# A Study on the Effectiveness of Technological Integration and Its Impact in Supply Chain Efficiency In L&T Constructions

Vigneswar A.G.[1], Dr. B. Bhavya[2]

[1]*B.A.LL. B(honous)., MBA., Sathyabama Institute of Science and Technology, Chennai, Tamil Nadu, India*

[2]*Assistant Professor, School of Management Studies, Sathyabama Institute of Science and Technology, Chennai, Tamil Nadu, India*

***Abstract*— The usefulness of technology integration in improving supply chain efficiency is investigated in this study. Technological developments in recent years have enabled automation, real-time tracking, data analysis, and enhanced communication, revolutionizing a number of industries, including supply chain management. This study looks at how important technologies like cloud computing, blockchain, artificial intelligence (AI), and the Internet of Things (IoT) might improve supply chain processes.**

## 1. INTRODUCTION

In the present-day business environment, technology has become a driving force in enhancing operational efficiency across industries. Particularly in the construction sector, where coordination, material flow, and project timelines are crucial, the role of technology in managing the supply chain has grown more important than ever. The title of this project, "A Study of the Effectiveness of Technological Integration and Its Impact on Supply Chain Efficiency in L&T Constructions*,"* captures the core of this transformation. Over the years, construction companies have shifted from manual processes to tech-based platforms for better planning, monitoring, and execution of supply chain functions. Integration of digital tools not only helps in real-time tracking of materials and machinery but also supports better forecasting and resource management.

Through this project, I intend to explore how L&T Constructions has adapted to these changes and what benefits and challenges it faces while implementing such technologies. The aim is to understand whether these integrations genuinely lead to better outcomes in terms of efficiency, cost reduction, and time-saving.

Primary Objective

- A study of the effectiveness of technological integrations and its impact in supply chain efficiency.

Secondary Objective:

- To Measure the Impact of Technology.
- To enhances real-time tracking and monitoring of inventory, shipments, and production.
- To identify cost savings through technology.

To measure improved supply chain efficiency on meeting customer expectations

Need for the Study:

1. To understand how technological integration enhances supply chain performance.
2. To analyses how real-time tracking systems improve inventory and logistics efficiency.

3. To explore cost reduction opportunities through advanced technology.
4. To assess technology-driven supply chains on customer satisfaction and business growth

Scope of the Study:

1. This study examines the effectiveness of technological integration in optimizing supply chain processes
2. This study aims to explores the impact of real-time tracking on inventory management, shipments, and production efficiency
3. It also helps us to evaluate cost-saving opportunities through technology-driven supply chain operations.
4. This Study helps to analyses how technological advancements contribute to improved customer satisfaction and business scalability

## II. REVIEW OF LITERATURE

- A Gunasekaran, (2024) This study aimed to clarify the impact of IT practices on building competitive advantage at all stages of the supply chain through a survey of 76 industrial companies in Greece. The researchers in this study attributed competitive advantage to the capabilities that provide the necessary basis for the organization to differentiate itself from its competitors, as they relied on price/cost, quality delivery, product innovation and time to market as critical sources of competitive advantage. The study concluded that IT practices play a crucial role in creating a sustainable competitive advantage based on supply chain management.
- Hult et al. (2024) report that memory of SC firms about the transaction with their partners was positively related to knowledge acquisition of the SC as a whole, which in turn had an impact on information distribution among the SC.
- Chirchir (2023) explored the correlation between supply chain integration, competitive advantage, environmental dynamism and performance of large-scale manufacturing firms in Kenya. Against the backdrop of Kenya's dynamic business environment, the study aimed to shed light on how supply chain integration initiatives impacted operational performance within the manufacturing sector. Employing a mixed-methods approach, the study combined survey data with qualitative interviews to gain a comprehensive understanding of the relationship between supply chain integration and firm performance. Through rigorous data analysis, including thematic analysis of qualitative data and statistical analysis of survey responses, the study revealed a significant improvement in operational performance among manufacturing firms that implemented supply chain integration initiatives in Kenya.
- Chirchir (2023) explored the correlation between supply chain integration, competitive advantage, environmental dynamism and performance of large-scale manufacturing firms in Kenya. Against the backdrop of Kenya’s dynamic business environment, the study aimed to shed light on how supply chain integration initiatives impacted operational performance within the manufacturing sector. Employing a mixed-methods approach, the study combined survey data with qualitative interviews to gain a comprehensive understanding of the relationship between supply chain integration and firm performance. Through rigorous data analysis, including thematic analysis of qualitative data and statistical analysis of survey responses, the study revealed a significant improvement in operational performance among manufacturing firms that implemented supply chain integration initiatives in Kenya.

## III. RESEARCH METHODOLOGY

Research methodology is mainly needed for the purpose of framing the research process and the designs and tools that are to be used for the project purpose. Research methodology helps to find the effectiveness in technological integration and its impact on supply chain efficiency in L&T construction.

## IV. RESEARCH DESIGN

Research design is the framework of research methods and techniques chosen by a researcher to conduct a study. The design allows researchers to sharpen the research methods suitable for the subject matter and set up their studies for success.

**Sampling Technique**

Convenience sampling method

A convenience sample is one of the main types of non- probability sampling methods. A convenience sample is made up of people who are easy to reach.

## V. SOURCES OF DATA

**Primary Data:**

Primary data is that data which is collected for the first time. These data are basically observed and collected by the researcher for the first time. I have used primary data for my project work. It is collected through Structured Questionnaire.

**Secondary Data:**

Secondary data are those data which are primarily collected by the other person for his own purpose and now we use this for our purpose. It is collected through journals, articles, books, foot notes, etc.

Sample size

The number of elements of the population is to be sampled. Total sample size for the research study is 130.

Tool used for the study: Statistical Tools:

- Chi-square test.
- Anova
- Correlation

CHI SQUARE:

Hypothesis 1

H0 (Null hypothesis): There is no significant difference between the technology impacted your ability to respond to market fluctuations and customer demands and rate your organization's adoption of technology in logistics and supply chain management

H1(Alternate hypothesis): There is a significant difference between the technology impacted your ability to respond to market fluctuations and customer demands and rate your organization's adoption of technology in logistics and supply chain management

| | Cases | | | | | |
|---|---|---|---|---|---|---|
| | Valid | | Missing | | Total | |
| | N | Percent | N | Percent | N | Percent |
| Technology impacted the ability to respond in market fluctuations organization adoption of technology in logistics and | 130 | 100.0% | 0 | 0.0% | 130 | 100.0% |

supply chain

**Technology impacted your ability to respond to market fluctuations * organization adoption of technology in logistics and supply chain Crosstabulation**

Count

| | | Organization adoption of technology in logistics and supply chain | | | | | Total |
|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | |
| Technology impacted your ability to respond to market fluctuations | 1 | 5 | 4 | 5 | 0 | 4 | 22 |
| | 2 | 6 | 3 | 11 | 4 | 2 | 29 |
| | 3 | 6 | 9 | 5 | 10 | 9 | 26 |
| | 4 | 6 | 5 | 7 | 9 | 4 | 28 |
| | 5 | 3 | 2 | 3 | 1 | 7 | 25 |
| Total | | 17 | 26 | 26 | 23 | 31 | 26 |

Chi-Square Tests

| | Value | df | Asymptotic Significance (2-sided) |
|---|---|---|---|
| Pearson Chi-Square | 24.014[a] | 16 | .089 |
| Likelihood Ratio | 26.672 | 16 | .045 |
| Linear-by-Linear Association | 2.853 | 1 | .091 |
| N of Valid Cases | 130 | | |

a. 12 cells (48.0%) have expected count less than 5. The minimum expected count is 2.83.

**INFERENCE:**

Since the p value (0.089) is more than 0.05. we accept Null hypothesis and we reject Alternative hypothesis. So, there is no significant difference between the technology impacted your ability to respond to market fluctuations and customer demands and rate your organization's adoption of technology in logistics and supply chain management

**ANOVA:**

**HYPOTHESIS 1:**

H0(Null hypothesis): There is no significant difference between the Customers satisfaction is increased in supply chain management and Technological advancement has developed the supply chain than the manual type.

H1(Alternate hypothesis): There is a significant difference between the Customers satisfaction is increased in supply chain management and Technological advancement has developed the supply chain than the manual type

**Descriptives**

Customers satisfaction is increased in supply chain management

| | N | Mean | Std. Deviation | Std. Error | 95% Confidence Interval for Mean | | Minimum | Maximum |
|---|---|---|---|---|---|---|---|---|
| | | | | | Lower Bound | Upper Bound | | |
| 1 | 20 | 2.0000 | 1.00000 | .44721 | .7583 | 3.2417 | 1.00 | 3.00 |
| 2 | 23 | 2.9000 | .91191 | .20391 | 2.4732 | 3.3268 | 1.00 | 5.00 |
| 3 | 37 | 2.9429 | 1.13611 | .19204 | 2.5526 | 3.3331 | 1.00 | 5.00 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 4 | 23 | 3.4894 | 1.13965 | .16623 | 3.1547 | 3.8240 | 2.00 | 5.00 |
| 5 | 27 | 3.8261 | 1.43502 | .29922 | 3.2055 | 4.4466 | 1.00 | 5.00 |
| Total | 130 | 3.2538 | 1.22197 | .10717 | 3.0418 | 3.4659 | 1.00 | 5.00 |

**ANOVA**

RESOURCES

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 23.888 | 4 | 5.972 | 4.424 | .002 |
| Within Groups | 168.735 | 125 | 1.350 | | |
| Total | 192.623 | 129 | | | |

**INFERENCE:**

Since the p value (0.002) is lesser than 0.05. we accept Alternative hypothesis and we reject Null hypothesis. So, There is a significant difference between the Customers satisfaction is increased in supply chain management and Technological advancement has developed the supply chain than the manual type

### 1.4 CORRELATION:

Correlation measures the relationship between two variables. It can be positive (both variables move in the same direction), negative (variables move in opposite directions), or zero (no relationship). Correlation is often quantified using the Pearson correlation coefficient (r), ranging from -1 to 1. However, correlation does not imply causation.

**HYPOTHESIS 3**

H0(Null hypothesis): There is no significant difference between Automation technology has more accuracy than with manual modes and technology integration saves time and human resources

H1(Alternate hypothesis): There is a significant difference between Automation technology has more accuracy than with manual modes and technology integration saves time and human resources

**Correlations**

| | Automation technology has more accuracy than with manual modes | Technology integration saves time and human resources |
|---|---|---|

| | | | |
|---|---|---|---|
| Automation technology has more accuracy than with manual modes | Pearson Correlation | 1 | .421** |
| | Sig. (2-tailed) | | .000 |
| | N | 130 | 130 |
| Technology integration saves time and human resources | Pearson Correlation | .421** | 1 |
| | Sig. (2-tailed) | .000 | |
| | N | 130 | 130 |
| **. Correlation is significant at the 0.01 level (2-tailed). | | | |

**Correlations**

| | | | Automation technology has more accuracy than with manual modes | Technology integration saves time and human resources |
|---|---|---|---|---|
| Kendall's Taub | Technology integration saves time and human resources | Correlation Coefficient | 1.000 | .343** |
| | | Sig. (2-tailed) | . | .000 |
| | | N | 130 | 130 |
| | Automation technology has more accuracy than with manual modes | Correlation Coefficient | .343** | 1.000 |
| | | Sig. (2-tailed) | .000 | . |
| | | N | 130 | 130 |
| Spearman's rho | Automation technology has more accuracy than with manual modes | Correlation Coefficient | 1.000 | .402** |
| | | Sig. (2-tailed) | . | .000 |
| | | N | 130 | 130 |
| | Automation technology has more accuracy than with manual modes | Correlation Coefficient | .402** | 1.000 |
| | | Sig. (2-tailed) | .000 | . |
| | | N | 130 | 130 |
| **. Correlation is significant at the 0.01 level (2-tailed). | | | | |

**INFERENCE:**

Since the p value (0.343) is more than 0.05. We accept Null hypothesis and we reject Alternative hypothesis. So, there is no significant difference between Automation technology has more accuracy than with manual modes and technology integration saves time and human resources

**FINDINGS**

- (29.2%) of the respondents are below 25 of age
- (60%) of the respondents are male
- (30.8%) of the respondents have only below 5 years of experience
- (25.4%) respondents earn in the category of 35,000- 50,000
- (48.5%) respondents are UG Graduates
- (48.5%) respondent is single
- (47.7%) respondents say rating 3 for satisfied are you with the current technology in logistics
- Majority (37.7%) respondents' say rating 3 for technological advancement helpful in controlling of logistics
- (29.2%) respondents say rating 3 for Automation technology has more accuracy than with manual modes
- (30.8%) respondents say rating 3 for satisfied are you with the real time tracking on inventory management
- (31.5%) respondents say rating 3 for tech integration enable cost cutting for the company
- (33.8%) respondents say rating 3 for integration saves time and human resources
- (34.6%) respondents say rating 4 for regulating and controlling errors / system crash to an extent
- (43.1%) respondents say they use Radio frequency identification
- Majority (39.2%) respondents say rating 3 at tech integration help company's ability to grow and adapt to market changes
- Majority (35.4%) respondents say rating 3 for reduce cost, time and improved the efficiency work
- (32.3%) respondents say rating 3 for technology impacted your ability to respond to market fluctuations and customer demands
- Majority (36.2%) respondents say rating 4 for Customers satisfaction is increased in supply chain management
- (33.1%) respondents say rating 4 for rate your organization's adoption of technology in logistics and supply chain management
- Majority (26.9%) respondents say rating 4 for Technological advancement has developed the supply chain than the manual type
- (30%) respondents say rating 4 for Proper tracking and delivery helps the company's name and fame
- (28.5%) respondents say rating 3 for organization's technological capabilities give you a competitive advantage
- (37.7%) respondents say rating 3 for technological advancement has enabled human resources and controlled cost of the business
- (31.5%) of the respondents say rating 4 for clients satisfied with the impact of tech in supply chain management
- (26.2%) of the respondents say rating 3 for technology improved the delivery of the supply chain operations of L&T
- Since the p value (0.089) is more than 0.05. we accept Null hypothesis and we reject Alternative hypothesis. So, There is no significant difference between the technology impacted your ability to respond to market fluctuations and customer demands and rate your organization's adoption of technology in logistics and supply chain management.
- Since the p value (0.002) is lesser than 0.05. we accept Alternative hypothesis and we reject Null

hypothesis. So, There is a significant difference between the Customers satisfaction is increased in supply chain management and Technological advancement has developed the supply chain than the manual type.

**SUGGESTIONS**

- The first suggestion is to improve awareness and understanding among employees by giving them regular, hands-on training on how to use the digital tools effectively in the supply chain.
- The current systems can be made simpler and easier to use, so that employees from both technical and non-technical backgrounds can use them comfortably without hesitation.
- It would be helpful to connect all departments through a common digital platform, so that communication becomes easier and decisions can be taken faster without confusion.
- Encouraging the use of mobile apps for site-level updates can reduce delays and help employees track materials and resources in real-time, especially in large project sites.
- Collecting regular feedback from employees can give better clarity on the practical difficulties they face while using the system and help in improving those areas.
- Recognizing and appreciating employees or teams who effectively use technology in their daily work can motivate others to adopt the same in a positive way.
- Using analytics to predict material demand based on previous project data can help reduce last-minute pressure in procurement and make planning more effective.
- A separate technical support system should be available for employees during the implementation of new digital tools, so they can get quick help whenever they are stuck.
- It is important to keep updating the digital tools and systems being used, so that they stay relevant to current project needs and industry standards.
- Before applying any new technology across all sites, it's better to test it on a small scale first. This helps in identifying any challenges early and avoiding big issues later.
- Instead of just focusing on using technology, L&T can also build a digital-friendly work culture, where employees feel comfortable and confident using these systems daily.
- Employees should feel supported, not stressed, during digital transformation. Proper guidance and training at each stage can make the transition smoother for everyone.

Site engineers and supervisors should also be involved in the planning of digital tools, because they know the ground-level challenges and can give practical suggestions.

- While choosing or designing digital tools, it's important to keep employee convenience in mind. When tools are easy to use and save time, it automatically boosts productivity.
- These suggestions can help L&T Constructions not just improve their supply chain operations, but also build a stronger connection between technology, efficiency, and the people using it.

**Limitations of the Study:**

- The study is limited within the Chennai branch of L&T.
- The study is done within 3 months.
- The data collected for the research is fully on primary data given by therespondents. There is chance for personal bias. So, the accuracy may not be true.

## CONCLUSION

To ensure a competitive and adaptive supply chain, the integration of modern technology plays a crucial role in improving operational efficiency and reducing unnecessary delays and costs. At L&T Constructions, the use of digital tools, automation, and real-time tracking has positively influenced coordination and overall performance across the supply chain. However, the data also reflects that a significant portion of respondents remain neutral or dissatisfied, indicating gaps in implementation, user training, or technology adaptability.

A well-integrated supply chain depends not just on technology adoption, but also on how well it is aligned with human processes and strategic goals. If not managed thoughtfully, technology can create confusion or resistance, especially when employees lack clarity or confidence in new systems. Therefore, to maximize the impact of integration, companies like L&T must invest equally in employee upskilling, system transparency, and user-friendly platforms.

Long-term effectiveness will come from a balanced approach—where innovation meets practical usability, and where decision-making is supported by real-time data and human insights. Encouraging feedback from the workforce, addressing their concerns, and ensuring clear communication across departments will help in building a stronger, more responsive supply chain. Ultimately, technological integration should empower the workforce, not overwhelm them, and when executed with vision and empathy, it leads to sustainable growth and a smarter future for the organization.

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