Role of Artifical Intelligence in Logistics and Supply Chain

Dr. K.Niranjan,
Professor, MBA Department
Marri Laxman Reddy Institute of Technology and Management
Hyderabad, India
kn.nifft@gmail.com

Dr. K.Surya Narayana,
Professor, MBA Department,
MLR Institute of Technology,
Dundigal, Hyderabad
suryan568@gmail.com

Mr. M.V.A.L. Narasimha Rao,
Asst. Professor, MBA Department
KL Business School,
Vaddeswaram, Guntur
mval.narasimharao@kluniversity.in

2021 International Conference on Computer Communication and Informatics (ICCCI) | 978-1-7281-5875-4/21/$31.00 ©2021 IEEE | DOI: 10.1109/ICCCI50826.2021.9402625

Abstract— **Artificial Intelligence plays a pivotal role in global logistics and supply chain management. It creates opportunities of cost reduction in demand forecasting, purchase requirement planning, production planning, inventory, packaging, transportation, warehousing, distribution planning, customer services, information services, finance, and marketing/sales and provides competitive advantages over the other competitors. Artificial Intelligence displays huge possibility in the area of making better decisions and in the enhancement of efficiency through its exceptional abilities.**

Keywords- Artificial Intelligence; global logistics; supply chain management; decision-making

I. INTRODUCTION

A. Artificial Intelligence (AI)

Artificial intelligence (AI) was introduced in the late 1970s. Its salient feature is to experiment and extend "thinking machines" that have the ability of imitating, grasping, solving problems, and replicating human brains and its goals include learning, reasoning, and perception. It is categorized into theory of mind and restricted memory, self-awareness and reactive machines.

B. Logistics

Logistics stands for the entire process of resources management which includes procurement, storage, warehousing, inter-transportation and intra-transportation to the required end. Logistics management includes identification of the potential suppliers, wholesalers, retailers and distributors, and in calculation of their effectiveness and the ease of access.

C. Supply Chain Management (SCM)

Supply Chain Management (SCM) is the organized, planned synchronization of the conventional production operations and the strategies across these production operations- inter and intra departments and across process units in the supply chain towards enhancing the business operations of the distinct units and in the entire supply chain.

D. AI in Logistics and SCM

Logistics and SCM promotes in ensuring required supplies reach to the destination in the specified time and location in the preferred condition in order to contribute highly to the business units.

The web-like nature of the industries provide proper framework in logistics to implement and to scale artificial intelligence and in increasing the components of SCM independent of manual interference in the global supply chains. Also, there is a high risk for the companies to run into the risk of turning obsolete in long run as the other companies that use SCM strategies would turn to be efficient in their businesses day to day.

Artificial Intelligence is evolving every day and is benefitting various organizations and units. Mostly the machines used in the industries are multi-disciplinary. They have mathematical, information technology enabled, lingual, psychological and other such features incorporated in them. Flows and algorithms are the core of artificial intelligence. Their difficulty ranges differently for simple, medium and complex applications.

AI plays an important role in digitalizing the supply chain. Through the implementation of artificial intelligence logistics is benefited as the entire process is made transparent. There is a large volume of data that is generated by the supply chain every day. This stands to be the most underutilized data which is structured and at times not structured. Artificial Intelligence helps in digitalizing the logistics companies and their supply chain by bringing about a digital transformation through transitioning away from the legacy ERPS to analytics. Enhancement in automated systems, robotics and mobile computing makes this transition easy.

978-1-7281-5875-4/21/$31.00 ©2021 IEEE

II. OBJECTIVES

- To identify the cost reduction opportunities of artificial intelligence in logistics and SCM in manufacturing
- To understand the role of AI in selection of distribution networks and routes
- To study the AI applications in inventory

III. REVIEW OF LITERATURE

According to Ben Gesing, "Artificial intelligence (AI) is again set to flourish; unlike past waves of hype and disappointment, today's current technology, business, and societal conditions have never been more encouraging to wide spread use and implementation of AI. In the consumer world, AI is already here to stay. Among businesses, leading industries are well into their AI journey. Industrial enterprise sectors like logistics are beginning theirs in intense."

Yu Et Al. from his research in 2002 reveals that a pattern matching procedure which is not static could be used in the framework system which has a combination of data mining techniques and manual skill in predicting the need of the upcoming products.

According to Steve, "A considerable progress has been made with respect to core AI technologies, and the scale of investment and the demand for improvement give good rationale to expect this growth to continue well into the future." According to Dr. Dirk, in engineering and in manufacturing the application of the artificial intelligence indicates an exit from the world that is digital. Artificial intelligence helps in shaping the surroundings.

IV. ADVANTAGES AND DISADVANTAGES OF AI IN LSCM

A. Advantages

1) The integration of artificial intelligence with the information system helps in keeping the informational flow rich.
2) It is widely put into use for real time pricing.
3) Profiles of various in-sources and out-sources are created through techniques of artificial intelligence.
4) Systems based on rules could help in outsourcing of logistics and in the decisions involved in making of contracts.
5) Machine learning through artificial intelligence could be used to explore the location and could be used in the assessment and the assortment issues of different suppliers.

B. Disadvantages

1) Implementation of AI solutions is not easy as they are esoteric and difficult to comprehend.
2) AI at times may display incorrect decisions as it completely depends on the software.
3) Artificial intelligence doesn't handle risks and uncertainties involved in cross-functional nature due to the information acquirement bottlenecks.

V. APPLICATIONS OF AI IN LOGISTICS AND SCM

1) Procurement

The objectives of procurement through artificial intelligence are supporting the requirements of operations, managing purchasing efficiently, developing, selecting and maintaining the supply sources, to support organizational goals and objectives, in developing firm relationships with other units and organizations and in developing strategies related to purchase such that they help in maintaining strategies of organizations.

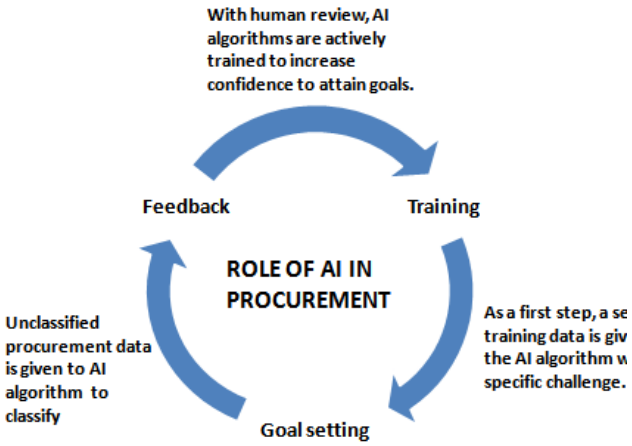

Figure 1. Role of Artificial Intelligence in Procurement

2) Manufacturing

The industrial revolution started from 1700s where each upgrade has brought significant changes in manufacturing of products. The 4 renowned revolutions are:

- Industrial revolution 1.0 (in 1970) – Mechanical automation, power generated through steam and weaving
- Industrial revolution 2.0 (in 1870) - bulk manufacture, process lines, energy generated through flow of electric charge
- Industrial revolution 3.0 (in 1969) – computerization and electronics
- Industrial revolution 4.0 (Today) – Networks, internet of things (IOT), cyber physical systems, and artificial intelligence (AI)

In the pandemics involving large-scale lockdowns, shortage of labors, restriction on time span and irregularities in supply chain the need for machine driven manufacturing increased. AI based solutions help in digitally transforming

manual operations involved in manufacturing of products and in making prompt data-driven decisions.

3) Warehousing

The management of inventory of goods stored in warehouses received from suppliers and vendors is governed by Warehouse management system (WMS). AI based systems track the can bans. They are used to locate the inventory in the production, processing and manufacturing units and accordingly handle the orders of the customers. It can also be integrated with SAP technology for tracking the stock and location.

4) Packaging (Automation)

AI is used in packaging to protect the products, to identify the product and provide information, to improve efficiency, to handle and distribute the products and to change the product density. It helps in easy return management with the help of barcodes and electronic data interchange (EDI).

5) Distribution

AI helps in making the process of physical distribution, communication functions and facilitating functions easier and faster. Tools collect required data and suggest measures to consolidate operations and enhance profits. AI helps in predicting consumer demands such that the customers are served effectively and efficiently using this information.

6) Customer Relations Management (CRM)

AI enables vendor management inventory through collaborative planning, forecasting and replenishment (CPFR). It helps in learning continuously about the customers, differently handling the customers, predicting the needs of the customers, customer interaction to focus on generation revenue and retaining of customers, creating rules to drive business decisions and enabling knowledge sharing across the organizations for smooth management of customer relations.

Allied applications

AI can be used in the prediction if the peak hours in logistic centers and ecommerce. It enhances workplace communication and human resource information systems (HRIS). Also, it can be used in healthcare logistics as outsourcing like third party and fourth party. It plays a pivotal role in cyber security.

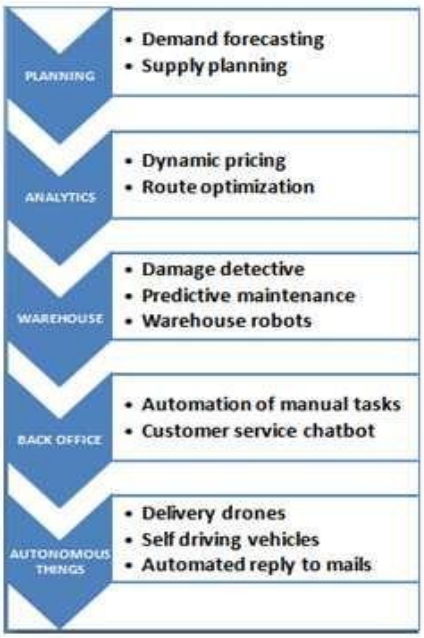

Figure 2. Allied applications of Artificial Intelligence

VI. CONCLUSION

Artificial Intelligence in logistics and supply chain management provides the ability of network optimization in distance and in time. This helps is revenue generation which cannot be attained entirely through human decision makings. It helps the logistics industry in redefining the present day activities, in making judicious operations, in planning like demand and seasonal forecasting, in processing by replacing human intervention with automation, and in transforming the processes from traditional to customized.

REFERENCES

[1] Chou, T. (2016)- Precision: Principles, Practices and Solutions for the Internet of Things.

[2] Curran, C. (2017)- Putting AI to Work in the Enterprise.

[3] Francis, S. (2017)- GreyOrange launches new AI for logistics robots and warehouse automation.

[4] Ben Gesing, Steve J. Peterson, Dr. Dirk Michelsen- Artificial Intelligence in Logistics

[5] Hokey Min- Artificial intelligence in supply chain management: theory and applications

[6] Russell, S. and Norvig, P., 1995- Artificial intelligence: a modern approach. Upper Saddle River, NJ: Prentice-Hall

[7] Timme, S.G. and Williams-Timme, C., 2003- The real costs of holding inventory. Supply Chain Management Review, 7, 30–37.

[8] Tarver, M. and Fae, M.I., 2007. Applications of multiagents in transport and logistics. International Journal of Logistics Systems and Management, 3 (4), 405–418.