The Impact of the Deployment of Smart Glasses in the Supply Chain Operations of DHL in the United Kingdom

Unula Godknows
M.Sc. Graduate
University of Hertfordshire Business School, College Lane, Hatfield, Hertfordshire
University of Hertfordshire
DOI: 10.56201/ijebm.vol.11.no9.2025.pg38.51

Abstracts
This study investigated the impact of the deployment of smart glasses in the supply chain operations of DHL in the United Kingdom. The study adopted a phenomenological design because was considered suitable as it seeks to understand and interpret lived experiences, perceptions, and institutional strategies regarding deployment of smart glasses in the supply chain operations of DHL in the United Kingdom. This study adopted both primary data obtained through semi-structured interviews and secondary data obtained from peer reviewed articles and publications. For primary data-interview was used through open-ended questions which allowed respondents to provide detailed narratives, experiences and perspectives on the deployment, uses and benefits of smart glasses. For secondary data, peer-reviewed academic journals and industry reports were derived from reputable database sources like Scopus, ResearchGate, Springer, Emerald-Insight, ScienceDirect, and the university's library. Data collection was conducted in two phases. The first phase involves interviews, which was conducted both face-to-face, via online video conferencing and filling of open-ended interview forms, depending on the participants' availability. The second phase involves articles, journal and publications analysis. The study discovered that the adoption, deployment and use of smart glasses has greatly enhance logistics and supply chain operations management generally and in DHL UK in particular. The deployment of smart glasses has been slow but steady process from the time it was first introduced. The slow pace has given companies the leverage to evaluate every step to ensure it success in the end. The deployment of smart glasses enhanced order picking, tasks scheduling and facilitates other warehouse activities and functions. Therefore, the study recommends that, Employees should be properly trained and there should be effective awareness on the deployment and use of smart glasses prior to its adoption and deployment in order to achieve intended goal.

Keywords: *Smart glasses, supply chain, deployment, DHL and supply chain operations*

INTRODUCTION

The supply chain function lies at the heart of any organization's success (Nadume, 2021). According to Binar, Vasikova and Safl (2022), supply chain is a key factor for the function, progress and development of companies and organizations globally. The term supply chain incorporates several connected functions and operations such as transportation, production, information, location and inventory, to ensure that the require material, as well as goods, is in the desire quantity and quality at the right place and right time. Thus, supply chain functions and processes are constantly being improved and made more efficient to smoothen warehouse and

logistics management by the implementation of new technologies, their modernization and automation (Binar *et al*, 2022).

Recognizing this critical role, companies are increasingly investing in technological advancements to optimize their operations and warehouse management to meet up the global expectations. One of the recent technological devices companies are leveraging on to improve and enhance their supply chain function is smart glasses. Smart glasses can be grouped into two basic categories - Virtual Reality (VR) and Augmented Reality (AR). Virtual Reality can be considered as a three-dimensional, computer-created environment, which is perceived realistically by human senses, but completely cuts off the user from external reality. Augmented Reality (AR) denotes the addition or superimposition of information or other visual elements directly into the field of vision while still allowing the user to perceive the actual reality (Berkemeier, Zobel, Werning, Ickerott, & Thomas, 2019). Rauschnabel, He and Ro. (2018) highlight this trend, noting the efforts of companies like DHL, Samsung, and Amazon in developing "glasses-like devices" equipped with augmented reality (AR) technology. These Augmented Reality Smart Glasses (ARSGs) seamlessly integrate virtual and physical information into the user's field of view, offering vast potential for applications in logistics, manufacturing, healthcare, and beyond (Eisenmann, Barley & Kind, 2014; Rauschnabel *et al*, 2018; Scholz & Duffy, 2018). Information technology has demonstrably improved flexibility, operational speed, and responsiveness, ultimately leading to more efficient service delivery (Paulraj & Chen, 2007).

The past decade has witnessed a surge in technological advancement and adoption of key Industry 4.0 components, such as artificial intelligence and smart devices within the manufacturing and supply chain sectors globally (Angelopoulos *et al*., 2020). Companies are utilizing these smart devices to outsmart their rivalries in the market hence the adoption and deployment of smart devices recently. This adoption and deployment of smart devices has spurred significant changes, necessitating a deeper understanding of their ramifications. Logistics and supply chain operations are among the most critical business functions with large volume of activities globally and its effectiveness and efficiency is paramount to every competitive and viable company. This study evaluates the use, benefits, and effectiveness of Smart Glasses in DHL's supply chain operations, aiming to inform other companies about their usefulness and benefits while highlighting their inherent challenges. Furthermore, to provide a comprehensive understanding, the research examined the challenges encountered during deployment and the cost-effectiveness of the technology. The findings of this study would extend beyond immediate competitors, offering valuable insights for industry regulators as well. The research has the potential to inform the development of a framework that facilitates the effective utilization and dissemination of knowledge surrounding the benefits and challenges associated with deploying Smart Glasses within supply chain operations.

Despite the perceived benefits of ARSGs in streamlining DHL's supply chain, limited research explores their effectiveness, specific advantages, and broader applicability. While Sachs (2016) highlights the technology's potential for faster operations and new applications, a deeper understanding is needed. Given DHL's clear commitment to deploying ARSGs within its UK supply chain, this study aims to: analyse the effectiveness of ARSGs in DHL's UK operations, identify the specific benefits experienced by DHL and extract valuable lessons and recommendations for wider adoption in the UK and other international organizations

Most of the previous studies about the deployment of smart glasses have majorly focused on the technological application of augmented reality to warehouse operations (Heb & Rob, 2018) (Eisenmann, Barley, & Kind, 2018: Scholz & Duffy, 2018). It is very obvious that, there is limited

study regarding the impact of the deployment of smart glasses in the supply chain operations in the UK. In view of this gap, the purpose of this study was therefore to examine the impact of the deployment of smart glasses in the supply chain operations of DHL, UK and also this study seeks to contribute to our understanding of the impact of adopting smart glasses in supply chain operations.

The objectives of the study includes:

1. To examine the use of smart glasses in the operation of logistics of supply chain management of DHL in the UK.
2. To examine the benefits of smart glasses in the operations of logistics and supply chain management of DHL in the UK
3. To assess the challenges encountered in deploying smart glasses in the logistics and supply chain management at DHL in the UK
4. To make recommendations for other competitors to learn from regarding deploying smart glasses.

Research questions

1. What are the uses of smart glasses in the operation of logistics Supply Chain management of DHL in the UK?
2. What are the benefits associated with the deployment of smart glasses at DHL in the UK?
3. What are the challenges encountered in the deployment of smart glasses at DHL in the UK?

Literature Review

Theoretical Foundation

Strategic Choice Theory

This study adopts Strategic choice theory to explain the impact of the deployment of smart glasses in the supply chain operations of DHL in London, UK. This strategic choice theory (SCT) shows the relationship between top management choices and organization performance as well as interaction of the internal and external organization. The theory stresses the importance of management decisions on organizational performance (Child, 2016). The strategic choices resulting from strategy development is technological, political and dynamic (Zimmermann, 2011) and affecting the operational contexts of the organization, performance standards, the organization´s economic pressure, and the organizational structure. Strategic choice theory therefore was first found to be adapted in the fields of politics and international relations in which it was used as explanatory tool for decision making and for breaking down redundant views (Lake & Powell, 1999).

Strategic choice theory also suggests that the quality of a manager's decision or choice is largely dependent on various environmental elements including purchasing, supply and inventory management. Simply put, the theory argues that management with the decision-making powers need to make relevant decisions regarding inventory investment, production, supply chain and inventory optimality in order to have significant positive effects on performance outcomes. Strategic choice theory stresses that taking the right decision is dependent on some environmental factors such as suppliers and on the strategic type of the organization but most importantly on the decision of the dominant coalition to lead purchasing goals and actions. Nevertheless, as interdependencies and collaboration can enhance performance, strategic choice theory advises to carefully balance the dependence of suppliers with the desired rate of return. This would lead

prospectors to apply early supplier integration (Cousins, Lamming, Lawson & Squire 2008; Schiele, 2010) to innovate together with suppliers and thus maximize the opportunity for diversification.

In contrast, defenders and analyzers would rather try to become preferred customer (Schiele, Veldman, & Hüttinger, 2011) of their supplier; in case of the defender this would aim at the highest possible cost-efficiency, while analyzers would not only try to achieve cost-efficiency but additionally try to achieve product development benefits from the relationship. Also, Ketchen and Hult (2010), posit that SCT perceives management as downstream decision makers who direct decisions while making changes to organizational processes, structures and systems. Thus, they need to make relevant decisions to protect organization's supply chain function regarding smart glasses for effectiveness and efficiency

The concept of Smart Glasses

Binar, Vasikova and Safl (2022) opined that, smart glasses belong to the wearable device category. These are small intelligent electronic devices for detection, analysis and data transfer, suitable for wearing directly on or close to a person. In supply chain, they are used in warehouse operations and material handling, remote cooperation of workers during installations and repairing of various devices, training of new employees and their remote support, and inventory checks as well. However, smart glasses can also be used in various industries like healthcare, sports, education and many others, including the gaming and entertainment industries. Smart glasses are categorized into two - Virtual Reality (VR) and Augmented Reality (AR).

According to Binar et al, (2022), noted that, Virtual Reality is said to be a three-dimensional, computer-created environment, which is perceived realistically by human senses, but completely cuts off the user from external reality. This happens because VR smart glasses have non-transparent displays, so the user only perceives the reality created by the glasses. Thus, the person becomes a complete part of a virtual world where he can explore space, manipulate and communicate with objects, and has the opportunity to try every activity in the so-called "rough outlines" without unnecessary costs and danger. AR smart glasses have transparent displays so the user can be in constant eye contact with the real environment around him through his field of vision. The point is that the real environment is enriched with virtual elements expanding the real image which the user can see (Binar, Vasikova & Safl, 2022). It has been noticed that, AR glasses are the current trend, especially in large companies, such as Coca-Cola, Volkswagen Group, DHL Supply Chain, etc. generally. There are three different ways to control the glasses. This could be either pure voice control of the glasses software through a microphone built into their frame (it has to be simple one-word passwords mostly), touch control using the settings on the side buttons or the touch sensor on the frame or a combination of these methods.

Augmented Reality (AR) denotes the superimposition of information or other visual elements directly into the field of vision while still allowing the user to perceive the actual reality (Berkemeier et al. 2019). It is the process of layering digital data onto the real world in the form of computer-generated content such as text, video, or animated three-dimensional models. AR is different from virtual reality (VR) and mixed reality (MR). VR aims to engage the user in an immersive experience which is completely closed off from the real-world environment using a high-end user-computer interface to enable real-time simulation and interactions through multiple sensorial channels (Wojciechowski & Cellary 2013). MR is a generalization of AR (Ricci, Tummolini, & Castelfranchi 2017) in which real and virtual worlds merge to produce new

environments and visualizations that enable physical and digital objects to co-exist and interact in real-time (Costanza, Kunz, & Fjeld 2009).

Deployment of Smart Glasses

Smart glasses are being deployed in the industry to enhance and improve performance and warehouse operations across different sectors. Abderahman Rejeba, John G. Keoghb, G. Keong Leongc and Horst Treiblmaier (2023) noted that, the increased 'smartness' of smart glasses is expected to drive B2B usage rather than the consumer market. For example, Google Glass is a specific brand of AR wearables (Liao *et al*. 2017) that has been applied to location recognition (Altwaijry, Moghimi, & Belongie 2014), surgical operations (Hashimoto *et al*. 2016), plant health monitoring (Cortazar *et al*. 2015), medical treatments (Jeroudi *et al*, 2015), and maintenance (Rauh *et al,* 2015). More specifically, Maruyama *et al*, (2017) employed smart glasses in the medical sector for the development of AR based neuronavigation to overlay 3D computer graphics onto the video image of a patient's head to precisely localize a targeted brain tumour during a surgical operation. AR glasses were also used in a study by De la Cruz *et al*. (2018), who suggested that, applying this technology could improve patient care processes, remotely execute medical procedures, and enhance the supply of health services and therapies. Ruminski *et al*, (2015) designed an eGlass platform using smart glasses to quickly and reliably recognize patients and integrate data obtained from health care information systems, connected devices, and patients.

The use of smart glasses, therefore, extends the senses of doctors. It allows them to bring together measured medical information (e.g. temperature, pulse rate, vital sign measurements) with contextual information, such as location and time: thereby enabling more reliable medical screening and fast data exchange (Ruminski *et al.* 2016). Rauschnabel and collegues (2015), for example, demonstrated that consumers are likely to adopt AR glasses (e.g., Google Glass) for functional benefits (e.g., increasing the efficiency in their lives) and for social signaling effects (e.g., signaling inclusion, or uniqueness, depending on their personality traits). The supply chain and logistics sector is seriously leveraging on smart glasses in its order picking, putting and warehouse operations to increase efficiency and effectiveness.

Supply Chain Management

Lu and Swaminathan (2015) opined that, the science related to supply chain management traces its history back to the early 1950s when several researchers were interested in understanding the optimal policies related to inventory management. According to Godana and Ngugi (2014), inventory management refers to all or any action involve in developing and handling the inventory levels of raw materials, semi-finished materials and finished good so that sufficient supplies are available and the costs of over or under stocks are low. Inventory management is the process of effectively overseeing the constant flow of units in and out of an existing inventory. The process usually involves controlling the transfer of the units in order to prevent the inventory from becoming too high, or dwindling to levels that could put the operation of a business into jeopardy. Effective inventory management seeks to control the costs associated with the inventory, from the perspective of the opportunity cost of the capital tied up in the inventory, the holding cost and the ordering costs. Inventory management is the process of effectively overseeing the constant flow of units into and out of an existing inventory (Onkundi, & Bichanga, 2016).

Inventory is defined as a list of goods and materials which are available in stock for business and in accounting inventory is considered as an asset (Sharma & Vivek, 2016). According to

Amahalu et al. (2018), inventory consists of idle physical goods or stock of high economic value held by organizations for packaging, processing or ready for sale.

Supply chain management has been defined by scholars in different ways according to their understanding and perspective of the concept. A supply chain is the alignment of firms that bring products or services to market (Lambert, Stock & Ellram, 1998). Chopra and Meindl (2001) define supply chain management as consists of all stages involved, directly or indirectly in fulfilling a customer request. That is to say, the supply chain not only includes the manufacturer and suppliers but also transporters, warehouses, retailers and customers themselves. Supply chain management involves the effective and efficient handling of materials and services from production to transportation, location of facilities, information and inventory

DHL London, UK.

London is the commercial and political capital of the United Kingdom. The city boast of diverse organizations with high volume of supply and logistics activities among the cities in the UK. Most of the data were collected from the London office of DHL and some selected places. DHL is one of the foreign companies handling high volume of supply chain functions in the UK. DHL Supply Chain, the Americas' leader in contract logistics and part of Deutsche Post DHL Group, successfully completed its global augmented reality pilots and is expanding its "Vision Picking" solution in warehouse operations around the globe, establishing a new standard in order picking for the industry. DHL has deployed the smart glasses device to enhance its operations and it is important to note that, DHL is one of earliest and pioneer firm to do so. The smart glasses provide visual displays of order picking instructions along with information on where items are located and where they need to be placed on a cart, freeing pickers' hands of paper instructions and allowing them to work more efficiently and comfortably. According to Sally Miller DHL Supply chain North America “As a result of the improved productivity and accuracy in our pilot sites in the U.S., we rolled out Vision picking across strategic locations and we expect the Vision Picking solution to continue to be rolled out,"

Deployment of Smart Glasses and Supply Chain Operation

Employees have been enthusiastic about being able to use state-of-the-art technology and are pleased with how light the smart glasses are, and how much more comfortable the process is now with hands-free picking and putting device. "We are very satisfied and happy that the pilot phase went so well and that we can now say augmented reality technology is one of our standard offerings at DHL Supply Chain," Voss adds. "As one of the first logistics companies using the technology, we have truly established a new way of order picking in the industry. DHL has taken a competitive lead in the warehouse, logistics and supply chain operation sector globally with the deployment of smart glasses. The deployment of smart glasses has improved their internal and external supply chain operations capabilities and efficiency that requests and need of customers are satisfy in record time and conveniently.

Methodology

This study adopts a qualitative research design with a phenomenological approach to examine the synthesized the impact of the deployment of smart glasses in the supply chain operations of DHL United Kingdom. The study adopted phenomenological design which was considered suitable as it seeks to understand and interpret lived experiences, perceptions, and institutional strategies regarding deployment of smart glasses in the supply chain operations of DHL United

Kingdom. Given that the study aims to synthesize diverse viewpoints, experiences and perceptions, this approach would allow for a deeper exploration and evaluation of the impact of smart glasses in the supply chain operations of DHL. The population of this study comprises selected employees and customers of DHL United Kingdom in London and other cities.

This study adopts primary data obtained through semi-structured interviews and secondary data from peer reviewed articles and publications. The primary data used interview which contain open-ended questions to allow respondents to provide detailed narratives, experiences and perspectives on the deployment, uses and benefits of smart glasses. The secondary data involved peer-reviewed academic journals and industry reports derived from reputable database sources like Scopus, ResearchGate, Springer, Emerald-Insight, ScienceDirect, and the university's library. The abundance of recent publications (Rejeb et al., 2021) exploring smart glass deployment, its benefits, and associated challenges across various industries provides a rich source of valuable information. The chosen data range spans from 2018 to 2023, ensuring the utilization of up-to-date information, as emphasized by Pontis *et al*. (2017). This is particularly crucial for a contemporary study like the deployment of smart glasses to supply chain operations in DHL in the United Kingdom.

Data collection was conducted in two phases. The first phase involved interviews, which was conducted both face-to-face, via online video conferencing and filling of interview forms, depending on the participants' availability. The second phase involved articles, journal and publications analysis. Data from interviews analyzed using thematic analysis following Braun and Clarke's (2006) six-step framework. This includes familiarization with data through transcribing, reading, and re-reading the interview responses; generating initial codes by identifying key phrases and concepts related to smart glasses; searching for themes by grouping related codes into overarching themes; reviewing themes for coherence and alignment with the study's objectives; defining and naming themes to clearly articulate their significance; and producing the report by synthesizing the findings into a comprehensive discussion. Findings from both sources were synthesized to present a holistic understanding of the issue. The table below presents a synthesized analysis of the research findings based on the research questions.

Table 1:1 Thematic Analysis of Research questions

Research Question	Key themes	Sample participant Responses	Synthesized Findings
What are the uses of smart glasses in the operation of logistics SCM of DHL?	--Several uses of smart glasses exist in the supply chain function --DHL has deployed smart glasses to improve SCM operations with certain uses and features	--Smart glasses are used for order picking, electric detection, analysis and data transfer. --AR smart glasses have transparent displays that enable user to be in constant eye contact with the real environment around him through his field of vision	Smart glasses are useful in large warehouse establishment and supply chain operations. It help to quickly identify, locate and pick desire items within minutes and improve analysis of supply chain operations from transportation, inventory management, production and environment interactions

What are the benefits associated with the deployment of smart glasses at DHL?	Internal inventory management has become effective and efficient with the deployment of smart glasses devices Time maximization Smooth operation	Large logistics operations and warehouse management is becoming more effective with the deployment of smart glasses --Customers desire and need are better satisfy in-time with deployment of smart glasses devices ---It takes less time to locate items unlike the traditional method.	Smart glasses has improved supply chain operations at DHL UK and customers are better served. DHL has taken a competitive lead in the deployment and utilization of smart glasses in supply chain operations It saves time and smoothen operations of warehouses
What are the challenges encountered in the deployment of smart glasses at DHL?	Design difficulties and user incomparability Health and safety concerns for users External control concerns	Skepticism about health and safety Lack of prior knowledge and concern about acceptance	The major challenges associated with smart glasses are categorized into technical, organizational, and ergonomic considerations

Source: Research Data, 2024

Table 2:2 Synthesized Results on the Impact of the Deployment of Smart Glasses in the Supply Chain Operations in DHL UK.

S/N	Research Question	Synthesized Finding
1	What are the uses of smart glasses in the operation of logistics SCM of DHL?	Smart glasses are useful in large warehouse establishment and supply chain operations. It help to quickly identify, locate and pick desire items within minutes and improve analysis of supply chain operations from transportation, inventory management, production and environment
2	What are the benefits associated with the deployment of smart glasses at DHL?	Smart glasses has improved supply chain operations at DHL UK and customers are better served. DHL has taken a competitive lead in the deployment and utilization of smart glasses in supply chain operations It saves time and smoothen operations of warehouses

3	What are the challenges encountered in the deployment of smart glasses at DHL?	The major challenges associated with smart glasses are categorized into technical; visualization of objects, display size, adjustment to low lighting, heat generation and field of view. Organizational; technology acceptance, fear of external control, cost implication, developing capabilities and limited experience and ergonomic; health and safety concerns, feeling of dizziness, headaches and distractions

Source: Research Data, 2024

DISCUSSION OF SYNTHESIZED FINDINGS

The study explored and assessed the impact of the deployment of smart glasses in supply chain operations of DHL United Kingdom. The thematic analysis revealed that smart glasses has several beneficial uses and its effective deployment and utilization enhance warehouse operations. This assertion aligns with Smith, Burch, Strawderman, Chander and Smith (2021) submission that smart glasses facilitate and improve logistics and operations as managers find the best alternative for their order-picking operations and Rauschnabel, He and Ro (2018), they explained that smart glasses are smart, wearable miniature computers that utilize various sensors to improve supply chain and logistics operations

Smith, E., & Burch, R. F., & Strawderman, L. & Chander, H., & Smith, B. K., 2021, '*A comfort analysis of using smart glasses during picking and putting tasks*. International Journal of Industrial Ergonomics, pp 1-13

In this article, Smith *et al* intelligently presented an argument that smart glasses facilitate and improve Logistics and operations as managers find the best alternatives for their order-picking operations. This was an empirical study that compared three, differently weighted smart glass solutions, to minimize order effect and improve supply chain operations in the warehouse. ANOVA analytical tool was used to assess and report all significant results. The limitation is that companies must master the use of smart glasses to improve their operations before it can be useful to them, without that smart glasses make no meaningful sense. However, this article provides veritable information that supports the benefits of the deployment and use of smart glasses which is one of the objectives of this study.

Rauschnabel, P. A., J. He, & Y. K. Ro., 2018, '*Antecedents to the adoption of augmented reality smart glasses: a closer look at privacy risks*. Journal of Business Research Vol. 92, pp 374–384.

Rauschnabel *et al* indicate that some studies have been carried out with corporate press releases that highlight the potential of a new form of wearable device appearing on the technology landscape: augmented reality smart glasses (ARSGs), that is digital eyeglasses that integrate virtual information into the user's field of vision. They explained that smart glasses are smart, wearable miniature computers that utilize various sensors to improve supply chain and logistics operations. It is important to note unequivocally that no single study could exhaust all the benefits and challenges that characterize the deployment and utilization of smart glasses hence it suffices to point out that this study is not all-encompassing. This study is very useful to my study because it

laid the foundation for unraveling the benefits, risks, and challenges that herald the deployment and utilization of smart glasses.

Smart glasses have improved supply chain operations at DHL UK and customers are better served. This assertion aligns with the position of Dalenogare, Baseggio, Ayala, Le-Dain and Frank (2019), their study discovered that the application of Smart glass technology in the service provision of PSS brought benefits from different perspectives and effective deployment of smart glasses enhance supply chain functions and warehouse operations. Scholz and Duffy (2018) the deployment of AR from the perspective of the consumer gives a broader picture of the effectiveness and usefulness of AR in the supply chain and logistics operation spectrum.

Dalenogare, L. S., Baseggio, M. M., Ayala, N. F., Le-Dain, M. & Frank, A. G. 2019, '*The contribution of Smart Glasses for PSS'*. Procedia CIRP Vol. 83, pp 318-323

In this article, Dalenogare *et al* emphasized the important contributions Smart glasses have brought to improve service delivery and value offering to meet customers' needs. "To provide higher-value offerings, manufacturers are under a transformation of their business models called servitization which aims to better meet the customers' needs". Dalenogare et al conducted an empirical study to compare the performance of 27 technicians. They made comparisons of two corrective maintenance indicators before the employment of smart glasses and after. Furthermore, through internal documents, they compare the performance of each technician with the evaluation of their supervisors and compare the number of sales of elevator components in the periods before and after the beginning of Smart glasses employment. The study discovered that the application of Smart glass technology in the service provision of PSS brought benefits from different perspectives. The limitation of this study is that the scope of comparison was narrow and limited to a few people. However, this study is relevant to my research topic because it compares two periods of deployment of smart glasses before and after, the performance, and the results.

Scholz, J., & Duffy, K., 2018, '*we are at home: How augmented reality reshapes mobile marketing and consumer-brand relationships*. Journal of Retailing and Consumer Services, Vol. 44, pp 11–23.

In this article, Scholz and Duffy explained, how AR revolutionized mobile marketing and influenced positive consumer brand relationships that give comfort to end users. The deployment of AR from the perspective of the consumer gives a broader picture of the effectiveness and usefulness of AR in the supply chain and logistics operation spectrum. Scholz and Duffy adopted secondary data by reviewing the work of others on AR as it relates to consumer brand relationships. This article is also important to my research topic because it explains the role technology plays in giving consumers comfort and mutually beneficial relationships between the firm and the consumers. The Limitation of this study is that it fails to widen its scope into other factors that contribute to making consumers feel comfortable with the use of AR to build productive relationships. However, the article shows that AR will facilitate and improve supply chain operations when it is properly deployed and used.

Impediments in the visualization of objects are still a significant concern as smart glasses are characterized by their small display, which hinders the comprehensive coverage of information suitable devices (i.e. hardware platforms) and design principles for market ready AR glasses. The major concern about smart glasses are technical, organizational and health and safety. This objective explores the challenges attributed to the adoption and deployment of smart glasses. Very important to note is that, smart glasses is a technology driven device which interact with people

hence technology related and privacy issues may be of concern. Security, safety and acceptance are issues that are prominent in the adoption and deployment of smart glasses. Kumar, Singh and Peddiny (2018) highlighted the aforementioned factors as the challenges that associated with deployment of smart glasses.

Lack of strong public acceptance, and less awareness over the smart glass usage and development, and their application, privacy issues arise mostly interrupting the smart glass system; these occur by the influence of external devices that are connected to a network or sensitive device towards electronic interference, lack of strong regulations either from the manufacturer's side, government side, and from the user's side and Lack of strong network security and robust wired or Wi-Fi connectivity Bandwidth. Rejeb, Keogh, Leong & Treiblmaier (2021) examined both benefits and challenges of AR smart glasses. The benefits were identified in terms of visualisation, interaction, user convenience, and navigation while the challenges posed by smart glasses in the supply chain and logistics operations centred on technical, organizational, and ergonomic considerations. It is true the smart glasses have numerous benefits but there are also mountainous challenges that resolve around its technical, organizational and ergonomic dimensions. Their assertion also aligns with Pierdica, Prist, Monterius, Ciarapica, Bevilacqua & Mazzuto (2020) security and safety concerns about the devices and Rauschnabel, He & Ro. (2018) privacy risk concerns.

Rejeb, A., & Keogh, J. G., & Leong, G. K., & Treiblmaier, H., 2021, *'Potentials and challenges of augmented reality smart glasses in logistics and supply chain management: a systematic literature review'.* International Journal of Production Research, Vol. 59, No. 12, pp 3747–3776

Rejeb *et al* investigated the potentials and challenges of deploying augmented reality (AR) smart glasses in logistics and supply chain management. They adopted secondary data and 82 publications on AR smart glasses-related articles were systematically reviewed and analyzed on AR smart glasses to provide an inclusive synthesis of what has been published in the literature to capture the dynamics surrounding this technology and identify areas deserving of improvement. The benefits of AR smart glasses were identified in terms of visualization, interaction, user convenience, and navigation while the challenges posed by smart glasses in the supply chain and logistics operations centered on technical, organizational, and ergonomic considerations. This study is relevant to my proposed research which seeks to examine the benefits and challenges associated with the deployment and usefulness of smart glasses at DHL.

Due, B. L. 2014, 'The future of smart glasses: *An essay about challenges and possibilities with smart glasses' working papers on interaction and communication,* Centre of Interaction Research and Communication Design, University of Copenhagen, 1(2), pp 1-21

In this piece, Due explained the twin factors of challenges and possibilities associated with the design and application of smart glasses and he specifically opined that the smart glasses and their functions must be sufficiently useful, operational, and user-friendly and have at least one so-called killer app before users will make use of them. Due adopted secondary data by extracting details from expert interviews and engaging in scientific reflections. He presented a series of state-of-the-art descriptions of issues that need further investigation in the future and also stands as the limitation of the study. However, this article is relevant to my study because it explains a plethora of challenges that relate to smart glasses design and deployment.

Findings

- The adoption, deployment and use of smart glasses have greatly enhanced logistics and supply chain operations management generally and in DHL UK in particular
- The deployment of smart glasses has been slow but steady process from the time it was first introduced. The slow pace has given companies the leverage to evaluate every step to ensure it success in the end.
- The deployment of smart glasses enhanced order picking, tasks scheduling and facilitates other warehouse activities.
- Smart glasses can only improve organizations' logistics and supply chain operations when they can effectively be utilized with maximum safety, without that smart glasses make no meaningful sense.
- Smart glasses are technology devices which required strong network stimulation, effective regulation and efficient application to achieve intended purpose.
- Smart glasses have special features and it can be design to suit the particular operational need of the firms
- Security, safety and acceptance are issues of concern that are prominent in the adoption and deployment of smart glasses.

CONCLUSION AND RECOMMENDATIONS

Fueled by my long-standing passion for logistics and supply chain management, I was captivated by documentaries and online media showcasing smart glasses and augmented reality in warehouse operations. This fascination sparked my interest in conducting this research which raised the research question, exploring the potential impact of this technology on industry operations in the supply chain function. From the findings above, we make the following recommendations.

- Employees should be properly trained and there should be effective awareness on the deployment and use of smart glasses prior to its adoption and deployment in order to achieve intended goal.
- The security and safety dimension of smart glasses should be properly addressed and integrated into the overall deployment and utilization of smart glasses to improve logistics and supply chain operations
- There should be strong regulation on all sides (manufacturer, user and government) to address the issues of privacy concern and ensure effective compliance
- Firms and competitors need to properly analyzed and understand the dynamics over the deployment of smart glasses before delving into adopting and deploying if not they might fail midway into their deployment.
- Based on the research analysis and findings, companies should leverage on the improved AI picking robots in the management of logistics and supply chain warehouse automation as showcase in the LogiMAT tradeshow in Stuggart in Germany.

REFERENCE

Amahalu, N. N., Abiahu, Mary,F.C., Obi, J.C., & Nweze, C.L. (2018). Effect of accounting information on market share price of selected firms listed on Nigeria stock exchange. *International Journal of Recent Advances in Multidisciplinary Research, 5*(1), 3366-3374

Altwaijry, H., M. Moghimi, & S. Belongie. (2014). Recognizing Locations with Google Glass: A Case Study. In IEEE Winter Conference on Applications of Computer Vision, 24- 26 March 2014, Steamboat Springs, CO, USA, 167–174

Berkemeier, L., B. Zobel, S. Werning, I. Ickerott, & O. Thomas. (2019). Engineering of Augmented Reality-Based Information Systems. *Business & Information Systems Engineering* 61 (1): 67–8

Chopra, S. & Meindl, P. (2001). Supply chain management: strategy, planning and operations, Upper Saddle River, NJ: Prentice-Hall, Inc.

Child, (2016) on the relationship between inventory and financial performance in manufacturing companies. *International Journal of Operations & Production Management, 29*(8), 789-806.

Cousins, P. M., Lamming, R., Lawson, B., & Squire, B. (2008). Strategic Supply Management. London: Pearson Education

Cortazar, B., H. C. Koydemir, D. Tseng, S. Feng, & A. Ozcan. (2015). Quantification of Plant Chlorophyll Content Using Google Glass. Lab on a Chip 15 (7): 1708–1716

Costanza, E., A. Kunz, & M. Fjeld. (2009). Mixed Reality: A Survey. In Human Machine Interaction: Research Results of the MMI Program, edited by Denis Lalanne, and Jürg Kohlas, 47–68. Lecture Notes in Computer Science. Berlin, Heidelberg: Springer Berlin Heidelberg. Accessed August 1, 2025

Dalenogare, L. S., Baseggio, M. M., Ayala, N. F., Le-Dain, M. & Frank, A. G. (2019). *The contribution of Smart Glasses for PSS*. Procedia CIRP, 83: 318-323

DHL. (2019). DHL Supply Chain Deploys Latest Version of Smart Glasses Worldwide." Deutsche Post DHL Group. 2019. Accessed August 24, 2019. https://www.dpdhl.com/ en/media-relations/press-releases/2019/dhl-supply-chaindeploys-latest-version-of-smart-glasses-worldwide.ht

De la Cruz, F., E. Condori-Castillo, D. Mauricio, J. Armas Aguirre, & P. Gonzalez. (2018). Telemedicine Model Using Smart Glasses: A Physical Therapy Rehabilitation Study Protocol. In 2018 Congreso Internacional de Innovación y Tendencias En Ingeniería (CONIITI), 1–5. IEEE. Bogota, Colombia. 3–5 Oct. 2018. Accessed August 1st, 2025

Eisenmann, T., Barley, L., & Kind, L. (2014). Google glass. Harvard Business School (Case Study)

Godana, E. B., & Ngugi. K. (2014). Determinants of effective inventory management at Kenol, Kobil Limited. *European Journal of Business Management, 1*(11), 341- 361.

Hashimoto, D. A., R. Phitayakorn, C. Fernandez-del Castillo, & O. Meireles. (2016). A Blinded Assessment of Video Quality in Wearable Technology for Telementoring in Open Surgery: The Google Glass Experience." Surgical Endoscopy 30 (1): 372–378

Jeroudi, O. M., G. Christakopoulos, G. Christopoulos, A. Kotsia, M. A. Kypreos, B. V. Rangan, S. Banerjee, & E. S. Brilakis. (2015). Accuracy of Remote Electrocardiogram Interpretation with the Use of Google Glass Technology." The American Journal of Cardiology 115 (3): 374–377

Ketchen, D.J.J. & Hult, L.C. (2010). The intersection of strategic management and supply chain management, *Industrial Marketing Management, 33*(1). 51-7.

Lambert, D. M., Stock, J. R. & Ellram, L. M. (1998) *Fundamentals of Logistics Management*, Boston MA: McGraw-Hill

Lake, D. A., & Powell, R. (1999). *Strategic choice and international relations*: Princeton University Press.

Liao, Y., F. Deschamps, E. de F, R. Loures, & L. F. P. Ramos. (2017). Past, Present and Future of Industry 4.0-a Systematic Literature Review and Research Agenda Proposal. International Journal of Production Research 55 (12): 3609–3629

Nadume, P., (2021), *Digital marketing and communication process efficiency*. Pearl Publishers, Port Harcourt, Nigeria.

Onkundi, K.E.H. & Bichanga, W.O. (2016). Factors influencing inventory management performance in public health sector. A Case Study of Public Health Sector in Kisii County.

Paulraj, A., & I. J. Chen. (2007). Strategic Buyer–Supplier Relationships, Information Technology and External Logistics Integration. *Journal of Supply Chain Management*, 43 (2): 2–14

Rauschnabel, P. A., J. He, & Y. K. Ro., (2018). 'Antecedents to the adoption of augmented reality smart glasses: a closer look at privacy risks*'*. *Journal of Business Research*, 92: 374–384.

Rejeb, A., Keogh, G. J., Wamba, S. F. & Treiblmaier, H., (2021). *The potentials of augmented reality in supply chain management: a state-of-the-art review,* Management Review Quarterly 71:819–856

Rauh, S., D. Zsebedits, E. Tamplon, S. Bolch, & G. Meixner. (2015). Using Google Glass for Mobile Maintenance and Calibration Tasks in the AUDI A8 Production Line. In 2015 IEEE 20th Conference on Emerging Technologies Factory Automation (ETFA), 1-4. IEEE. Luxembourg, Luxembourg. 8-11 Sept. 2015

Ricci, A., L. Tummolini, & C. Castelfranchi. (2017). Augmented Societies with Mirror Worlds. AI & SOCIETY 34: 745–752

Smith, E., & Burch, R. F., & Strawderman, L. & Chander, H., & Smith, B. K., (2021). A comfort analysis of using smart glasses during picking and putting tasks. *International Journal of Industrial Ergonomics*, 1-13

Scholz, J., & Duffy, K. (2018). We are at home: How augmented reality reshapes mobile marketing and consumer-brand relationships. *Journal of Retailing and Consumer Services*, 44:11–23.

Sharma, A. & Vivek, A. (2016). Study of inventory management in manufacturing industry. *International Journal of Advanced Engineering and Global Technology, 4*:3-12

Schiele, H. (2010). Early supplier integration: the dual role of purchasing in new product development. *Research and Development Management, 40*(2), 138-153.

Schiele, H., Veldman, J., & Hüttinger, L. (2011). Supplier innovativeness and supplier pricing: the role of preferred customer status. *International Journal of Innovation Management 15*(1), 1-27.

Zimmermann, N. (2011). *Dynamics of drivers of organizational change*, Gabler Verlag