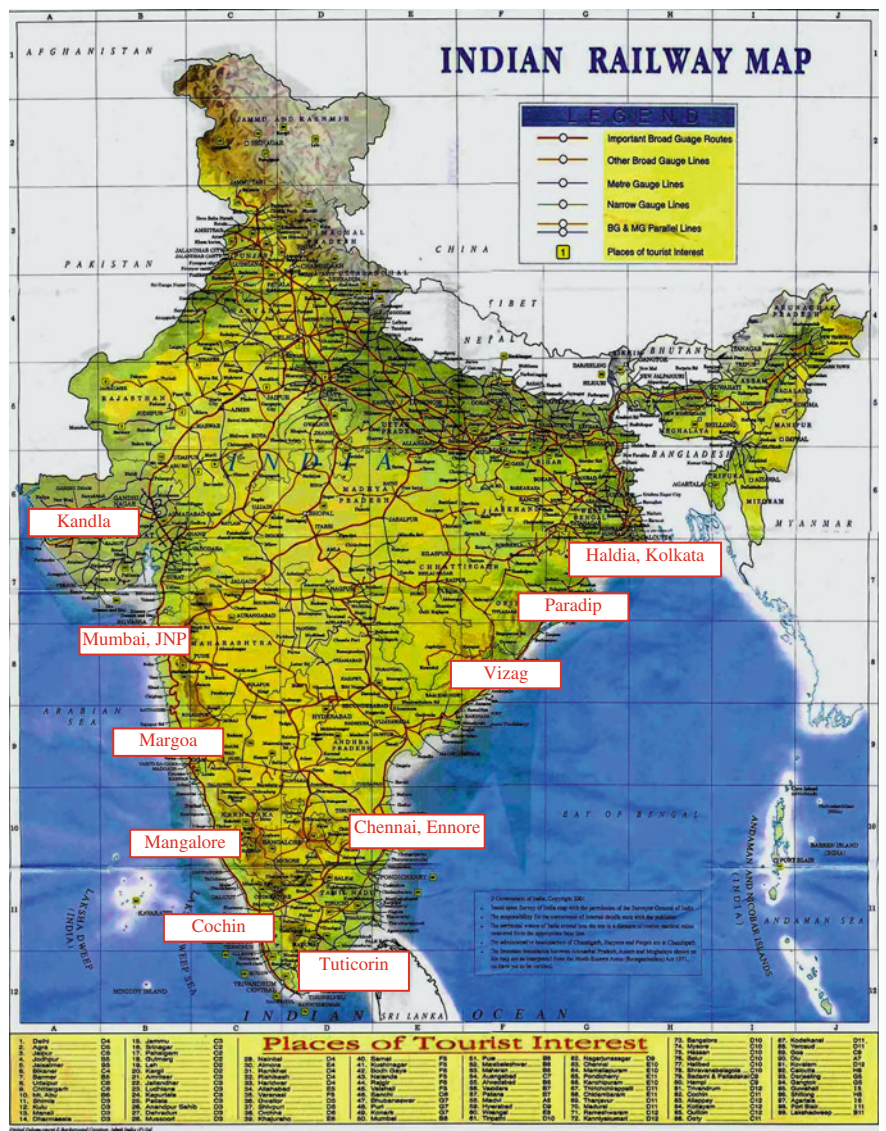
Large Indian Organization

This opinion of our interviewee—about the utility of EPS for large organizations—is supported by our follow-up research on Indian Railways² (IR). IR, a state-owned organization with a 150 year history, is one of the world's largest organizations with a network of about 64,000 km. As the national carrier, it plays a key role in India's social and economic development, by providing affordable transportation to about 19 million passengers and 2.3 million tonnes of bulk freight every day (see, for example, IRYB 2010; www.ireps.gov.in for more information).

IR provides a key link to other modes of transportation. Owing to its access to remote areas of the country, IR can extend the reach of the fast growing airline industry. IR is also linked to India's extensive road network. For example, Konkan Railway, one of the zonal branches of IR, introduced an intermodal system whereby trucks are transported on flatbed IR trailers (Konkan 2011). Finally, in addition to the above, the IR-port interface provides great economic benefits to a globalizing India. About 95 % of the country's international trading is through the thirteen major ports of India (Sundar et al. 2009), and goods from/to ports are transported by IR. Figure 2.2 conceptually gives these connections.

IR and ports also interact for carrying intra-country freight, with the coal industry as one of the major beneficiaries. Coal is the second largest commodity handled at ports. Coal accounts for US\$ 1.2 billion of ports' import-revenue, and constitutes over 45 % of the goods transported by IR, in terms of both tonnage and revenue (Raghuram et al. 2004). Moreover, coal is a key raw material for steel,

² Another such example is Coal India, a Government of India undertaking.



Source: <http://www.indianrail.gov.in/images/rail-map.jpg>
Thirteen Major Ports: Kandla, Mumbai, JNP, Margoa, Mangalore, Cochin, Tuticorin, Chennai, Ennore, Vizag, Paradip, Haldia, Kolkata

Fig. 2.2 Railway routes overlaid with major ports

cement and power industries. To give an example, coal from Talcher mines (in Orissa) is a raw material for the power plant at Ennore. One option is to send the coal through IR’s network, which will take 1350 km. The other option is to send the coal to Paradip by rail (200 Kms) and then use waterways for 1025 Kms

between the Paradip and Ennore ports (see Fig. 2.2) Raghuram et al. (2004) found that the latter intermodal option provides over 40 % savings.

While the aforementioned discussion establishes the importance of IR to India's transportation sector, it is the case that the organization's market-share predominance has steadily eroded from over 80 % in the 1950s to less than 40 % in 2005 (Sundar et al. 2009). Hence, to improve, IR has been reengineering itself, including its logistics and materials management operations that play a crucial role.

IR has 220 stocking-depots that contain about 300,000 components. Expenditure on purchases is over US\$ 500 million. Recognizing the importance of procurement to IR's logistics and in turn to India's social and commercial interests, IR has developed and implemented a secure EPS for procuring and managing its materials effectively. This system permits vendors to search and download tender-information, and submit online offers into the system (www.ireps.gov.in) in a fair, secure, confidential and transparent manner (See also Lin and Hsieh 2000).

Every online bid is submitted with a valid digital signature certificate, and is acknowledged by the system, by including the date and time of the bid-receipt. Vendors cannot access submitted bids, but they can add a revised bid superseding their original bid. While cost-effectiveness is the role of procurement in the private sector, for public organization such as IR, the larger "public good" is an important goal of implementing an EPS. Thus, all vendors who have submitted e-bids can view every offer made by each vendor, along with the respective timestamp. Another feature provided for the sake of transparency is to ensure a proper payment procedure (i.e., electronic funds transfer), so that the lag between good-receipt and payment is uniform for all vendors.

Incidentally, the IR case brings out the importance of intangible benefits as well (e.g., transparency and process decentralization), as given in §4, in order to justify and implement an EPS system.

Public-Private Partnership of ITC's e-choupal. ITC is a hundred-year-old company that was established under the name of Imperial Tobacco Company, and that later re-named itself to ITC Limited (for more details on the information given below, see Upton and Fuller 2004).

In 1999, to grow its agricultural part, ITC's chairman, Y. C. Deveshwar, commissioned a plan to use technology for improving the competitiveness of the value chain. At that point in time, after the harvest, farmers brought their produce to a local shop (called *mandi*) where agents bought the goods and then sold them to ITC (generally at a much higher price). ITC processed these goods and delivered them to stores. Farmers had little connection amongst one another, and therefore lacked the knowledge of their harvest's market price. Thus, with this process, middlemen (i.e., agents) ended up getting a substantial part of the proceeds.

As a way to break this inefficiency, ITC established a total of 1,695 kiosks or e-choupals (*choupal* means meeting place in the Indian language, Hindi). The choupals were setup in the villages of one Indian state, namely Madhya Pradesh. Each kiosk contained a printer, as well as a microcomputer that was connected to the ITC's website through dial-up or VSAT terminals. The website provided

information on such matters as the weather, crop-cultivation practices, and more importantly, on market prices. A lead farmer was picked, and was provided training to operate the website and then post a printout of the above information on a notice board.

Farmers benefited from that information, because it provided them a very easy way to know the prices at remote locations of the country. Previously, this knowledge required time-consuming travel, which was seldom undertaken. Further, this price-discovery allowed them to make informed decisions about where to sell their produce—they could sell to the agents as before (at *mandis*) or directly to ITC hubs, which were located to be within convenient distance of every farmer. Third, unlike agents, the hubs provided prompt payment to farmers. Finally, the hubs also featured facilities such as soil-testing that was previously available only at a remote government lab.

For its part, ITC's direct contact with farmers entailed several benefits. First, it provided ITC with a reliable supply-source. Second, ITC was able to understand the current farming technique employed and thus gauge the quality of its purchase. Third, it was able to influence the farmer to practice improved techniques. Finally, direct contact reduced the chances of adulteration by middlemen. In turn, the improved quality fetched a higher price for ITC at international markets.

To grow this successful concept further, ITC then expanded to other states as well (ITC 2011). Partners from the village communities, non-governmental organizations, and the government itself were involved in this effort. For example, in the states of Andhra Pradesh and Rajasthan, ITC collaborated with the state government to develop over 8,000 hectares of previously unused land. Overall, this gave ITC enormous coverage—ten states, 4 million farmers, six different crops, 40,000 villages and 6,500 e-choupals. Thus, in 2006–07, the company was cited by the Government of India's Economic Survey for its transformational impact on rural lives.

To summarize, the implementations at both IR and ITC were somewhat home-grown, and do not fit the high-end commercial systems that were put in place at companies such as Cisco. In terms of the EPS framework given in Fig. 2.1, the ITC system helps with searches and information provision, while the IR system entails specific applications such as auctions. In both cases, volume appears to be an important commonality for adoption.

2.6 Supply-chain Implications

Our first finding is that EPS adoption can be imagined to consist of different stages, with each higher level being more complex in function and use than the lower one. The stages are: (1) eCatalogue and Electronic Request For Quotes; (2) Approval Workflow, Order Dispatch, Electronic Goods Receipt and Electronic Invoice Matching; (3) Electronic Marketplace, eTendering, eAuction & Negotiation and eEvaluation; and (4) eContract Management and eCollaboration. Firms with more

management support are more likely to adopt the features of Stage 2, while those having Customer Orientation and Top Management Support adopting the Stage 3 features. These results indicate that the Indian view of EPS features matches that in the literature.

Our interview and survey results provide several lessons about the adoption of EPS in India. First, most benefits listed in §4 are aimed at reducing the complexity of operating the supply chain, which in turn is related to uncertainties existing in the chain. However, it appears that medium-size Indian companies are not yet focused on the delivery of highly customized products to customers. There is thus less need to reduce uncertainties, nor a need for complex procurement systems. Alternatively, the volume of transactions in an organization can provide the required economy of scale, so that overall savings in transaction costs (e.g., inventory, order, acquisition costs etc.) can justify the use of an EPS system.

As of this writing, select Indian organizations meet the latter criterion. In IR's case, it is clear that large bulk is involved, whereas with ITC's e-choupal, the volume lies in the sheer number of farmers and villages covered by the system. Thus, lessons from IR are potentially applicable to organizations such as Coal India, while the ITC case has implications for JR and Gopaljee, owing to the suppliers being spread out. It should be remarked, however, that both systems offer only a subset of the EPS features discussed in §3.

To facilitate the adoption of EPS, suppliers must be engaged and be made aware of the benefits of using EPS, along with the infrastructure needed to operate such systems. This is a crucial point for the Indian context, since the supply chain is fragmented and the workforce is unorganized. Thus, simple systems with possible facilitated use (as was the case with ITC) are likely to gain user-acceptance and thereby provide the anticipated supply chain benefits.

2.7 Summary

Supply chains can be globally competitive only if all of its links work together in an efficient coordinated fashion. This coordination can be facilitated by the use of electronic procurement technologies, which offer a number of strategic benefits (e.g., design collaboration) and operational ones (e.g., order cost reduction). Thus, multinational firms, which tend to be part of a well-connected supply chain, have incorporated EPS into their processes and have reported enormous savings as a result. In India, our study shows that such systems are known to a wide section of managers, and are beneficial to organizations that deal with large volume. Given the attributes of Indian supply chains, relationship-cultivation with various stakeholders can serve as an important precursor to generating the required volume, and in turn, to actual implementation. The EPS set-up itself must be focused on practical targeted use, rather than on a full set of sophisticated functionalities. Finally, medium and small companies appear to be observing industrial trends and are likely to adopt such packages, as the Indian economy grows and gets more globally oriented.

References

- Bakos J (1997) Reducing buyer search costs: Implications for electronic marketplaces. *Manage Sci* 43(12):1676–1692
- Barua A, Prabhudev K, Andrew W, Fang Y (2001) Driving e-business excellence. *MIT Sloan Manage Rev* 43(1):36–44
- Boer L, Harink J, Heijboer G (2001) A model for assessing the impact of electronic procurement forms. In 10th International Annual IPSE Conference, pp 119–130
- Carter P, Carter J, Monczka R, Slaughter T, Swan A (2000) The future of purchasing and supply: a ten year forecast. *J Supply Chain Manage* 36(1):14–26
- Chopra S, Meindl P, Kalra D (2010) *Supply chain management*. Pearson Education, Noida
- Cisco (2010) www.cisco.com. Accessed Oct 2010
- Commerce One (2011) www.commerceone.com. Accessed 2011
- Croom S (2000) The impact of web-based procurement on the management of operating resources supply. *J Supply Chain Manage* 36(1):4–13
- Davila A, Gupta M, Palmer R (2003). Moving procurement systems to the internet: the adoption and use of E-procurement technology models. *Eur Manage J* 21(1):11–23
- Gopaljee (2011) www.gopaljee.com. Accessed Feb 2011
- Grosvenor F, Austin T (2001) Cisco's eHub Initiative. *Supply Chain Manage Rev* pp 18–26
- Gunasekaran A, Ngai EWT (2008) Adoption of E-procurement in Hong Kong: an empirical research. *Int J Prod Econ* 113(1):159–175
- Gunasekaran A, McGaughey R, Ngai E, Rai B (2009) E-procurement adoption in Southcoast SMEs. *Int J Prod Econ* 122:161–175
- Hawking P, Stein A, Wyld CD, Foster S (2004) E-procurement: is the ugly duckling actually a swan down under? *Asia Pac J Mark Logistics* 16(1):3–26
- Irani Z, Love PED (2002) Developing a frame of reference for ex-ante IT/IS investment evaluation. *Eur J Inf Syst* 11(1):74–82
- IRYB (2010) Indian Railway Year Book 2008–09 at http://www.indianrailways.gov.in/indianrailways/directorate/stat_econ/pdf/Year_Book_English2008-09.pdf. Accessed 2 Nov 2010
- ITC (2011) <http://www.itcportal.com/sustainability/lets-put-india-first/echoupal.aspx>. Accessed Feb 2011
- Jaipur (2011) www.jaipurug.com. Accessed Feb 2011
- Johnston H, Vitale M (1988) Creating competitive advantage with interorganizational information systems. *MIS Quarterly* 12:153–165
- Kheng CB, Al-Hawamdeh S (2002) The adoption of electronic procurement in Singapore. *Electron Commer Res* 2:61–73
- Konkan (2011) <http://pib.nic.in/newsite/erelease.aspx?relid=68761>. Accessed Feb 2011
- Lee E-K, Ha S, Kim S (2001) Supplier selection and management system considering relationships in supply chain management. *IEEE Trans Eng Manage* 48(3):307–318
- Lin B Hsieh C-T (2000) Online procurement: implementation and managerial implications. *Hum Syst Manage* 19(2):105–110
- Pearcy DH, Giunipero L (2008) Using E-procurement applications to achieve integration: what role does firm size play? *Supply Chain Manage: Int J* 13(1):26–34
- Pierson J (2002) Johnson Controls Journal to E-procurement. *Supply Chain Manage Rev*, January–February pp 56–62
- Piotrowicz W, Irani Z (2010) Analysing B2B electronic procurement benefits: information systems perspective. *J Enterp Inf Manage* 23(4):559–579
- Poba-Nzaou P, Raymond L, Fabu B (2008) Adoption and risk of ERP systems in manufacturing SMEs: a positivist case study. *Bus Process Manage J* 14(4):530–550
- Puschmann T, Alt R (2005) Successful use of E-procurement in supply-chains. *Supply Chain Manage: Int J* 10(2):122–133

- Raghavan SNR, Prabhu M (2004) Object-oriented design of a distributed agent-based framework for E-procurement. *Prod Plann Control* 15(7):731–741
- Raghuram G, Verma S, Dixit K, Kapshe S (2004) Strategies for improving indian railways' market share of port based coal traffic: a diagnostic study, Indian Institute of Management Ahmedabad Report, Vastrapur, Gujarat, India
- Raisch WD (2001) *The E-marketplace: strategies for success in B2B E-commerce*. McGraw-Hill, New York
- Reddick CG (2004) The growth of E-procurement in American state governments: a model and empirical evidence. *J Public Procurement* 4(2):151–176
- Rodovitsky Z (2010) Electronic procurement. In: Bidgoli H (ed) *The handbook of technology management: supply chain management, marketing and advertising, and global management*, vol 2. Wiley, Hoboken, New Jersey pp 53–67, 07030
- Sundar S, Agarwal V, Chawla R, Diljun G, Garg A, Ghate A, Krithika P (2009) Competitive issues in regulated industries: the case of indian transport sector. The energy and resource institute, Project Report No 2007CP21, Darbaro Seth Block, Lodhi Road, New Delhi 110003
- Soares-Aguiar A, Palma-dos-Reis A (2008) Why do firms adopt E-procurement Systems? Using logistic regression to empirically test a conceptual model. *IEEE Trans Eng Manage* 55: 120–133
- Soh C, Kien S, Tay-Yap J (2000) Cultural fits and misfits: Is ERP a Universal solution? *Commun ACM* 43(4):47–53
- Subramaniam C (2004) The effects of process characteristics on the value of B2B E-procurement. *Inf Technol Manage* 5:161–180
- Sundarraj R, Mok W (2010) Models for human negotiation elements: validation, and implications for electronic procurement. To appear in *IEEE Transactions of Engineering Management*
- Talluri S, Narasimhan R, Viswanathan S (2007) Information technologies for procurement decisions: a decision support systems for multi-attribute e-reverse auctions. *Int J Prod Res* 45:2615–2628
- Tatsis V, Mena C, Van Wassenhove LN, Whicker L (2006). E-procurement in the Greek food and drink industry. *J Purchasing Supply Manage* 12:63–74
- Upton D, Fuller V (2004) *The ITC eChoupal initiative*. Harvard Business School Case 9-604-016. Boston, MA, 02163
- WEF (2010) <http://gcr.weforum.org/gcr2010/>. Accessed Feb 2011
- Wu F, Zsidisin G, Ross A (2007) Antecedents and outcomes and e-procurement adoption: an integrative model. *IEEE Trans Eng Manage* 54:576–587



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