# Readiness, Benefits and Barriers of E-Procurement Implementation in the Maintenance Repair and Overhaul Industries in India

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*This is quite evident that technological advancements are bringing automation almost in every activity specially core activities of the business in cost effective ways. The advent of internet technology provides the platform to perform procurement activities between business to business using electronic medium which is known as E-procurement. E-procurement is a key to optimise supply chain performance through cost reduction and process efficiency. Maintenance, Repair and Overhaul (MRO) sector of the aviation industry has not kept pace with the ever growing sector in India. Though this industry is expected to grow about $1.6 billion (spending each year) in the next 10 years from the current market size of about $700-800 million, it still remains largely unexplored. E-procurement focuses on acquisition of resources, especially MRO items, and increasingly materials and components. The purpose of this paper is to understand the facts that influence the implementation of e-procurement for MRO in an aviation industry. A cross-sectional survey is used as the methodology for the data collection. Conceptual model developed by the previous researchers was used to explain the readiness, benefits and barriers of e-procurement implementation in the MRO environment in India.*

**Keywords:** Maintenance Repair and Overhaul (MRO), E-Procurement, Survey, Readiness, Benefits and Barriers

## 1. Introduction: E-Procurement in an Aviation MRO Industry

In recent era, aviation safety and airworthiness of aircrafts impose much concern on the maintenance, repair and overhaul activities of an aircraft and therefore MRO has become an important sector in an aviation industry. Several information and communication technologies have changed the face of market place which encourages businesses to enter into fully integrated value chain network between supply chain partners. Maintaining or repairing fixed wing or rotary wing aircraft is a capital intensive affair for business and to ensure airworthiness and optimal flight efficiency while lowering cost as much as possible, is a challenge for the supply chain where procurement plays an indispensable role (Basak, 2016). Procurement is an important as well as expensive business activity for the organisations because organisations spend considerable proportion of their operational budget on purchasing goods and services (Rahim, 2008). By adopting e-procurement, it is

expected that the problems and inefficiencies encountered in the traditional procurement process such as spending considerable time on non-value added activities and reconciliation (Chia, 1998, Rahim, 2008), unplanned purchases from non-preferred suppliers at a higher price (Turban et al., 2008), high error rates, long purchase cycle times, complicated and time consuming logistics and fulfilment procedures in dispatching goods or services to the final consumers (Gueritz, 2001), can be eradicated significantly. E-procurement is a mechanism that enables purchasing cycle from requisition to delivery process such as sourcing, ordering, receipting, delivery, making payment while sharing of information among all supply chain partners (business to business and business to consumer) using electronic medium. A great deal of study has been done on procurement issues of production supply chain but limited study conducted on procurement issues in aircraft maintenance, repair and overhaul activity which has left further scope for research. The objective of this study is to understand the current status of the e-procurement in aviation MRO in India and to examine facts that influence E-procurement adoption.

## 2. Background Study: SCM and MRO Procurement in an Aviation Industry

Existing literature highlights different aspects of SCM and e-procurement and provides extensive knowledge on the concepts such as current issues and challenges of e-procurement (Williams and Hardy, 2007), understanding the benefits of e-procurement (Parida et al, 2006, Gueritz, 2001), adoption and acceptance of e-procurement and its impact on organisational performance (Gunasekaran and Ngai, 2008, Davila et al, 2003, Rahim, 2008, Pires and Stanton, 2005, Teo et al,. 2009), e-procurement in hotel supply chains (Kothari et al, 2005), e-procurement and SCM (Presutti, 2003), assessing the impact of e-procurement (Boer et al,2002), governance of complex procurement in oil and gas industry (Olsen et al, 2005), e-procurement for governmental purchasing (Panayiotou et al, 2004). Farzin and Nezhad (2010) expressed the benefits of e-procurement in the construction supply chain along with the drivers and barriers of e-procurement as well as framework of supplier selection. A supply chain is a network of facilities which starts with the procurement of materials and delivering services to the final customer (Jain et al., 2010). An efficient supply chain maximises the opportunity of lowering operational costs, enhancing productivity along with complex challenges regarding end-to-end integrated planning, increased availability of assets, inventory optimization and effective spend management (Khandelwal, 2011). Procurement is a support activity in the supply chain for the purchase of material and services for all parts of the value chain while anticipating requirements, sourcing and obtaining supplies, moving supplies to the organisation, and monitoring the status of supplies as current assets (Pires and Stanton, 2005). As procurement engages huge amount of cash flows in the business so any improvement in procurement process can help to cut down costs incurred in selection of the preferred suppliers, increase the value gained in terms of price and quality, lower transaction cost, shorten lead time and consequently will significantly influence SCM (Lancioni et al., 2000).

MRO procurement in an aviation industry is required for scheduled and preventative maintenance against any technical, mechanical and electrical failure to ensure safety and airworthiness of aircraft (Basak, 2016). Maintenance, Repair and

Overhaul (MRO) for the aviation sector has not kept pace with the ever growing sector in India. Though this industry is expected to grow to about $1.6 billion (spending each year) in the next 10 years from the current market size of about $700-800 million, it still remains unexplored. Lack of such facilities has been forcing the aviation operators to take their planes/helicopters to Sri Lanka and South East Asia, resulting in foreign exchange losses as well as time delays. Experts state that every $1 million spent on MRO could create 30-40 new category of jobs which could boost employment from the current 62,000 to over 1, 17,000 in the next couple of years. Also, the wages paid in the country (30-50 USD/man-hr) compared to global rate (40-100 USD/man-hr) is almost 50% less. Therefore, strategically India is becoming the aviation MRO hub.

Aircraft maintenance, repair and overhaul (MRO) activities invariably demand well-coordinated information technology and communication in place to face challenges in aviation industry (Basak, 2016). These days business management has entered into the era of internet work oriented competition where the competition is not within brand versus brand, store versus store but in SCM versus SCM (Lambert and Cooper, 2000). Global market opportunities have encouraged companies to go global. In a global enterprise environment, companies have to utilize the various B2B information technologies or systems such as EDI, Internet, ERP and E-procurement to standardize and automate business processes. E-procurement has become an indispensable tool for automating procurement in a physically distributed enterprise environment (Gunasekaran et al 2009).Basak (2016) described the e-procurement benefits realised in an MRO industry in India. However, the study did not measure the readiness and the benefits of e-procurement quantitatively before implementation of e-procurement in an organisation. As procurement is an expensive activity for the organisation, all the parameters associated with readiness, benefits and barriers of e-procurement implementation need to be properly measured for structuring an efficient and effective SCM which will be examined in this study. The purpose of this paper is to understand the facts that influence the implementation of e-procurement MRO in an aviation industry.

## 3. Hypothetical Framework of E-Procurement Implementation Process in Indian MRO Industry

E-procurement adoption poses many challenges for MRO companies in India. One serious impediment to adoption is the lack of awareness of E-procurement and its implications for organizational performance (Gunasekaran et al. 2009). Theoretical framework suggested by Gunasekaran et al. (2009) is adopted here to investigate the readiness of MROs for e-procurement, perceived benefits, and perceived barriers to e-procurement implementation. Critical success factor and future organisational performance with e-procurement were not studied here.

### 3.1 E-Procurement Implementation Readiness

According to (Tran, 2011) companies must meet “a required readiness level” to absorb effective IT enabled innovation into its work practices prior to investment. Even though there are few literatures available (APEC 2009, Bridges.org) in this subject, however, there is no specific definition available due to its dependency on various contexts, different situations and users (Tran et al. 2011). Moon (2005)

highlighted two important areas that influence successful E-procurement adoption: (1) behavioural issues and (2) the procurement process. Thus, one can reasonably concludes that an organisation's readiness in terms of its resources, its procurement process, and its technology will influence the E-procurement adoption success (Knudsen, 2003).

### 3.2 Perceived Benefits of E-Procurement

As per Aberdeen (2001) the materials required for maintenance, repair and operation accounts for 30% to 60% of the company's total expenditure. So, successful implementation of e-procurement helps to achieve benefits for the organisation. Moon (2005) highlighted some of the potential benefits of e-procurement such as reduction in cost through better negotiation, quick and efficient ordering process as well as more efficient procurement process, wide range of database of suppliers to select appropriate vendor for particular category of product, higher control over procurement spending and budget, more accessible internet alternatives for buyers, and less paper work and repetitive procedures. As per Basak (2016) cost reduction is influenced by better negotiation and improved relationships with suppliers, better prices from key suppliers and competitive bidding. E-procurement benefits are not only limited to cost reduction but also lower lead time, timely order fulfilment, purchasing effectiveness and delivering value added services, control over maverick buying process, reduced inventory-carrying costs, and shorter order cycle time (Panayiotou et al., 2004). The organisation can better negotiate when they plan procurement based on the forecast and approach multiple suppliers to maximise benefits of competitive bidding. The suppliers are willing to cut the price when they get purchase assurance from the company (Parida et al, 2006) and also attempt to deliver goods on time to maintain the flow of contracts from the buying organisations.

### 3.3 Perceived Barriers Involved in E-Procurement

Organisation also needs to concentrate to overcome the barriers that may slow down the implementation of e-procurement. Paper-based purchasing systems still dominate the maintenance world and 86% of MRO order transactions are not online and 84% of MRO payments are processed by paper (Foroughi, 2007; Aberdeen group, 2006). Barriers such as the lack of capital, lack of expertise and technical skills, lack oftechnologies and tools, resistance to change, and lack of top management support will delay adoption of E-procurement, and influence E-procurement performance post implementation (Gunasekaran et al., 2009). Hawking et al. (2004) identified barriers to the adoption of E-procurement as follows: (a) security of transactions, (b) lack of supplier E-procurement solutions, (c) high cost of technology, (d) lack of a legal framework, (e) lack of technical expertise, (f) lack of E-procurement knowledge, (g) no real business benefits identified, (h) lack of data exchange standards, and (i) lack of business relationships with suppliers.

According to Davila et al, (2003) risks are classified into four categories. 1) Internal business risks means uncertainty of appropriate resources for successful implementation of e-procurement systems as these systems need to be integrated with the existing information infrastructure such as accounting, inventory management etc. 2) External business risks associated with integration of e-procurement solutions with internal information systems and external constituencies

like customers and suppliers. External constituencies need to develop internal systems to communicate electronically, 3) Technology risks are standards for coding, technical, process specification and clear understanding of e-procurement technology that can block integration of different e-procurement software across the supply chain, 4) E-procurement process risks are associated with security and control of e-procurement processes.

## 4. Research Methodology

A cross-sectional field study survey method was employed here, using questionnaires mailed to 42 MRO companies including suppliers in India involved in the aviation field. The respondents were assured anonymity and notified that only comprehensive information on contributors would be published (Gunasekaran et al. 2009). A self-addressed, stamped envelope was provided for return of questionnaires directly to the authors. A five-point semantic differential scale ranging from 1 (not used at all, have not been realised, strongly disagree) to 5 (used very extensively, fully realised, strongly agree) is used. Data analysis was carried out using Excel.

A total of 42 questionnaires were developed, tested and distributed to the companies. The respondents were also personally contacted by phone to participate in the survey. The returned/replied questionnaires, 17 represent a total response rate of approximately 40%. The response is slightly higher than the responses observed by other researchers i.e. 15% (Hassan et al. 2015; Gunasekaran et al. 2009).That is because three reminders were issued to increase the response rate within 2 months' time period. This response rate is considered acceptable for a survey focusing on gaining responses from industry practitioners (Love, 2002).

## 5. Results

Basic demographic data was collected (see Table 1) on respondents who are involved in the purchasing activities in their companies within the MRO environment. Out of 17, only 6% financial and logistics managers, 12% purchasing and supply chain managers, 24% procurement officers, 18% buyers & purchasing clerks and 6% involved in material selections and quality control were responded to the questionnaires.

**Table 1** *Demographic Data*

| **Job Title** | **%** | **Work experience** | **%** |
|---|---|---|---|
| Purchasing clerk | 18 | 1-5 years | 41 |
| Buyer | 18 | 6-10 years | 29 |
| Procurement Officer | 24 | 11-20 years | 18 |
| Purchasing Manager | 12 | > 21 years | 12 |
| Financial Manager | 6 | | |
| Logistics Manger | 6 | | |
| Supply Chain Manager | 12 | | |
| Others – involved in material selection and quality | 6 | | |
| **Education level** | **%** | **No. of employees** | **%** |
| High School | 29 | 1-10 | 35 |
| Post-Secondary Certificate/Diploma | 35 | 11-30 | 18 |
| Graduate degrees | 18 | 31-99 | 29 |
| Bachelor degrees | 12 | 100-199 | 12 |
| Post-graduate degrees | 6 | >200 | 6 |

Amongst them only 12% had experience in MRO procurement more than 21 years, 18% had 11-20 years, 29% had 6-10 years and 41% had <5 years of experience. 29% of the respondents had high school certificate, 35% had post-school certificate/diplomas, 18% had graduate degrees, 12% had bachelor degrees, and only 5% of them had post-graduate qualifications. 35% of the companies had <10 employees, 18% had 11-30 employees, 29% had 31-99 employees, 12% had 100-199 employees and only 5% had >200 employees. These statistics suggest that the respondents were generally well-educated, experienced, procurement professionals in the field of aviation MRO in India.

### 5.1 E-Procurement Implementation Readiness

In this section the readiness of e-procurement implementation is analysed. Figure 1 depicts that 82.3% of the total respondents have their own websites. Companies are mainly using their websites to provide information of their products and services. However, a detail of website usage was not studies here. Gunasekaran *et al.* (2009) found out that companies were rarely using their websites for transactional purposes.

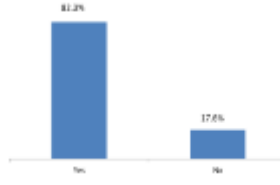

**Figure 1** *Company's Website*

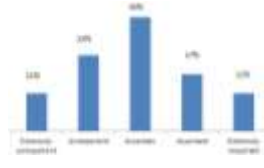

**Figure 2** *Importance of the Internet in Procurement in MRO*

Figure 2 shows the perceived importance of the Internet in procurement in the MRO industry. Only 28% respondents perceive it to be important (including extremely important and important). Most of them consider it as unimportant or simply do not know if it is important or not. This statistic is in agreement with Gunasekaran *et al.* (2009) and suggests that people filled the questionnaires, may not be aware of potential advantage of the information technology in the supply chain of MRO. At the same time there may be a possibility that the person managing purchasing/procurement process is also managing other duties (multitasking). Similar observation was also noted by Gunasekaran *et al.* (2009), which in smaller organisations employees perform more than one organisational role. Tale 2 shows the utilisation of the websites by the company. Most of the companies use their website to communicate, provide information about the company, product and services, approving purchase requisition and taking orders electronically. All of these items are rated higher than 3; however, the highest was only 3.4. Only one item rated below 3, suggesting the companies were allowing the suppliers or client to access their websites.

**Table 2** *Utilisation of Website*

| Information on website | Not used at all - 1 | Used very less - 2 | Uncertain - 3 | Used - 4 | Used extensively - 5 | Average Rating |
|---|---|---|---|---|---|---|
| Provide information about company | 1 | 3 | 4 | 4 | 2 | 3.2 |
| Provide information about product and services | 1 | 5 | 3 | 5 | 3 | 3.2 |
| Approving purchase requisitions electronically | 1 | 5 | 3 | 4 | 2 | 3.0 |
| Tracking orders electronically | 2 | 3 | 3 | 4 | 2 | 3.0 |
| Purchasing goods and services by issuing electronic calls for tenders | 1 | 3 | 3 | 3 | 2 | 3.1 |
| Communication with supplier and client electronically | 1 | 1 | 3 | 3 | 2 | 3.4 |
| Permitting sub-suppliers to directly access suppliers internal systems | 2 | 0 | 1 | 1 | 1 | 2.8 |

## 5.2 Perceived E-Procurement Benefits

This section analyses the perceived benefits of adopting e-procurement in the aviation MRO industry in India. Table 3 shows that e-procurement benefits are not largely realised by the companies. It is evident that the companies realised that the benefits of e-procurement in vendor management, customer satisfaction, reduction in transactional time, reduction in inventory level and efficient procurement process in Indian MRO. The highest rating was 3.5 shows that it is between 'somewhat just begun to be realised' (3) and 'realised' (4) as also observed by Gunasekaran et al (2009). This may be because the companies were not utilising the e-procurement benefits to a great extent.

**Table 3** *E-Procurement Benefits*

| Benefits from implementing e-procurement | Have not been realised -1 | Somewhat realised - 2 | Just begun to be realised - 3 | Realised - 4 | Fully Realised - 5 | Average Rating |
|---|---|---|---|---|---|---|
| Reduction in transactional cost | 5 | 3 | 2 | 3 | 1 | 2.8 |
| Increase in ordering process | 5 | 3 | 2 | 2 | 2 | 2.5 |
| Increase in Vendor choice/selection | 6 | 3 | 4 | 2 | 2 | 2.4 |
| Efficient procurement process | 5 | 2 | 1 | 3 | 3 | 2.8 |
| Better utilisation of staff | 5 | 1 | 3 | 2 | 0 | 2.2 |
| Reduction in paperwork/support environmental issues | 1 | 4 | 1 | 1 | 2 | 2.9 |
| Lower lead time | 0 | 2 | 1 | 4 | 1 | 3.5 |
| Reduction in inventory levels | 5 | 4 | 2 | 2 | 0 | 2.1 |
| Reduction in non-contractual buying | 2 | 4 | 5 | 1 | 1 | 2.6 |
| Increase in customer satisfaction | 4 | 3 | 2 | 3 | 1 | 2.5 |

**Barriers to E-Procurement Implementation**

This section discusses the perceived barriers of e-procurement implementation in the aviation MRO industry in India. Table 4 depicts the summary of the responses. The most important barrier to implementation was that it was not the priority of the company (3.4). The next barrier is the high cost of technology (3.3). The third important barriers were lack of management support and fear to change into a new system (3.2), the fourth barrier was security concern (3.1).

**Table 4** *E-Procurement Implementation Barriers*

| Barriers | Strongly disagree -1 | Disagree - 2 | Uncertain - 3 | Agree - 4 | Strongly agree -5 | Average Rating |
|---|---|---|---|---|---|---|
| Fear to change into a new system | 3 | 4 | 6 | 6 | 4 | 3.2 |
| Security concerns | 4 | 3 | 2 | 3 | 5 | 3.1 |
| Immaturity of technology | 4 | 5 | 4 | 2 | 4 | 2.8 |
| High cost of technology | 2 | 5 | 5 | 6 | 5 | 3.3 |
| Lack of e-procurement knowledge | 4 | 6 | 3 | 5 | 4 | 3.0 |
| Lack of management support | 3 | 4 | 1 | 3 | 5 | 3.2 |
| Not in priority list of the company's deliverable | 4 | 2 | 1 | 7 | 6 | 3.4 |
| Lack of data exchange standard | 4 | 3 | 4 | 5 | 2 | 2.9 |

All of the items rated higher than 3 which represent “uncertainty” regarding the extent to which the item is a barrier. All the other items were rated below uncertain (3). Gunasekaran et al (2009) found out that the greatest barrier to implementation was a lack of enthusiasm. However, in Indian context the barriers are ‘not in priority list of the company’, ‘the high cost’ and ‘the fear of change from conventional procurement to e-procurement’.

## 6. Conclusion

The purpose of the study is to highlight the readiness, benefits and barriers of e-procurement implementation in the aviation MRO supply chain in India. E-procurement readiness did not seem to be the primary issue upsetting the acceptance, as they had few basic infrastructure and organisational conventions in place to engage in E-procurement. Due to the inexperience with the system, companies have not yet recognised the benefits of e-procurement to be significant. The most important barriers are mainly the priority of the company in implementing the e-procurement system along with the higher cost and the fear of change from conventional to e-procurement system. However, there are few other barriers like lack of knowledge and skills of electronic environment. It also highlights the importance of e-procurement for MRO to enhance supply chain performance of the aviation industry in India. It has been found in the literature that there is a tendency to follow traditional procurement process in MRO supply chain due to low volume and less importance of indirect materials (Puschmann and Alt, 2005). Future study needs to be carried out to investigate the success factor and organisational performance after e-procurement implementation in the MRO industry in India.

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