

# Identification and Analysis of Critical Success Factors Influencing Technology Implementation of Supply Chain

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## ABSTRACT

Firms have realized the importance of having an effective supply chain, in order to compete effectively and efficiently. Technology is the back bone which helps in realizing supply chain vision into reality. Disappointing outcomes of implementing IT-enabled supply chain have posed serious challenge and thus it is essential to understand the factors affecting its implementation. The earlier research in implementing IT-enabled supply chain has been fragmented and non-exhaustive. Also, the earlier research has focused mostly on Enterprise Resource Planning (ERP) implementation and less on supply chain. This paper aims to provide literature review in identifying the critical success factors (CSFs) for implementing IT-enabled supply chain. This paper has systematically reviewed relevant papers and has identified 20 CSFs. 20 CSFs have then been further categorized into five categories- 'People', 'Management Processes', 'Project Strategy', 'Structure' and 'Information Systems'. This study will help academicians and practitioners, by providing a framework for implementing IT-enabled supply chain.

**Keywords:** Critical success factors (CSFs); IT-enabled supply chain; Supply chain management (SCM); Technology implementation.

## INTRODUCTION

In today's highly competitive scenario, supply chain is the mantra of successfully running an organization. The competition is no longer between the organizations; it's between the supply chains. The success of supply chain implementation depends on

- Collaboration between partners
- Alignment of supply chain planning and business planning
- Integration of functional areas
- Sufficient establishment of financial, human and technology

Thus, it is essential for an organization to implement supply chain strategy effectively and adequate technology investment is required to realize supply chain vision into reality (Mohsen, A., 2020; Sahay, B.S. et al., 2003). IT-enabled supply chain helps in improved performance and increased collaboration. The features of IT-enabled supply chain are

- Faster implementation of supply chain strategy
- Improve decision making
- Seamless integration of all functional areas of supply chain
- Improve operational benefits like inventory levels, shipment tracking, production scheduling, etc.

From the existing literature, it has been seen that implementing IT-enabled supply chain has not always been successful (Chakravorty et al., 2016; Dwivedi et al., 2015; Kim et al., 2006). 47% of supply chain technology applications failed to meet the expectations (Heckmann, P. et al., 2003) and thus it is essential to identify parameters affecting implementation of IT-enabled solutions.

## NEED FOR THE RESEARCH AND OBJECTIVES

Implementation of IT-enabled supply chain has shown disappointing outcomes posing a serious challenge in adopting IT solutions (Chakravorty, S.S. et al., 2016; Dwivedi, K.Y. et al., 2015). Implementation of IT-enabled supply chain is a major stream and organizations have seen a lot of benefits coming through its implementation (Arora, R. et al., 2020; Esper, L. T. et al., 2010; Manuj, I. et al., 2011; Brah, S.A. et al., 2006). There is a lot of research done in the area of implementation of IT in organizations, but research is scarce and fragmented in the area of CSFs affecting IT-enabled supply chain (Denolf, M.J. et al., 2015). The serious concern for adoption and successful implementation of IT-enabled supply chain has motivated the authors. Thus the need is to prepare a comprehensive list of CSFs and provide guidance to academicians and managers. The main objective of this paper is to find the CSFs for successful implementation of IT-enabled supply chain by undertaking comprehensive literature review.

## RESEARCH METHODOLOGY

The research uses systematic literature review methodology and the steps used are

### Step 1: Research question formulation

The objectives of this research are

- Provide a comprehensive view of CSF's for successful implementation of IT-enabled supply chain
- Categorization of identified CSFs into a framework

Based on the objectives of this study, the following questions were frame

- Research question 1: What previous research has been done to identify the CSFs for implementation of IT-enabled supply chain?
- Research question 2: What inferences have been published by the previous researches?
- Research question 3: What research has been conducted to categorize CSFs into a framework for implementation of IT-enabled supply chain?

### Step 2: Defining the search criteria and selecting the database

The following keyword were used for searching the database “Information Technology (IT) enabled supply chain”, “Technology”, “Barriers”, “Critical success factors”, and “ Supply Chain Management (SCM)”. The databases searched were Emerald, Taylor & Francis, Elsevier, Wiley, IEEE, Inderscience and Google scholar.

### Step 3: Defining the inclusion criteria

Some of the inclusion criteria are

- Previously published research papers
- Proceedings of international conferences

Post initial screening of the articles and removing of duplicates, articles were shortlisted for initial review. Based on the initial assessment of the articles and their relevance for our study, the articles were considered for detailed analysis.

**Step 4:** Analysing and presenting the content of selected papers

The detailed analysis and presentation is provided in the findings section.

**Step 5:** Focus Group Discussion

Division of CSFs into groups via focus group discussion

**LITERATURE REVIEW**

It-enabled Supply Chain

IT-enabled supply chain has become an enabler for the organization (Longfei, H. et al., 2020; Anna L. J. et al., 2020; Hong, I.B., 2002). Organizations have invested a large amount of money in buying IT which had no relation to long-term strategy. Organizations should prepare a clear IT strategy which is aligned to SCM strategy (Qrunfleh, S. et al., 2012) which is in-turn aligned to business strategy.

IT-enabled supply chain has transformed the organizations by delivering the following benefits

- Reduces high level of supply chain complexity (Manuj, I. et al., 2011)
- Improves effectiveness of decision-makers (Chen, I.J. et al., 2004)
- Increases inter and intra-organization collaboration along with monitoring & visibility of the extended supply chain (Thakkar, J. et al., 2008).
- Acts as an enabler, by linking processes throughout the organization (Esper, L. T. et al., 2010)
- Increases efficiency by reducing processing lead time and eliminating errors (Brah,S.A. et al., 2006)

Analysing And Presentation Of The Content From Past Research

CSFs for implementation of IT-enabled supply chain have been identified from the methodology explained above. Based on this, a total of 20 CSFs have been collated. Along with CSFs, key features of the CSFs and references have also been presented in the table 1.

**Table 1.** CSFs, key features of the CSFs

S.No	Critical success factors	References
1	Top management support and commitment	Tarhini, A. et al., 2015; Annamalai, C. et al., 2013; Singh, K.R., 2013; Stanley, E. F. et al., 2006; Favilla, J. et al., 2005
2	Willingness in the organization to invest in technology	Arora, R. et al., 2018; Damien, P., 2005; Hammant, J., 1997
3	Well aligned technology and business objectives	Tarhini, A. et al., 2015; Annamalai, C. et al., 2013; Upadhyay, P. et al., 2011; Done, A. et al., 2011

4	Proper change management process	Saini, S. et al., 2013; Sandhu, M. et al., 2012; Bozarth, C., 2006;
5	Trust between supply chain partners	Kumar, R. et al., 2016; Borade, B. A. et al., 2010; Stanley, E. F. et al., 2006
6	Cultural alignment along supply chain partners	Gunasekaran, A. et al., 2013; Thakkar, J. et al., 2008
7	Technology infrastructure with supply chain partners	Kannabiran, G. et al., 2012; Somuyiwa, A. et al., 2011; Thakkar, J. et al., 2008;
8	Adequate governance and program management during implementation	Stanley, E. F. et al., 2006; Mandal, P. et al., 2003
9	Effective risk mitigation strategy	Giunipero, L.C. et al., 2005; Mandal, P. et al., 2003
10	Involvement of end-users or employees during implementation stage	Shaaban, M.S. et al., 2014; Sandhu, M. et al., 2012; Upadhyay, P. et al., 2011
11	Proper training program for end-users	Denolf, M.J. et al., 2015; Thakkar, J. et al., 2008
12	Job security of employees post technology implementation	Garg, P. et al., 2013; Daneva, M., 2007
13	Competent implementation team	Upadhyay, P. et al., 2011; Hashim, J., 2007
14	Proper information security	Kannabiran, G. et al., 2012; Borade, B. A. et al., 2010
15	Selecting the right supply chain package	Annamalai, C. et al., 2013; Sahay, B.S. et al., 2003
16	Cooperation and commitment of supply chain partners	Olorunniwo and Li, 2010; Buxmann et al., 2004
17	Preparedness for business process reengineering	Garg, P. et al., 2013

18	Data Management	Corney, D, 2002
19	Gaining competitive advantage	Sabir, B.L. et al., 2014; Korotkov, N. et al., 2013
20	Peer Pressure	Kannabiran, G., 2012; Cragg, P. et al., 2002

### GROUPING OF CSFS

A lot of study has been done in the past to group CSFs into various categories. These studies have been covering ERP, e-business and supply chain information systems. In the table 2, few frameworks have been categorized.

**Table 2.** Categorization of CSF

S.No.	Categorization	References
1	People, Management Processes, Project Strategy, Structure and Information System(s)	Denolf, M.J. et al., 2015
2	57 critical factors classified in eight categories (Leadership, Organization and competency, Management, Technology, Overall features and functions, Function for suppliers, Functions for customers and Customers and suppliers)	Li, J., et al., 2004
3	Organizational, Inter-organizational, Human, Technology, Program Management and CPG Sector Specific	Arora, R. et al., 2017

For categorizing CSFs identified from existing literature, we have categorized CSFs into 5 categories as used by Denolf, M.J. et al., 2015. The five categories encompass the 20 CSFs which have been identified from various reviews.

- Project strategy: how the organization (supply chain) fulfils project goals
- Structure: process, structure and functions
- Information system(s): use of technology for the business processes
- People: role, skill, attitude and knowledge of people
- Management processes: steering committee enabling implementation

**Table 3.** Five categories encompassing twenty CSFs

<b>People</b>	<b>Management Process</b>	<b>Project Strategy</b>	<b>Structure</b>	<b>Information System (s)</b>
1. Top Management support and commitment	6. Adequate governance and program management during implementation	10. Trust between supply chain partners	14. Preparedness for business process reengineering	16. Data Management
2. Involvement of end-users or employees during implementation stage	7. Effective risk mitigation strategy	11. Cooperation and commitment of supply chain partners	15. Proper change management process	17. Selecting the right supply chain package
3. Proper training program for end-users	8. Well aligned technology and business objectives	12. Gaining competitive advantage		18. Proper information security
4. Job security of employees post technology implementation	9. Cultural alignment	13. Peer Pressure		19. Technology infrastructure with supply chain partners
5. Competent implementation team				20. Availability of sufficient technology enablement budget

Validation of this grouping has been done by a focus group discussion. The panel consists of 3 supply chain industry experts and 2 academicians having expertise in supply chain and IT. The discussion took place for 1.5 hours and the focus group discussion concluded with the experts reviewing the grouping done and agreeing with the same

## **DISCUSSION ON FINDINGS**

Based on the extensive literature review, the main findings are

- Importance of supply chain in enabling an organization
- In order to implement supply chain effectively, organizations need to invest in IT
- Implementation of IT is a major stream and lot of research has been done in this area. But most of the research has been done in the area of ERP. Few studies have been done in IT-enabled supply chain and these studies are not exhaustive.
- The existing study is not focused on a particular industry segment and is broad based.
- Existing research in identifying factors for implementing IT-enabled supply chain is non-exhaustive.
- Twenty CSFs effecting implementation of IT-enabled supply chain have been identified and grouped into five categories
- ‘Project strategy’- Trust between supply chain partners, Gaining competitive advantage, Cooperation and commitment of supply chain partners, and Peer Pressure
- ‘Structure’- Preparedness for business process reengineering and Proper change management process
- ‘Information system(s)’- Data Management, Selecting the right supply chain package, Proper information security, Technology infrastructure with supply chain partners, and availability of sufficient technology enablement budget
- ‘People’- Top Management support and commitment, Proper training program for end-users, Job security of employees post technology implementation, Involvement of end-users or employees during implementation stage and Competent implementation team
- ‘Management processes’- Adequate governance and program management during implementation, Well aligned technology and business objectives, Effective risk mitigation strategy, and Cultural alignment
- Strengthens existing literature by focusing on implementation of IT-enabled supply chain

## **CONCLUSION AND IMPLICATION**

In order to be competitive in this globalized environment, firms need an effective supply chain strategy. Technology has become a strong pillar of every supply chain strategy implementation and implementing IT-enabled supply chain is the focus of firms. The implementation of IT-enabled supply chain has not been successful and disappointing outcomes have increased focus on understanding CSFs effecting implementation. CSFs are categorized based on how the supply chain organizations fulfill project goals; structure of supply chain; business processes impacted by IT; role of people and management processes.

IT-enabled supply chain requires committed organization along with top management support and effective change management process. Trust and cultural alignment between supply chain partners and ability to invest in IT infrastructure along with their ability to effectively use resources also play a critical role. Employees are at the heart of IT-enabled supply chain, and they should understand implementation rationale along with getting proper training. It is essential to have effective risk-mitigation strategy, program management and governance along with preparedness for Business Process Reengineering.

This research will help industry practitioners and academicians to prepare well for implementing IT-enabled supply chain. The implications from this paper are

- Helps managers to focus on critical and important CSFs influencing IT-enabled supply chain
- Improves decision making by reinforcing the fact that implementation of IT-enabled supply chain makes organization competitive and improves market positioning
- Provides clear understanding to managers that implementing IT-enabled supply chain provides a lot of benefits to the organization and thus should be an area of focus
- Guidance to supply chain partners on the role managers in their organization need to play for implementing IT-enabled supply chain

Future research can be undertaken by using these barriers and doing an in-depth questionnaire based survey followed by use of statistical tools for data interpretation. Also a similar literature review can be conducted for other industries.

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