

“Impact Of Communication Technologies On Modern Supply Chain: A Brief Review Of Literature “.

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ABSTRACT:

Supply chain management (SCM) is the 21st century global operations strategy for achieving organizational competitiveness. Organization are trying to find ways to improve their flexibility and responsiveness and in turn competitiveness by changing their operations strategy, methods and technologies that include the implementation of SCM information technology (IT). However, a thorough and critical review of literature is yet to be carried out with the objective of bringing out pertinent factors and useful insights into the role and implications of IT in SCM. In this paper, the literature available on IT in SCM have been classified using suitable criteria and then critically reviewed to develop a framework for studying the applications of IT in SCM. Based on this review and analysis, recommendations have been made regarding the application of IT in SCM and some future research directions are indicated.

Keywords: *Information technology; Supply chain management; Literature review; Framework*

1. INTRODUCTION:

Modern organizations are in the race for improving their organizational competitiveness in order to compete in the 21st century global market. This market is electronically connected and non-static in nature. Therefore, companies are trying to improve their flexibility level with the objective of being flexible and responsive to meet the changing market scenario (Dubey 2017). In an effort to achieve this, many companies have decentralized their value-adding activities by outsourcing and developing virtual enterprise (VE). All these directed towards the importance of information technology (IT) in integrating suppliers/partnering firms in virtual enterprise and supply chain. Supply chain management (SCM) is an approach that has evolved out of the integration of these considerations. SCM is defined as the integration of key business processes from end user through original suppliers that provides products, services, and information and hence adds value for customers and other stakeholders (Dubey & Gunasekan 2015;Kim 2011).

SCM is an increasingly applied operations paradigm for enhancing overall organizational competitiveness. A recent survey of more than 300 supply chain-related executives found that 92% of those surveyed were

planning to implement one or more supply chain initiatives (Hitt 2015). SCM is based on the integration of all activities that add value to customers starting from product design to delivery.

According to Wang (2016) and Festo (2010) SCM is a set of approaches utilized to effectively integrate suppliers, manufacturers, warehouses, and stores, so that merchandise is produced and distributed at the right quantities, to the right locations, and at the right time, in order to minimize system wide cost while satisfying service level requirements.

There are numerous articles on the strategies, techniques and technologies for the design and development of SCM. Also, several literature- survey papers which include taxonomy of SCM, and modeling and analysis of SCM (Dubey 2017). However, there is a very few literature survey article that deals with IT in SCM. However, it is impossible to achieve an effective supply chain without IT. Since suppliers are located all over the world, it is essential to integrate the activities both inside and outside of an organization. This requires an integrated information system (IS) for sharing information on various value-adding activities along the supply chain. IT is like a nerve system for SCM. There are many articles on IT in supply chain. Most of the literature discusses only the implications of one or two aspects of supply chain, for example, strategies, tools and techniques, but not in an entirety. However, a comprehensive survey of IT in SCM will be useful to identify the critical success factors of IT for an integrated supply chain. Unfortunately, design and implementation of IT system for an effective SCM have not received adequate attention from both researchers and practitioners, in particular, business to business (B2B) e-commerce (EC) and SCM. There are lots of debates around the applications of IT in SCM concerning business to business e-commerce model, matching to business model, etc. Considering the importance of IT in achieving effective SCM, an attempt has been made in this paper to review the literature on IT in SCM based on suitable criteria. The main objective here is to identify the major issues surrounding the application of IT in SCM, using suitable classification scheme and develop a framework for IT applications in SCM. Also, some future research directions are indicated for developing IT embedded SCM system.

However various studies (Dubey & Gunasekaran 2015; Hitt 2015; Shoenherr 2015; Closs.2000) has explained use of information technologies in supply chain management. And also produced details of different type of IT system These are as follows this review focuses on impact of communication technologies on supply chain performance so more attention has been given to the those elements which comes under communication technology.

1	Backbone of logistic information system	1.Enterprise resource planning 2. Legacy system.
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2	Communication system	1.EDI 2.EPC 3. Bar-coding& scanning. 4.RFID 5.Internet 6. Satellite.
3	Execution system	1. Warehouse management system. 2. Transport management system. 3. customaries selection with ERP.

The organization of the paper follows as Section 2 discusses objectives of same study. The details of the research methodology are presented in Section 3. Section 4 presents the researcher proposed model with respect to selected literature available on IT in SCM. A brief review of the literature is presented in Section 5. In Section 6, represent research gaps. Section 7 present conclusion and section 8, 9, 10, 11 present future direction, managerial Implication, followed by Bibliography.

2. OBJECTIVES OF REVIEW

1. To analyze impact of communication technologies on supply chain performance.
2. Implementation and adoption of new technology always causes financial bourdon on the organization. Few studies have mentioned that implementation of connective technologies not show quick result in supply chain performance. The important objective of review is to understand, do the benefits outweigh the cost of implementation of communication technology?
3. as big firm (like Wal-Mart) can manage to adopt new technology in shorter time and also enforced supplier to adopt it. This review is an attempt to understand size of firm and its role in adoption of new technology.
4. External environment (political, economical, infrastructure etc.)play an important role in adoption and implementation of new technology.(Lin 2011)(Voronnaeu 2009)Various studies has been done in context of developed countries like USA,Germany.
5. Role of employee is important, as effective implementation could be possible with co-ordination and co-operation from employee. Also point to be noted that technology causes operation deployment which is directly related with decreasing labor cost. Focus has been made to understand acceptance from employee for connective technology.
6. Integration of customer is essential to understand his demand fluctuation. Focus is required to understand whether technology implementation make positive impact on buying process.

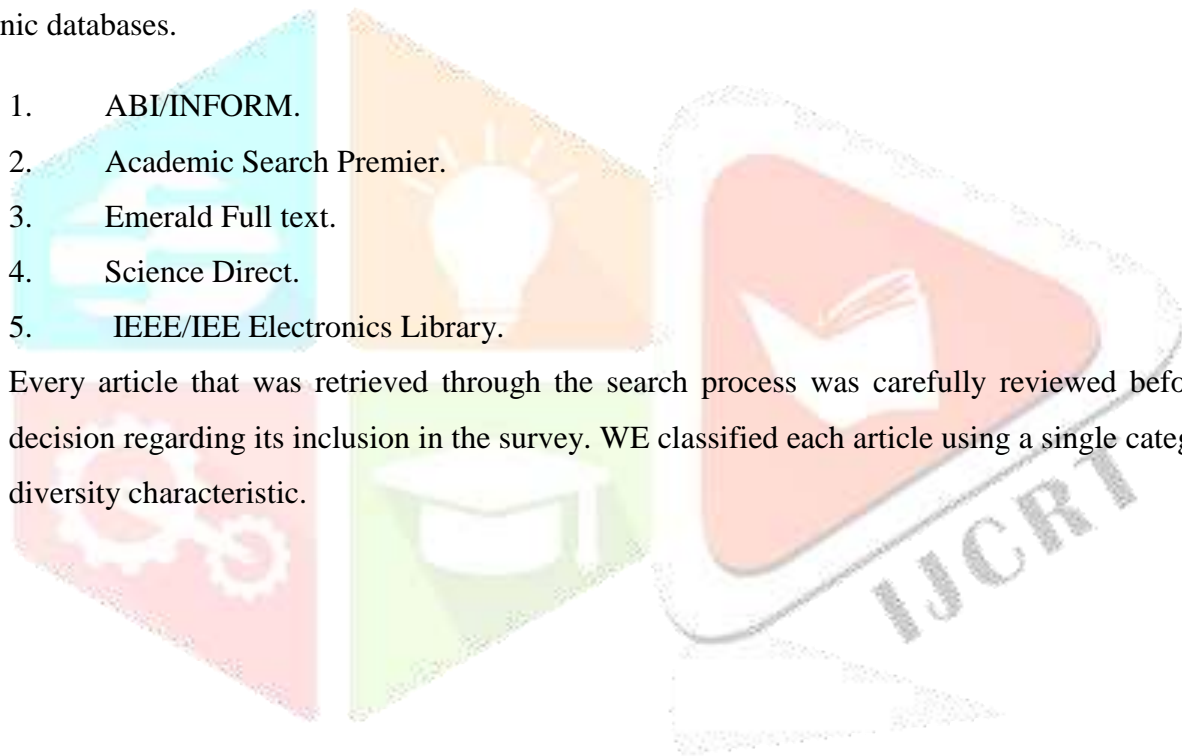
7. This study will try to produce justification for supply chain traceability will improve supply chain performance and if yes, this enhanced performance can convert into competitive advantage.

3. Research Methodology:

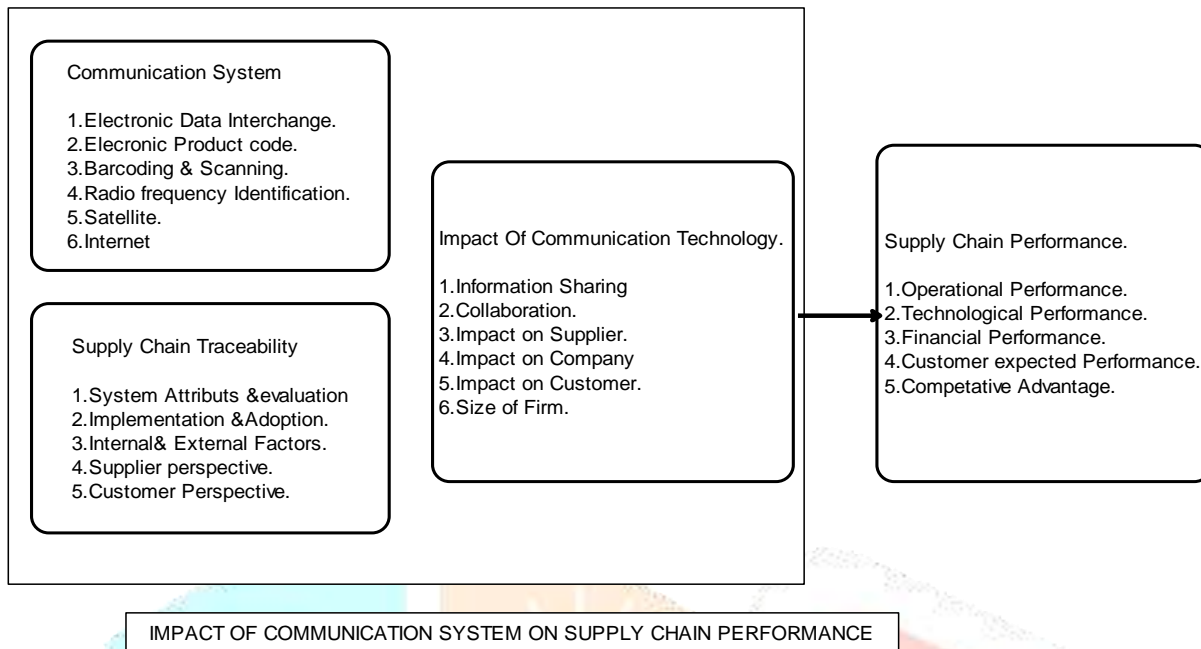
The aim of this study is to analyze impact of traceability impact on supply chain performance. To accomplish the study aims, this research is based on the examination of various journals, all of which are directly related to Information Technology and its application. As we believe that journals are the recourses that are most commonly used to acquire information and release new findings, conference papers, Master Theses, doctoral dissertations, text books, news reports, and unpublished working papers are excluded. Due to the youth and diversity of this area of research, journals, and thus a literature search was conducted using the following electronic databases.

1. ABI/INFORM.
2. Academic Search Premier.
3. Emerald Full text.
4. Science Direct.
5. IEEE/IEE Electronics Library.

Every article that was retrieved through the search process was carefully reviewed before making a decision regarding its inclusion in the survey. WE classified each article using a single category for each diversity characteristic.



4. PROPOSED MODEL:



5. REVIEW OF LITERATURE.

1. Gunasekaran, A et al. (2017) This study acknowledges the importance of big data and predictive analytics (BDPA) in achieving business value and organizational performance. However, the impact of BDPA assimilation on supply chain (SCP) and organizational performance (OP) has not been thoroughly investigated. To address this gap, this research draws on resource-based view. It conceptualizes assimilation as a three stage process (acceptance, routinization, and assimilation) and searched out the influence of resources (connectivity and information sharing) under the mediation effect of top management commitment on big data assimilation (capability), SCP and OP. The findings suggest that connectivity and information sharing under the mediation effect of top management commitment are positively related to BDPA acceptance, which is positively related to BDPA assimilation under the mediation effect of BDPA routinization, and positively related to SCP and OP.

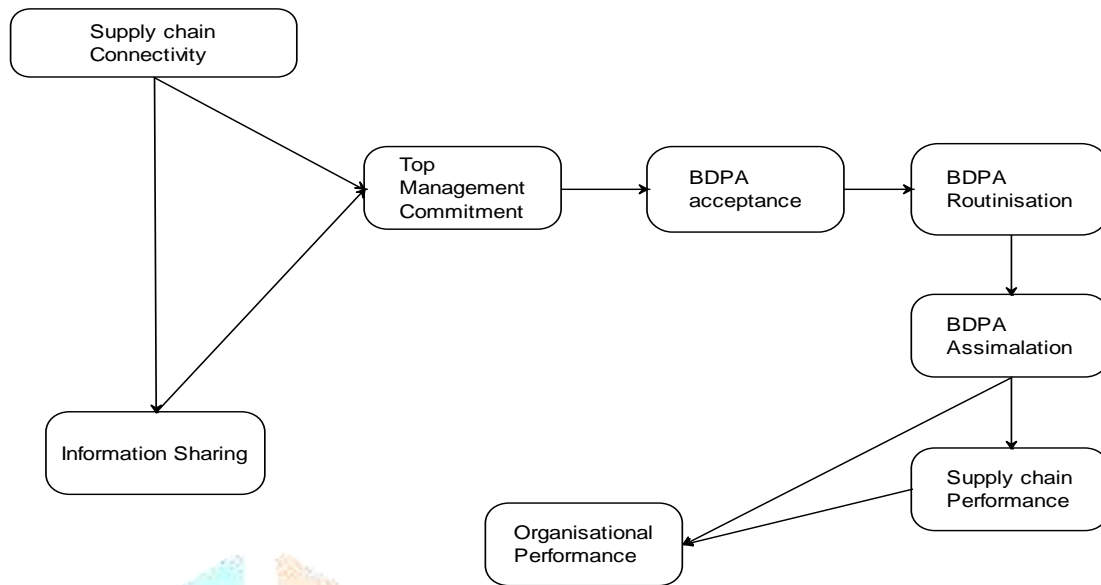


Fig 1 Proposed Model for Big data and predictive analytics for supply chain

2. Srinivasan (2017) Many business are seeking to develop and exploit analytics capabilities today. Using organizational information processing theory (OIPT), the study demand visibility and supply visibility as foundational resources for analytics capability, and organizational flexibility as a complementary capability. The research further examine relationships among these factors under varying conditions of market volatility, a type of environmental uncertainty. The results from our analysis of data from 191 global firms indicate that both demand and supply visibility are associated with the development of analytics capability. In turn, analytics capability is shown to be more strongly associated with operational performance when supply chain organizations also possess organizational flexibility needed to act upon analytics-generated insights quickly and efficiently. Furthermore, the empirical results indicate that analytics capability and organizational flexibility are more valuable as complementary capabilities for firms who operate in volatile markets, rather than in stable ones. These findings extend OIPT to create a better understanding of contemporary applications of information processing technologies, while also providing theoretically grounded guidance to managers in the development of analytics capabilities within their firms.

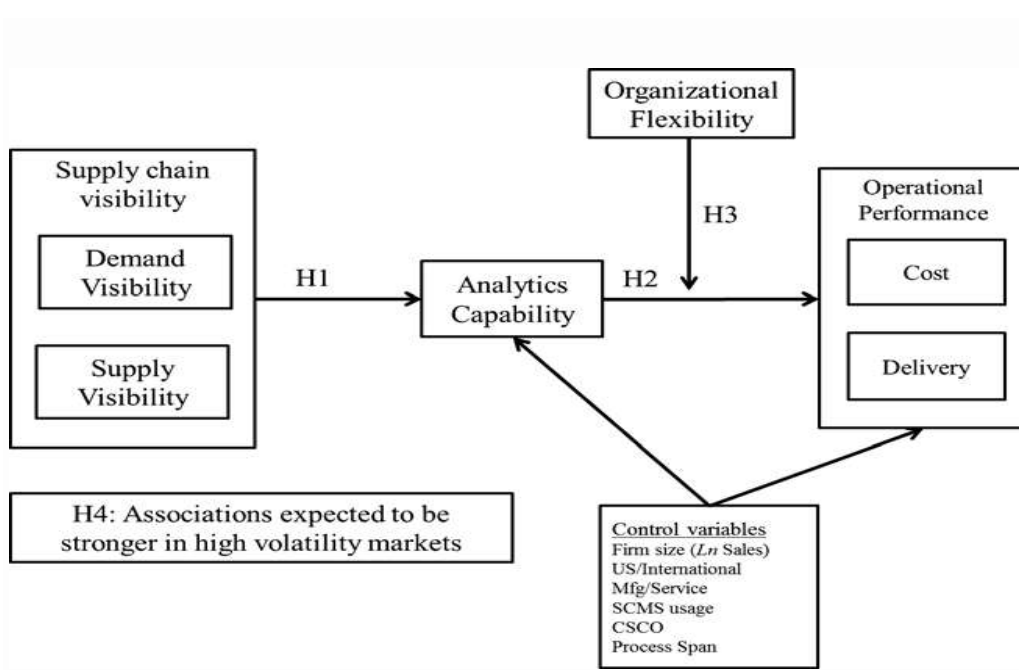


Fig 2: The conceptual model for An Investigation of Visibility and Flexibility as Complements to Supply Chain Analytics

3. Sanchez, A., (2010):- This research analyses the impact of EDI on inter-organizational co-operation along with co-ordination in the supply chain for Spanish automotive supplier. The use of EDI is greater among supplier that perceive more strategic benefits, fewer cost and organizational difficulties. The pro-active management, are less dependence on suppliers, operational & strategic benefits, mainly are of technology, organizational, external pressure, pro-active management, supplier dependence mutual understanding, coordination with customer & supplier, company size ties, experience in use & EDI.

Study indicates that adopters have operational benefits reduced difficulties and high degree of co-operation & co-ordination over non-adopters study should carried out to focus performance improvement of logistic

function with the help of EDI in automobile supplier industry where-

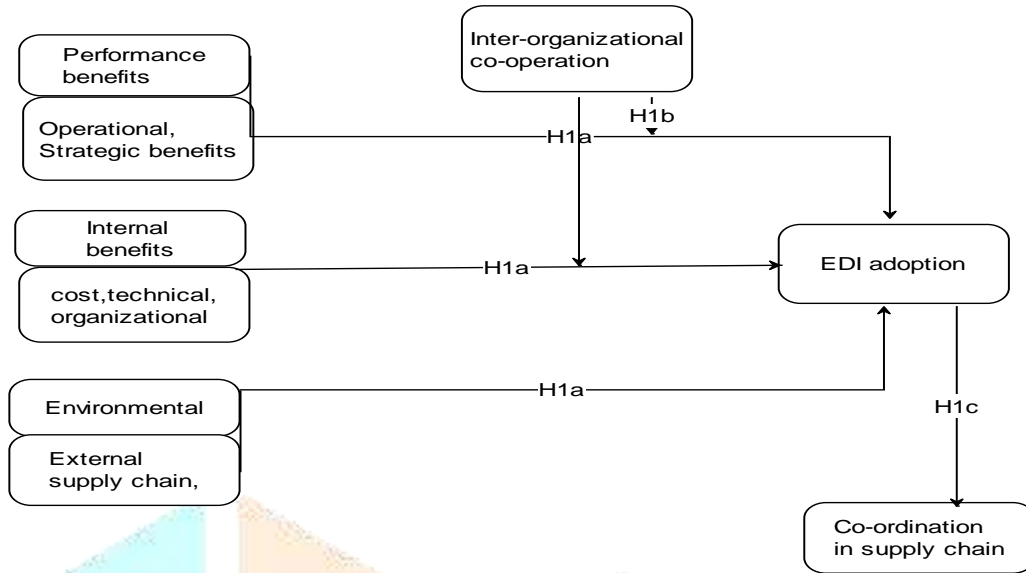


Fig.3 The conceptual model of EDI on inter organizational co- operation

Higher co-ordination is required.

4. White, A., (2008):- This study focused on use of EDI with the potential to improve the performance in supply chain with the study of early adopters in Europe. This study consists of two key elements namely factors that determine the outcomes of RFID adoption and outcomes themselves. First variable is divided into four variables as customer mandate, industry sector, perceived organization innovativeness and level of integration, embedded vs. slap & ship. The second component covers anticipated benefits, anticipated ROI and operational deployment. The results state that use of RFID yields faster sales cycle, competitive advantage and cost reductions for organizations. It could be concluded from above study that tracked data if share with supplier in faster change result in performance of supply chain.

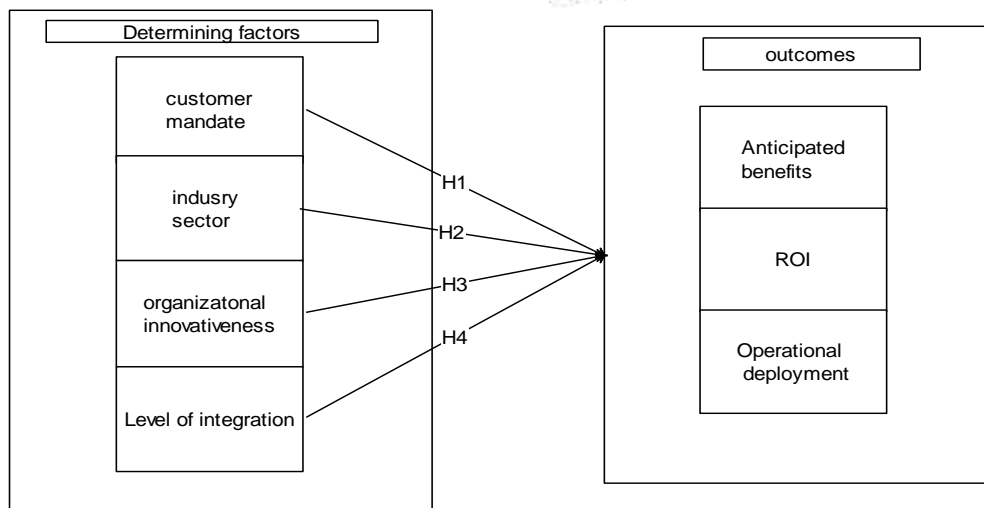
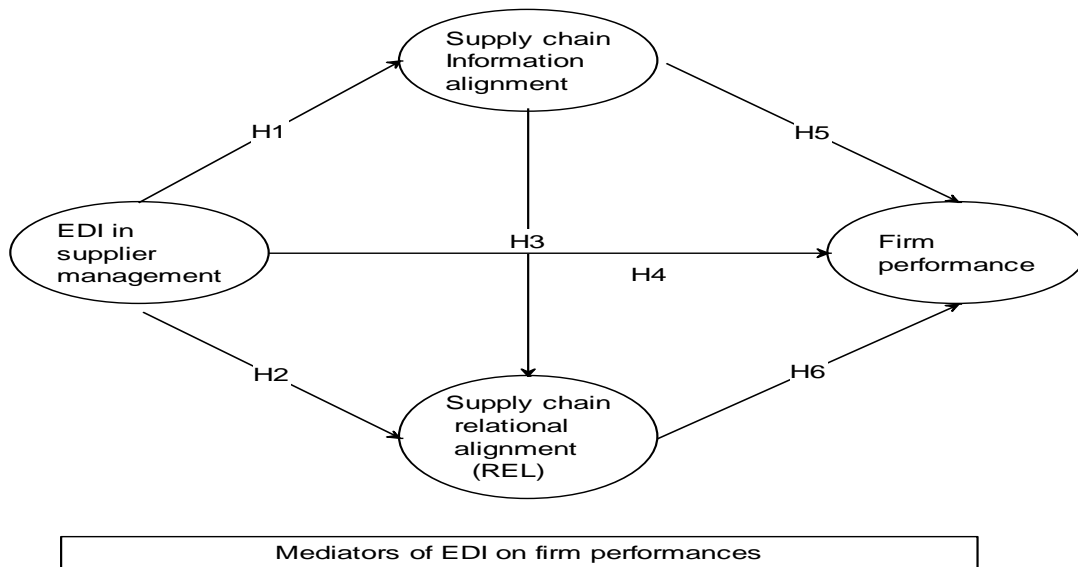


Fig 4. Conceptual model developed on RFID outcomes.

5. Savitskie, K., (2007):- The study investigates the internal and external logistics information technology from an international perspective. The first focus was to categories LIT into internal and external LIT, and the second was to determine the relationship between them. Internal LIT is used to share information within firm. The parameters used under it are logistics information system, integrated database and access method for sharing. External LIT is used for communication and information exchange. It includes parameters like sharing information, facilitating e-commerce, increase the use of EDI. Overall study gives the information about the role of LIT and investments in LIT, given the linkage between internal LIT and external LIT. , It carries strong limitation of small sample size. Same study is expected to carry out in different types of business domain to analyze usefulness of proposed work.

6. Tan.K.C (2010): The study present multi dimensional framework for considering EDI adoption in supply chain management and its effects on relational alignment. EDI has been viewed largely as a technology to allow firms to exchange data. However, EDI also serves as a means for alignment around shared objectives. The results show that merely considering EDI capability to be important or aligning information sharing will not lead to better performance. Prior literature, with few exceptions, has emphasized direct linkages between EDI use and performance without examining the role of mediating variables. The major contribution of this study is in demonstrating the role of supply chain information and relational alignment as mediating variables. The study not only illustrates the importance of attitudes towards EDI in facilitating this alignment, but it also demonstrates that the value of EDI comes in part, if not significantly, from efforts to build inter-firm relationships and aligning information flows in the context of these relationships. Developing elements of the "soft" infrastructure including information and relationships is thus a key to enabling firms to work together for mutual benefit. This in turn requires that firms carefully consider their own as well as partner EDI capabilities when managing suppliers.



7. Azvedo.,(2009) :- The study carried out by researcher to identify role of communication technologies in logistic firm. Four variables like individual, organizational, technological, and environmental studied. These four factor grouped with communication technologies .It is proposed by researcher that use of ICT can significant impact on the performance of an organization.

Tough this study cover big span it not produce justification for following statement. Adoption and implementation always can create challenge in front of management. Researcher has focused on only aspect of it. (i.e. after success full implementation ICT become competitive advantage.).Some study should carried by making additional focus on difficulties faced in internal co-ordination.

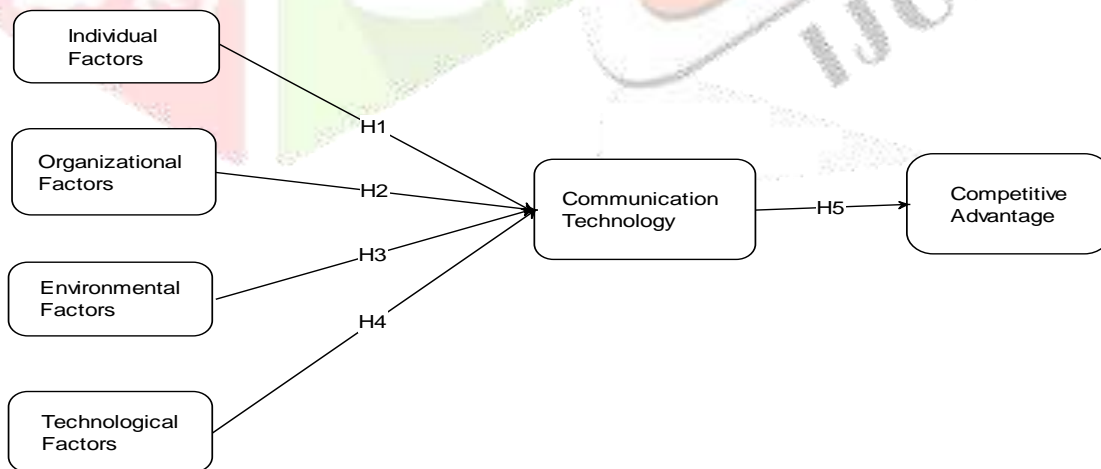


Fig.6 Importance of information and communication technology in promoting competitive advantage

8. Li.et.al (2009): This study focus impact of IT implementation on supply chain performance and supply chain integrations. Result shows that IT implementation didn't support supply chain performance, but strongly

support supply chain integration, which ultimately result for better supply chain performances. As supply chain performance cover cost, quality, flexibility and time which are inclusive of money. Detailed analysis should be done to give investment priority either supply chain performance or information technology.

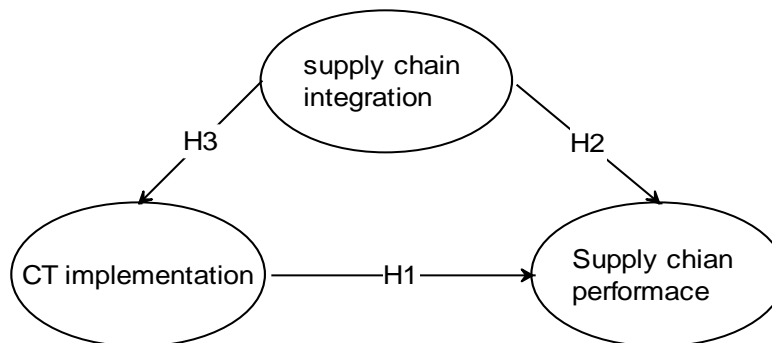


Fig: 7 Impact of CT on SCP&SCI

9.Germine, R., (2001):- This study proposer connection between EDI technology adoption and just-m-time (JIT) strategy in theoretical framework content refers to organizational immediate operating environment that is uncontrollable by management in short-run, size described by physical scale & operation and environment uncertainty refers to unpredictability in external including technologies customer competitor & market involved in manufacturing and operation based on review of literature concepts are taking into existence are size and JIT strategy, environmental uncertainty and JIT strategy, production complexity and JIT strategy adoption, production complexity and environmental uncertainty, effect of form size on EDI adoption. The result depicts that EDI adoption depends primarily on extent of JIT strategy implementation and secondarily on organizational context. This result output of research of few manufacturing firm. Same model should applied for small and medium scale organization.

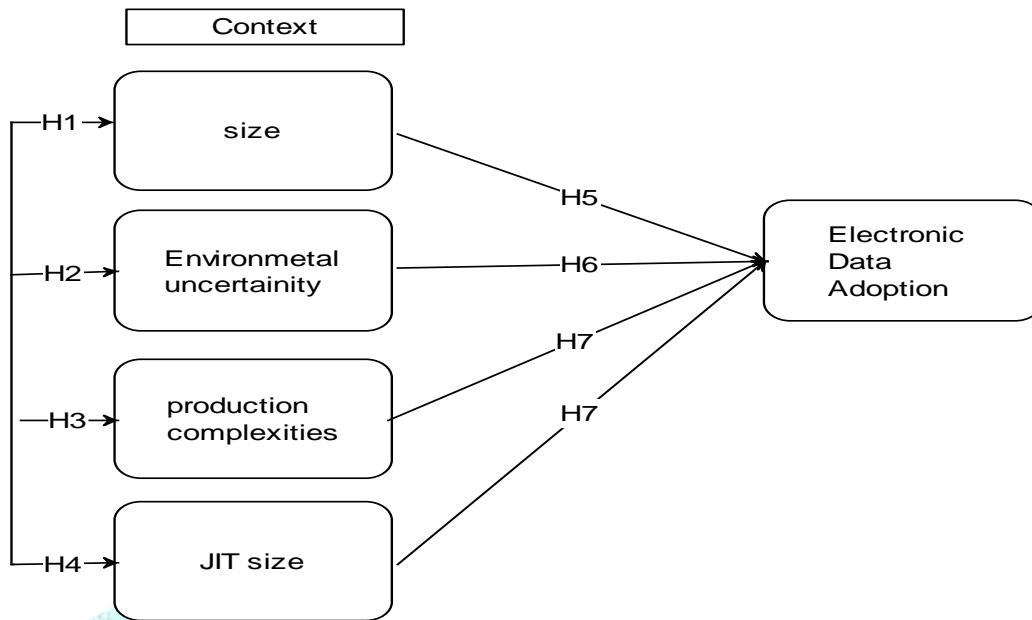


Fig.8 Conceptual model EDI and its impact on JIT

10.Larson, P., (2007):- Focuses on the performance improvement programs and its impact on logistics people as well as performance. The two most popular programs are EDI and outsourcing. Performance improvement programs are classified under three groups:

- i. Technological program – improve logistics performance not relations.
- ii. Relational program – improves both logistics performance and relations.
- iii. Analytical program – improves logistics performance not relationships.

The survey studied the impact of programs on co-operative relations and customer service and total costs. The programs included benchmarking, TQM, ILM, carrier reduction, bar-coding, EDI, JIT and outsourcing. The research unable to produce justification for following points,

. Does the communication level between people makes positive impact on logistic performance?

2. Change in result, if applied in developing country like India.

11. Smith, A., (2005):- The purpose of this paper is to understand impact of reverse logistic to accommodate return item by customer In return item by customer though web based technologies with the help of RFID. In return management researcher has focused following parameters of supply chain they are capability, customer return centers, compatibility customer return centers, Distribution centers of reverse logistics, strategic sources web-based Auto identification and data capture (AIDC),RFID system observed as great tool for collecting data for return product The reverse logistic strategy having following steps involved. 1) Assessing the role of reverse

logistics 2) Information supports 3) Relationship commitment. Study also focuses on cost and non-glamorous part of reverse logistics, but as reverse logistic related with customer relationship management, organization can seek greater advantage by adopting reverse logistics as part of strategic supply chain, increased Brand image and shows responsiveness to society.

This study linked with RFID and its application for returnable goods through web based technology. Though this study covered important aspect of reverse logistic still it uncover following points, to improve online purchase experience whether managing good return is more important than fast, effective service, and user-friendly solutions.

11. **Trainor.k.j.et.al** (2011): This research focuses on performance implication and information technologies with marketing capabilities. Model was derived having eight measure parameters. These are market orientation, technological orientation, competitive environment-marketing capabilities, market turbulence, competitive intensity, customer performance, organizational performance. Industry should pay special attention to complementary resource that is needed to be successfully implemented. IT enabled marketing initiative and emphasis on technology is not sufficient. However this study lacks to produce justification for some firm which realizes more gain from e-marketing initiative than other firm. A study should carry out to investigate it.

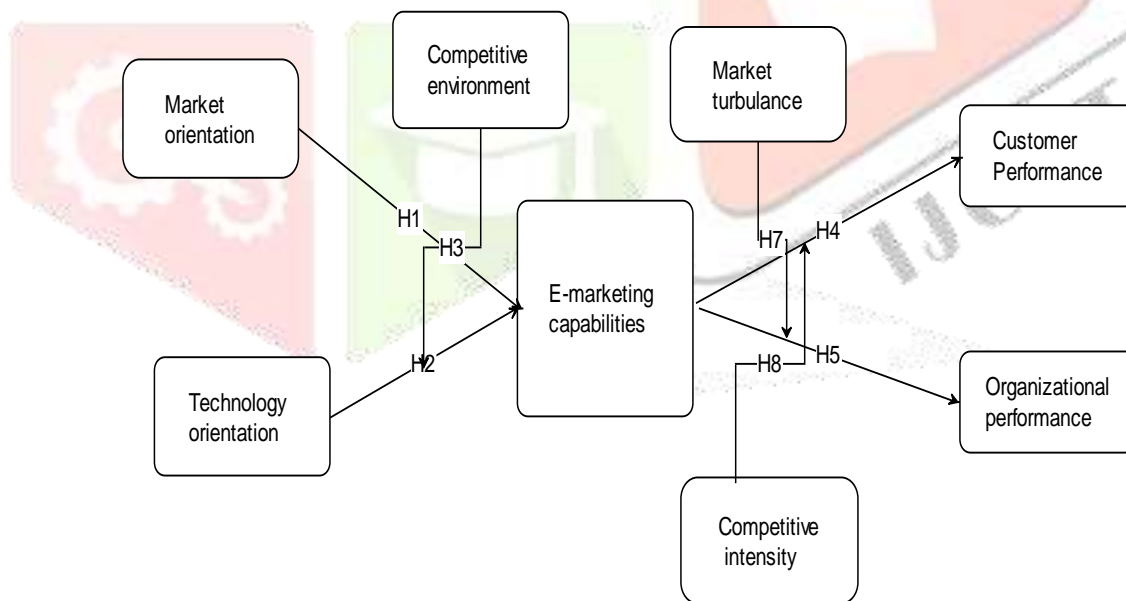


Fig: 9: Impact of firm level resources on e-marketing capabilities.

6. RESEARCH GAPS:

1. Investment for new technology is always matter of concern for management, As it is important for manufacturer to know return on capital employed. (Bollou 2006)(Ding 2011) Few studies have focused this

issue. A study should be carried out to calculate cost of implementation of communication technology & in return benefits achieved in stipulated time. As implementation CT does not show quick impact on supply chain performance.

2. Communication technology causes operational deployment. Which may resulted to decrease labor cost. A Study should carry out to understand role of management and employee on same issue. As decrease in labor cost is directly associated with ROI.

3. The big firm like Wal-Mart, IBM forces their supplier to adopt new technology related with supply chain. Study should carry out in Indian Automobile field where inter organizational co-operation is highly desirable.

4. Some study shown great result for adoption of new technology in big firm .A study should be carry out to find out size of firm matters in adoption and implementation of new communication technologies.

5. Impact of external factor (political, infrastructure, economical) play an important role in adoption and development of new technology. Indian business scenario changes from last decay of 20th century. Various model developed by researcher to identify impact of CT on supply chain performance tested positively. Similar study should carry out in country like India which is differing in external factor as compared with developed country.

6. Customer is an integral arm of supply chain management. In-fact he evaluate supply chain performance on own criteria (fast, effective, efficient).A study should carry out to understand customer behavior after implementation of new technology.

7. CONCLUSION:

Technology also plays an important role in the success of supply chain management. Even though the supply chain concept pre-dates the Internet, only through the use of web-based software and communication can it truly reach its full potential. Before the use of communication technologies companies were limited because they were not able to receive or to send updates, feedback, or other important information in a timely fashion. Additionally, companies were limited in their ability to work with global partners because of language barriers and time differences. Using the communication technologies to handle most of the elements involved in supply change management, including procurement and communication, makes the exchange of data and the running of the supply chain faster.

While the benefits of supply chain management are many, using technology to achieve those benefits does have two main drawbacks: one is resistance from vendors and the other is resistance from employees. Suppliers of goods are often hesitant to jump onboard because of the initial costs involved in setting up their own end of supply chain management system and because most vendors do not have a trusting relationship with their buyers. To overcome this obstacle, the strong relationship must be present and the seller needs to be able to see the profit potential on their end of the arrangement. Likewise, many employees have learned to develop a hate-hate relationship with new technology. After all, it costs them their jobs and often makes them feel that their work is more tedious or more complicated. Plus, software mistakes, which are inevitable at the beginning, may cause other employees to lose faith in the system altogether. Employees need to trust the system, the company, and their ability to use the program if they are going to adopt the supply chain management software.

8. FUTURE RESEARCH DIRECTION.

It has been demonstrated that communication technologies are an essential ingredient for business survival and improves the competitiveness of firms. As a result of the literature review, we can see that IT has a tremendous influence on achieving an effective SCM. Integrating the supply chain activities is driven by the need to streamline operations to achieve quality service to customers. There are many research articles on IT in SCM, but there is a lack of critical review of the literature with the objective of brings out the pertinent factors that would influence the successful application of IT in SCM. In this paper, an attempt has been made to review the literature on IT in SCM and to develop a framework for the development and implementation of IT in SCM.

Besides, the following are comments that derived from the literature survey on IT in SCM:

1. The strategic role of supplier/vendor, and customer in IT driven supply chain require more focus.
2. Information systems architecture needs to be designed for SCM that could be different from that of traditional organizations.
3. Successful information systems are not easy to implement in SCM. They require support from employee internally and also with external partner.
4. Commercial enterprise information systems require flexibility in order to accommodate individual organizational characteristics.
5. Performance measures and metrics need to be established for measuring the performance and suitability of IT in SCM.
6. There is a need for developing standards and legal frameworks for the application of IT in SCM.
7. The alignment between information model and supply chain model or objectives needs further investigation.

9. FUTURE SCOPE:

The fast-paced evolution of information technology continues to offer new tools for firms to apply in logistics planning and operations. In particular, the development of enterprise resource planning (ERP), Internet-based e-commerce and e-business applications, collaborative planning, forecasting and replenishment (CPFR), RFID, and advanced planning and scheduling (APS) certainly offer significant potential to enhance logistics performance. However, the new developments in ERP, Internet, CPFR, and APS, RFID still build on the empirical observations developed in this paper. New technologies employ the infrastructure developed using EDI, real-time communications, and bar-coding.

The current level of these new technologies still focus on the transaction- oriented planning and operating applications that share substantial common ground with the "traditional" technology such as EDI, bar-coding and satellite communications. This leads us to believe that much of our findings related to "traditional" LIT would also be applicable to this new LIT technique to a certain extent. While this research has focused on the development leaders and trends for LIT, there is certainly a need for comparable research investigating the application of these newer technologies.

10. BIBLIOGRAPHY:

1. Azevedo. *et al.* "The role of logistic technologies and communication technologies in promoting competitive advantage of firm" *The ICFAI University Journals of Managerial Economics* Vol.6.No.3 2009.pp 1-20.
2. Brah, S., and Lim, H., "The effect of technology and TQM on the performance of logistics companies", *International Journal of Physical Distribution & Logistics Management*, Vol. 36 No. 3, 2006, pp. 192-209.
3. Brandon-Jones, E., Squire, B., Autry, C. W., & Petersen, K. J. (2014). A contingent resource- based perspective of supply chain resilience and robustness. *Journal of Supply Chain*
4. Byrd.T.*et.al.*"Examination of path model relating technology infrastructure with firm performance." *Journals of Business Logistics*. Vol.29, No.2 .2009.pp161-187.
5. Chao.S.L. *et.al* "Critical factor affecting adoption of container security service: The shipper perspective" *.International Journal of Production Economics*.122, 2011. pp 67-77.
6. Closs.D., "Logistics information technology practice in manufacturing and merchandising firms – an international benchmarking study versus world class logistics firms", *International Journal of Physical Distribution & Logistics Management*, Vol. 30 No. 10, 2000, pp. 869-886.
7. Ding.H., "Information sharing and profit allotment based supply chain co-operation." *International Journal of Production Economics*. Vol.122.2011, pp 566-578.
8. Dubey, R., Gunasekaran, A., & Ali, S. S. (2015). Exploring the relationship between leadership, operational practices, institutional pressures and environmental performance: A framework for green supply chain. *International Journal of Production Economics*, 160, 120-132.
9. Dubey, R., Gunasekaran, A., Papadopoulos, T., Childe, S. J., Shibin, K. T., & Wamba, S. F. (2017). Sustainable supply chain management: framework and further research directions. *Journal of Cleaner Production*, 142, 1119-1130.

10. Fabbe-Coster, N., *et al.* "Supply chain integration: the role logistic service providers", *International Journal of Productivity & Performance Management*, Vol. 58, No. 1, 2009, pp. 71-91.
11. Festo.o.et.al, "Information sharing and collaboration pricing in reverse logistic system " *Supply chain management an International Journal*. Vol15 No.6 2010, pp 454-467.
12. Galloway, I., "Design for support and support the design: integrated logistic support-the business case", *Logistic Information Management*, Vol. 9 No. 1, 1996, pp. 24-31.
13. Girmenez, C. *et al.*, "Logistics integration processes in the food industry", *International Journal of Physical Distribution & Logistics Management*, Vol. 16 No. 3, 2006, pp. 231-249.
14. Hasan M.et al, "Implementation of ERP of the Australian manufacturing companies" *Industrial management and data management*.Vol.111 No.1, 2011 pp 132-145.
15. Hellstorm.D., *et al* "The cost and process of implementation of RFID technology to transport item " *International Journal Of Logistics:Resaerch application* .vol.2 2009 pp 1-21
16. Hitt, M. A., Xu, K., & Carnes, C. M. (2015). Resource based theory in operations manage- ment research. *Journal of Operations Management*, 41, 77–94.
17. Jayraman. V.*et al.* "Role of information technology and collaboration in reverse logistic supply chain." *International Journals of Logistics: Research Application*.Vol.11No.6. 2008 pp 408-432.
18. Johanson, O., and Palsson, H., "The impact of auto-ID on logistics performance –A-benchmarking survey of Swedish manufacturing industries", *An International Journal*, Vol. 16 No. 4, 2009, pp. 504-422.
19. Kearney A. T., "Achieving customer satisfaction through logistic excellence", *Managing Service Quality*, Vol. 4, No. 2, 2004, pp. 47-50.
20. Kim.J.;*et al* "A market based approach for dynamic vehicle development planning using RFID information." *International Journal Of Production Economics*.128,2011; pp 234-245
21. Kim.S.*et.al.*, "Understanding users behavior regarding supply chain technology: Determining impact on implementation of technology in South Korea." *International Journals Of Information Management*.224,2011."pp 119 -131.
22. Lai, F., Zhao, X., "The impact of information technology on the competitive advantage of logistics firms in China", *Industrial Management & Data Systems*, Vol. 106 No. 9, 2006, pp. 1249-1271.
23. Larson, P., *et al* "Logistics improvements programs – The dynamics between people and performance", *International Journal of Physical Distribution & Logistics Management*, Vol. 29 No. 2, 2007, pp. 88-102.
24. Li.G &Sohal A.S "The impact of IT implementation on supply chain integration and performance". " *International Journal of Production Economics*.120 (2009); pp125-138.
25. Lin., Hutchinson, J., "Radio frequency identification (RFID) in china: Opportunities and challenges", *International journal of Retail and distribution management*, Vol.33, No.12, 2011, pp.905-916.
26. Ngai,E., and Gunasekaran, A., "Implementation of EDI in Hong Kong: an empirical analysis", *Industrial Management & Data Systems*, Vol. 104 No. 1, 2004, pp. 88-100.
27. Ngai. *et al* "RFID future research direction". *International Journal of Production Economics*.122 ,2008 pp 512-534.
28. Park.K.S, "Perception of RFID technologies a cross national study " *Industrial management and data system*. Vol.110.No.5, 2011.pp 682-700.
29. Qu.W.G.et.al, "Impact of experience on open Inter organizational system adoption" *Industrial management and data system*.Vol.111 No.3, 2011 pp 432-448.
30. Sanchez, A., M., and Perez, M., "The use of EDI for inter organizational co-operation in the supply chain", *Integrated Manufacturing Systems*, Vol. 14 No. 8, 2010, pp. 642-651.

31. Sari.K. "Exploring the impacts of radio frequency technology on supply chain performance." *European Journal of operation research*.207 (2009).pp174-189.
32. Saura, I., *et al.* "Logistics service quality: a new way to Loyalty", *International Journal of Physical Distribution & Logistics Management*, Vol. 33 No. 8, 2002, pp. 651-679.
33. Savistkie, *et al.* "Logistics information alignment: a reference framework", *Journal of Manufacturing Technology Management*, Vol. 15 No. 3, 2007, pp. 280-290.
34. Savistkie., "Internal and external logistic technology" . *International Journals of Logistics: Research Application*.Vol.11No.6. 2007 pp 232-244.
35. Schoenherr, T., & Speier-Pero, C. (2015). Data science, predictive analytics, and big data in supply chain management: Current state and future potential. *Journal of Business Logistics*, 36(1), 120–132.
36. See, W., *et al.* "Wireless technologies for logistics distribution process", Vol.18 No.7, 2007, pp.876-888.
37. Sezen, B., *et al.* "The role of logistics in linking operations and marketing and influences on business performance", *The Journal of Enterprise Information Management*, Vol. 18 No. 3, 2005, pp. 350-356.
38. Slettemeas D. *et al.* "RFID in consumer product relation or Orwellian Nightmare? Challenges for research and policy". Springer science, Business Media.2009 pp 220 -243
39. Smith, A., *et al.* "Reverse logistics programs: gauging their effects on CRM and online behavior", *The Journal of International and Knowledge Management*, Vol. 35 No. 3, 2005, pp. 166-181.
40. Smith, J., Lee, L., Gleinn, M., "The impact of RFID on service organizations: a service chain profit perspective", *Managing Service Quality*, Vol. 19 No. 2, 2009, pp. 179-194.
41. Speier. C.*et al.* "The role of information integration in facilitating 21st century supply chains." *Transportation Journal*.vol.4.No.2 2009 pp 21-38
42. Srinivasan R., M. Swink. An investigation of visibility and flexibility as complements to supply chain analytics:an organizational information processing theory perspective. *Production and Operations Management* (2017), <https://doi.org/10.1111/poms.12746>
43. Sum, C., Ngai K., "Strategic logistics management in Singapore", *International Journal of Operations & Production Management*, Vol. 21 No. 9, 2001, pp. 1239-1260.
44. Tan.K.C, "Supply chain information and relational alignment: mediators of EDI on firm performance " *International Journal of physical distribution and Logistic management*.vol.40 No.5.2010.pp 377-394.
45. Trainor..K.J.et.al; "Integrating information technology and marketing: An examination of drivers and e-marketing capabilities." *Industrial marketing management*.40, 2011 pp 162-178.
46. Varonnaeu.S; "RFID benefits and cost possibilities: The economical analysis of RFID deployment in cruise corporation global service supply chain" *International Journal Of Production Economics*.122(2009)pp692-702
47. Walton, S., Gupta, J., "Electronic Data Interchange in an integrated supply chain", *International Journal of Operations & Production Management*, Vol. 19 No. 4, 1999, pp. 372-388.
48. Wamba, S. F., Akter, S., Edwards, A., Chopin, G., & Gnanzou, D. (2015). How 'big data' can make big impact: Findings from a systematic review and a longitudinal case study. *International Journal of Production Economics*, 165, 234–246.
49. Wang, G., Gunasekaran, A., Ngai, E. W., & Papadopoulos, T. (2016). Big data analytics in logistics and supply chain management: Certain investigations for research and applications. *International Journal of Production Economics*, 176, 98–110.
50. White, A., Johnson, M., "RFID in the supply chain: lessons from European early adopters", *International Journal of Physical Distribution & Logistics Management*, Vol. 38 No. 2, 2008, pp. 88-107.

- 51. Wyld, D., *et al.* “RFID: the next big thing for management”, *Management Research News*, Vol. 29 No. 4, 2006, pp. 154-173.
- 52. Zhang, Q., Vanderembse, M., “Logistics flexibility and its impact on customer satisfaction”, *The International Journal of Logistics Management*, Vol. 18 No. 3, 2005, pp. 350-356.



Sr. No.	Authors	Year of Study	Title	Nature of Study	Type of firm	Country	Conceptualization	Determinants of connective technologies
1	Savitskie	2007	Internal and external logistics information technology	Empirical	Manufacturing, wholesale/distribution and retail	USA	Impact of logistics information technology on internal and external performance capabilities	A) Product flexibility. B) Low cost logistics. C) Delivery time.
2	Tan.K.C	2010	Supply chain information and relational alignments	Empirical	Supply chain firms	USA	Examine effects of inter organizational information exchange on supply chain information and relational alignment.	A) EDI in supplier management. B) Supply chain information alignment. C) Supply chain Relational alignment. D) Firm performance
3	Sanchez.b	2010	Use of EDI for interorganization ,co-operation, Co-ordination.	Empirical	Automobile	Spanish	To study Logistics operating systems and logistics planning systems influence and exert on logistics information technology.	A) EDI adoption B) EDI use C) Pro-active management D) Strategic benefits.
4	White A.	2008	RFID in the supply chain: lessons from the European early adopters	Empirical	Supply chain firms	Europe	Benefits if RFID adoption based on factors such as customer, industry, organization and adoption	A) Customer mandate. B) Industry sector. C) Perceive organization innovativeness. D) Level of integration.
5	Hellstorm.A	2009	The cost and process of implementing RFID To manage and control transport items	Empirical	Retail and packaging industries	Sweden	Stages of implementation of RFID.cost benefit analysis	A) RFID implementation B) return on investment C) choosing system integrator D) RFID trial.
6	Azevedo.S	2009	Using logistic information and communication technologies for competitive advantage.	Empirical	Logistics industry	Portugal	To find out impact of communication technologies on logistic process.	A) individual factors B) Organizational factor C) Technological factors D) Environmental factors.
7	Li.G.et.al	2009	Impact of IT On SCL,SCP	Empirical	Manufacturing firm	China	To find out impact of IT on supply chain integration.	A) IT implementation B) Supply chain performance C) Supply chain integration.
8	Germain R.	2001	Just-in-time and context	Empirical	Food, Beverage, tobacco, chemicals,	USA	Interrelationship between JIT strategy and EDI adoption and context	A) Organization size. B) Environmental uncertainty. C) JIT strategy. Production complexity..
9	Larson P.	2007	Logistics improvement programs	Empirical	Logistics firms	Canada/USA	Logistics performance in relation with technical, relational and analytical programs	A) Technological program (Bar-coning, EDI). B) Relation program (Outsourcing). C) Analytical program (Benchmarking & JIT).
10	Smith A.	2005	Reverse logistics programs: gauging their effects on CRM and online behavior	Empirical	Financial and marketing firms	USA	Relationship of concerns by customer about making an online purchase with well documented return procedure and ease of locating	A) Better customer service. B) User friendly technology. C) Easy processing.
11	Trainor.et.al.	2011	Integrating supply chain technology in marketing	Empirical	Marketing firm	Belgium	To find out impact of IT on marketing capability	A) Technology orientation B) Market. C) E-marketing. D) Market turbulence. E) Customer performance. F) Organizational performance.

ADDITIONAL TABLE: DETERMINANTS OF COMMUNICATION TECHNOLOGY. (As per sequence of review of literature)