APPLIANCE OF SMART TECHNOLOGIES IN TRANSPORTATION

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Summary

The Internet of Things, Automation, and Big Data are technologies that already exist and companies in different sectors are using them for great benefits. The transportation sector hasn't taken advantage as soon as the technologies emerge since there is a lot of equipment that is involved which makes the transition harder. The Internet of Things (IoT) will make the transportation industry more transparent. This technology will allow companies to add sensors to their fleet and have more accurate information and customers will be able to access information in real-time. The automation technology once implemented will have great benefits in the area of customer service since the information will always be available for customers to access and ask simple questions, which will help the companies to reduce labor costs. Transportation and logistics have extensive data that needs to be analysed in order to understand customers' needs, create better routes, have the necessary supplies and labor, which big data is a necessary technology that needs to be implemented. All these technologies will bring great benefits and companies need to use them in order to create loyal customers based and to keep new customers coming. These technologies can be used alone or with a combination to have a greater competitive advantage.

Keywords: Smart technologies, Transportation, Internet of Things (IoT), Automation technology, and Big data technology

Introduction

Transportation and logistics services are essential for the economy and society. As we are experiencing during this pandemic, the transportation of goods can't stop and truck drivers can't stop delivering all those essential goods that the countries need. As transportation services do not stop, the improvement of technology and new developments don't stop either. The world moves forward with all the technological advancements and the new smart technologies that keep emerging so it is important that the sector of transportation take advantage of all the new technologies that are available to provide a better and safer service.

This article task to present and analyse the smart technologies and their applications in the transportation sector that are included in Logistic 4.0.

Research aim: To present and analyse the smart technologies and their application in the transportation sector that are included in Logistics 4.0.

The following **objectives** have been set to achieve the aim:
1. To characterize the latest smart technologies and innovations that can be applied to the transportation sector.
2. To identify benefits of applying smart technologies.

Research object and methods

The object of the research: Smart technologies in transportation

The methodology used in this article was to collect qualitative data through an analysis of the scientific literature. Literature sources were collected doing online research for articles in Google Scholar and ResearchGate using keyword terms such as "smart technologies in transportation", "smart technologies", "logistics 4.0", and "application of smart technologies in transportation". A total of nine articles were analysed that are within the period from 2012 to 2019.

Research results and discussion

Smart Technologies

Smart technologies are changing the way we communicate in our daily lives and at work. Smart technologies have giving more power to the consumers of the transportation sector as well to the truck drivers. The customers are now able to check information about their products or loads by simply going online and visiting a website. Smart technology also helps truck drivers improve their work efficiency. Not to long ago, drivers had to control their driving hours by paper logs creating a lot of mistakes and now they can do that all through smart technologies. Logistic 4.0 embrace the new smart technologies that can be used for the transportation sector and tries to achieve a balance between automation and mechanization (Galindo, 2016). In this article three smart technologies will be analyse; Internet of Things (IoT), automation technology, and big data technology.

Internet of Things (IoT)

The Internet of Things can be described as a network that connects everything with the Internet through information sensing equipment to exchange information and communicate, so as to realize the intelligent identification or tracking of the location of equipment or products (Patel & Patel, 2016). The Internet of Things (IoT) allows physical elements such as trucks to be connected to Internet-enabled devices and systems. With the help of the Internet of Things, logistics processes and applications have been transferred to a fully intelligent environment (Akkaya & Kaya, 2019). The Internet of things offers great possibilities for improvement for the transportation sector such as having IoT vehicles so the company can be more detailed and reliable information of where the truck is or if the driver stopped at a different place, this technology is a great benefit for the companies. There is a lot of equipment that will be able to share information in real-time to the necessary parties, which will create a better service for the consumers. Figure 1 shows the many application IoT technology can by apply in transportation.
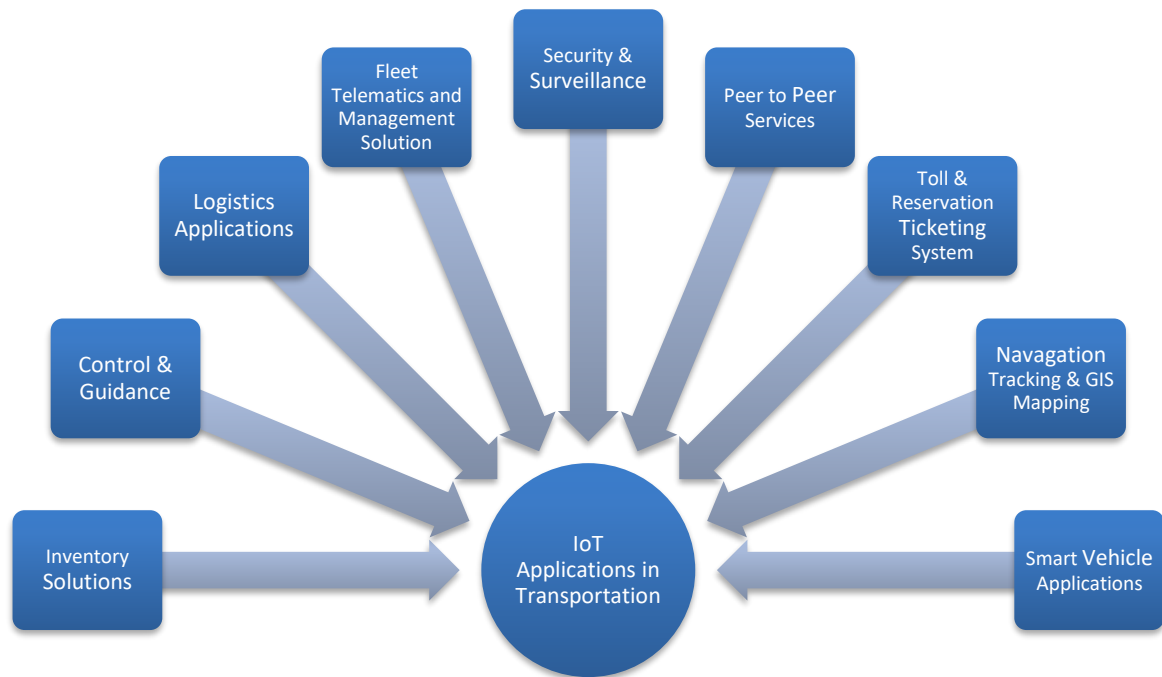
Fig. 1. IoT Applications in Transportation
Source: according to Dash & Kumar (2017)

Dash & Kumar (2017) mentions some of the benefits of integration Internet of Things technology to the transportation sector;

- Distance to be travelled by the vehicle is optimized giving the benefits by reducing the fuel consumptions leading to the better profits.
- Optimizing or diverting the routes is possible during the deadly and dangerous conditions.
- Through centrally controlled network, a service can be operated based on the demand.
- Public safety is possible through a control of traffic based on the vehicle count.
- Goods and material exports imports, purchase and other shipping details can be maintained effectively.
- Improves the revenue of the transportation and logistics company owners.

There is a lot of potential on how the logistics sector can use this technology to provide better services and have a competitive advantage. Having this technology will make it easier to share information with customers and provide more reliable load and cargo updates.

Automation Technology

Automation is the process of using physical machines, computer software, and other technologies to perform assignments that are generally complete by humans (The Difference Between Robotics and Automation, 2020). In last year, the world has been seeing the progress of this technology in several fields such as education and medical, etc. One example of the application of Automation technology in a company, for example, a transportation or logistics company is Chatbots. Most people have already experienced this technology either when visiting a website when you interact in the chat to ask simple questions that the response is automatically answered by automation technology. The application of this technology in the transportation and logistics sector will help customers get an answer to a simple question faster since there is not necessary to wait for a human to answer the question. Using Chatbots will improve the customer-facing operation, creating better customer service (Lahoti, 2019).

Lahoti (2019) explains how Chatbots can help the logistic operations of a transportation company to provide a flawless flow of information. Some examples of those operations are:

1. Customer Order: A Chatbot will help employees to access and review all customers' orders.
2. Warehouse Matters: A Chatbot will help to manage the inventory and help find packages faster.
3. Fleet Information: For a transportation company is very important to know where their vehicles are at all times and a Chatbot will help the companies to know where their fleet is just by asking a Chatbot.
4. Personnel Information: With a Chatbot, companies can get a quick answer to know availability of their drivers.

The use of this automation technology will bring a lot of benefits to the logistic and transportation companies. Some of those benefits are the following. Cost reduction, companies can save up to 30% on customer support. Increasing availability for customers is another benefit since the Chabot will be available for customers at all times. The next benefit is optimizing time management; a Chatbot will allow employees to access information quicker. Chatbots can provide a better workflow as well by creating better communication between employees. Another benefit of using a Chatbot is by sending more effective messages to employees and customers about their shipment status. As well, a Chatbot can provide information and track a shipment in real-time such as by sending the location or delivery status (Lahoti, 2019). Several companies not only in the logistics sector are already using Chatbots. Implementing this automation technology to a logistic company will bring a lot of monetary benefits but as well it will provide better customer service, which will create a competitive advantage and will create loyal customers and attracting new customers.

Big Data Technology

Big data is a label for all the data that is beyond the usually used programs to analyse data. It is a combination of extensive data and has a grade of the complexity of analysis but needs to be analysed in order for a company or organization to benefit from that data. (Akkaya & Kaya, 2019)

Big data technology is characterized by 4Vs: volume, velocity, variety, and veracity. It has become challenging to manage and analyse bigger data, which is necessary in order to have a useful application for companies (Govindan et al., 2018). Companies need to know whether the data they have is considered big data that can be measured by the 4V mentioned earlier.
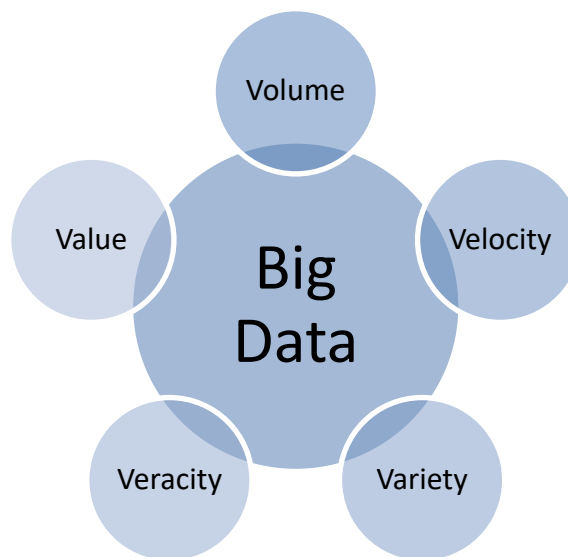
Fig. 2. Big Data 5 V's
Source: according to Govindan et al. (2018)

Big data can be applied in different ways in the logistics and transportation sector and give companies a competitive advantage. With the massive amount of data that the companies in the logistics and the transportation sectors will be dealing for the new hardware and software tools will need Big Data technology in order to analyse it (Swaminathan, 2012). Theses sectors have a lot of critical data in many areas such as transportation, inventory, warehousing, material handling, packaging and security that need to work together in order to have visibility into customers' plans (Malhotra, 2019). If logistics companies have visibility and access to all the data is generated from orders, trucks, inventory, etc. companies will be able to create plans and meet more efficiency customers' needs. Malhotra (2019) explains in more detail in which areas these sectors could benefit from Big Data.

- Inventory planning: Companies will be able to analyse big data from inventory and can prevent overstock or out-of-stocks.
- Route design: By analysing all the data from the routes, the company can plan the new route correctly and create an effective delivery time.
- Forecasting/Labor: Analysing customers' needs will help transportation companies to prepare the necessary equipment in advance and that they have the necessary labor resources.

Conclusion

1. The latest smart technologies and innovations that can be applied to the transportation sector were identified in this article to achieve the research aim; which are the Internet of Things (IoT), Automation, and Big data technology. These smart technologies can be applied in many ways to help the quality of logistics services in the transportation sector. The articles reviewed provide several options for the application of smart technologies in transportation. The Internet of Things can be applied in smart vehicle applications, control, guidance, and peer-to-peer services. These applications can be applied to the physical equipment transportation companies have such as trucks, which will provide real-time information to the needful users. An example of the application of automation technology in transportation is chatbots, which is a well know application since it is used in many sectors. Chatbot consists of a chat that will respond automatically to customers' requests. Big data technology can be applied to transportation by helping companies analyse and process the data they have about routes, customers, and inventory.

2. The aim of this article was achieved by identifying the benefits of applying smart technologies in transportation this was achieved by reviewing scientific articles. Each of the three smart technologies identified in this article is beneficial for transportation companies. The Internet of Things will provide benefits such as better information on equipment location to customers, vehicle performance is optimized, and better information about routes and road conditions will be available. The benefit that can be provided by applying automation technology with a chatbot is reducing up to 30% customer support costs and as well chatbots will provide better communication within the company and with customers. Since transportation companies have a lot of critical data, big data technology will benefit transportation companies by helping to analyse all the data to create a better route design companies can plan new routes that can optimize delivery times. Another benefit of the application of big data technology is forecasting and labor; this will help companies prepare the necessary equipment in advance. The benefits that are more relevant in the literature review that was analysed were cost reduction, more effective communication, and optimization of routes.

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