Investigation of Factors Underlying the Benefits of Logistics Information System

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The purpose of this paper is to identify and understand the usage of softwares in Logistics Service Companies (LSC) where the Logistics Information System (LIS) is in use. Further an attempt is made to identify and confirm the factors underlying the benefits of Logistics Information System (LIS). A review of main stream literature was carried out to identify the factors underlying the effectiveness of LIS. A total of 125 Logistics Service Companies were first listed as using LIS. Out of which 12 companies were excluded from the study as they did not participate in the survey even after repeated contacts. Hence census study had been adopted to contact the remaining 113 respondents. The data were collected using a structured questionnaire and analyzed with AMOS 18. The analysis revealed the factors underlying the benefits of LIS, namely organizational impact, user satisfaction, communication effectiveness, top management support and individual impact was identified. Further it was found that only three factors were confirmed after carrying out confirmatory factor analysis.

Keywords: Logistics Information System, Logistics Service Companies, Organizational Impact, User Satisfaction, Communication Effectiveness

1. Introduction

The logistics sector in India has today become an area of priority. India is emerging as one of the world's leading consumer market with the raise of middle income group. Estimated at US$ 991 billion in 2010, total consumption expenditure is expected to grow to nearly US$ 3.6 trillion in 2020. Food, housing and consumer durables, transport and communication are expected to be the top three categories, accounting for 65 percent of consumption in 2020. The FMCG sector alone is expected to grow at a base rate of at least 12 percent annually to become an INR 4000 billion industry by 2020. To serve such large market at shortest possible time with the least cost, the logistics sector is expected to play an important role in accessing this emerging market and enabling this growth.

Growth opportunities in Logistics Sector
According to Drive India Enterprise Solutions limited (DIESL) a Tata group company's analysis on the sector wise data, organised retail sector has seen a phenomenal growth in modern India over the past 5–7 years. The retail sector of India is now among top five fastest-growing markets globally and by 2015 it is going to touch US$637 billion. Most of it is going to be through modern retail i.e. through shopping malls, which is expected to increase by 22 per cent by 2015. In addition, the e-commerce market in India has grown by 34 per cent in the last seven years, was about US$ 600 million in 2011-12 and is expected to touch US$ 9 billion by 2016 and US$ 70 billion by 2020. This explosion will need supply-chain capabilities with agile in movement of goods that are widespread and provide visibility of inventory and delivery both to the manufacturer/retailer and to the end consumer. The logistics service providers should focus on physical dispatch capabilities, minimising order processing errors, providing secondary in-city distribution channels and embedding technology into the entire transaction is the only way to survive in markets.

Challenges faced by logistics sector
Several challenges remain before the Indian logistics sector and its future success will depend on the ability of the industry to overcome these hurdles. At the policy level, the issues of infrastructure and integration of the nation's logistics network remain the two most critical areas that require attention. The trend towards a higher road cargo traffic as compared to rail is going to require better logistics control and coordination. Banks have developed venture capital funds for logistics players. Small Industries Development Bank of India (SIDBI), for instance, has invested $ 2.3 mn in the Mumbai based firm Direct Logistics. While the use of IT for logistics management is increasing, it is largely limited to large size firms. This represents an opportunity to further improve the decision making abilities across the supply chain and reduce costs further. In recent years, there has been increased interest from companies to improve their distribution logistics in an effort to address a fiercely competitive market. This in turn has led to the emergence of independent distribution and logistics agencies to handle this important function. Marketers are increasingly outsourcing of value add services like freight forwarding, fleet management, import/export and customs clearance, order fulfillment, consulting services like distribution network planning etc. to courier and logistics companies and searching for more efficient ways to reach the consumer.

For any industry, use of Information System (IS) and innovation is necessary in order to stay ahead in the competition. The logistics industry is a classic example of the birth and development of a vital new service-based industry. Logistics management consists of activities from customer service, orders processing, inventory management, transportation, storage, packaging, demand and forecasting, production planning, purchasing and procurement, facility location, and distribution that are supported by enormous information flow (Celebi et al., 2010). Many firms have applied information technology such as enterprise resource planning (ERP) and information systems (IS) in operational process management to cost effectively serve the customer's requirements (Tilokavichai and Sophatsathit, 2011; Ngai et al., 2008; Cheung et al., 2003).

2. Literature Review

Logistics encompasses all of the information and material flows throughout an organization. It includes everything from the movement of a product or from a service that needs to be rendered, through to the management of incoming raw materials, production, the storing of finished goods, its delivery to the customer and after-sales service (Pollitt, 1998). The scope of logistics has changed since the emergence of new technologies and strategic alliances in order to compete on flexibility and responsiveness. The growing importance of logistics arises from companies becoming globalized to gain access to new markets, realize greater production efficiencies, and tap technological competencies beyond their own geographical borders (McFarlan, 1984; Bovet, 1991; Cooper, 1993; Fawcett et al., 1993). A number of researchers have examined logistics issues in a global perspective, including Fawcett et al. (1993), Gary and Davies (1991), Quinn and Hilmer (1994), Welch and Nayak (1992) and Wyatt (1992). The integration of logistics with other functional areas will help bring a company to realize the full potential of its value-added activities and, hence, to gain a significant competitive advantage. It will also lead to a reduction in operational costs and an improvement in customer services (Christopher, 1989; Richardson, 1995). In recent years, Logistics Information Systems (LIS) are increasingly being regarded as resources that support various business processes (Alshawi, 2001). Feraud (1998) pointed out similarities between the strategic management of information technology and logistics information management. Some researchers (Baglin et al., 1996; Christopher, 1997; and Cooper, 1994) have explained the close links between information systems and the management of logistics. Chiu (1995) presented an integrated framework to improve the performance of distribution systems. He also highlighted the role of information technology (IT) in improving the efficiency of the logistics value chain.

Therefore it is necessary to streamline the logistics process to maintain the efficiency of the logistics network. In addition to integrating information system and advanced logistical approaches into their business operations, firms are beginning to realize the need to focus on their logistics strategy in order to efficiently maintain their supply chain capabilities.

Information Flow in Logistics Management

Logistics management plays an important role of adding competitive advantage to a firm in customer support and business excellence (Buyukozkan et al., 2008). Effective logistics management provides the right product in the right place at the right time. It involves control of product and information flow to create value-added activities such that delivery is accomplished through suitable distribution channels (Narasimhan & Kim, 2001). It is managed to yield minimize cost and time but maximize service level, for example, on time delivery, minimum stock level, high quality or non-damage products (Celebi et al., 2010; Lai et al., 2010; Murthy et al., 2004).

Thus, logistics management is a one of the contributing operations that encompasses activities ranging from customer service, order processing, inventory management, transportation, warehouse management, packaging, demand and forecasting, production planning, purchasing and procurement, facility location, and distribution. All of these functions are supported by enormous information flows (Celebi et al., 2010; De Haan et al., 2007).

Importance of Logistics Information System

Stock and Lambert (1998) state that the first step towards logistics excellence is to develop performance improvement strategies which contribute to customers satisfaction. Information systems and computer technologies are vital to the development of an organization willing to understand and attain to customers' requirements and needs. Bardi et al. (1994) noted that the ability of a company to optimize its logistics costs and levels of customer service is based on the LIS it uses. Lai et al. (2005) add that these logistics information systems are extremely important in reducing inventory and lead time along the supply chain. Ngai et al. (2006) have conducted a survey on the use of Information system and its benefits and barriers in the logistics industry. The implementation of IT to support logistics processes can lead to wide range of potential benefits, such as reducing errors from the entry of data and improvements in customer services (Gutierrez and Duran 1997; Hammant 1995; Piplani et al. 2004). On the other hand LSPs may also face various barriers such as inadequate financial resources to support the high investment in hardware and software technology which is required in implementing LIS (Lai et al. 2005). Information Systems are also valuable in promoting learning within the firm, which consist of information acquisition, dissemination, and shared interpretation of information across the functions within a firm (Sinkula, 1994). Not having an effective information system or allowing free information flows within the firm can be very detrimental, as it can lead to distrust and antagonism that result in ineffective group processes (Argyris and Chris, 1996). ERP systems allows companies to replace their existing information systems, which are often incompatible with one another, with a single, integrated system, thereby streamlining data flows throughout an organization and promising dramatic gains in a company's efficiency and bottom line (Davenport, 1998).

Factors Underlying the Effectiveness of Information System

System effectiveness, which describes how successful a system is in terms of user satisfaction and the impact of that system on individuals and the organization itself, has been studied a lot in the past about the measures of IS effectiveness by (Ortiz de Guinea et al., 2005; DeLone and McLean, 2003; DeLone and McLean, 1992). Factors underlying the effectiveness of an information system (IS) depend on two aspects: the organizational and the technical contexts. For the organizational context, the most important factors are top management support, user training, communication effectiveness, and firm size. With regard to technical context, two essential attributes are system quality and information quality. Many approaches have been suggested to assess IS effectiveness. These include cost-benefit analysis, utility analysis, IS use estimation, measurement of user satisfaction, incremental performance in decision-making effectiveness, and the analytical approach [Ives and Olson, 1984; Lees, 1987; Remenyi and Smith, 1999; Kanungo et al., 1999]. Among the measures of IS effectiveness, the most frequently used are from the framework of DeLone and McLean [1992]. They have comprehensively reviewed and organized past research on IS effectiveness and have proposed that the success level of an information system depends on the quality of the system itself, its output information, its use level, whether users are satisfied with it, and its impact on individual and the organization. A major area of potential for Information System is in helping to manage the linkages between business activities, both inside and outside the company. Exploiting these linkages usually requires information flows that allow optimization or coordination to take place. By reducing the cost, improving the quality, and increasing the speed of information flows, Information System allows higher levels of coordination and optimization, thereby expanding the effective business scope and scale **Pieter Klaas Jagersma (2011).**

Logistics Service Providers (LSPs)

The globalization of business and the increase in competitive pressures have prompted many firms to develop logistics as a part of their corporate strategy for cost and service advantages (McGinnis and Kohn, 2002). Nowadays, many manufacturers and retailers are seeking to outsource their logistics activities to logistics service providers (LSPs) to introduce products and service innovations quickly to their markets. Their actions seem to reflect the trend of business firms using LSPs to satisfy their increasing need for logistics services (Lieb and Miller, 2002). In general, an LSP can be broadly defined as a provider of logistics services that performs all or part of a client company's logistics function (Coyle et al., 1996; Delfmann et al., 2003). This consists of at least the managing and operating of the transportation and warehousing functions. An LSP can also provide other services such as materials management services information-related services (e.g. tracking and tracing), and value-added services (e.g. secondary assembly) (Berglund et al., 1999).

Several studies in adoption of LIS were conducted in Hong Kong, Brazilian countries to access the level of LIS and their benefits in organizational context. A framework of Delone and Mclean[1992] model was adopted to find the success of LIS in LSPs. Based on these literatures the researcher was able to identify the measures for LIS benefits.

Objectives of the Study
- To understand the usage of softwares adopted in Logistics Information System (LIS) by Logistics Service Companies (LSC).
- To identify the factors underlying the benefits of LIS in respondent companies.

3. Research Design And Methodology

Research Design: In order to achieve the above objectives, initially, a descriptive research was conducted.

Sources of Data: The secondary data relating to details of Logistics Service Companies (LSC) operating in the study area and number of companies using Logistics Information System (LIS) were collected from Custom House Agent Association in Coimbatore and also from Logistics Directory available at just dial.com. The researcher had to mainly depend on the primary data which were collected from the responsible officers in the position of managers or assistant managers of LSC using LIS through the field survey using a pretested structured questionnaire.

Questionnaire Design: The instrument used for data collection was a structured questionnaire .The questionnaire consisted of both multiple choice and open ended questions relating to application area and usage characteristics of LIS. Also the questionnaire contained 13 statements relating to the benefits of LIS with 5-point likert scale ranging from the score of 5(strongly agree) 4(agree) 3(neutral) 2(disagree) 1(strongly disagree).

Population and Census Study: The total population of LSC in Coimbatore district in Tamilnadu (India) is identified as 225. The **sampling frame** of the study is LSCs who use LIS. A total of 125 logistics service companies were identified as using LIS. 12 companies were excluded from the study as they did not participate in the survey even after repeated contacts. Hence **census study** had been adopted to contact the remaining 113 respondent companies. The researcher had collected the primary data from a responsible officer working in the main branch of LSCs in the study area eventhough nearly 40 LSCs are having more than one branch.

Tools Identified to Analyse Data: Statistical tools such as percentage analysis and descriptive statistics, confirmatory factor analysis using AMOS were used.

4. Results and Discussion

All the software applications of logistics management are ready- made package applications usually targeted for dealing with certain set of tasks e.g for tracking product related information during the transportation process. Many companies use mix of packages software applications to manage their business.

Table 1 *Name of the Software and the Application Areas of LIS*

Application Area	No. of companies using software's	Percentage analysis on usage of softwares
Freight management	90	79.6
Warehousing	70	61.9
Customs brokerage	17	15
Custom House Agent	13	11.5
Project Logistics	6	5.3
Industry Logistics	4	3.5
Surfacemode transportation	2	1.7
Vehicle Tracking	50	44.2
Supply chain solutions	8	7
All the above	10	8.8

From table 1 it is observed that the top three application areas are 79.6% of the LSCs use different software pacakage for freight management services, wheareas 61.9% for warehousing services and 44.2% for transportation services. The results are nearly similar to the study conducted in Taiwanese firms that the most popular application areas of ICT are order processing, warehousing and transportation (Cheng and Yuan 2006).

Table 1A *Name of the Software and the Application Areas of LIS*

Software Name / Appln Area	Online		Intra Company		Logysis		SAP		EDI		E-freight		I sell		E-track		Hell		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Freight management	50	55.5	22	24.4	10	11.1	5	5.5	1	1.1			2	2.2					90	100
Warehousing	36	51.4	16	22.8	11	15.7	6	8.57					1	1.42					70	100
Customs brokerage	8	47	3	17.6	4	23.5			2	11.7									17	100
Custom House Agent	7	53.8	1	7.7	2	15.4			3	23									13	100
Project Logistics	1	16.6	1	16.6			1	16.6					3	50					6	100
Industry Logistics	Nil						1	25					3	75					4	100
Surface mode transportation	1	50			1	50													2	100
Vehicle Tracking	17	34	5	10			1	2							27	54			50	100
Supply chain solutions	1	12.5	1	12.5			3	37.5					3	37.5					8	100
All the above	1	10	2	20	1	10	3	30			2	20					1	10	10	100

From table 1A it is observed that out of total of 113 respondent companies, 90 of LSCs use softwares for *freight management services*. Among these LSCs 55.5% of the LSCs use **online software** for freight management services while 24.4% of them use **intracompany** software and on the other hand 11.1% of them use **logysis software** while 5.5% of them use **ERP** software. Hence it is concluded that majority of the Logistic Service companies use online software for handling freight management. Online software provides them with online distribution and warehouse model which helps the companies in providing entry of dockets etc. Online ERP software helps the companies with order to cash , supplier scheduling etc. the benefits of this software is that they operate in real time, without relying on periodic updates. Logysis software provides a single- window view of operations across locations, helps manage revenue flows, streamlines documentation and meets regulatory requirements. It also tracks job status and can enhance customer satisfaction by providing real-time updates.

It is also inferred from the table 1 that out of 113 LSCs 70 companies use softwares for *warehousing services*. 51.4% of these Logistics Service Companies use **online** software followed by 22.8% use **intracompany** software, 15.7% of them use **logysis** software and nearly 8.6% of the **ERP software** for warehousing services. For *custom house brokeraging services* 17

LSCs use softwares. In this category 47% of the LSCs, use **online software**, 23.5% of them use **logysis software**, 17.6% of services use **intracompany software** and the remaining 11.7% of warehousing services use **ERP software** for their operations. For *customs house agent services* online software is used by 53.8% of them, **EDI software** by 23%, **logysis software** by 15.4% and the remaining 7.7% use **intra company** software for their operations.

  Only six LSCs use softwares for *project logistics services*. **I-Sell software** is used by three companies and for the remaining LSCs **online, intracompany and ERP softwares** are applied respectively. For *industry logistics services* four of the LSCs use softwares. Three companies use **I – Sell software** and one use **ERP** for their operations. It is inferred from the table 1A that out of 113 companies two of them use softwares for *surface mode transportation services*; one company uses **online software** and another one uses **logysis software** for their operations. For *vehicle tracking services* 50 Logistics Service Companies use softwares. for their operations. 54% of them use e-tracker, 34% of them use online software and 10% of them use **intracompany software**. Only one company use **SAP** software for their operations.

  The table 1A also shows that on a total of 113 LSCs eight of them use softwares for *supply chain solutions*. **SAP** is used by three companies and **I Sell software** by another three companies. One company use **online** and another one uses **intracompany software**. Out of 113 companies only ten companies use software for *comprehensive services*. Three Logistic service companies use **SAP software** for all the services mentioned in the above table 1. Intra company software and **e freight software** are used by two companies each. The remaining **online** and **logysis softwares** are applied by one company each.

Usage of Softwares and their benefits of LIS
Logistics Service Providers use softwares for various departments like freight management, vehicle tracking and for warehouses to streamline the logistics processes which benefits the entire organization. Therefore it is necessary to study the factors underlying the benefits of Logistics Information System.

Factors of Existing Theoretical Model :(DeLone and McLean (1992), Vincent Cho (2007).
  1. **Organizational Impact:** It reduces risk and uncertainty of a changing environment by improving the producitivy of the organization.
  2. **User Satisfaction:** It can be defined as the extent to which users believe that the LIS   is available to them to meet their requirements.
  3. **Communication Effectiveness**: A learning organization should have enough channels to transfer and encode individual learning, and should communicate effectively with its customers, employees, suppliers, and all other stakeholders.
  4. **Top management Support:** It is reasonable that, when senior executives dedicate a high level of resources to support LIS they tend to foster a great use of information systems within that organization.
  5. **Individual Impact:** The effect of information on the behavior of a recipient and   indicate that it is closely related to an individual's performance.

  The instrument used in this study for measuring benefits of LIS is based on the factors identified by Bowersox et al. (2010) and Vincent Cho (2007). These two researchers had reviewed the framework of Information System effectiveness from DeLone and McLean (1992 and 2003) and also from various research works conducted between (1992 -2001).

Rotated Component Matrix
The table 2 shows the varimax rotation, where the factors are kept at right angles to each other, is the most frequently chosen method. The rotated component matrix reduces the number of complex variables and improves interpretation. Factor 1 comprises of six items with factor loadings ranging from .62 to .82. Factor 2 comprises of three items with factor loadings ranging from .59 to .75. Factor 3 comprises of two items with factor loadings .78 and .81. Factor 4 and factor 5 comprises of single item with values of .91 and .92. All items in the table are with factor loadings greater than .3 on more than one factor. The final step in factor analysis involves determining how many factors to interpret and then assigning a label to the factors.

Table 2 *Rotated Component Matrix*

Rotated Component Matrix[a]	Component				
	1	2	3	4	5
the top management actively participates in LIS implementation				.917	
LIS provides the ability to compete internationally					.920
tracking facilities provides high returns on the investments		.597			
LIS improves the channel relationship			.783		
LIS decreases the operating cost through reduced labour			.819		
the end users are satisfied with the performance of LIS		.756			
LIS provides flexibility to meet all customer documentation needs		.746			
LIS improves quicker shipment tracing	.624				

LIS improves customer service by more timely definition of task	.735				
LIS improves faster transfer of sales and inventory information	.669				
LIS enhances two way communication	.832				
LIS can reduce the required time to handle documents	.776				
LIS increase the level of transparency in records and information sharing	.827				

Extraction Method*: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.*

Table 3 *Factor Loading and Reliability for benefits of LIS*

	Factor loading	Reliability
Organizational Impact		.832
LIS improves quicker shipment tracing	.624	
LIS improves customer service by more timely definition of task	.735	
LIS improves faster transfer of sales and inventory information	.669	
LIS enhances two way communication	.832	
LIS can reduce the required time to handle documents	.776	
LIS increase the level of transparency in records and information sharing	.827	
User Satisfaction		.602
Tracking facilities provides high returns on the investments	-.597	
The end users are satisfied with the performance of LIS	.756	
LIS provides flexibility to meet all customer documentation needs	.746	
Communication Effectiveness		.633
LIS improves the channel relationship	.783	
LIS decreases the operating cost through reduced labour	.819	
Top Management Support		
The top management actively participates in LIS implementation	.917	
Individual Impact		
LIS provides the ability to compete internationally	.920	

The table 3 summarizes the result of the reliability analysis of variables. It can be seen that all factors are of quite high alpha values over 0.6. So it can be claimed that all variables are reliable. Moreover, all the measures of constructs have been used in the past research and the variables are validated. The factors are loaded as six items for organizational impact, three items for user satisfaction, two items for communication effectiveness, one item for top management support and one item for individual impact.

Confirmatory Factor Analysis: Benefits of LIS.
The principal component factor analysis was followed by Confirmatory Factor Analysis. The model was found to be of good fit as indicated in Table 4 highlighting goodness of fit statistics.
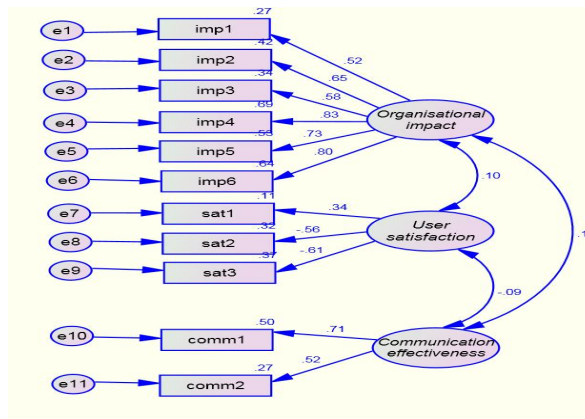

Figure 1 *Model for Benefits of LIS*

Table 4 *Confirmatory Factor Analysis –Goodness of Fit*

Parameter	Value	Cut-Off values
Chi-square	53.256 (Probablity = 0.095)	> 0.05
GFI (Goodness of Fit index)	0.930	>0.9
AGFI (Adjusted Goodness of Fit index)	0.987	>0.9
RMSEA (Root Mean Square Error of Approximation)	0.042	<0.05

As shown in the **table 4**, the Chi-Square value was found to be 53.256 with a probability of 0.095. The value of probability is greater than the cut-off value of 0.05. Similarly the values of GFI (0.930), AGFI (0.987) and RMSEA (0.042) satisfy the criteria for good fit.

Table 5 Correlation Matrix

Factors	(1)	(2)	(3)
Organisational Impact (1)	1	0.099	0.139
User satisfaction (2)	0.099	1	-0.086

The factors 'Organisational impact', 'User satisfaction' and 'Communication effectiveness' was confirmed using confirmatory factor analysis. On the other hand two of the factors namely – 'Top Management Support' and 'Individual impact' was not confirmed in the analysis. **Table 5** highlights the correlation matrix for the concerned factors. The factor 'Organisational impact' was positively correlated with factors 'User Satisfaction' and 'Communication effectiveness' . The factor 'User satisfaction' was negatively correlated with 'Communication effectiveness'.

Table 6 *Squared Multiple Correlations*

ITEMS	Estimate (R^2)
LIS decreases the operating cost through reduced labour	0.271
Logistics Information System (LIS) improves the channel relationship	0.502
LIS provides flexibility to meet all customer documentation needs	0.375
The end-users are satisfied with the performance of LIS	0.315
Tracking facilities provides high returns on the investments	0.113
LIS can reduce the required time to handle documents	0.637
LIS enhances two way communication	0.535
LIS improves faster transfer of sales and inventory information	0.687
LIS improves customer service by more timely definition of task	0.341
LIS improves quicker shipment tracing	0.425
LIS can avoid shipping errors	0.271

The 'Squared multiple correlations' (R^2) associated with the items are shown in **Table 6**. The items 'LIS improves faster transfer of sales and inventory information' and 'LIS can reduce the required time to handle documents' received the highest squared multiple correlations at $R^2 = 0.687$ and $R^2 = 0.637$ respectively. This indicates that the two items explained for the maximum variance in their respective factor namely – 'Organisational Impact'. The item 'LIS provides flexibility to meet all customer documentation needs' explained for maximum variance of 37.5% ($R^2 = 0.375$) within the factor 'User satisfaction'. On the other hand , the item 'Logistics Information System (LIS) improves the channel relationship' explained for maximum variance of 50.2% ($R^2 = 0.502$) within the factor 'Communication Effectiveness'.

Table 7 highlights the regression weights associated with the model. As observed from table 6, the items – 'LIS can avoid shipping errors', 'LIS improves quicker shipment tracing', 'LIS improves customer service by more timely definition of task', 'LIS improves faster transfer of sales and inventory information', ' LIS enhances two way communication' and 'LIS can reduce the required time to handle documents' loaded on the factor 'Organisational Impact'. The item 'LIS improves faster transfer of sales and inventory information' had the highest loading on the factor 'Organised impact' with standardized coefficient (β) = 0.829. The factor 'User Satisfaction' comprised of items namely – 'Tracking facilities provides high returns on the investments', 'The end-users are satisfied with the performance of LIS' and 'LIS provides flexibility to meet customer needs'. The item 'LIS provides flexibility to meet all the customer documentation needs" carried the highest loading on the factor 'User Satisfaction' with standardized Coefficient (β) = -0.621. On the other hand the items- 'Logistics Information System (LIS) improves the channel relationship' and 'LIS decreases the operating cost through reduced labour' loaded on the factor Communication Effectiveness'.

Table 7 *Regression Weights – Benefits of L.I.S*

Items	Factor	Unstandardised Coefficients	Standardised Coefficients (β)	Standad Error (S.E) 9S.E	CriticalRatio (C.R)	p
LIS can avoid shipping errors	Organisational Impact	1.000	0.520	-	-	-
LIS improves quicker shipment tracing		1.110	0.652	0.229	4.854	***
LIS improves customer service by more timely definition of task		0.929	0.584	0.204	4.548	***
LIS improves faster transfer of sales and inventory information		1.329	0.829	0.244	5.451	***
LIS enhances two way communication		1.212	0.731	0.235	5.159	***
LIS can reduce the required time to handle documents		1.051	0.798	0.196	5.370	***
Tracking facilities provides high returns on the investments	User Satisfaction	1.000	0.336		-2.074	-
The end-users are satisfied with the performance of LIS		-1.438	-0.561	0.693	-1.966	0.038
LIS provides flexibility to meet customer needs		-1.296	-0.621	0.659	-	0.049
Logistics Information System (LIS) improves the channel relationship	Communication Effectiveness	1.000	0.708		-	-
LIS decreases the operating cost through reduced labour		0.874	0.520	1.070	0.817	0.414

The item 'Logistics Information System (LIS) improves the channel relationship' had the highest loading score on the factor 'Communication Effectiveness' with Standardised Coefficient (β) = 0.708.

5. Managerial Implications and Suggestions

- The results of the confirmatory factor analysis revealed three factors namely Organisational Impact, User satisfaction, Communication effectiveness for benefits of Logistics Information System (LIS). Without any aphrension the Logistics Service Companies (LSC) are suggested to take these factors into consideration for improving their overall efficiency of Logistics Information System (LIS).
- Only ten companies use softwares for all services in logistics operations. By choosing the appropriate comprehensive software for all logistics operations, Logistics Service Companies (LSC) can combine functions of the various departments enabling them to easily access and share information with each other.
- For any industry, use of Information System and innovation is necessary in order to stay ahead in the competition. If they give importance to set aside more funds for the adoption of the latest software they can ensure greater ROI, leading to profitable business growth. IT solution providers can use suitable marketing communication tools to create awareness among Logistics Service Companies (LSC), and persuade them to adopt LIS since it is a cost saving tool and enables access to the real time information not only to management, but also to supply chain partners and customers.

6. Conclusion

Logistics industry is growing rapidly in India. Logistics Information System is a valuable tool for effective logistics management. This study is an attempt to examine the factors underlying the benefits of LIS. The results of confirmatory factor analysis revealed that 'organizational impact' was positively correlated with factors 'User Satisfaction' and 'Communication effectiveness'. Therefore the top management should focus on the communication gap internally and externally in the organization to improve the overall performance. The study area limits only to Logistics Service Companies. Therefore the work can be extended to different industries to find the benefits and the level of software applications of LIS in different areas in India.

7. Future Research

The study focused only on the companies using LIS and their benefits. The future research should focus on the dark side of technology adoption and barriers to implement in LSPs. Another area of research can focus on the integration of collaboration in social networking and mobile technologies within the logistics management systems.

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