Internet of Things (IoT) on E-commerce Logistics: A Review

Vikas Sharma¹, Madhup Kantilal Gandhi²*
¹Symbiosis Institute of Management Studies, Symbiosis International (Deemed University), Pune, Maharashtra, India
²Dr. D Y Patil Vidyapeeth, Pune, Maharashtra, India
Email: *mk.gandhi@sims.edu

Abstract. A revolutionary technology Internet of Things in the global infrastructure of e-commerce business that provides extreme transparency to supply chain management and other related departments. In RFID technology, network transmission interconnection, signal processing, and computing information are common, and the continuous link is achieved between products or customers and products. The actual-time data achieved through RFID further helps in monitoring activities of products from production to warehouse to end customer, and thus efficiency in managing the system and methodical management is possible. In this review, the trends of expansion of IoT in e-commerce through different phases or stages have been studied, starting from when e-commerce meant telesales. Also, this study talks of various advantages this IoT technology has brought to the e-commerce industry, then talking of challenges in e-commerce enterprises which includes both technical and personal perspectives. This study also considers the working of IoT in production and warehousing logistics which are crucial for any type of supply chain work.

Keywords: Internet of Things, E-commerce, Logistics, Radio Frequency Identification, Supply Chain Management.

1. Introduction
Disruptive technology in today's world is very much relevant in both academic research and business-related practices which were first introduced. Also, new business models like Amazon or Flipkart nowadays are based on disruptive technologies, which are much better in terms of efficiency, productiveness, and convenience in comparison to incumbent technology. [1]For example, the Internet of Things entirely commutated warehouse and inventory management by a stringent combination of supply hubs, transportation, and customer handling system which is a boost for e-commerce industries, and because of that, IoT can provide more personalized, responsive, and novel or unconventional customer service in addition to the reduced operational cost [2]. It is believed that the Internet of Things is going to portray a crucial act in the coming future in the logistics segment; also, it can be seen as of now that many objects or items have started carrying or tagging bar codes, RFID tags, sensors thus bringing geospatial data which provides precise and real-time data, and enable us to track a variety of goods and merchandise through a unified supply chain from any remote location [3]. Figure 1 represents the 4 major components of the system.
Figure 1: IoT, the networked connection of people, process, data, and things

E-commerce typically is a different industrial setup, where the client prefers shopping on websites or applications, trade is online among sellers and operational automated portions and combination of business work out, swap works out, budgetary activities, and related consolidated organizational happenings, shoppers and shippers are not met to coordinate diverse occupational practices. In an exposed framework state of the internet, there is a sample extent of business and trade practices far and wide [4].

The motivation for doing research on this topic is to understand the impact of IoT, which is a technology of a near-future on logistics of e-commerce industries. It is imperative to apprehend the importance of it in the logistics of e-commerce from various outlooks like challenges and impact of IoT in the e-commerce business, gaps in the previous research studies, and the conclusion of this study. Figure 2 shows the workflow of the IoT system and the types of process phases.

Figure 2: IoT Enabled Capabilities
2. Literature Review

2.1 Timeline of literature
To provide a broad Literature Review for the research paper on the topic IoT in e-commerce logistics, we collected related data from various sources like "Web of Science," "Scopus," "Science Direct," and "Research Gate." The time-stretch incorporates 16 years from 2002 to 2018. We have done a thorough reading of the research procedure and the Literature Review of the all-related papers [6]. This is speaking about the very beginning in 2003 when the internet was at a nascent stage. Accomplishment in Internet-set up an electronic exchange depends on how affiliations intentionally position their things and organizations through other Internet-based electronic systems and central individuals, similarly as to how they empower the associations with their customers, suppliers, and accessories [7].

Albeit the hunt started in 2008, the genuine happening to the Internet of Things peril was perceived in 2010. A justification for this is the ascent of late advancements and the akin exploration exercises. At the end of the paper analysis, we finished with a conclusion including future scopes to bridge the gaps of current research [8].

2.2 Ecommerce operations and development of IoT through phases
The fundamental working of present-day logistics is the same. In any case, the purpose has. In the customary present-day culture, physical things were part of logistics similarly to what gets gathered and dissipated. In a society full of information, regardless, the genuine assortment and dispersing limit of a logistics place is several kinds of handy information [5].

E-commerce online business has grown quickly in the previous thirty years. Three periods or phases of e-commerce are to start with. Phase 1a major boost of sales by calls through dialing and televisions to computer-based e-commerce. So, stage 1 got done with the "Dot-Com Bubble" burst. Stage 2 [9]; this stage was a, for the most part, serene period spreading over directly around ten years in 2000s. Upgrades during this resulting stage had insisted the constant affirmation of e-commerce demand in the ever-growing market, likewise established noteworthy changes foreseen in the first period of online business. So, it is better method for organizations in supply chain management to control their online business and at the same time for the consumers to go online shopping. Phase 3[10], the third stage, has seen an exponential rise by the snappy impact of both e-commerce scale and expansion in the progressing decade. It is shocking to see how developing economies like India are also in the e-commerce market in the world, and eCommerce has further become more sophisticated and smoother by the inclusion of IoT technology in recent times.

The perfect IoT image is that everything has its peculiar propelled article identifier, and it is by and by possible to make an overall framework with objects as the establishment with the help of IoT. The goal of IoT is to make an around-the-global mastermind system to energize the basic interchange of supplies, services, and data [11].

Ecommerce undertakings extend the expansion all through the supply chain from the production unit, transport, and logistics department, supply and management of inventory, arrangements and publicizing procurement and portion, and then customer care support similarly as outstandingly changed regard including operations. Logistics-related work because of the complexity remains the bottleneck in e-commerce. E-commerce, logistics have many issues like sluggish or wrong deliveries, misplaced parcels, spoiled goods, inappropriate packaging, etc. [12].

Ecommerce logistics contains three important stages. Stage 1 is the restoration of products from producers to supply centers or ware houses of e-commerce logistics handlers. Stage2; it deals with the order accomplishment on e-commerce, supply centers by sorting out orders, selection, and packing operations. Stage 3; deals with the quick transport of solicitations from supply/distribution centers to customers [13]. Providing service through express delivery is regularly in use for transports amongst dispersal hubs furthermore, customers where the cost of "last mile" movements have a duty to be lessened, and service improved. The 2nd stage is the main tailback in e-commerce logistics work [14].
By and large, the IoT-based e-commerce setup has quite outstanding advantages as the Potential to
raise the quality of logistics service through real-time checking helpful data on freight movement.

1. Able to do constant checking with the goal that item data from various phases of the important
supply chain can be adequately investigated and anticipated to turn away dangers to the best
degree.

2. Equipped for recording the whole procedure of production, packing, putting away, and dispersion
by implanting IOT marks on products. When shopping on the web, the buyer just needs to utilize
the item EPC mark given by the vendor to do an inquiry about the whole procedure and akin data
from raw material to the final item, and afterward to the procedure of deals. At that point, the
individual can decide whether to spend money on it [15]. The presentation of IoT advancements
has not just constructed a sheltered buying stage for the customer but also has prevented any
potential major fraud in the whole process by bringing up the required transparency on the side of
the businessman. Figure 3 represents a structure of smart logistics designs for e-commerce
logistics and distribution.

![Smart Logistics Designs for e-commerce Logistics and Distribution](image)

**Figure 3**: Smart Logistics Designs for e-commerce Logistics and Distribution

2.3 Impact on e-commerce (analysis); warehousing operations
The capability and feasibility of a logistics chain whether it is e-commerce or traditional business it is
subjected to the introduction of its pragmatic segments in explicit warehousing operations [16]. They
facilitate putting away and pad limits among arduous and ensuing core interests of the SC system.
Talking of e-commerce business receiving is the foundation of the warehousing procedure, wherein
the showing up things is discharged from the vehicle transporters. Their character, sum, and condition
are checked before stocking up, and things may be taken again and placed to distinct stock-keeping
stores. With their responsibilities, they resolve varying economic circumstances and the challenges of
formulation and demand indecisions.

In e-commerce business, whether Flipkart or amazon, warehouse operational work is undeniable in
the SC organization framework [17]. There are many articles envisaging the use of RFID in a
warehouse, like gave a method for solving storage location assignment problem and thus using it to
promote storage in a haphazard and distributed style.

Since first involvement in the logistics area, Radio Frequency technology has been acknowledged
as an encouraging advancement that can smoothen operational work inside an association just as a
broader structure partner association. In 1999 MIT proposed the EPC (Electronic Product Code),
which applied to all products with unique code; IoT has various choices in the labeling of items, for example, Bar-code or Radio Frequency Identification innovation and labeling of Radio Frequency Identification is regularly bestowed with EPC encoding strategy [18].

The creative characteristics of IoT make it fit for helping out each other on the board and logistics. The term IoT was first sired by the RFID social order longer than ten years back; along these lines, it was not stunned that RFID appeared among the most obvious. The subject systems contain the thoughts of the customer, judgment, and backing. The systems have distinctive conflicting destinations, declared that the IoT system is profitable to achieve different conflicting cash related, regular and quality-based destinations [19]. In a substitute setting, an IoT system can be used to accumulate data to replace the manual delegate appraisal system in the canny industry, which is essential in the modern-day e-commerce industry.

The IoT development applications are far-reaching in electronic business. Its procedures of application and forms are diverse. Internet of Things advancement is fit for use in various pieces of electronic-commerce, it has delivered not simply one more money related improvement point in online business, and a movement of issues can be comprehended, and the technology is updated basically for a competitive electronic business [20]. Regardless, it must be seen that the utilization of IoT development is still at a modest and starting stage; the huge advancement isn't fully developed.

2.4 Production logistics using IoT for online business
Before goods are sent to the client, the seller needs to arrange them from the supplier. Next, they are taken to the warehouse location center and put away, and after the request has been set, they are bundled and sent to the client. These cycles are characterized e-commerce as satisfaction. Because of their multifaceted nature and time and cost weight of e-clients, they are increasingly more frequently directed by outer administrators [21]. In spite of the dynamic advancement of the satisfaction administration in web-based business practice, this, despite everything, stays a generally obscure issue in the management hypothesis.

IoT applications constantly engage the noticeable quality of things over the overall gathering supply chain and convey receptivity and precision to exercises crucial to the business. Applications based on the Internet of Things also help industries in shrinking data or information dullness, assessment inaction, and ruling inactivity. Despite modified object ID, the IoT includes an overall [22] electronic information building, empowering the exchanging of items and ventures in overall precise chain frameworks. Therefore, the IoT will extraordinarily shape the improvement of creative collaborations in collecting and smooth chain movement in different endeavors at an inclusive scale.

The Internet of Things is conceived to be making a structure where everything got a mechanized character and can interface with a data grid. As more undertakings handle IoT advancement, its applications are depended upon to reliably consolidate knowledge and change corporations into a persistent endeavor. In any case, the nonappearance of bound together, clear exhibiting structures, and formal model endorsement procedures presents various troubles for organizing and executing IoT-based production. Working up a complex IoT application may incorporate different individuals, for instance, experts and bosses, from various divisions or associations. These individuals need to bestow normally during application improvement.

3. Challenges in IoT E-commerce Logistics
The electronic business section had progressed dependent on the retail zone of the past; therefore, the orthodox online business establishment is lagging behind, the improvement is required game plans. Likewise, [23] the thing quality is a challenge to ensure, the remuneration surety is pinched, collaborations are not set up, and given concern have genuinely inhibited the improvement of online business. In fact, in the earliest reference point when a web-based business had recently begun to create, clients were not certain of the legitimacy, and trust was absent when it came to purchasing items. Figure 4 shows zebra 2017 Retail vision study.
3.1 Paying concern
Paying easiness and safeguard are basic to provide quick headway of web business. The online portion currently benefits notwithstanding everything that ought to be upgraded and broadened. Even though e-payment has become revolutionary because of a surge in subscription numbers and trade capacity, but regardless of everything ought to be improved. The basic issues include massive customer movement, poor, strong safeguard structure, no clear-cut definitive cash-related structures on the framework portion, hardly any acceptable assistance to the online portion, the dearth of motivation. Looking at laws and rule enhancements is slack on the online portion. In addition to that, it is a significant difficulty for customers to pay in faraway locals and to match electronic purchasing needs; it has moreover crippled the headway of the online business grandstand.

3.2 Logistics and supply structure issues
The improvement of online business is furthermore solidly related to an enormous business scattering structure. The business activities related to stocks, logistics, storing, finance, and various sections should be there in a completely online business; logistics and transport viability are essential. With the swift improvement of web business, logistics and distribution necessities are moreover growing. In India, regardless of the way that there are different dispatch associations and postal courier associations, they simply completed the logistics system and distribution services, and their organizations are for a long time, they have defenseless access, vulnerable customer reputation and it cannot meet the essentials of the high capability and insignificant exertion in electronic business logistics and distribution, the quick progression of web business is truly constrained.

3.3 Weak potential of the framed network
Electronic-commerce is the latest technology in business movement established on network traffic data, and its aspect is actual time and swift. The evolution of online commerce activity to some degree banks on the volume or size of the data infrastructure. In India, the data infrastructure in terms of speed is still lagging and is slow too. The system for this technology is building, but its quality is still not up to the mark even though good progress has been made. Hence, the building up of the whole system has to be pushed at a higher pace, improvement in the efficiency of investment is also crucial, the web of communication demands change and hence the advancement of this technology that is electronic-commerce becomes undeniably most essential.
3.4 Economic
High expenditure is the main reason, which incorporates expenses for equipment like RFID tags and readers, software, and framework. Regardless of whether technological developments lessen the expenses for installed computing systems and tags regularly, the computing capacity and repository rise concurrently. This simply explains that expenses are surely a deterrent. SMEs specifically face the test of great responsibility beyond boosting the benefit of IoT. On this particular system, an individual platform displays itself as a creator of the system and thus sets the model, and thus it becomes the leading provider and therefore gets the first-mover advantage. On occasion, referenced issues consolidate the risk of significant worth changes, higher money-related unconventionality, and the brunt of IoT on the stable. The huge impact of IoT on the Supply chain and the macro-environment results in extensive fears.

3.5 Social
The noteworthy social test and one of the most inspected perspectives, as a rule, are security concerns. Privacy is strictly related to security issues from a technical point of view. Security concerns address the viewpoint on the customers, additionally, the assessment of dark outside control. Affiliations have used sensor-assembled data in the SC for quite a time now. Regardless, the introduction of it and the believability of get-together customer-related information in real-time has on an essential level changed the association between customers and associations. The outcome is a better connection with higher security concerns. In this way, these trust issues are a key test, which could provoke a decrease in development gathering. Despite the accentuation on security concerns, the lack of data about the usage of IoT, the prosperity stresses of customers, and the missing powerful activity of inhabitants to execute their characteristics and prerequisites are a bit of the social challenge category. The ambiguity regarding the adoption of technology and surveillance and lack of trust in organizations are ensuing risks emergent of privacy concerns.

4. Conclusion
Unique in relation to the present-day electronic-business model, the E-commerce system dependent on IoT advancements is described by more noteworthy straightforwardness, higher working edge, and higher expenditure power. As a higher number of enterprises adopt IoT systems, their uses are going to blend data, and real object flows, thus bring revolution in organizations working into a real-time business. IoT is basically a complex system, and thus, developing it in e-commerce requires expertise from various departments or companies. In the wake of experiencing different articles and papers, it is unmistakably perceived that the utilization of IoT innovation still at the beginning phase. Thus, the focus is required in the long term to ease the complexity of IoT in small e-commerce businesses as there is a vast push to the growth of e-commerce. Therefore, a formal mode of communication is required to communicate frequently during its development.

This study provides contributions to the literature. It has shown evidence that costs and benefits vary through stages or phases as technology evolves. The research clearly shows that the extent of modernization results occurs as the IoT technology spreads. IoT technology requires further development in the e-commerce sector, which will not only help in reducing product and service costs but also foundation is laid down for online shopping, and customers or client's experience in online shopping is enhanced several times. Radio Frequency Identification (RFID) and wireless sensor network software and system integration are important aspects of IoT technology. It has also shown that as technology has evolved with time and efficient design has come, the profile cost has changed, and also important in terms of benefits of RFID/IoT in e-commerce has been observed from early adopters to the early majority.
5. Future Scope

Even though this paper determines great challenges and risks, the review studied shows; technological challenges are responsible for two-thirds of all issues. The strength of innovative components isn’t astonishing due to their job as empowering influences for IoT. Thus, it can be suggested that IoT service providers need to focus on higher training so that the team which provides this service can reduce the risk and uncertainties of such a system.

Future research has to be done to find that if such disparities have been detected in other such technologies, and therefore by what way such patterns are emulated. The exploration likewise demonstrates that organizational apprehensions (for example, cost concerns) may become obstructions to the selection, and the most powerful factor influencing IoT reception of an association may be the outside inspiration power. In any case, the connection between the apparent reliability of innovation and its reception expectation is seen as inconsequential, demonstrating an intervening impact that innovation trust, by implication, influences the selection aim through apparent advantages. Regardless of the clear central purposes of IoT, organizations are yet to go ahead with extensive use of IoT-working logistics and SCM. Also, a major gap is that not many small as well as medium enterprises have adopted IoT in e-commerce business because trust in technology actually hampers the intention of adoption over benefits. The analysis shows that still, quite a number of organizations are reluctant to the urgency of implementing IoT in their online business due to mentioned challenges and also when there is no external motivation like global standards or compliance and robust desires from consumers.

References

[1] Atzori, L., Morabito, G., & Iera, A. (2010). The internet of things: a survey. Computer Networks, 2787-2805.
[2] Bandypadhyay, D. a. (2011). Internet of things applications and challenges in technology and standardization. Wireless Personal Communications, 49-69.
[3] Bardaki, C. K. (2012). Deploying RFID-Enabled services in the retail supply chain: lessons learned toward the internet of things. Information Systems Management, 233-245.
[4] Ben-Daya, M., Hassini, E., & Bahroun, Z. (2017). Internet of things and supply chain management: a literature review. International Journal of Production Research.
[5] Cassidy, J. (2002). Dot.com: How America Lost Its Mind and Money in the Internet Era. Harper, New York.
[6] Christensen, C. (1997). "Patterns in the evolution of the product. European Management Journal., pp. 117-127.
[7] De Cremer, D., Simkin, L., & Nguyen, B. (2017). The integrity challenge of the internet-of-Things (IoT): on understanding its dark side. Journal of Marketing Management, 145-158.
[8] De Koster, R., Roodbergen, K., & Le-Duc, T. (2007). Design and control of warehouse order picking:a literature review. European Journal of Operational Research, 481–501.
[9] Fawzy Soliman, M. A. (2003). Internet-based e-commerce and its impact on manufacturing and business operations. Industrial Management and Data Systems, 546-552.
[10] Gershenfeld, N., Cohen, D., & Krikorian, R. (2004). The internet of things. Scientific American, 76.
[11] Hackathorn, R. (2003). Minimizing action distance. DM Review, 22-23.
[12] Ho, S. S., Ho, S., & Sarma, S. (2008). The fragmented warehouse: location assignment for unit-load picking. IEEE International Conference on Industrial Engineering and Engineering Management, 1159–1163.
[13] Howcroft, D. (2001). After the goldrush: deconstructing the myths of the dot.com market. J. Inform. J. Inform. Technol, 195-204.
[14] Karkouch, A. M. (2016). Data quality in internet of things: a state-of-the-art survey. Journal of Network and Computer Applications, 57-81.
[15] Kaur, N. a. (2015). Cognitive decision making in smart industry. *Computers in Industry*, 151-161.

[16] Kawa, A. (2017). FULFILLMENT SERVICE IN E-COMMERCE LOGISTICS. *Scientific Journal of Logistics*, 429-438.

[17] Kortuem, G. K. (2010). Smart objects as building blocks for. *IEEE Internet Computing*, 44-51.

[18] Lee, I., & Lee, K. (2015). The internet of things (IoT): applications, investments, and challenges for enterprises. *Business Horizons*, 431-440.

[19] Leone, L. (2017). Beyond connectivity: the internet of food architecture between ethics and the EU citizenry. *Journal of Agricultural and Environmental Ethics*, 423-438.

[20] Li, J. (2013). An exploration of the new e-business model based on ICT technologies. *China Business and Trade*, 110-111.

[21] Lindqvist, U. a. (2017). The future of the internet of things. *Communications of the Acm*, 26-30.

[22] Liu, X. a. (2011). “Information flow management of vendor-managed inventory system in automobile parts inbound logistics based on internet of things. *Journal of Software*, 1374-1380.

[23] Luo, H., Kong, X., Wang, K., Lu, S., & Qu, T. (2017). Synchronized production and logistics via ubiquitous computing technology. *Robotics and Computer-Integrated Manufacturing*, 99-115.

[24] Miorandi, D. S. (2012). Internet of things: vision, applications and research challenges. *Ad Hoc Networks*, 1497-1516.

[25] Neirotti, P. R. (2018). How SMEs develop ICT-based capabilities in response to their environment: past evidence and implications for the uptake of the new ICT paradigm. *Journal of Enterprise Information*, 10-37.

[26] Amjath Ali, J., Thangalakshmi, B., & Beaulah, A. V. (2017). IoT Based Disaster Detection and Early Warning Device. *International Journal of MC Square Scientific Research (IJMSR)*, 9(3), 20-25.