International Journal of Advanced Science and Research
ISSN: 2455-4227; Impact Factor: RJIF 5.12
Received: 14-11-2018; Accepted: 19-12-2018
www.allsciencejournal.com
Volume 4; Issue 1; January 2019; Page No. 12-14

An integrated analysis using Dematel approach for exploring the impact of smart logistics on SCM in telecom industries

Reetik Kaushik[1], Gangesh Chawla[2], Suraj Singh[3], Ranganath M Singari[4]
[1] Department of Mechanical Engineering, Delhi Technological University, Delhi, India
[2, 4] Department of Production & Industrial Engineering, Delhi Technological University, Delhi, India
[3] Department of Electronics and Communication Engineering, Delhi Technological University, Delhi, India

Abstract
Supply Chain includes all stages involved directly or indirectly in fulfilling customer request. It includes forming a link between manufactures, suppliers, warehouses, retailers and customers. The main motive of supply chain management includes integration of demand and supply. To fulfil the objective of an efficient supply chain a company has specialised departments for sourcing, procurement, materials management, operations and customer experience. Smart Logistics includes integration of Technology and logistics to fulfil the objective of an efficient supply chain by increasing the transparency of the involved processes and thus resulting in devising a methodology to decrease turnaround time. This research paper aims at devising new strategies to inculcate the concept of smart logistics at every level of supply chain management with the minimum capital investment supported by practical case studies performed over two companies and showing the practical returns of the concept in a concise manner. The whole chronological order of the research is based on first conduction surveys to identify the challenges faced by Telecom Industry and how it impacts supply chain by breaking into different categories and lastly prioritizing the considered challenges by applying decision-making trial and evaluation laboratory (DEMATEL) method.

Keywords: supply chain, turnaround time, transparency, smart logistics, minimum capital investment, new strategies, DEMATEL approach

1. Introduction

Today, in the era of globalisation cost of any product is enormously impacted by the efficiency of the logistical setup applied during the various phases of its life i.e. production phase, transportation phase etc. Smart logistics deals with smoothing all these phases as well as cutting the cost at the same time. With the help of various technological setups e.g. Physical Internet (based on the IoT), Data analytics, Block chain, Robotics & automation, Autonomous vehicles, UAVs / Drones we can simplify most of the stages involved in logistical setup.

Customers in the logistics industry comprises of both B2B & B2C segments and their satisfaction is the key driving force of the industry. Business model for B2B segments basically comprises of Logistics & Service Providers (LSP), Carriers, Courier /express /Parcel (CEP) etc. and in the B2C segment comprises of CEP only. EBIT margins usually varies from -1% to 8% for the industry [1]. In most of the industries logistical particularly supply chain management support is provided by the third party vendors because of the competitive advantage they provide owing to their highly specialized skills specifically designed for the industry.

According to Cap Gemini more than 70% of firms in Western Europe, USA, and Asia pacific have outsourced logistics activities from basic transportation to full logistics network control. Also, 82% of logistics executives worldwide are clients of logistics service providers during 2007; this number demonstrates an increase of nearly 72% from the start of the 2000s which clearly shows the emerging trends of the industry [2].

Smart logistics can be applied to all the business models e.g. LSP, CEP etc. irrespective of their nature. All the problems faced by the industry have some common root causes and the processes involved in smart logistics tries to counter these basic causes and hence the importance and need of these processes can be seen in all the verticals in the industry. Common causes are:

- Lack of transparency of material flow & inventory status.
- Real-time communication & data analysis.
- Lacking in predictive instruments for the industry.
- Pace at which markets are changing.
- Low margins, Cost-focused business model & balancing act.
- Lacking the skills for development of critical maths.

In this research paper we will first try to state and discuss, the current problems and challenges in front of the industry. Then we will put forward our research which will help us to understand current demands of customer from the industry and finally we will suggest technological solutions that will show how smart logistics can be applied to the industry processes of Supply Chain to improve its functioning in a cost effective manner. The purpose of this study is to explore different types of challenges faced by the Telecom industry and use DEMATEL approach to analyse the problem. The DEMATEL approach helps us to understand both direct as well as indirect criteria and helps to filter out the best criterion.

2. Statement Problem

In any production process the main objective is to fulfil the demand of the customer in a cost effective and time efficient manner. Although outsourcing of activities creates many opportunities for the organization, but it cannot work properly, it will face with problems. If they make a mistake

in selecting suppliers and deep gap occurs between them and suppliers, internal cooperation and collaboration will be eliminated, and therefore efficiency and productivity of works will decrease.

Every supply chain aims at delivering the commodity as swiftly as possible to the customer for a better customer experience. We want to device strategies which ensure maximum participation of the customer at each stage so as to make sure that a relationship is built with the customer base. This includes part of after sale services till customer receives the product i.e. the transportation part, supply of human technical support to the service point e.g. for the setup of a machinery, supply of electronic services to the customer e.g. service of tracking the order etc.

This method must consider the various benefits and risks before implementing solutions to smart logistics so that company can make decision and evaluate by considering different criteria like market structure, material flow, communication problems etc. However, to make decisions and evaluate current situation, there are criteria that they can create problems for organizations to make decision. Therefore, decision makers must identify appropriate criteria. For example when dealing with selected problems like maximizing timely delivery, minimizing cost or increased quality the company finds itself in rattrap which can impose high cost to system. Therefore, using mathematical techniques such as DEMATEL methods can help a lot in this regard to the decision makers. Thus through this research we aim to find effective and efficient solution for the implementation of smart logistics in Telecom industry.

3. Literature review

A considerable number of studies have investigated the supply chain challenges in different industries, and analysing them by using different approaches.

Matthias Heutger [3] discussed in detailed study of IoT in logistics which focused on individual use cases along the supply chain provided how companies should not just consider implementing a single use case within warehousing, transportation, or last-mile delivery. The key to success lies in understanding the convergence of these cases with one another.

Arkadiusz Kawa [4] wrote a paper on Smart Logistics chain, proposed an idea of the SMART model, which is based on agent technology and cloud computing. It will allow easier collection and flow of information as well as better and cheaper access to logistics management systems.

Manuj, I [5] this study used to research the different challenges of the pharmaceutical industry in supply chain, which bears on the Supply Chain Management (SCM), categorically in the Indian setting. In this the whole research design is proceed firstly by finding out the challenges, secondly analyse all the challenges by dividing into different categories according to its importance and how it impacts the supply chain of pharmaceutical industry and in last prioritize the considered challenges by using DEMATEL technique. This study provides more efficient, efficacious, robust and systematic way to surmount challenges.

Jiunn-IShieh [6] presented an approach of DEMATEL method in identifying key success factors of hospital service quality by finding the key criteria and then applying DEMATEL method was issued to the hospital management by evaluating the importance of criteria and constructing the casual relations among criteria.

4. Research Methodology

Dematel Approach: Decision making trial and evaluation laboratory (DEMATEL) technique was first developed by the Geneva Research Centre of the Battelle Memorial Institute to visualize the structure of complicated causal relationships through matrixes or digraphs. As structural modelling approach, it is useful in analysing the cause and effect relationships among components of a system. The DEMATEL approach deals with both direct as well as indirect influences of one criterion over another criterion and filters the efficacious criteria. The existing steps of DEMATEL method [7] are given as:-

Step 1: Calculate Average Direct Relation Matrix

Data collected in form of expert opinion which was regarding the impact of i^{th} criteria over the j^{th} criteria. For i = j, the diagonal elements are set to zero. For each respondent, a non-negative matrix can be given as:

$$Y^r = \left[y_{ij}^r\right]_{n\times n}$$

here, 'r' is the number of respondent's i.e. $(1 \le r \le m)$ and x_{ij} represents the degree of respondents believes of i^{th} criteria over the j^{th} criteria. Then summarize the opinions of 'm' respondents and find out the average direct relation matrix as given in equation 1.

$$B = \left[b_{ij}\right] \quad (1)$$

Where, $b_{ij} = \frac{1}{m}\sum_{r=1}^{m} y_{ij}^r$

Step 2: Determine the Normalized Direct-Relation Matrix 'N':-

$$N = C \times B \quad (2)$$

Where $C = \frac{1}{\max_{1\le i\le n}\sum_{j=1}^{n} b_{ij}}, i, j = 1,2, \ldots\ldots, n$

Step 3: Estimate the Total Relation Matrix 'T' Using Equation 3:-

$$T = N(I - N)^{-1} \quad (3)$$

Where, 'i' is the identity matrix.

Step 4: Development of Causal Diagram.

The sum of rows (h) and the sum of columns (v) of Total Cognation Matrix 'T' are calculated. Then, 'Prominence' (H + V) and 'Relation' (H - V) have been calculated, to provides the relative importance and categorization in to cause and effect group of each criterion. It is predicated on positive and negative criterion, if 'Relation' is positive, then criterion will subsist in cause group while with negative 'Relation', falls under effect group [8]. By mapping the dataset of (H + V, H - V), casual diagram is obtained, to observed some visions for decision making

$$T = \left[t_{ij}\right]_{n\times n,} i, j1,2 \ldots\ldots, n \quad (4)$$

$$H = \left[\sum_{j=1}^{n} t_{ij}\right]_{n\times 1} = [t_i]_{n\times 1} \quad (5)$$

$$V = \left[\sum_{i=1}^{n} t_{ij}\right]_{1\times n} = \left[t_j\right]_{1\times n} \quad (6)$$

Table 1: Average Direct Relation Matrix:

	M1	M2	M3	M4	M5	M6
M1	0	3.571429	3	2.857143	3.428571	3.571429
M2	3	0	3	3.285714	2.714286	2.857143
M3	2.285714	2.857143	0	3.857143	2.428571	3.142857
M4	2.714286	2.714286	3.142857	0	2.857143	3
M5	3	3.428571	2.571429	3	0	3.285714
M6	3.428571	4.142857	2.428571	2.428571	2.571429	0

Table 2: Normalized Direct Relation Matrix:-

	M1	M2	M3	M4	M5	M6
M1	0.000	0.214	0.179	0.171	0.205	0.214
M2	0.179	0.000	0.179	0.197	0.162	0.171
M3	0.137	0.171	0.000	0.231	0.145	0.188
M4	0.162	0.162	0.188	0.000	0.171	0.179
M5	0.179	0.205	0.154	0.179	0.000	0.197
M6	0.205	0.248	0.145	0.145	0.154	0.000

Table 3: Total Relation Matrix

	M1	M2	M3	M4	M5	M6
M1	-0.11177	0.136156	0.113764	0.088418	0.151653	0.14721
M2	0.123118	-0.11402	0.122594	0.137751	0.099401	0.096806
M3	0.061447	0.095434	-0.09456	0.190776	0.078843	0.126631
M4	0.101155	0.081557	0.14022	-0.10308	0.116792	0.113108
M5	0.116005	0.135109	0.083486	0.112122	-0.09734	0.132011
M6	0.156066	0.201692	0.072098	0.063027	0.08465	-0.10933

Table 4: The Sum of influences given and received on criteria

	H	R	H+R	H-R
M1	0.52543	0.44602	0.97145	0.079411
M2	0.465652	0.53593	1.001582	-0.07028
M3	0.458571	0.437602	0.896173	0.020968
M4	0.449751	0.489015	0.938766	-0.03926
M5	0.481391	0.433996	0.915387	0.047394
M6	0.468199	0.506431	0.97463	-0.03823

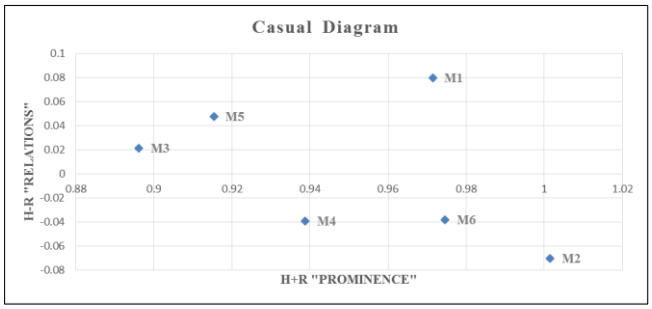

Fig 1: Casual Diagram.

By mapping the (H + R) and (H - R) values, casual diagram has been made as shown in figure 1. Based on this diagram, "challenges of Telecom industry" analysed easily under cause and effect group.

5. Conclusion

In this study, DEMATEL approach has been applied for exploring the impact of smart logistics on SCM in Telecom industries. After analysis, findings suggested that challenges of Telecom Industry "Inefficient Turnaround Time" come out with the highest importance rating (1.001582) and '' with lowest importance rating "Remote Access To Inventory Data" (0.896173). The categorization in to the cause and effect group can be seen through casual diagram as shown in Figure 1. The challenges namely Inefficient Turnaround Time (M2), Meeting Fluctuation in Consumer Demand (M4) and Inefficient Inventory Management (M6) exist in effect group due to having negative (H - R) value while Infrastructure Required (M1), Remote Access To Inventory Data (M3) and Distribution System (M5) comes in the cause group category with positive (H - R) and have a significant impact over the effect group practices. Finally, the importance rating order for considered challenges of Telecom Industry comes as: $M_2 > M_6 > M_1 > M_4 > M_5 > M_3$. Hence, the "Inefficient Turnaround Time" in important in order to build a better supply chain performance system to impact the smart Logistics in Telecom Industry.

Availability of data and Materials

The study is based on secondary data which have been collected from the annual audited reports of sampled automobile industries. All data generated and analyzed during the study are included in this article. All sample industries that were analyzed for this study maintain company websites and provide information regarding products and services via downloadable PDF format documents of their annual reports.

Authors' contributions

First author conducted the literature review, data collection, tabulation, and empirical studies. Second author assisted to check and interpret the whole paper several times including referencing. Both authors read and approved the final manuscript.

Competing interests

The authors declare that they have no competing interest.

6. References

1. Andrew Tipping. The future of the logistics industry by PwC Retrieved from, 2016, https://www. pwc. com/ sg/ en/publications/assets/future-of-the-logistics-industry.pdf
2. Rishabh Verma, Bhim Singh. ISBN-978-93-84588-07-6. 2017; 43:373.
3. Markus Kückelhaus. Internet of Things in Logistics by DHL Retrieved from, 2015, http:// www. dhl. com/content/dam/Local_Images/g0/New_aboutus/innovation/DHLTrendReport_Internet_of_things.pdf
4. Arkadiusz Kawa, 2012, DOI: 10.1007/978-3-642-28487-8_45
5. Manuj I, Mentzer JT. Global Supply Chain Risk Management. 2008; 29:1.
6. Jiunn-I Shieha, Hsin-Hung Wub, Kuan-Kai Huangcd. Published by Elsevier B. 2010; 23(3):277-282.
7. Gaurav Mishra, Mohit Tyagi, Ranganath Singari M, Walia RS. ISBN-978-93-84588-07-6. 2017; 44:380.
8. Praveen Kumar, Shivam Ashish. ISBN-978-93-84588-07-6. 2017; 46:393.
9. Betty Chang, Chih-Wei Chang, Chih-Hung Wu. Expert Systems with Applications 38 1850–1858 Published by Elsevier B.V, 2011.