Barriers affecting successful technology enablement of supply chain: An Indian perspective

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Abstract. In order to compete, organizations need to focus on improving supply chain and technology acts as a major enabler. Technology enablement of supply chain has not always been successful and has been examined by many researchers. The purpose of this paper is to do a systematic literature review of technology enabled supply chain from a strategic viewpoint. The literature is examined from two perspectives. Firstly, it studies the growing interest in technology-enabled supply chain in India. Secondly, it studies barriers affecting technology enablement of supply chain. The literature review identifies that technology enabled supply chain helps in improving performance via effective decision making, monitoring entire supply chain, faster reaction to customer service problems, etc. The research has emphasized the importance of 12 barriers affecting technology enablement. This research will help as a guide for practitioners in order to successfully implement technology and fills the gap in existing literature by highlighting and consolidating the significant research work done in past.

1. Introduction
Indian economy before getting liberalized in 1991 witnessed slackened industrial production, high inflation rate (in double digits) and high borrowing as a percentage of Gross National Product (GNP) [1]. Post 1991, performance of Indian economy started improving [2] but organizations were under pressure as they had to compete globally. It is predicted that by 2025 India will be at third place among world economies, contributing 6% of the world trade and Gross Domestic Product (GDP) growing from US$ 2 trillion to US$7 trillion [3].

In order to remain competitive Indian organizations need to operate supply chain efficiently so as to gain operational and service excellence [4]. But improving supply chain is challenging in Indian context due to lack of infrastructure, modern technology, developed supplier base and concentrated markets [5]. Thus, Indian organizations are forced to implement various productivity improvement efforts along with evolution of supply chain mind set. Technology is a key enabler and can achieve breakthrough in the area of supply chain [6, 7].

The literature on technology enablement of supply chain is non-exhaustive. This has encouraged the authors to prepare a comprehensive list of barriers affecting technology enablement. The main objective of this paper is to study the increasing interest in technology-enabled supply chain in India and study the barriers affecting technology enablement of supply chain.

2. Methodology
Systematic literature review methodology has been used and following are the steps

- Research done in technology enabled supply chain for India market
- Selecting database and defining search criteria
- Defining criteria for inclusions and exclusions
- Content presentation and analysis

A total of 27 papers and books have been considered for final review. Year wise analysis of books and journals reviewed is depicted in figure 1. Table 1 depicts the details of name of journals with publisher considered for review. Figure 2 depicts the number of papers considered for review by publisher.

![Graph showing number of studies each year](image)

**Figure 1.** Number of studies each year

**Table 1.** Name of journals with publisher considered for review

| Journal                                                        | Publisher                        |
|----------------------------------------------------------------|----------------------------------|
| Thunderbird International Business Review                      | Wiley                            |
| Journal of Organizational Change Management                    | Emerald                          |
| A joint A.T. Kearney and CSCMP study                          | A.T. Kearney-CSCMP study         |
| Journal of Manufacturing Technology Management                 | Emerald                          |
| Measuring Business Excellence                                  | Emerald                          |
| Supply Chain Management – An International Journal             | Emerald                          |
| International Journal of Productivity and Performance Management| Emerald                          |
| Industrial Management and Data System                          | Emerald                          |
| International Journal of Physical Distribution & Logistics Management | Emerald                          |
| Information Management & Computer Security                     | Emerald                          |
| Journal of Operations Management                               | Elsevier                         |
| Industrial Marketing Management                                | Elsevier                         |
| Production Planning & Control                                  | Taylor and Francis               |
| The International Journal of Business and Information          | Inderscience                     |
Small Business Economics
Journal of Enterprise Information Management
International Journal Business Information Systems

Springer
Emerald
Inderscience

Figure 2. Number of paper by publisher

3. Findings

3.1. Technology usage by Indian organizations

The previous research highlights the impediments Indian organizations need to overcome
- Technology spending for Indian organizations is 1.3% as compared with the overall global average of 4.93% worldwide [6]
- Technology is still a luxury with organizations [6]
- Reluctant to adopt new technologies [8]
- Preference to adopt stand-alone modules instead of integrated solutions. Indian organizations are using in-house developed solutions instead of standard package solutions [6]

3.2. Technology enabled supply chain

Research has been done by leading researchers in the area of technology-enabled supply chain and it helps in
- implementation of supply chain strategy [10]
- providing tangible business value [11]
- creating visibility to upstream and downstream changes in demand or supply [12]
- enabling effective decision-making [12]
- monitoring of the entire supply chain [13]
- seamless linkage between point of delivery/purchase with production [14]
- decreasing customer service lead time [15]

3.3. Barriers for technology enablement of supply chain
The barriers for successful technology enablement of supply chain have been researched in the past but the research has not focused on supply chain only. For this study it is assumed that barriers impacting technology enablement in Enterprise Resource Planning (ERP) space can also be considered for supply chain technology enablement. The barriers have been investigated in three broad categories- 'Employee', 'Technical' and 'Organization'. Total 12 barriers have been identified and are described below.

3.3.1. Category 1- Employee

- Barrier 1: Non-involvement of people- employees play a critical role as technology is an enabler and people/employees are the link [16]
- Barrier 2: Low level of Top Management support- level of support of top management for technology enablement of supply chain [17, 18]
- Barrier 3: Non-involvement of end-users during implementation- end-users should be involved during the entire implementation cycle as non-involvement of end-users don’t motivate them to adopt technology [19]
- Barrier 4: Lack of end user training -proper training and education of end-users is critical for successful implementation [11]

3.3.2. Category 2- Technical

- Barrier 5: Lack of technical know-how - the adoption of technology in an organization depends on the level of technology knowledge among managers [20]
- Barrier 6: Lack of existing technology usage-the future adoption of new technology depends on the technologies already existing in an organization [21]
- Barrier 7: Lack of technical capability of the organization-level of technical capability increases technology adoption. If technical capability is not available then organization should seek training of employees towards technology [22]
- Barrier 8: Risk of information security-fear for data/information security inhibits technology adoption [23]

3.3.3. Category 3- Organization

- Barrier 9: Insufficient budget for technology- higher costs forbid technology adoption among organizations [22]
- Barrier 10: Inappropriate change management- change management is a key component for bringing any change in the way things happen [24]
- Barrier 11: Lack of trust and understanding between partners- trust between partners and cultural alignment between organizations influence technology adoption [25, 26]
- Barrier 12: Fear of supply chain failure- organizations fear that once technology is adopted existing system will not work [8, 27]

4. Result and Discussion
A lot of work has been done by various researchers in the field of technology implementation. This paper has reviewed existing literature and tried to consolidate the previous work but majority of work in this field is focused towards ERP implementation and is not focused on technology enablement of supply chain. This work has identified barriers from ERP implementation also which could possibly effect technology enablement of supply chain.

Technology enablement of supply chain is challenging and 12 barriers have been identified from existing literature. The literature review highlights that focus of Indian organizations is on effective and efficient implementation of technology enabled supply chain.
The critical barriers have been allocated into three broad categories- ‘Employee’, ‘Technical’ and ‘Organization’. The ‘Employee’ barrier emphasizes on non-involvement of people, low level of top management support, non-involvement of end-users during implementation and lack of end user training. The ‘Technical’ barrier emphasizes on lack of technical know-how, lack of existing technology usage, lack of technical capability of the organization and risk of information security. The ‘Organization’ barrier emphasizes on insufficient budget for technology, inappropriate change management process, lack of trust and understanding between partners and fear of supply chain failure.

5. Conclusion
The paper through systematic literature review has emphasized the increasing interest in technology-enabled supply chain in India along with studying barriers affecting technology enablement of supply chain. The paper has collated 12 factors in three categories (‘Employee’, ‘Technical’ and ‘Organization’) highlighting the critical barriers for successful technology enablement of supply chain. The review provides Indian practitioners with a list of barriers and the key focus areas. This paper has taken into consideration only 12 barriers and future research can be undertaken by identifying more barriers. Along with this statistical tools can be used for further analysis.

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