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Use of Internet of Things (IOT) in Supply Chain: A Literature Review

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Abstract

In recent years supply chain has become more agile and responsive by using upcoming technologies like Internet of Things (IoT), Artificial Intelligence (AI), Block chain, and so on. Many researchers have stated the usefulness of integrating IoT in supply chain to enhance its performance. The use of IoT has given rise to appropriate information sharing in supply chain. Information sharing is the most crucial factor to achieve the desired targets of supply chain performance. Information sharing has been considered an important resource over the past few years. Information sharing results in efficient control over performance of supply chain partners. The supply chain partners primarily consist of suppliers who play an important role in its performance. This paper aims to provide research scholars an overview of the use of IoT in supply chain.

Keywords: Supply Chain, Supply Chain Management, Supply Chain Performance, IoT, Information Sharing, Supplier Partnership

Introduction and Literature Review

Supply Chain

Basset et al. (2018) observed that supply chain consists of processes and participants to fulfil customer orders based on Supply Chain Operations Reference Model (SCOR Model). The main processes of supply chain, according to the SCOR model, are planning, sourcing, making, delivering, returning, and enabling. In a traditional supply chain there exists several problems, like overstocking, delivery delays, and stock shortages, resulting in several problems like complexity and uncertainty in the actual workings of the supply chain personnel. The traditional supply chain, with time, is becoming costlier, complex, and vulnerable, for which innovation is required to overcome the challenges and make the supply chain smarter. A modern smart supply chain can be defined as a systematic and widely implemented interconnected system within an organisation.

Supply Chain Management

Themistocleous et al. (2004) highlight supply chain management as the integration of key business processes from end user to the original suppliers who provide products, services, and information that add value for customers and other stakeholders.

To achieve the goal of a smart supply chain, there is need for a strong information sharing system, trusted and loyal suppliers, motivated and dedicated personnel, and most importantly, the infrastructure for smart supply chain, including upcoming technologies like IoT, Industry 4.O, JIT, AI, and so on.

Supplier Participation

Lintukangas et al. (2019) stated that supplier participation is an important driver for collaboration and coordination in supply chain. The research on buyer-supplier relation shows that it is advantageous for the organisation's performance. Suppliers can be the driver for innovation, and thus contribute to the organisation's innovation and other expectations.

Information Sharing

According to Hidalgo et al. (2020), the infrastructure required for a huge amount of information sharing is a great challenge, but it avoids distortion of information in supply chain. Information technology (IT) is crucial for generation, processing, and distribution of information

electronically. The rise of information use in supply chain or reverse supply chain for robust and flexible decision making, along with reduced cost, has given rise to the Internet of Things (IoT).

Internet of Things (IOT)

Lee and Lee (2015) highlight IoT as a technology, which has a network of devices and machines that can interact among themselves. It is considered as important technology for the future and has been gaining interest from various industries. The complete potential of IoT can be exploited when the network of devices/sensors collects data, processes them, and helps the management in decision making for inventory system, customer management, business analytics, and much more.

Phase and Mhetre (2018) observed that IoT has revolutionised industries globally, with the most impact on global supply chain. It has improved communication, collection, and transmission of information for quick decision making, without affecting the performance of the supply chain. With the use of IoT, supply chain is becoming agile, adaptable, and transparent among supply chain partners.

Atzori et al. (2010) mention that IoT is a novel paradigm that is gaining ground in the modern scenario of wireless telecommunication. The concept is based on the presence of various things or objects, like RFID tags, sensors, actuators, and so on, which interact and coordinate within themselves via unique addressing schemes to achieve the desired goal.

IoT has a strength to highly impact several aspects of day-to-day life and behaviour of potential users. In the near future it will play a leading role in domestic fields for assisted living and in business fields like automation, industrial manufacturing, logistics, process management, and smart transportation of people and goods.

Hidalgo et al. (2020) stated that IoT is the interconnection of physical objects via the Internet, to share information and coordinated decision making on sensed data. It helps to improve quality and integrity of information sharing. IoT can deliver advances in reverse supply chain and reverse logistics, as traditional waste management strategies of collecting and recycling are complex due to the diversity in waste materials.

Cortés et al. (2015) said that IoT aims to enhance communication in the current scenario, which will enable human-to-human, human-to-devices, and devices-to-devices communication.

IoT may not have a universal definition, but is a core concept to equip everyday devices with identification, sensing, networking, and processing abilities to communicate with each other and with other devices via the Internet. It is generally defined as a concept for information exchange in a network of devices.

Adoption of IoT in Supply Chain

Hidalgo et al. (2020) said that IoT has been the fundamental pillar for digitalisation in various fields of industry and in society for data storage, availability, transmission, and analytics of information. IoT along with Wireless Sensor Networks (WSN) are being used in consumer as well as industrial applications, including transportation, healthcare, energy, and so on. With the use of IoT, asset tracking and logistics have gained importance as the deployment costs have reduced for connected devices and improved performance for decision making in real-time. For an IoT ecosystem, connectivity is a major challenge with increase in communication standards. Some of the communication standards are: Wireless Fidelity (Wi-Fi), Long Term Evolution (LTE), Bluetooth Low Energy (BLE), ZigBee, Radio-Frequency Identification (RFID), and Low Power Wide Area Network (LPWAN), which enable long-range communication. These communication standards are being developed to reduce energy consumption for achieving efficient transmission as per application requirements.

The rise of innovation and transformation in organisations has resulted in the adoption of IoT in various industries. After careful cost-benefit analysis, the adoption of IoT can result in the smooth and effortless working of the supply chain.

Literature Review

IoT is a technology used for real-time data collection, and its connectivity helps the user access information from any place at any time. The use of IoT in supply chain has been a topic of research for some time. Researchers have conducted survey-based analysis to find out the effect of IoT on supply chain.

Supply Chain

Themistocleous M. et al. (2004) mention that supply chain is a network of relations/connections between the supplier and the customer. The authors also mention that collaboration among supply chain partners has improved

the management of supply chain. The supply chain personnel can achieve significant improvement in working by integration of business processes and information flow among supply chain partners. Supply chain integration has the following benefits:

- Competitive advantage.
- Reduced operational costs.
- Improved collaboration and coordination among supply chain partners.

Supply Chain Management

Lintukangas et al. (2019) highlight that innovation means changing based on external environment or pre-emptive action to control the environment. Hence, innovation can be defined as the need to introduce new products/services, processes/technologies, organisational structure/administration, and plans/programmes to the existing organisation's members. Further, innovation is mentioned as a multi-stage process with an outcome of being able to compete in the market successfully.

Phase and Mhetre (2018) said that in a competitive world, supply chain faces a variety of risks and has to work under continuously changing environments. Organisations have to manage customer expectations and operating costs. With exposure to wide geographies there are risks on a global scale. The supply chains are spreading across the globe and are challenged by customer awareness. Nowadays, customers want on-time delivery along with product quality, price, and service. With this rapid development of supply chain, its complexity has increased and supply chain management has become the backbone of many industries.

It becomes very important to identify the areas where IoT can be used to enhance the performance of an organisation. It is very likely that an organisation transfers information among its supply chain partners. Thus, IoT can be very useful for sharing appropriate information among the supply chain partners to meet global competition.

Supplier Participation

Lintukangas et al. (2019) highlight that the supplier-buyer relations, attitude, professionalism, and specialisation increase the innovativeness of the supply base. The supplier participation and collaboration promotes innovations, but the relations must remain within certain boundaries. Established and market-leading companies should influence their suppliers for boosting their capabilities. Active supplier participation helps the organisation to take quick decisions, as the suppliers are aware of the organisation's strategies and goals.

Huang et al. (2020) stated that the supplier relationship has a strong impact on supply chain's performance. The supplier relationship can be categorised into 2:

- *Contract Type:* These relations are well defined with detailed expectations, deliverables, and revenue share among the partners, and have a legal structure to define boundaries.
- *Non-Contract Type:* These relations are loosely organised.

Caniëls et al. (2013) highlight that lack of supplier participation is an obstacle for development of supply chain. A collaborative approach and active supplier participation can lead to the performance enhancement of an organisation's supply chain. It includes a strong structure for information sharing, commitment, and generation of common goals with suppliers.

Information Sharing

Ipe (2003) highlights that for the past decade information sharing has been considered an important source for competitive advantage and crucial for maintaining the success of an organisation.

Daya et al. (2019) state that information sharing plays a crucial role while dealing with supply chain challenges. It has become the biggest enabler in supply chain for forward integration with customers and backward integration with suppliers. This is achieved by improved communication, relevant data transfer, and effective decision making. With the use of developments like IoT, it can be easier to share information across the supply chain, making it agile and adaptable to any challenge.

Haulder et al. (2019) state that information and communication technology (ICT) is a cost-efficient, quick, and convenient way for management and transmission of crucial information across the supply chain. Over the past decades, technologies like OCR, RFID, and barcodes made product tracking and inventory management a convenient process; artificial intelligence refined automation; e-commerce has changed the way the products are being sold; and big data analytics has made forecasting very accurate.

With a variety of technologies being used in different areas of supply chain, coordination has improved. Using

a common platform for the entire supply chain has made data collection, its processing, and communication smooth, for operations and decision making.

Research Findings

The process of finding literature for the topic started with the searching for the content with key words like supply chain and IoT, which resulted in a collection of 82 articles. These articles were screened for connections to IoT and supply chain. Finally, 26 articles from various authors during different years were selected.

Fig. 1 shows that the articles are from 2010 to 2021, which indicates that the subject has been researched in the past decade, with extensive work being done after 2016.

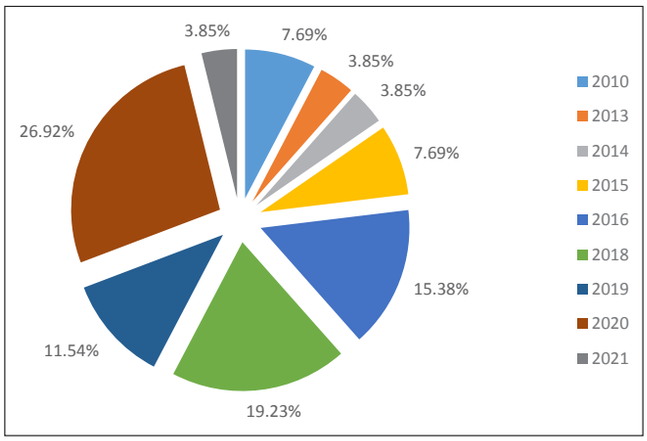

Fig. 1: Documents of Years

Internet of Things (IOT)

Basset et al. (2018) said the term IoT is defined as a set of physical and virtual objects that are connected together via a network for communication and sensing, or interaction with internal and external environment. The definition for IoT relating to supply chain would be to have a set of physical objects connected digitally for monitoring, sensing, and interacting within the organisation and among its supply chain partners, for agility, transparency, information sharing to facilitate plans, along with controlling and coordinating the processes of supply chain.

The author mentions that goods can be monitored anytime and anywhere via integrating RFID tags and GPS technology. They even mentioned that to have sharing access, cloud technology can be used among the supply chain partners.

Pal and Yasar (2020) mention that the devices primarily capture data about manufacturing, transportation consumption, and additional details about product movement in an industry. The devices interact with each other via a unique address, which helps to achieve common goals and effective decision making.

Wang and Wang (2021) mention the use of IoT for secure data sharing via wireless medium, like the Internet without human intervention. Kawsar et al. (2010) discuss about IoT and managing supply chain risks. Xu et al. (2014) state that IoT is a global network infrastructure with various devices connected to each other via different technologies for development of an architecture. They further highlight the technologies under the IoT umbrella, its layers, and focus area for its use and applicability in industries. Gubbia et al. (2013) highlight the definition of IoT as an emerging technology, with elements like RFID (Radio Frequency Identification Devices), WSN (Wireless Sensor Networks), addressing schemes, data storage, and visualisation. The authors also mention applications of IoT in personal and home devices for convenience features, in enterprises for connectivity, for utility activities like waterfall measurement and air temperature, along with mobile logistics.

Lee and Lee (2015) highlight the IOT technologies:

- *Radio Frequency Identification (RFID):* It helps in capturing information from a barcode by using radio waves, tags, and readers.
- *Wireless Sensor Network (WSN):* A network is designed in a workspace by sensor-equipped devices for monitoring physical or environmental conditions. With the help of RFID, higher accuracy can be achieved. It is used to monitor product movement, temperature of workspace, quantity of products, and so on.
- *Middleware:* It is the software layer between the physical devices and the collected data; it interprets the incoming data and displays it in a predetermined form as output.
- *Cloud Computing:* It is a model where the data collection, storage, processing, and display is done by use of the Internet, making it available to the concerned personnel for access.
- *IoT Application Software:* It is required for device-to-device and device-to-human interaction in an understandable manner. The software helps make appropriate decisions on time to avoid any unforeseen situations.

Cortés et al. (2015) discuss the following features of IoT.

- *Comprehensive Perception:* Use of sensors and development of code for information access anytime anywhere. The data collected through IoT is large due to the connection of a number of devices.
- *Reliable Transfer:* For achieving real-time information monitoring, the information about the external environment and the relevant object information are converted into a suitable format for transmission to the data centre via a network.
- *Intelligent Processing:* The use of vast technology for analysis and data processing of information to gain intelligent control over objects.

Kousiourisa et al. (2019) highlight that IoT helps achieve new capabilities with real-time data monitoring, optimisation of inventory, and management of product distribution in supply chain network. The authors mentioned that it had been a trending technology since 2018 for supply chain advancements. It also helps to monitor regular activities by collecting data for temperature, humidity, location of product, and so on. By using the collected data and AI, big data, or cloud technology, various issues regarding sensitive goods can be tackled in the industrial and agricultural fields.

IoT functioning and architecture have not been standardised, and different research scholars have described them in various ways. Some of them are as follows:

According to Cortés et al. (2015), IoT architecture comprises 3 layers.

- *Network Layer:* It is used for transmission of processing data from various devices to the data storage centre.
- *Middleware Layer:* It is used as the operating link between the other 2 layers for data collection and filtration of data, along with application logic.
- *Application Layer:* It is used as an interface that is simple and transparent, making the entire supply chain simple and reliable.

According to Phase and Mhetre (2018) and Wu et al. (2020), IoT architecture is an umbrella term that involves the following things:

- Wireless sensor/actuator networks.
- Internet-connected wearables.
- Low-power embedded systems.
- RFID tracking
- Use of mobile phones for interaction
- Devices that connect via Bluetooth phones to the Internet

According to Phase and Mhetre (2018), IoT is described as a network of physical devices that connect various devices, allowing/facilitating exchange of data. The devices have in-built electronic and software systems interconnected with each other to operate in an established infrastructure.

The advantages of using IoT are as follows:

- *Communication:* It provides a transparent way for communication to increase customer service.
- *Automation and Control*: It speeds up work to deliver output on time.
- *Monitoring:* It helps to keep track of end product's processes at every stage.
- *Timeliness:* It helps to decrease working time of supply chain processes.
- *Money:* It can send alerts in case of unexpected events, to help take appropriate corrective action to reduce damages.
- *Efficiency:* It improves work efficiency via the interaction of man and machine.

Wu et al. (2020) mention the following IoT benefits:

- It helps in accurate and quick identification of different products with the help of barcodes and RFID.
- The object that is captured is visible, as well as traceable, by management.
- It provides transparency in information sharing.
- The real-time data availability helps in optimal decision making.

Atzori et al. (2010) stated that in spite of the wide acceptance of IoT, there were various challenging problems concerned with technological and social knots. The main concern is to make processes interoperable and interconnected with a higher degree of smartness, by autonomous behaviour and maintaining trust, privacy, and security.

IoT is the convergence of different visions which depend on specific interests, finalities, and backgrounds. The various visions of IoT are as follows:

- *Internet Oriented Vision:* It considers the communication medium required by the physical devices.

- *Things Oriented Vision:* It considers the various objects (like RFID, UID, NFC, and so on) that are being used for the smooth functioning of different goals.
- *Semantic Oriented Vision:* It considers the unique addressing, representing, and storing of the shared information.

Adoption of IoT in Supply Chain

Talib et al. (2020) highlight that a supply chain network always needs to be connected and continuously monitored, which can be easily achieved by using IoT, as the devices capture data that can be analysed and monitored remotely at any time. It helps to increase visibility of supply chain network, thus increasing confidence of the personnel. This helps a supply chain to face sudden disruptions and increase its working capabilities. It can be used to restructure traditional supply chain models to eliminate various error-generating or bottleneck operations.

Ku (2018) mentions that wide acceptance of IoT in supply chain has resulted in a huge requirement of storage devices, as the large amount of collected information is required to be saved before further analysis. This increasing demand for storage devices will affect various supply chains linked to them. According to Ali et al. (2020), use of IoT in construction supply chain can be beneficial for its proper management. Tu (2018) mentions that IoT-enabled supply chains provide a virtual connection among various organisations, and independent or common interface for information access, which can be processed for further decision making. Lin et al. (2016) conducted a survey-based research to identify acceptance of IoT for supply chain by creating a survey of technical factors in different variables. The study suggests that IoT can be adopted for a supply chain but requires efficient planning before implementation. Birkel and Hartmann (2016) proposed a conceptual model based on literature review by combining various intra-organisational factors in 2 major categories of perceived usefulness and perceived ease of use, cross-referenced to external environmental factors. Gill et al. (2016) highlighted the connectivity modes like Wi-Fi, Bluetooth, mobile network, and any other app (Resalert suggested by author) between the originator and the end user. Daya et al. (2019) highlighted the role and impact of IoT on various supply chain processes through their literature review. The supply chain processes mentioned by the authors are sourcing, making, delivering, and returning. According to the author, use of IoT in a supply chain leads to: an improvement in visibility, efficient strategic planning, improvement in product design, saving time and money, reduction in lead time, and enhanced customer satisfaction. Omitolaa and Willsb (2018) highlighted the security features required for IoT ecosystem in a supply chain. The authors examined direct and indirect relationships across iPhone supply chain. The endpoints are required to be secure for smooth and safe functioning of supply chain.

Phase and Mhetre (2018) proposed a system for integrating IoT and supply chain, as shown in Fig. 2.

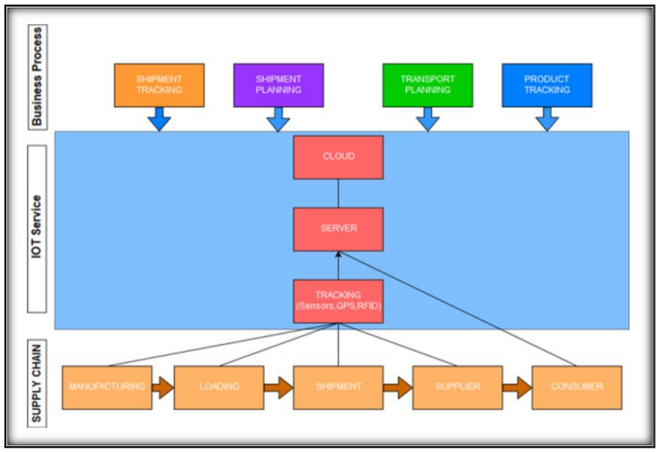

Fig. 2: IoT Integration with Supply Chain

IoT is the joining link for supply chain processes and business processes.

Hidalgo et al. (2020) mention the requirements of implementation in supply chain as follows:

- Timeliness, which is ability to transmit information in the least possible time for responsiveness.
- Cost, which is an economic value associated with deployment of communication infrastructure directly proportional to the number of devices deployed.
- Volume is the amount of information to be transmitted between 2 or more supply chain partners during a specific time period.
- Flexibility is the ability to react in a dynamic scenario, modifying scheduled plans based on available information, without affecting performance.
- Availability is the ability to update information about materials, products, and parts.
- Visibility is the access to any level of supply chain for information.

- Accuracy corresponds to the objective and qualitative amount of information being transmitted.

Selection criteria of IoT communication standards for supply chain can be as follows:

- Communication range is the distance between which 2 IoT devices can communicate without information loss.
- Data rate is the number of data bytes a device can transmit in a measured time interval.
- Latency is the time elapsed between transmission of data packet and its reception at the destination.
- Cost is the financial investment to implement baseline network, depending on the cost associated with deployed IoT devices.
- Battery life is the time frame during which a device can operate while maintaining its basic functionality.
- Reliability is the relation between number of data messages sent from the origin device and received by the destination device.

Basset et al. (2018) mention that traditional supply chain is a grid of raw materials, information, services, and processes to characterise the supply, transformation, and demand from the consumers. The supply chain can be either internal, i.e., within the organisation or external, i.e., with other organisations, as displayed in Fig. 3.

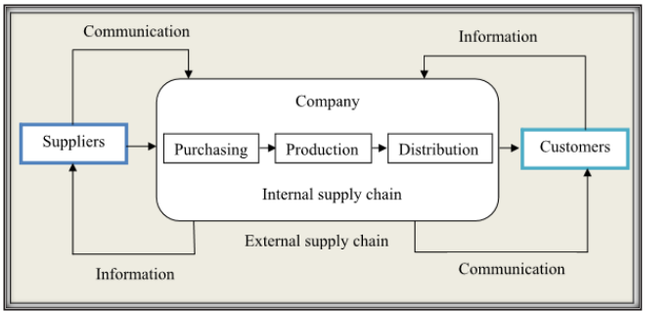

Fig. 3: Internal and External Supply Chain Model

Basset et al. (2018) mention that applying IoT in supply chain management will deliver the following characteristics:

- *Instrumented:* Information in supply chain being machine generated.
- Interconnected via using smart objects and IT systems.
- *Intelligent:* Optimise performance via making large-scale optimal decisions.
- *Automated:* All processes must be automated to substitute low-efficiency resources.
- *Integrated:* Collaboration between supply chain stages.
- *Innovative:* The evolution of new values via solutions for meeting new requirements.

Author mentions the impact of IoT on supply chain over traditional supply chain as follows:

- *Enhanced Management of Inventory:* IoT gives real time visibility of inventory, along with high accuracy, with use of sensors. In traditional supply chain, the data is recorded manually, giving chance for errors.
- *Real-Time Supply Chain Management:* The use of RFID tags enable recoding different types of information about a product, like production and expiry date, warranty period, and so on, and sharing among supply chain partners. In traditional supply chain, the information is generally stored by limited partners.
- *Maximise Transparency of Logistics:* The transport information can be shared in entire supply chain, providing ease of access in case of priority products. It can also minimise unnecessary planning and improve customer satisfaction.

Gunasekaran and Ngai (2004) mention that for implementation of any technological upgrade, changing product distribution channels, customer service procedure, and so on in an organisation requires a huge amount of money. The author found some problems cited for developing IT-integrated supply chain.

He et al. (2020) observed that an IoT-enabled supply chain information is an integral part of a product. The data being captured by sensors, its processing and the analysis software help in real-time data monitoring and storage for a product in a supply chain. By use of IoT, supply chains can now function with more reliability, better product utilisation, and cross-border boundaries of traditional products. The use of IoT replaces manual accessories and increases working range of devices under various conditions.

In an IoT environment, a product's information related to its resources and production capabilities improves

the supply chain operation efficiency. A supply chain governance mechanism can be created to face challenges.

Cortés et al. (2015) proposed a model called Highly Visible Supply Chain (HVSC), which is a combination of supply chain and IoT, where details about objects are ascertained anytime, things could interact among themselves, and are governed by supply chain economic phenomenon. In pharmaceutical supply chain, the transparency is less, leading to counterfeiting issues, which can be avoided by the application of RFID and IoT for information sharing and to enhance operational practices. In food supply chain, use of IoT for real-time and accurate information sharing of location and intelligent monitoring can improve supply chain efficiency and safety of food. Similarly, the availability of raw material information of fresh agricultural products can help the buyer make quick decisions about buying, with smooth functioning of supply chain. For efficient quality management for an organisation, tractability of a product is required, which can be easily achieved by implementation of IoT in any supply chain. It will help trace the product from customer to its origin in a supply chain.

The traditional performance evaluation index cannot reflect the supply chain performance based on the Internet of Things; therefore, the performance evaluation should be done based on:

- *Visualisation:* The Internet-based supply chain gives tags to all network items containing information; with the information shared, quality of products can be maintained and brand strategy can be implemented.
- *Network Seamless Change*: By using the information flow, inventory can be reduced and transportation can be optimised. By using IoT, an organisation can reduce preparation time, enhance production efficiency, and improve the manipulation strategy for emergency situations.
- *Management Process Optimisation*: By use of communicating devices and reduced dependency on employees, the efficiency increases and error rate decreases.
- *Information Synchronisation Features:* With the smooth and real-time information sharing among and by supply chain partners, quick corrections can be made for sudden changes, with efficient tracing of material flow.

Challenges for IOT (Lee & Lee, 2015):

- *Data Management Challenge:* The large amount of data generated and stored safely is a very difficult task and requires a lot of research work to be done, as technology is rapidly growing.
- *Data Mining Challenge:* The collected data needs to be processed to identify competitor's strategic steps, customers' behaviour, and the impacts on business activities. Specific data mining tools are required to address the mentioned tasks.
- *Privacy Challenge:* It is very difficult to maintain privacy when a lot of information is collected and requires processing.
- *Security Challenge:* With the increase in collected information there exists a chance for cyber-criminal activity.

Summary of Research Findings

Table 1: Research Findings

Sr. No.	Authors	Year	Key Findings
1	Luigi Atzori, Antonio Iera, Giacomo Morabito	2010	Visions of IoT and its acceptance
2	B. Cortés, A. Boza, D. Pérez, L. Cuenca	2015	Architecture, features of IoT and various sectors, along with evaluation criteria for IoT in supply chain
3	In Lee, Kyoochun Lee	2015	IoT technology and its challenges for use in supply chain
4	Avani Phase, Nalini Mhetre	2018	Architecture and advantages of IoT, along with system for use of IOT in supply chain
5	Mohamed Abdel-Basset, Gunasekaran Manogaran, Mai Mohameda	2018	Impacts of IoT use in supply chain
6	George Kousiourisa, Stylianos Tsarsitalidisa, Evangelos Psomakelisa, Stavros Koloniarisa, Cleopatra Bardakib, Konstantinos Tserpesa, Mara Nikolaidoua, Dimosthenis Anagnostopoulosa	2019	Capabilities of IoT
7	Celia Garrido-Hidalgo, F. Javier Ramirez, Teresa Olivares, Luis Roda-Sanchez	2020	Requirement criteria for IoT use in supply chain
8	Longfei He, Mei Xue, Bin Gu	2020	Benefits of IoT use in supply chain
9	Wei Wua, Chunfai Cheungb, Sin Yu Loa, Ray Y. Zhonga, and George Q. Huang	2020	Architecture and benefits of IoT

Conclusion

This paper presents an overview about supply chain, its major operating factors, and IoT, along with its application in supply chain. The supply chain performance variables mentioned here are the most affected by IoT. IoT is a broad concept, and to exploit its complete potential it is used along with other technologies like machine learning, business analytics, artificial intelligence, and so on. The use of IoT in any field is helpful and enhances the performance efficiency of the organisation. IoT is being widely accepted in the field of supply chain due its ease of user friendliness and customisability as per requirement. Its use enhances the decision making power of the top management during unforeseen events and helps to effectively manage the demand.

Scope for Further Research

IoT has its drawbacks, like the implementation time and cost, which are the biggest anchors for its implementation in small and medium scale industries. Further research can be done on the search for effective but less expensive devices. A focused research can be conducted on a particular industry group to extensively analyse the use of IoT and its benefits.

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