

The modern-day warehouse employee

A study of augmented reality skills inside warehouses

Group 14

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Abstract

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Purpose:	This paper analyzes modern-day warehouses and their employees to understand the required competencies needed to prevail and successfully work in a smart warehouse. According to many scholars, technological advancement will push through over the years. The problem lies within determining general skill sets that the workforce should be having to be able to work with AI or smart warehouse management systems.
Method:	The empirical exploration into our subject was served with a qualitative and abductive approach. Furthermore, six open structured interviews were conducted with warehouse workers from different companies in primarily Germany. The interviews were carefully chosen convenience samples. Different employees in different positions were interviewed to get a cross-contextual understanding of warehouses. The material was analyzed with a thematic approach.
Conclusion:	The skills and mindset required range through many different areas and consist of habits such as stress resistance, organizational skills, time consciousness, communication skills, adaptability in culture and hierarchy, awareness of the environment and tasks, farsightedness and independence when solving tasks and problems.

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Introduction Chapter

1.1 Introduction

Industry 4.0 includes the improvement and incorporation of groundbreaking information and communication tools into the industry. The central goal is to promote the smart networking of products and processes alongside with the value chain, therefore, letting it to use more effectively the structural processes, into the making of goods and services to enrich customer benefit by putting forward to the new products and services (A. Reiner 2014, C.A. Valdez, L. Barteveyan 2015).

The expression "Logistics 4.0" is to indicate the combination of using logistics with the modernizations and functions added by Cyber-physical systems (CPS). Logistics 4.0 is linked to the same requirements as Smart Services and Smart Products (In J.P. Müller 2015).

Over the past two decades and with the appearance of computer systems, the advancement of information and communication technologies has repeatedly suggested as an excellent solution to managing warehousing operations (Davarzani and Norrman, 2015). Lately, a technology that has caught the business owners' attention concerning its potential to support manufacturing and logistics operations is augmented reality, the beginning of new areas for mobile cyber-physical applications (White et al.,2010).

Augmented reality consists of the physical and the digital world mixture in real-time through a wearable device (Glockner et al.,2014; Ong and Nee, 2013; Cirulis and Ginters,2013). Augmented reality is the tool they intend to remove the boundaries between the real and virtual worlds, linking them in such a way that the management of physical objects has resulted in the virtual world and, likewise, the in-world events have an influence or result on the physical world (Oliveira, 2007). Therefore, it has been familiarized as an enabler for industrial cyber-physical systems (Leitao et al.,2016; Khalid et al.,2014; Gorecky et al.,2012). When discussing augmented reality, we discuss a system that incorporates virtual elements with real-world elements, generating a mixed environment in real-time (Azuma 1997).

The labor force is incorporated in the manufacturing systems, which, too, requires flexible and adaptive (Yew, Ong, and Nee, 2016). Therefore, augmented reality can be implemented for labor force training (Fischer et al., 2016), aiming for better communication between humans and machines. This indicated that they could accelerate the reconfiguration of production lines, provide support for operators, virtual training, manage the warehouse effectively, and interact with the working environment to minimize risk (Damiani, Revetria, and Volpe, 2016).

The skills necessary for a position in a warehouse have increased along with the increase in complexity of supply chains and movements such as outsourcing and globalization. Corporations are searching for suitable resources, skillful employees, and partners to achieve higher outcomes and performance. The most crucial objective of a more advanced warehouse management system is to aggregate value for the customers and to be more efficient and more profitable. It also benefits owners and workers through more effective processes. Moreover, the lack of appropriate skills, competences, and capabilities to work with augmented reality and new technologies can lead to delays or even harm to the business. Therefore, the advancement of skills and competencies should be essential for the long-term labor market (Peltola, 2008).

1.2 Warehouse Management Systems

The warehouses have always been an essential focal point during goods within a supply chain. Nevertheless, in the present day's economic climate, they as well need to serve as a crucial source of competitive advantage for logistics contributors (DHL and Cisco 2015). The implementation of the Industry 4.0 idea will bring in remarkable transformation on how the warehouse operates these days. Notably, the incorporation of 'smart' management during the process of the implementation of Warehouse Management Systems (WMS) which will make over the warehouse activities into the future requirements of the logistics to be in harmony with the Industry 4.0 (S. Schrauf, P. Bertram, 2016). As a result, transports will be able to transfer information on the position and predicted arrival time to the smart warehouse management system, which will select and prepare a docking slot, improving just-in-time and just-in-sequence delivery. At the same time, the RFID sensors will show what has been delivered and send out the track-and-trace data to the supply chain. The warehouse management system will systematically make storage space according to the delivery specification and request the right equipment to move the goods to the right storage space autonomously. Once pallets are placed to the assigned location, tags will send signals to the warehouse management system to make available real-time visibility into inventory levels, which could avoid costly out-of-stock (C. Cunnane, 2017).

1.3 Problem Background

Logistics has been the main growth sector in the global economy in terms of stages of activity and expenditure for several decades. Moreover, being an important sector in its own right, logistics effectively influence the economic performance of many industries and the countries in which they are located. Given its vital importance to economic progress and social welfare, logistics must be effectively resourced—in the physical sense and the relation of human resources. Regardless of extensive mechanization and automation, logistics at the operational level naturally remains a people

business. Therefore, this makes the logistics operation of companies and countries highly dependent on the quantity and quality of the workforce (Alan et al., 2017).

The workers of Logistics and Industry 4.0 require new skills for transforming and adjusting jobs that are appearing with the initiation of advanced technology such as augmented reality to improve productivity (BMW, 2014; Manyika 2013). Much researches have been performed to discover which kind of job profiles are mainly impacted by the changing of Industry 4.0 (e.g., (Arntz & Spöttl, 2016; Frey, 2013). In the industrial sector, jobs with many activities are impacted by development and foreseeable change. For instance, workers acting in the operation of warehousing systems will have to gain different skills within their tasks to cope with the changing and introduction of new technology such as augmented reality.

Jobs possibly will disappear due to Industry 4.0 changes; however, the new jobs that will emerge will require highly skilled and well-trained labor, in order to operate the systems and to avoid any possible failure that might occur (Baxter, G., 2012).

Nowadays, there is a gap between task execution and competence development (EC & EFFRA, Rübmann, 2015). Moreover, skills such as e.g., creativity, social intelligence, innovation skill, troubleshooting, as well as domain skills, are being required in such new technological environment (e.g., the configuration of cyber-physical systems, maintenance of sensor networks, or knowledge about Internet of Things) (Letmathe, P 2015). These skills shortages range from a lack of truck drivers' analytical and computation skills to problems in filling senior supply chain management (SCM) positions (Alan, Chris, Flo, Kai, Bus, 2017).

With the Logistics and Industry 4.0-technology supplying organizations, such as McKinsey, SAP, Microsoft, German Telekom, or Scheer Consulting, previously recognized how important the need was to improvements on the education of the employees to complement the beginning of Industry 4.0 concepts into the operation process (Pesch, A. Zukunftsbild 2014).

This could indicate the competence and skill set of the people that are attracted to the industry, the level of training and education they receive, and how they are being managed and motivated. Its relatively poor image often views the logistics department for recruitment. The warehouse industry has been known for exploiting low-skilled labor inside their firms, jobs get less complexed, and new arising tasks that come with the technology need more specialized personnel, such as maintenance personnel (Gutelius and Theodore, 2019). Therefore, career planning can also be deficient; this can result that some high skilled operatives and managers choose to leave logistics for other roles (Alan, Chris, Flo, Kai, Bus, 2017).

The modernization of warehouses is taking place. It is elaborated very well inside research papers to a point where the industry will need a few years to catch up to the latest findings. With the development of warehouses comes the necessary development of blue-collar workers according to the new competencies that need to be gained. The problem lies within the fact that the employees have been widely left out of research for warehouses.

1.4 Purpose and Aim

This paper analyzes modern-day warehouses and their employees to understand the required competencies needed to prevail and successfully work in a smart warehouse. According to many scholars, technological advancement will push through over the years. The problem lies within determining general skill sets that the workforce should be having to be able to work with AI or smart warehouse management systems.

This research paper has the intention to investigate the skill gap and organizations are facing with the introduction of new technology, barriers, and limitations that augmented reality could bring in warehouse management as well as to identify certain skill sets or the basic understanding that employees should have to work with warehouse systems in smart logistics. Furthermore, we want to fill in the gap of educating future warehouse employees in the right way and identify a set of cross-contextual skill sets or characteristics that will help to find and/or educate the right employees for warehouses.

1.5 Point of view

To understand the education in warehouses better, the authors focused on people working in different warehouses in Germany and Sweden on different positions and hierarchical levels, to get a full understanding of the research topic.

1.6 Research Question

What skill does a modern-day warehouse employee have to obtain or bring with him/her to work with augmented reality in logistics 4.0?

Literature Review

2.1 Human Resource Management

2.1.1 Human Resource Management and Identifying Skills

Human resource management is the phrase which is used to describe all the organizational procedures and activities that have to do with selecting and recruiting, design the work for, training and developing, directing, motivating and controlling employees(Wilton, 2016), HRM consists of separate but overlapping areas with managerial activities (Wilton, 2016; Sousa & Wilks, 2018), *human resource development*- which is a term that gathers the activities that aim towards identifying individual, teams and organizational development requirements, implementing and evaluating learning and training process. (Wilton, 2016; Sousa & Wilks, 2018). Furthermore, *managing performance*- which is a term that gathers the procedure of managing individual and team performance, and how the workers are contributing to achieving the organizational goals through goal setting and performance/development reviews. (Wilton, 2016; Sousa & Wilks, 2018).

It is the human resource department of every organization that is considered responsible for identifying and recruiting workers that the organization needs to be able to pursue the strategic goals they aim for (Wilton, 2016). With the usage of the rapidly growing technologies (AI and AR) in logistics, HR department need to identify what skills and mindsets they need to search for or develop their current employees towards, so they would be able to embed the new technologies which are claimed that would help the logisticians and logistics workers to operate most effectively. (Sousa & Wilks, 2018) The new technologies emerging help the organizations to be more cost-efficient, provide quality services and products, and reach for the continuously evolving customers' expectations and demands. On the other hand, those technologies force organizations to change, old skills possessed by logisticians and logistics workers become obsolete, and new ones are needed (Sousa & Wilks, 2018). The continuous demand for obtaining new characteristics, skills, and mindsets is becoming a new force shaping the logistics recruiting department within the organization's demands from their future employees. Moreover, previously conducted research showed that investing in training the employees helps to keep them and secure a more competitive advantage (Sousa & Wilks, 2018).

2.1.2 Skills and Capabilities

The organization members' knowledge of logistics, skills, and inputs is central in logistics management and logistics education. In contrast, skills and assets are seen to be the crucial components that create the different capabilities needed to deal with the new emerging technologies and challenges that come with it from a resource-based point of view (Kovács, Tatham & Larson, 2012). Some researchers within the area of Logistics skills separate and distinguish between skills, experience, and knowledge areas. As an example, few researchers make a distinction between knowledge that could be taught through different types of education as the basic knowledge that would promote the skills needed for dealing with the new technologies, the knowledge that gets acquired through working experience and the tacit type of skills such as problem-solving, time managing and multi-tasking (Kovács, Tatham & Larson, 2012), while others prefer to gather the different parts into three main skill categories or skill sets as follows: 1-logistics skills (as the skills that relate warehousing functions and communication technology and technical skills) 2-business skills (as the skill that enable the worker to understand and relate to the other functions within the organization) 3-management skills, such as organizing and planning skills or leadership skills (Kovács, Tatham & Larson, 2012).

This mix of these skill categories has prompted Mangan and Christopher's (2005) T-molded skills profile that accentuates the distinction in broadness versus in-depth of knowledge, abilities, and skills in various sectors and dimensions. Logisticians need to have a mix of depth of logistical abilities (or SCM skills) and broad knowledge and capabilities in a few different sectors (Kovács, Tatham & Larson, 2012).

Logisticians in general and warehouse workers in specific should have in-depth knowledge and abilities which will lead to higher comprehension which in turn it will reflect on the skills of the workers, on the other hand logisticians and warehouse workers should have some broad shallow knowledge within other segments and sectors. Some of the needed in-depth knowledge and skills could be (inventory management, stress management, problem solving, problem recognition, warehousing) while some of the needed broad knowledge and skills could be (oral communications, technological skills, listening, customer relation skills and information sharing) (Kovács, Tatham & Larson, 2012).

When properly managing and combining the assets that the organization operate and the skills that each employer within the organization contribute with, the absorptive capacity of the organization increase significantly, which will lead the organization to expand and thrive new capabilities which eventually will help with the organization survival over different circumstances, skills are considered to be tacit and even inimitable, which if utilized properly can be a source of strategic competitive advantage. (Kovács, Tatham & Larson, 2012).

For an organization to be sustainable and able to offer its clients a greater value than their competitors, they need to focus and recognize their internal resources (including skills). (Kovács, Tatham & Larson, 2012), in general, there is no unanimity in previous research on how logistics capabilities should be broken down into particular skills, nor there is unanimity about what skill have to be placed in which skill set, but there is a unanimity that:

1. determining the needed set of skills within the different links of any supply chain (logistics, production, etc.) is important for any organization to be able to acquire the set of skills that will push it towards the continuous development of capabilities.
2. skills can be categorized and prioritized based on their importance for the specific link within the supply chain.
3. the industry and the surrounding environment determine which capabilities are needed for the success of the supply chain (Kovács, Tatham & Larson, 2012).

2.1.3 Mindsets in Logistics 4.0

The "person way of thinking," "a set of attitudes that somebody has and that are often difficult to change," these definitions indicate that mindset is something that takes place in the worker's head and has the power to influence and even control the worker's attitude toward different situations and his behavior in general (fang, Kang & Liu, 2020).

The massive changes and developments in the last few decades shaped the way that the people viewed the world of business in various ways. The industrial era required and therefore shaped the attitudes and ways of thinking that are needed for that certain age while the newly emerging technologies are shaping a new era that requires different ways of thinking. Those two eras created two main mindsets: 1- the industrial age mindset. 2- the new emerging mindset is the information age mindset (fang, Kang & Liu, 2020).

Different research has been conducted to understand and determine the different characteristics/ skills of those two mindsets to help the different industries recruit the best fitting mindsets (fang, Kang & Liu, 2020). The following paragraphs will illustrate and discuss the different characteristics/ skills which concern the logistics industry in general with the focus on warehousing.

Through the past years and decades the industry has been shifting and forced to be reshaped by the emerging technologies, in the era previous to the informational era that we are living at now (the industrial era) the workers were supposed to have a certain mindset that fits with that time ways of

running a business, warehouse workers and logisticians in general preferred better salaries/tangible assets over better education/training offers by the employees, the organization were built in a centralized bureaucratic way where the relation in work was determined by (boss workers mindsets) where the decisions are made by managers in a centralized way which makes the communication process a one way communication (top-down communication), the workers were asked to focus solely on their assigned division and the quality control activities were also centralized, the industry in that time was mass standardized production focused. Those characteristics has shaped the workers of that era mindsets so they could fit within that type of industry structure (division focus, mass standardize production where quantity is superior to quality, no decision making is required from the workers and the communication is a mean only to deliver the boss new recommendations and orders) (fang, Kang & Liu, 2020).

While the technologies are rising and the industrial era is shifting toward the informational era where the workers mentalities and mindsets are shaped in a different way where they are required to possess different mindset that would fit with the new organizational structure and focus, the worker is requiring and preferring a better education system within the organization over the better salaries, the workers are asked to be integrated with other divisions or at least to possess knowledge that would enable them to understand the supply chain dynamics, the organizations are structured in a team based way where the communication is network communication more than one way directions and the quality control is required from each worker with shared accountability measures, the organization in the informational era are empowering the workers to take some decision to improve the efficiency of the entire process (fang, Kang & Liu, 2020).

2.1.4 People Resourcing and Human Resource Development in Industry 4.0

With the new technologies emerging within the different sectors in logistics, the emphasis on improving the skill-job procedures are getting stronger over time, since the jobs are suitable for workers within logistics in general and warehouses in specific who possess the certain skill level and specific mindset (Badillo-Amador and Vila, 2013) when the required skills and mindset by the job but the workers possessed skills and mindset are mismatched (skill-job mismatch) the results will be performance failure and the entire process will be far from reaching the aimed effectiveness (Collings and Mellahi, 2009). Hence, investing in the skills- matching procedures within warehouses could result in better organizational results. Studying the degrees of the skills, mindset, and knowledge needed for a specific job may prompt an exact clarification of their impact on the overall results of the entire supply chain.

2.1.5 Types of Training in Industry 4.0

Training enhances the efficiency at work of workers, teams, and organizations by investing to increase their knowledge, hone their skills and characteristics, and develop the right frame of mind (Aguinis and Kraiger, 2009). It is generally agreed that investing in training is crucial for building solid human capital where the employees are capable of adapting to the new emerging technologies or newly implemented systems within an organization (Conley and Kadrlík, 2010). Lacking training offers can cause career-minded people to look somewhere else for possibilities to advance and develop. Training can be divided into the following two types of training: on-the-job training, off-the-job training (Sambrook, 2003).

On-the-job training includes arranged connections among mentors and learners in the work environment (Jacobs et al., 1992). The point of on-the-job training is to give vital preparation to all workers (Lechner, 1999). on-the-job training is progressively focused on the skills that are explicitly pertinent to the organization (Lynch, 1991). McArdle (2015) expressed that on-the-job training can be learner engaged as it is predominantly concentrating on the learner's present circumstance utilizing one-on-one guidance. Jacobs (2003) noticed that most workers would, in general, be engaged with on-the-job training disregarding the work type. Appropriately executed on-the-job training can improve workers' effectivity (Kainen et al., 1983).

Off-the-work training incorporates different preparing programs, for example, organization supported off-site training programs, just as classes at professional specialized schools and universities and correspondence courses (Jacobs, 2003). Off-the-work training can be set up in areas close or a long way from the working environment (Jacobs, 2003). In an off-the-work training program, a coach may execute the educational plan utilizing introductions or role-plays (Rowold, 2008). While at work and off-the-work projects may contrast by the way they are directed, they give representatives a chance to learn new information and skills.

2.1.6 Managing Performance

Performance management procedures are mainly an internal activity within an organization, the data generated by those procedures should be connected and shared with different systems through the organization such as rewards, recruiting, training and development and career development (Kavanagh & Johnson, 2018). The main aim of performance management procedures is to enhance and motivate the workers to perform their best in their role; hence the procedures should be inherently self-explanatory, job performance management tools aim to measure the individual's knowledge, skills and abilities (KSA), and rates the KSA score of the individual in accordance with the unit goal, in a broader scope the worker's score will be gathered under units scores, and the units scores will be rated in accordance with the strategic goals of the entire organization (Kavanagh & Johnson, 2018).

Since performance takes place at an individual level, most of the data regarding performance management are individualistic data; the data contain all the different performance criteria picked by the top managers for the individuals, the precise measures that the managers will use to rate the individual's performance on the different criterion and the performance standards for each measurement (Kavanagh & Johnson, 2018). The resource planning management measures, according to the implementation of Industry 4.0 and the adoption of Cyber-physical systems (CPS), will boost the overall efficiency, tractability, and responsiveness to the changes that possibly will occur in the supply chains. The proper configuration and incorporation between the most important actors of the supply chain and the growing level of prospect and directness will guarantee an adequate projection of resources (people, materials, equipment) (KPMG 2016) which will potentiate the advancements of resources/processes, the opportunity to showcase the market orientation and develop asset employment (Mckinsey, 2015).

The level of difficulty required will increase significantly during the IoT and the level of specialization of human resources. The human resource (HR) competence requirements will transform dramatically with the nonstop adoption of Industry 4.0. The necessity of computational and analytical skills, along with the technological systems integration, will transform the ordinary profiles of the HR in industry.

2.2 Logistics

2.2.1 Warehouse Management

Warehouse management is describing the process of managing storage and distribution systems efficiently, as well as the optimization of those, in complexity gaining, issues, which have reached a complexity that is only manageable with the support of intelligent systems (Hompel and Schmidt, 2006). Furthermore, the complexity of products and more specific customer demand is adding up to the challenges faced by logistics and, ultimately, by the whole supply chain (Issaoui et al., 2019). According to Hompel and Schmidt (2006), this aspect of logistics has three foundations, which consist of the technical structure, the organizational frame, and the coordination of those aspects. The technical structure can be summed up by demand forecasting, sales planning, supply requirements, inventory management, and product distribution (Issaoui et al., 2019).

The increasing merging of the physical space in connection with the design of the intelligent system provides a competitive advantage in the logistics industry. Continuous monitoring, scheduling, and adaptation of the processes inside a logistics company are vital aspects, in addition to the implementation of intelligent systems without failures, which could cause expensive disruptions, is another major factor determining the competitiveness of logistics companies (Hompel and Schmidt, 2006; Gutelius and Theodore, 2019). A possible failure may be too complicated systems that are not user friendly and, therefore, not suitable for the use inside warehouses.

The reasons for building a warehouse can vary, as they can have different logistical competencies. Among them is the optimization of logistical performance, securing the production and manufacturing of products, additional services (Labelling or assembling), the reduction of transportation cost and the balancing of products demanded, and products supplied (Hompel and Schmidt, 2006).

The exchange of goods between different agents in growing economies is the foundation for the survival and development of firms (Albach et al., 2000), hence the development of logistics will be a significant factor in the overall development of supply chains. Gutelius and Theodore (2019) are describing the impacts of technological change in the US logistics industry, among other aspects. Exhausting and wearing tasks get redistributed with the help of technology so that employees have to walk less inside the warehouse, do not have to do the heavy lifting, which can result in severe injuries and the technology is also improving ergonomics which is partly taking away the amount of stress being put on the human body (Gutelius and Theodore, 2019).

This change is also enabling the workforce to focus more on their personal productivity and is enabling management to advanced ways of measuring the performance of low-skilled workers (Gutelius and

Theodore, 2019). WMS's can support employees in three ways. Firstly, discrete order picking is implementing software of showing the labor force where which item is stored. This will require the most walking of the three adaptations of WMS. Secondly, batch picking software is showing the employees multiple items that are in close range to each other but are used for multiple orders. This is a complex approach, and this form of organization is decreasing the effectiveness in terms of time. Thirdly, waveless picking systems are bringing the products to the employees, which then must pick items from a tray or conveyor belt.

Some skills rely on the individual experience in the warehouse (Gutelius and Theodore, 2019), as tasks and systems for employees vary. Aspects such as RF scan guns with different commands, the layout of warehouses and other non-intuitive aspects of the work need to be taught to new employees. In the paper of Gutelius and Theodore (2019), de-skilling describes the process of making tasks simple for employees. The simplification of tasks, if done with intuitively operable systems, is decreasing the demand for highly skilled labor. Contrary, new technological systems, including systems that support augmentation for employees, need a highly specialized workforce for maintenance. This is defined by the term "Up-skilling" (Gutelius and Theodore, 2019).

Even though the industry of logistics and the aspect of warehouse management is implementing increasing automation in their warehouses, the fully automated warehouse or logistics firm will not unlikely be developed in the near to medium time frame (Gutelius and Theodore (2019)). Reasons for this may be the financial risks that are connected to experiment with new technologies inside warehouses, in an industry in which the competition mainly is being measured on the cost that is quoted (Gutelius Theodore, 2019). A more probable outcome of the technological improvements and the implementation of intelligent systems is the application of labor augmentation (Gutelius and Theodore, 2019), which means that the systems will instead support the human workforce rather than replacing them, at least in the short term.

2.2.2 Augmented Reality in Logistics 4.0

Many concepts of Artificial Intelligence can be applied to various business fields in the arising industry 4.0. The authors of this paper decided to focus their study on the implementation of Augmented Reality (AR) in Smart Logistics.

Augmented Reality (AR) is a broad term to classify a method to add virtual elements, items, or data in real-time in the physical world. It can be reinforced by numerous technologies (e.g., Computers, TV, smartphones and tablets, glasses, wearables). The term is not restricted to the visual feature, because it can also include audio or engage other senses of the user. For this chapter, we will concentrate only

on the visual viewpoint. The explanation of an augmented reality system can consequently vary; however, three significant characteristics that a system should have can be summarized from literature (Azuma,1997; Van Krevelen and Poelman,2010): The system is supposed to, work in real-time, combine virtual elements with the reality, be incorporated in a 3D environment. In logistics, especially, even though the existing literature is somewhat limited, augmented reality is viewed as one of the technologies that could be the cause of the "next major change" in the industry (Glockner et al.,2014). It has as well been discussed that it can make better the execution of many logistics processes (Cirulis and Ginter's, 2013). The attentive reader is denoting to (Glockneretal.,2014) for a practice-oriented evaluation of use events in logistics comprising warehousing operations, transportation optimization, last-mile delivery, and enriched value-added services.

2.2.3 Application of Augmented Reality inside Warehousing

The main operation existing in a warehouse can be divided into four work terms (Davarzani and Norrman, 2015): receiving, storing, ordering, and shipping. Order picking is undoubtedly the most researched area, possibly because it accounts for more than 50% of warehousing expenses (Giannikas et al.,2016). Existing studies have aimed at how the routing of human labor could be improved using AR (Reif and Gunthner, 2009; Schwerdtfeger et al.,2009), what is the most useful way to point out a storage location to a picker (Schwerdtfeger and Klinker,2008) and the link between pick lists communicated by voice, via ahead attached display, using lights, or on the printed sheet (Tumler et al.,2008; Weaver et al., 2010; Guo et al.,2014).

From an industrial point of view, businesses like Knapp, SAP, DHL, and Generix have started working on better solutions focusing on upgraded hardware and software elements of an AR solution. The aim is to allow picking, which is fast, mistake-free, and user friendly, whereas guiding a worker. On the other hand, some attributes are missing from industrial solutions, particularly concerning bar code readers and real-time 3D projections. Many of the existing solutions with wearable glasses are able only to display the correspondent of printed pick lists in front of the eyes of the operator. Relevant researches and solutions for the supplementary three main operations, i.e., receiving storing and shipping, are more constrained (Real and Marcelino,2011), and they above all aim to hand over potential use cases for future developments (Glockner et al.,2014). Nevertheless, the use of augmented reality in receiving, storing, and shipping might lead to advantages similar to those observed in order picking, i.e., decreased error rates and faster execution of operations.

2.3 Conceptual Framework

Warehouse procedures for managing storage and distribution to reach efficiency have rapidly developed in the past years, reaching a point where warehouse management needs to implement intelligent systems to support them with various tasks such as inventory management and product distribution (Issaoui et al.,2019). One of the intelligent systems used and implemented in nowadays warehouses is augmented reality, which is considered to be one of the forces that could cause the industries to be reshaped (Gloockner et al.,2014).

It is believed that Augmented Reality systems have great potential to reduce and eliminate the incompetences within order picking where 50% of warehousing expenses are allocated, AR can be implemented and connected through various devices such as computers, scanners, wearables and tablets (Van Krevelen and Poelman, 2010).

For those systems to be implemented successfully it is human resource management office within the organization which is responsible for identifying the needed skills and mindset that the organization needs their potential and current workers to possess, so HRM would focus on recruiting workers with the needed skills and developing their current workers in various ways of training (Wilton, 2016).

Research recommends HRM to treat skills, knowledge, and experience in different ways. Where knowledge can be transferred through training, and the experience will be gained in an accumulated way while working and facing the difficulties of the job station that the worker is assigned to. However, skills are considered a tacit knowledge that the organization cannot train the worker toward (Kovács, Tatham & Larson, 2012). When the required skills set for a certain job is not matched by the worker's skills set, this combination will lead toward a situation called "job-skill mismatch" where the organization will be not able to reach the desired state of effectiveness or efficiency, this mismatch can result in failures which will disturb the entire supply chain.

(Collings and Mellahi, 2009). Nevertheless, in the past few decades, job requirements have been changing. Those changes were hand in hand with the emerging technologies, this combination lead toward two main types of mindset the industrial era mindset and the relatively new informational era mindset, those two mindsets think differently and are driven in different ways, this means that those two mindsets operate and prioritize job-related tasks in different ways (fang, Kang & Liu, 2020) thus HRM needs to determine which mindset fits the job better.

Methodology

3.1 Research Method

In the design of our research, the authors were confronted with truth and reality and what the nature of both was. The authors of this paper believe that there is not a certain reality and that realities depend on the context in which they appear, hence depending on the context, multiple realities can be constructed. The truth evolves and changes according to our own frame that is created by our own experience in the research process. Therefore, the authors are following a relativist approach of the truth and reality, meaning that we will understand the context of experience to acquire an in-depth understanding.

Following this, the epistemology is concerned with the way we want to gather our data, how we want to interact with our study environment. To get an in-depth understanding and because we are supporting a relativist approach, the authors of this paper decided to get in direct interaction with the study field. We are aware that we are sacrificing the generalizability of the findings of this paper with our perception of truth. Yet, we are more concerned with finding the reality of warehouses, employees, and augmented reality.

The authors of this paper decided upon a qualitative research approach, as we are exploring the logistics world. This philosophical approach will enable the group to “design a solid piece of study” (Eriksson et al., 2008). Furthermore, this way of conducting our research enables us to be aware of social realities by giving a detailed description of our study environment (Bryman & Bell, 2011). Bryman and Bell (2011) state that qualitative “evidence” often describes a change over time, which is optimal when describing what type of education logistics firms want their employees to have. We decided to shed light in the social realities of education for employees that are not to be expected to be specialized, even though we are in a world which is gaining complexity over time in almost all fields, which makes education of labor force one of the key aspects of our time.

Along with the qualitative method comes for us the abductive approach, which is a constant change between the inductive and the deductive approach. The line between inductive and deductive approaches cannot be drawn to tight, and not necessarily one path must be followed (Bryman & Bell, 2011). This was decided to connect the everyday descriptions of interviewees to the different categories of our theoretical framework. Furthermore, the abductive approach helped the authors of this paper have a basic understanding and foundation, but also freely explore the field.

The inductive approach was necessary as the authors need to develop a theory or understanding after empirically experiencing the research field (Eriksson et al. 2008). It explores the social reality of the increasing educational standards that will be expected by employees. Inductivity enables the authors to continuously cross-adapt the paper (Bryman and Bell, 2011; Eriksson et al., 2008), accordingly with the extension of the mental frame, that is gained by reading or experiencing the desired research field, which in turn makes it possible to accurately analyze social realities. This happened, for instance, considering augmented reality. We had to first learn how the augmented reality was perceived by participants to know what skills are required to engage with that virtual environment. When the authors reached a point where the findings led to a strong theoretical base, the deductive approach was applied.

The deductive approach enabled us to build a strong theoretical foundation, on which basis we followed our path of designing and conducting our research. Usually, the first theory has been drawn, and then the empirical findings support or do not support one's theory (Eriksson et al., 2008), which we followed until a certain point. We tried to learn a lot about our research field and therefore hypothesized/philosophized about the deeper meaning of our literature, for instance, when it came to think of skills as variables that we wanted to examine closer. If we reached a point and saw that the paper was not leading properly, we would switch back to the inductive approach and let the data lead our quest.

We established ourselves with a circular research process, continuously cross adapting our different parts, based on the advancements that we make in total (Eriksson et al., 2008). It is a strength to be able to adjust research along the way of getting a wider knowledge frame on the research. The authors focused on this aspect by first determining literature that was important and comparing it to the findings that we had. When our findings suggested aspects that were completely new to us, such as the unexpected usage of scanners, we would try to find more literature relevant to this topic.

3.2 Data Gathering

In their task to explore the field of warehouse technologies and employees within those, the authors decided to conduct six open structured á 20-minutes interviews to get lead in the quest to find certain social realities. The latter can be found in the appendix, and if needed, all interviews were recorded and transcribed. If needed, we will be able to share the recordings with the assessors of this paper. Additionally, we found a secondary source from a world bank study, of which some aspects further added to our findings.

The authors created an interview guide, as presented by Bryman and Bell (2011). In the beginning, an introducing question was asked about the working experience and the specific work of the participant inside a warehouse. From this point on, the interviewees went freely, and the authors focused on determining key ideas and focusses that were stressed by the participant. If it fulfilled the cause, follow up questions were asked. If parts were unclear or required, further explaining, the authors asked for details and an explanation that does not require to have many years of experience.

Furthermore, mostly indirect questions were asked not to influence the participants too much and tried to carry the interview smoothly through areas such as technology inside the warehouse, reward or punishment systems, education inside, and many more. Most of those topics were coming out of the situation of letting the participant speak and ask the right question according to age and other factors. Taking all interviews under consideration, most were a mixture of unstructured and semi-structured interviews.

The operationalization of our interviews was divided into different parts and sections, by introducing us and our study to the interviewees. Afterward, we gave our participants time to introduce themselves to the audience, and we would ask questions to get to know the employees' education and let them explain what their daily tasks consisted of. After listening carefully to the daily tasks, the authors would ask to follow up questions to see the connection to the augmented reality, which mostly looked like asking what types of work could be done with their scanners and what type of problems the scanners lead up to. Furthermore, we asked each participant to give us the skills that an employee in the warehouse should be having. Lastly, we asked our interviewees about their thoughts about the future and technology in general. Those were the structured parts of our interviews. However, we went according to the answers to get insights into where our interviewees would lead us in our quest to discover more about the augmented reality inside warehouses.

3.3 Sampling Method

According to Bryman and Bell (2011), a trustworthy sampling method requires hard work and not being opportunistic or convenient in search of sources. That is why the authors tried to interview as many different employees as possible to find cross-positional and cross-company similarities in the mentality or skill set required in smart logistics.

Therefore, the authors contacted friends and family to find five men in Germany and one in Sweden. In the end, all were some convenience samples, as we could relate to most people through our closer social circles. The challenge was to find six employees from 6 different companies. In the table below, a description of each participant can be found:

Name	Age	Company	Industry	Position	Experience	Status	Affiliation
Participant A	33	OBO Bettermann/Wilhelm- Kirchhoff GmbH	Electro- Installation	Warehouse clerk	14 years	Still in warehousing	Son of Friend of Father
Mister Fink	66	Dachser	Forwarding Company	Warehouse clerk	25 years	Retired, still working 20 hours a week	Neighbor-known for loving work in warehouse
Micheal Stewart	35	Meisinger	Producer and trader of dental products	Manager of warehouse	1,5 years	Not working in warehouse anymore	Husband of cousin
Jan-Phillip Hildenbrand	22	UPS	Forwarding company for industrial products	Onloading trucks in warehouse	1 year	Not working in warehouse anymore	Childhood Friend
Participant B	22	Winner-Spedition	Forwarding company	Warehouse employee	3 years	Still working in warehouse	Snowball after interview with Jan
Mister Baraa	27	Recticel AB	Mattress manufacturer	Warehouse team leader	4 years	Still working in warehouse	Friend of a cousin

3.4 Analysis Method

We focused on a thematic analysis to analyze our data, which helped us to sort and categorize our data and determine which aspects are essential for our study. We generated different themes or codes along with the collection of our data. For instance, if one interviewee sheds light on a topic field that was important for augmented reality and we were unaware that beforehand, such as broken scanners, we would tackle this topic with the next interviewees. After we collected our data and established codes, we started to put our findings into themes and identified similarities and differences.

After we were sure that our themes were reflecting our findings in a way that fits with the adapted research question, we continued now to systematically view our theoretical framework and went to each paragraph to see how we can connect it to the data that we collected. We connected those in the analysis and discussion chapter and expanded it by our conclusions.

3.5 Limitations and Criticism

Reliability is the extent to which our research outcomes will be replicable, taking into context the same sort of data. The authors tried to be as transparent as possible so that we can enable the research to be understood and consistent with the outcome of the research that the authors have found. We understand that establishing a repeatable study in qualitative research is a hard matter and therefore hope for a similar if not equivalent result of other people reading our paper.

We are aware that in qualitative research, humans' interpretation can be a cause for many mistakes, which can ultimately lead to wrong results, especially when studying a field only over a short period

(Bryman and Bell, 2011). Furthermore, validity is concerned with the applicability of our knowledge across different social settings (Bryman and Bell, 2011).

The authors of this paper asked themselves if the research can be understood in the broader sense of context than in this specific example, which is the definition of generalizability, according to Eriksson et al. (2011). The authors tried to design a frame that would make it possible to understand the specialization problem for other fields in the industry 4.0 or at least logistics 4.0. Of course, generalizability in qualitative business research is challenging to realize, due to the endless interpretation possibilities of each human. Therefore, we are limited when it comes to generalizability.

We tried to contact many companies, to maybe even observe or participate in a warehouse. However, we got similar replies: "To conduct such kind of study is reserved for our internal students." In one case, with Dachser, the authors even were suspected of conducting industrial espionage, which was demotivating and hard to find companies that would be ready to help us. The issue was to find a company that is ready to help and is implementing a sufficient amount of augmented reality in their warehouse. Furthermore, we had to sadly notice that blue-collar workers were more ready to speak with us, than managers. Some managers promised us interviews, but then would never reply again, which would have added more quality to our study.

Lastly, we would criticize the fact that we conducted short interviews, which sometimes was caused by not knowing which parts to dig deeper into the matter. It depended on the people we spoke to, and how much they would be sharing from themselves. Therefore, we need to be aware next time to make a better interview guide and to "force" the people to speak more. It was a challenge to handle the information smoothly and to take our time to ask enough to follow up questions so that no questions would arise in the later process. To fill in the blank spots of our questionnaires, later on, was one of the most disturbing and hard challenges that we faced.

Findings

4.1 Education inside Warehouses

The data on the education inside warehouse is rather limited, due to the fact that employees didn't receive extensive training programs or other forms of education. Participants had to figure many steps out after a short education period of one week, that could also be regarded as period of proving oneself. Almost all participants reported that they learned from more experienced people, as Mister Baraa is putting it:

"so every time we hire a new worker/order collector we team him up with the oldest collector within the warehouse for 2 or 3 days to show him the process of the job, within this three days and up to one week we keep an eye on the worker and evaluate his capability to learn how to use this technology. There has been some situations where we hired workers and they had very little background with technology, so he is not able to learn or catch up how to use those scanners which makes it really hard for us to teach him, so we assign him to a different department... there is no need for him to make any individual decisions"

Most participants learned by their own experience by dealing with the tasks at hand. Participant B explained that:

"There were more effective and efficient methods that you learned with time and experience. So, they taught you a method, but the small tricks, that would have helped you to do your job better... you were everyday 4 hours connected with the device, and at some point you also learned the small tricks." Mister Fink added that "you explain it and after half a year they still make mistakes... I have for instance only one week to get you in the job."

When a new system was introduced to Participant A's warehouse department, external staff from the company who designed the new augmented reality was grouped together with a few trusted employees of Participant's An ex-company which in turn educated the warehouse employees in a cascading education program, explaining it to the rest of the colleagues.

Conclusively it is to state that, the education of warehouse employees was rather small, and no participant actually received in depth training in handling augmented reality inside the warehouse. Systems were supposedly designed as easy as possible and our interviewees, when confronted with the term augmented reality, could not really relate.

Barnes and Liao (supply chain strategic management researchers) conducted a research in 2012 where they came to the conclusion that skills, knowledge and abilities are the factors which are shaping the competences which the employees need to achieve higher performance on the job. (Barnes & Liao, 2012) The papers illustrated through the world bank study defined knowledge as "organized sets of principles and facts." Where the definition of Abilities was illustrated as "enduring attributes of individuals that influence performance," and skills can be described as "developed capacities that facilitate learning or the further acquisition of knowledge". (McKinnon, Flöthmann, Hoberg & Busch, 2017) Another research within the world bank study claimed that logistics organizations that operate in developed countries rely heavily on training services that are being provided by an external company which they contract with to supply them with external trainer to help them educate their workers. (McKinnon, Flöthmann, Hoberg & Busch, 2017) while logistics organizations within developing countries depends on internal-training typically relying on (on-the-job-training) programs, where they team up the new employee with an experienced co-worker so the new employee will receive a tour on how-to (McKinnon, Flöthmann, Hoberg & Busch, 2017).

4.2 Augmented Reality

Augmented reality is basically a database that is virtually capturing the physical warehouse, with all halls, storage places and products inside the warehouse. At the very basic level the database constantly compares storage, location, and quantity of goods. In a more advanced version, it integrates all shelve sizes, and even the paths to goods. To access this virtual or augmented reality, devices are necessary that commonly have scanners integrated.

Forms and shapes of scanners to access augmented reality can vary greatly from company to company. In one case it had the shape of a scanner wrapped around the finger, like a ring, which is connected to a Pager on the belt, which is communicating with the employee. On another instance, in Dachser, employees get smartphone like scanners that have an integrated camera. Whereas the first scanner was only used for scanning, the latter version is also used to take pictures of damaged products and directly upload them to the database.

The devices were able to just display information as a form of communication or in the case of the finger piece and pager a sound was emitted by the device and an error was displayed to warn the employee about potential mistakes, to be careful with special freight and about missing information of the product.

Mister Baraa gave an in-depth description of the use of scanners:

"The computers are connected to mobile scanners which the workers use. Let us say the worker started the day in which we have received an order to be shipped the next day, the worker will take the number of the order from the computer screen and type it in the scanner, the scanner then will show the different items within the order... the scanner will tell the worker to collect the ordered item from let us say A23. ... then the worker will scan a barcode on the container to verify that he is at the right container, then the worker will scan every mattress he will collect which we call "in-code", the scanner will then ask the worker to verify that he collected 5 mattresses from A23 after verifying multiple times, the scanner will tell the worker what item to collect next and where to find it. And after collecting all the ordered items and organizing them in a certain way on the pall, the scanner will tell the worker that he is done with this order, then the worker needs to print a paper that is kind of a bill that shows in detail every item within the order"

Once a barcode gets scanned all the information saved within this are saved within the database. The employee then must verify the information, so it then can be saved inside the augmented reality or virtual space of the warehouse. Humans are often doing mistakes when translating information into a barcode, as in the case of Participant B 50% of the information represented in a barcode were often wrong.

Augmented reality or the database constantly relates to scanners in different variations, headsets or even glasses. Devices, most commonly scanners, are used to connect the employees with augmented reality. The database sorts specifications of products in different categories. Aspects that are saved about products are the worth, weight, instructions, expiration date and many more depending on the nature of products that get stored.

The scanners could also be perfectly used as performance measuring device for upper management. Each scanner, in the beginning of shifts, gets registered to specific employees, and gives insight about data such as items scanned in one hour, or about the number of products misplaced and damaged by employees. This data is used to give employees rewards or punishments depending on the company. In Dachser employees get salary incentives if the they do a good job, and in UPS employees get fewer working hours and hence less money in the end of the month.

Scanners can become a powerful tool to navigate through the company's database, but systems and devices are kept as simple as possible to not over-complicate processes inside warehouses. Furthermore, not all devices inside the same company have the same quality. As some lasers take 5-10 times longer to scan barcodes. Employees come early to work just to get a good device, because exchanging scanners while working meant a disturbance that would make one employee, Jan-Phillip Hildenbrand, even quit the job. Jan Phillip Hildenbrand described it as following:

"they were broken, and the plastics were worn out... one reason why I quit... because it was so frustrating working with that... Every time you had to go up to the office and get a new machine and try to register it ... because the conveyor belt was running fast... would always try to get early to work and to get the best devices... if I got a bad device I had to change like three times a shift, maybe if I was lucky."

Depending on the size of the company, more or less AR is required to solve the daily tasks of a warehouse. Participant A explained Dachser, one of the biggest forwarding companies in Germany, by:

"They have huge palette racks, you cannot get all the work done by humans, because its thousands of customers... it is chaos, if you are inside one drives left, one right, the other one straight."

4.3 Skills

All participants agreed on the fact that motivation plays a huge role inside a warehouse. The motivation cannot be found in terms of money, but, in the case of Jan-Phillip Hildenbrand for instance, the work could be regarded as a physical workout. For younger people it is even interesting to navigate through the different options that are possible with the scanners, hence the learning of something new can be as well regarded as motivation to work in a warehouse. Experienced staff enjoys working with more developed technologies, as they are commonly making processes easier and the work more enjoyable.

Various studies have studied the different aspects of skills with the aim to identify the core skills which are needed within the supply chain and as a result they came to the point where they needed to separate and distinguish the skills needed within the supply chain into 3 core skills (technological core skills, supply chain management core skills and interpersonal core skills) the world bank studies claimed that there are increasing number of logistics companies around the world where they are

facing developing difficulties to acquire skilled employees, supported by a general agreement in the researchers environment on the strategic importance to possess the required skills within logistics (McKinnon, Flöthmann, Hoberg & Busch, 2017).

Another aspect of motivation is that senior staff accepts only new employees that work motivated. The more motivated newcomers are, the better the work they deliver, and ultimately the better the way they will get received in the warehouse by colleagues. Younger people have the drive to prove themselves, which is also a contributor to understand the workflow with and without smart devices inside warehouses.

The reward and punishment system in connection with the scanners plays another important role for the motivation of employees. Employees that are good according to the statistics will earn more and hence get more motivated in working properly inside warehouses. With a fair reward system, employees can see a future in their work, which further contributes to motivation. Even-though a lot of technologies are applied, employees need to bring a certain mental contribution to the work. Participant A stated that:

"...you have to first prove yourself. You must bring in ideas and farsightedness. Speaking of, telling your boss: Look we can save money like that. This will lead to promotions and more rights in the system if the right situation is created. The specific rights look as follows: When you are in the beginning you only have the right to print out shipping labels or to outsource pallets. But with the time you can change storage places and change quantities... I could even reproduce the movement of products inside the system."

We asked Michael Stewart to identify characteristics that are required to work inside a warehouse, he responded:

"five to keep it simple, so the first training that I think is really necessary for a lager logistics to have is they need to be organized, the second thing that I would say they need to be somebody who can focus on simple work and keep a high level of focus, the third thing I will say is that they need to be self-starters, they have to be a person that when they come to work, they want to attack the work, Four, I would say it's very good to be accurate, somebody who let's say double checks their work would be really good in this line of work and the fifth thing I would say is you need to be a time conscious, you need to be aware of time."

Logistician and logistics workers should be able to work on a process bases, and to be able to capture the full picture beyond their appointed stations or department to understand the importance or how crucial it is to fulfill their job correctly for the success of the entire supply chain (McKinnon, Flöthmann, Hoberg & Busch, 2017).

Employees need to be also aware of many different factors inside a warehouse. Focus on tasks that are very monotonous is needed, as the human always needs to verify what devices and screens display. Furthermore, regarding that due to the advancements in augmented reality warehouses are able to be more efficient and hence are able to deal with more orders, the work gets more hectic. This is leading to more stress and requires the employees to stay composed at any time, and to not get overwhelmed by emotions. According to Mister Fink certain people are able to cope with the stress and the hectic environment and some cannot, therefore it is not something that gets taught. Micheal Stewart described it as follows:

"...when stressed out, there were certain people that did not know how to manage their emotions and interfere with their ability to make sound judgment in tough situation...to give you an example in the logistics field, there are many orders that need to be filled that are worth, let's say millions or a significant business transaction amount of money and if things get, let's say confused or the order does not get fulfilled on time...that would cause the management to interfere in the warehouse, which would further demotivate employees... we can all avoid that with clear communication and people being able to separate their personal life from work to focus on the task at hand."

Participants reported that employees need to be detail oriented and accurate while thinking clearly and aware that small mistakes can cause problems for the whole team. Additionally, being conscious is required to regard that staff in the warehouse is working with expensive material, that in some instances can break very easily. Michael Stewart regards mistakes as a waste of money and other resources such as time.

Even though the introduction of smart devices to integrate the employees into augmented realities enables a simplification of tasks, it also enables one employee to handle more tasks at once. Employees do not have to "think outside the box". The work in a warehouse is not of creative nature and, as already stated above, requires focus on several monotonous tasks.

Augmented reality plays in an important role when determining which product, item or good can be stored on which shelve or container. But when only a space of 1,20m is free but a

product is 1,40m in length the staff can still only rely on their own planning skills. Furthermore, when it comes to general optimizations of the storage, delivering or receiving process, the human is still the most important factor.

Lastly, Mister Baraa described the perfect warehouse employee, which we would like to present in an uncut format:

"the perfect worker or the ideal worker is the worker that can deal with tense work with no stress, he is self-aware so he would not harm himself by pushing himself beyond his capabilities and to be able to find ways to improve his working style. The worker should not consider the quantity target as his only concern, because if the worker is only concerned about being fast and collect as many items as possible to compete with the co-workers and to try to keep the high quality at the same time, then the worker will fail to deliver because we are humans, we cannot be as fast and keep the quality. One will sacrifice the other, for me as a person, I give attention to the quantity I am delivering, but I give much more attention to the quality I am delivering. Some people do not care for the quality let us say the quality of the mattresses that will be sent, the worker should check it thoroughly, we have customers that are waiting for their beds. Let us say we send a defect item then the customer needs to wait for an extra two weeks (the delivery time) this will be result as a unsatisfied customer, which will lead to negative consequences for the entire company."

4.4 Problems and Barriers

According to participant A the human can be considered as a "creature of habit", which makes it difficult to implement new technologies, especially with older staff that is more resistant to changes. When SAP, Germany's biggest software company, tried to implement a new system in the warehouse of the Wilhelm Kirchoff GmbH, participant A's ex-company, the employees could not handle the new functions.

Especially old people had a problem with the fact that steps that took a single step with the old AS-400 system, now took several steps in the new system of SAP. Employees that did not grow up with technology and do not have a natural capability of learning to handle new systems and gadgets were only concerned with knowing what buttons to press when, but not with understanding in depth the

meaning or possibilities of devices. Mister Fink, who is 66 years old, described his job with the scanner as follows:

"You have three men that are explaining you the process and then you work... F4, F7 and then you tell them exactly where to go. Enter, Enter."

Because of the over-complication of systems quantities, delivering addresses were not correct anymore, which resulted in delayed deliveries and penalties for the Wilhelm-Kirchhoff GmbH. After the firm was not able to deliver products on time, the firm started to write red numbers and the whole company went bankrupt and was later bought by an investor from Germany.

The problem with augmented reality software in case of a failure in the software, is the rather complex and expensive process of maintaining the systems, that often require multiple days of preparation. Specialized external personnel have to be brought to the warehouse in order to fix or develop software, which could end up with the whole warehouse falling back into an entirely manual state, with files, papers and pencils.

Communication is another major factor inside warehouses that apply intelligent systems to cope with the amount of work. On a personnel level staff always needs to stay friendly, to not damage the teamwork that is required. This can be especially difficult regarding the amount of stress that employees experience in their daily routine. Mistakes need to be reported immediately to higher management as they can only be corrected by following back multiple systems inside the database. Michael Stewart described it as:

"there's all the stuff you sort and every single day there's been more things that are sourced, so you have to go inside the database, you have to shuffle through all these small tiny packages that are filed from you know different days, you have to make sure you get all of them back, so you're working backwards and if there were smooth communication, there would be a lot more progress"

When searching in previous studies it was found in a journal published by the world bank that there is a study (The Quest for Logistics Competence: Survey Evidence) that had the findings which supported earlier studies and it stated that the interviews (the authors of the mentioned paper have conducted) verified the results of earlier research logisticians and logistics workers should possess a cross-functional understanding and have a grasp on the purpose and the process of the different parts within the supply chain, the skill decision-making, to be able to communicate, to possess inter-cultural skills and to possess a sufficient technological

background and analytical skills in order to perform efficiently the task required within warehouses on a daily basis (McKinnon, Flöthmann, Hoberg & Busch, 2017).

Analysis and Discussion

5.1 Embedding Augmented Reality with Warehouse Employees

Our data suggest that after a certain size companies need to implement a certain level of augmented reality to warehouse to cope with the amount of orders and products flowing through the large warehouses, with multiple halls. As already mentioned in the theoretical frame the processes in warehouse management get more complex the further a company is developing. The customer demand gets more specific and the technical structure and coordination build the foundation for warehouses according to Hompel and Schmidt (2006). According to Wilton (2016) HRM departments need to create and shape systems to motivate, control and direct employees towards the firm's goal. Our participants reported about being measured and led by scanners or smart devices, which is an effect of augmented reality.

Managing and measuring knowledge, skills, and abilities of employees on an individualistic scale is a major challenge according to Kavanagh and Johnson (2018). This is also true for warehouses, in which smart devices, such as scanner, that are registered to each employee individually, play a crucial role in today's dynamics to measure performance inside a warehouse and to determine which employees receive rewards or punishments. Our data suggests that this process is not always fair as scanners have different qualities and that those qualities influence the efficiency and effectiveness of staff, which could make them look bad inside the system. Therefore, augmented reality does not only virtually grasp products and storage places but is also capturing employee behavior and performance.

Interestingly, scanners caused competition. The fact that not all scanners were working properly or some scanners working better than other ones, impacted employees' minds as to so far to come extra early to work just to get a good scanner. A not properly functioning scanner would register items or barcodes 5-10 times slower than a regular working one, which in turn led to worse statistics that were analyzed by managers, which in turn led to fewer working hours ultimately resulting in less salary. Sometimes employees had to work without scanners altogether and broken ones had to be replaced in the middle of the shift while the conveyor belts were still running, which can be frustrating considering the fact that anyway only the worst scanners are available in case of a break down.

KPMG (2016) related to the industry 4.0 and concluded that the implementation of Cyber-Physical systems or augmented reality will advance efficiency, tractability, and responsiveness to changes in

the demand of products in supply chains. The virtual connection of whole supply chains constitutes a competitive advantage to changing market landscapes. Our data shows that companies connect their warehouses to forwarding companies automatically, so that the exact measurements and other specifications get transmitted flawlessly, to ensure that no problem in the picking or delivering of products occurs. Issaoui et al. (2019) found that the integration of supply chains with intelligent systems concerns demand forecasting, sales planning, supply requirements, inventory management and product distribution.

Our data shows that disruptions with automating systems or devices that are connected with augmented reality can cause major problems to a firm, which was also noted by Gutelius and Theodore (2019), the implication of that is the issue of relying too much on intelligent system and taking too many key aspects of the daily routine of the workforce. Systems may be good to support employees but will in the short- to middle-term is not able to take a major role inside warehouse, this is true for our findings and what Gutelius and Theodore (2019) have found. Companies realize that systems are case-sensitive which means that if non-ordinary situations occur, the systems will be overwhelmed by simple tasks.

There is development towards the automation of whole warehouse process with the help of augmented reality and machines, but companies are realizing that the maintenance of those systems can cost well-beyond the cost of labor. Gutelius and Theodore (2019) describe that tasks inside today's warehouses get redistributed so employees have to shorter paths and less stress in the warehouse. Our data agreed to the shorter paths, but employees can save time with tasks which they will have to invest in other tasks, which makes the work inside a warehouse more stressful.

Up-skilling is another phenomenon described by Gutelius and Theodore (2019) and means that due to more technology and more complex system better educated systems are needed to control, work with, and maintain those systems. That means more costs on several levels, such as the cost of paying highly qualified employees in the warehouse to maintain augmented realities and to invest in extensive training programs from the company as the solutions for augmented reality differ from company to company. If external consultants, programmers or experts need to be brought on company site, to fix in complexity gaining issues, the costs can increase dramatically.

5.2 Identifying necessary Skills for Augmented Reality inside Warehouses

According to Sousa and Wilks (2018) the education and identification of skills and mindset are crucial in harmonizing employees with the technologies inside warehouse, to enable logistics to be more effective. Even though the education is an important factor, employees do not receive extensive training in warehouse, and are expected to learn by themselves from their own experience. The data showed us that companies deliberately simplify the application of scanners, because the skillset of employees is not developed sufficient to control a complex system, which in one case of our findings led to bankruptcy. Over time, employees can get more right in the system, after proving themselves and accumulating a certain experience in the warehouse, in terms of workflow and process.

Our participants understand the importance of their daily tasks in preserving the firm's competitive advantage. Furthermore, age was greatly mentioned by participants as a factor of dealing with augmented reality, as new skillsets must be learned, and older employees are more resistant to change or were not comfortable to work with AR. This is covering what Sousa & Wilks (2018) already pointed out, by stating that employees need to gather new skillsets and drop obsolete mindsets in warehouses. The older generation of blue-collar employees are used to the industrial era, which characteristics are described by Fang et al. (2020), as standardized work practices that have a centralized quality control, working not in teams and understanding their tasks only in their own division and regarding qualifications as not important.

In today's time, in the informational era, more competencies got shifted to the lower working classes and the augmented reality devices help employees to handle multiple tasks sets at once. The work got less monotonous and hence a constant focus on work is needed. Sousa & Wilks (2018) describe the demand that is set to new employees to bring new skills-set and different mindsets then before, and to develop training to make the company more secure and give it a better competitive advantage. Fang et al. (2020) described the competencies in the informational era as collecting and possessing more knowledge and experience, to have creative ideas, to communicate in a network and to understand the firms drive to satisfy a wide variety of customers individually. Our data suggests that employees understand that they are still the driving force of giving insights into optimizations, and participants explained the importance of far-sightedness.

Kovács et al. (2012) differentiated between skills, experience and knowledge areas that employees need to acquire while working in the warehouse, furthermore they concluded that certain skills are already expected by employers, such as problem solving, time management and multi-tasking. The data only supported this, and participants knew most things come over time by experience, after a short training period. Also, Kovács et al. (2012) and our data supported that employees need to have

a certain background with technology, which our participants described by the age-factor, as younger people grew up with smart devices and were able to use and understand those intuitively.

As our data suggests that some devices were not working properly anymore and caused disturbances in the working process, participants could not rely entirely on the systems. Kovács et al. (2012) suggested that when companies can overcome a system breakdown in the warehouse, it could even lead to a competitive advantage later on. Furthermore, our data suggests, in case of a technological maintenance period, which basically made the whole warehouse go back to the industrial age, employees needed to preserve a certain type of skill sets. Those are categorized and prioritized by Kovács and Tatham's (2009) t-shaped model, which in the depth identifies problem solving skills and functional logistics skills. Furthermore, in the width interpersonal skills, such as stress management and communication, were both emphasized by our participants as crucial factors of dealing with the working environment in warehouses.

Badillo-Amador and Villa (2013) supported that jobs within warehouses require a certain skill level and a specific mindset, additionally Collings and Mellahi (2009) described that a mismatch between the skills of employees and job requirements will generate a performance failure, that will negatively affect the entire process. If employees cannot cope with the technology of augmented reality inside warehouse and are not able to handle smart devices such as scanners, new tasks must be found, and employees get shifted to other departments that match their skill sets.

The training force inside a warehouse mostly consists of experienced employees, as this is a cost-efficient method to share knowledge. Only in case of an introduction of a new system, external specialists get deployed to the companies, which still results in training of a few employees that in turn teach the rest. Off-site training as mentioned by Jacobs (2003) and Rowold (2008) in terms of seminars that get visited or other off-the-work training were of no interest for warehousing companies.

Aguinis and Kraiger (2009) researched the fact that training enhances efficiency of workers, teams and develop the right mindset. The issue that we were facing in our own research is that all participants did not get training in terms of understanding the underlying principles of augmented reality and the intelligent systems that were incorporated by the firm. Older employees, the technologies were viewed in a standardized way, as they only knew which buttons to push when, but not understanding what each button meant. This phenomenon is described by Gutelius and Theodore as de-skilling and is describing the continuous simplifications of competencies to a point that employees do not need extensive training.

Conclusion

6.1 Research Question

Our research question is, "What skills does a modern-day warehouse employee have to obtain or bring with him/her to work with augmented reality in logistics 4.0?" and we connected theories from human resource management and skills/capabilities to our findings. We concluded that modern-day warehouse employees need to have essentially the same skill sets then a post-day warehouse employee, except for the fact that today's blue-collar workforce needs to handle information technology to the extent that communication flows inside warehouses enable the firm to operate better, not only in the warehouse but for all departments. Employees need to understand themselves as an important part and additionally need to capture their environment, which consists of colleagues, machines, supporting software, and smart devices.

The essential skills were depicted as basically having a significant stress resistance, and hence being able to fully focus even if the work inside a warehouse gets hectic. According to our sources, stress resistance is nothing that can be taught, and it is nothing that employees learn through experience. Instead, it was described as a phenomenon that some employees possess, and others do not. Furthermore, connected to the stress resistance comes the ability to organize one's surroundings and oneself to get done the work and see where tasks are open that can be fulfilled. Here it is essential to be self-aware of the role in the team inside the warehouse. The fact that technologies enable one employee to work more and get done with tasks quicker also adds to their stress level.

The communication skill is important on multiple levels. First, the warehouses still have old-school hierarchical systems and have the typical blue-collar working culture, in which problems get sorted out immediately and roughly. It is crucial to stay friendly and to communicate with the rest of the team, not to cause problems that in the end have to be solved by the whole working-force, or in the worst-case let upper management take a closer look and intervene inside the warehouse. Secondly, scanners enabled a better information flow, which enhanced the communication ability of employees inside a workforce.

According to our data, the young staff is more capable of dealing with augmented reality inside a warehouse. Older employees were more concerned with the right order of pressing certain buttons, and it was rather conditioning then really understanding what a scanner could do. The better the scanners were understood by participants, the higher the effectiveness and efficiency become, which results in receiving more rights in the system and being able to handle more tasks with smart devices. The advantage of younger personnel was that most grew up with technology and had a kind of intuitive

sense when it comes to technology. Furthermore, a younger workforce is more willing to learn challenging and new technologies, also to prove themselves.

Farsightedness is another important factor. It could be argued that employees are able to think less because the devices for the augmented reality take the complicated tasks of processing data and filling it into the databases. Nevertheless, to be successful, employees need to think of advancements that can be made, now more than ever. The human is the connection of the augmented reality and the physical space inside a warehouse and needs to think of improvements to strengthen this connection further. Only humans are capable of thinking "outside the box" and identify problems and think of solutions to get rid of them. Companies are actively motivating a blue-collar workforce to think of better ways of operating and are rewarding those.

Another aspect that will be valid in the short- and mid-term is that systems do not run without failures and mistakes. Therefore, the blue-collar workforce will not be able to rely entirely on technology and machines as those can shut down and leave the whole warehouse with many tasks that need to be done without proper working devices. Employees get mostly trained about their tasks that need to be fulfilled, but not about the essentials that are driving the warehouse. The issue of not educating warehouse employees well can result in many problems, such as not being able to think out of one's frame, not being able to think of solutions that could boost the efficiency of multiple departments, and not being able to design systems on their own.

Lastly, it can be stated that with a further progression of augmented reality the workforce inside a warehouse needs to obtain further skills for technologies, such as being able to program and repair systems, which would require higher qualification and hence would force companies to pay more for those kinds of employees. Currently, the industry is at a point in which the augmented reality is kept easy enough so that a cheap low-skilled workforce is enabled to work efficiently and effectively without really understanding the foundation of smart devices.

6.2 Future Research

We stumbled upon other interesting fields that would be worth investigating along the way of conducting our research. For instance, the changed hierarchies and cultures due to technology inside the warehouse. It is difficult now to "waste" time on work and to socialize with other employees because upper management always has access to one's working performance. Hence, the behavior of employees changed because they are aware that each hour is monitored.

Furthermore, it would be interesting to draw a generational comparison of the blue-collar workforce, as we could identify differences in all age groups that we interviewed. The age seems to be an important factor for the blue-collar workforce, especially when researching the implementation of different technologies. We suggest comparing the 20-29-year-olds to the 30-45-year-olds to the 45+-year-old's, as they all perceived the technology differently.

Lastly, we believe it is important to view management's view on the augmented reality and how they perceive the implications of progressing in the merging of cyber and physical spaces and what they believe is where the blue-collar workforce's problems are arising from. Furthermore, it would be interesting to see how exactly performances can be measured and what type of variables get saved from rating an employee; we already grasped this a little bit by finding that, for instance, packages scanned per minute play a role. However, there is more detail to it that we could not find out about.

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Appendix I

Interview Guide



Appendix II

Interviews:

Participant A

Mister D is working at OBO Betterman inside the warehouse. He has a finished internship and is specialized in warehouse logistics. He already worked 15 years in that branch. On the question of what systems, the firm uses, in which the participant is working, he replied that:

“In our warehouse, we developed our system. In my apprenticeship I worked for Wilhelm Kirchoff, they used the AS400-System, which the old people were comfortable using.” The AS400 system is a classic example of a system which is capturing all products and shelves virtually. It was a warehouse management system where the storage, place, and quantity were constantly compared.”.

The interviewer asked whether or not problems were implementing the system and how they were taught the system, the participant replied:

“The system is quite easy, even old people came along. But over time, as the economies developed, sometime soon SAP came...”.

The authors asked who took over the education for the new system, and Mister D replied that employees of both companies met in a smaller group and then tried to jointly explain it to the rest of the employees. The interviewee is stating that:

“because I was young it took me only 30 minutes to understand the system, younger people are fresher, motivated and they want to prove themselves”.

According to Mister D, this is because younger people are being raised with tablets and technology.

“The older people are having a hard time; the human is a creature of habit. The human wants hardly stuff changed, whereas for young people learning new stuff is cool, SAP is the biggest software company in Germany. SAP implemented in the Wilhelm-Kirchoff-GmbH a warehouse management system, that completely took the place of the old AS400. And starting from there problems started, especially for old people.”

According to the interviewee people born in the '70s and '80s had severe problems with the system:

“They may haven't had the experience, or they couldn't understand it”. According to the observation of Mister D starting from there, things started to get worse, When SAP was implemented everything fell apart, and nothing was working because the workers could not get used to it.”

The interviewee reported that the system had problems to capture and track quantities and that delivering addresses were not correct anymore.

“There were only penalties of customers coming in, delay of deliveries, they were not capable to deliver on time...And then the firm wrote only red numbers.”

The author wanted to know what exactly what the problem with SAP software was:

“The difficulty was with the old people that thought “Oh, I don’t want to do anything wrong...”.

Mister D is reporting that they were not confident enough to interact with the computers. Furthermore, the fact that employees suddenly had to control more than one “mask” (window) on the terminal was causing severe problems. With the new SAP system:

“steps that only took one or two steps with the AS400 suddenly took 5 steps with the new SAP, which the people couldn’t grasp anymore. The younger ones just managed to work with the system, because they were more involved with computers since their youth and are receiving better.”

After the bankruptcy of Willhelm Kirchhoff, the interviewee traveled through many companies and is reporting of companies that used automation in their warehouses:

“And the system was running alone. But then there were stops and a locksmith (Maintenance personnel) had to come, but parts were missing, and the machines were standing for several hours.”

Mister D is reporting about a warehouse that is implementing an AKL system, which is bringing the products to a workplace and the employee can just take out the right quantity of products. Conclusively, the interviewee is reporting that machines consumed a lot of time in their maintenance and that in case of a breakdown/failure products could not be processed. When asked about bigger competitors, such as Dachser the interviewee replied that they could not handle that many products, without proper software:

“They have huge palette racks, you cannot get all the work done by humans, because of its thousands of customers... it is chaos, if you are inside on drives left, one right the other one straight.”

Mister D reported about automatic pallet-driving systems inside the bigger warehouses:

“you can imagine a small robot that has two arms, two forks, that is driving to the palettes and is bringing the items to the fitting places. It is scanning the ways and is saving everything with the help of cameras and sensors... no worker needed”

The authors asked about supporting systems for augmented reality, and Mister D connected it directly to headsets and is stating that:

“Even there, system failures can occur. At our place everything is easy, you type in the article number and you know everything...”.

The interviewer asked how the interviewee is imagining the future, on which Mister D replied:

“Yeah, we know ourselves that development is there, and that humanity is sadly focusing on machines. In my opinion... the perfect machine is the human... A machine needs to be exchanged after 15 years, but as mentioned... you can take a human and just teach him and make him better. Even today we as employees bring optimizations inside... a machine is working according to how it was set-up.”

The participant would personally “bet” on human power/labor. Lastly, the author asked about different rights in the system and the interviewee replied:

“...you have to first prove yourself. You must bring in ideas and farsightedness. Speaking of, telling your boss: Look we can save money like that. This will lead to promotions and more rights in the system if the right situation is created. The specific rights look as follows: When you are in the beginning you only have the right to print out shipping labels or to outsource pallets. But with the time you can change storage places and change quantities... I could even reproduce the movement of products.”

Furthermore, the participant has the right to manage reclamations.

Mister Fink

Mister Fink worked for 25 years inside Dachser's warehouse. His job consists, due to his old age, of offloading products from trucks and using a forklift machine or "ants" to move items inside the warehouse to the shipping department. When asked how his work changed in the last 25 years Mister Fink reported that:

"we worked a lot with pallet trucks and now with machines... and with scanners". Later he continued that "in the beginning we had none of that, we had to figure it out ourselves... with papers and files... today our scanners have the size of a mobile phone."

About the education Mister Fink was able to tell me that:

"in the beginning you need to be nice and friendly... many people are driving to the wrong places, they do not care where what belongs, they just want to get it away... The new ones do not know the letters and numbers..." He stated further that it is "all experience, that you have to learn... you cannot tell them sit down and drive. ... There are some who are not getting along, and then there is the door."

According to his statements Mister Fink never had difficulties to work with the computer system.

"You have three men that are explaining you the process and then you work... F4, F7 and then you tell them exactly where to go. Enter, Enter." He elaborated later that "now there are many who do not like it... because of the stress... you explain it and after half a year they still make mistakes... I have for instance only one week to get you in the job."

The author asked about the type of person with which it is working, and the Interviewee is stating that "you can see it... they either have motivation to learn or not." He said that motivated persons are asking a lot and are curious in getting better in the job.

In a previous interview Mister D reported that he saw a lot of chaos going on in big companies such as Dachser, which Mister Fink countered, stating that:

"it depends on the people... some can cope... with the hectic inside and some cannot. The people who are longer there are understanding... we have hall A, B, C ... you have to know it by heart."

Mister Fink was asked about terminals or computers and he replied that

"on each loading station there is one... it is telling us about guarantee, super-express, or daily speed." He explained the system that Dachser uses to flag different products with colored stickers, that contribute in determining the priority of products. All products also get documented, "that means that everything gets photographed, all the damages for instance with the scanner... and then everything works automatically with the scanner"

He was asked whether he experienced any difficulties, and he stated that:

"No, it is a lot computer work. And there you have to first work yourself in... products get sorted according to zip-codes, and those you receive by receiving pallets and the scanner is showing you where what belongs... and then there are two people who are loading the trucks... young people on the position that are loading, 3 women are scanning the products and we drive them to their places." He stated that the young men "have to load the trucks with stowage bags, so it does not fall over and breaks."

The author asked whether there is any automation in this process and the interviewee said, “Nothing automatic.” He listed a broad variety of products that get transported manually, with the help of so called “ants” that can be controlled with 2 joysticks and a pedal.

After a while on the job “Every hand move you know by heart... every morning you go the office and get a...” reflection. The reflection paper counts the mistakes and according to that “you get points. According to the points you can get paid more.”

The author was curious on how the mistakes or point system was kept track of, and the interviewee stated that:

“the scanners have numbers; they exactly know which one belongs to who... you can understand from people who are breaking a lot that they have a certain anger.” On the other hand, “you can bring in improvement advices and you receive 50€, if they get implemented.”

When asked about the future Mister Fink is oriented towards growth, “we started with one hall and now we have five and a fresh service, we are delivering food supplies, bicycles. We have everything, the whole life.”

Michael Stewart

Mister Stewart was working for a leading company within the field of dentistry and implantology, it is called Hager and Meisinger in Germany, when he described his role within the company he said:

“I work as a Lager logistiker (logistician) and my duties consisted of for example taking finished products such as implants that came from the production in Meisinger and then it would get packaged sent to us and then we would address it, shelf it, send it out or it would just come as a finished product and we would put it into our internal warehouse”,

and when asked about the type of system they were using he said:

“ it was an internal database that Meisinger produced itself and what it did is it tracked all incoming parts that we expected from external suppliers that would aid in our own production and we also sent out packages, so it was a total collection of all of the moving parts”.

Mister Stewart was asked about the education and the training that the company gave him when he started and he replied “whenever you work in Germany of course you have to do a Probetag (Trial day), just to see if you're able to handle the responsibilities of the job” he further explained another two types of training by saying:

“they put me with one of the people who have been working there that were very experienced and they just showed me around the whole entire Meisinger for like a one to two week period, that was in one form of training and the third form of training was uh we had monthly meetings, where we would talk about what the different departments are doing well, what we should keep doing well and what we need to focus on as weak points”.

Mister Stewart was asked to describe the augmented reality and the database they were using in the company and he explained it as follow “you actually entered the systems there is a bunch of different categories that have everything to do with the different products that Hager and Meisinger has.” he explained furthermore by saying:

“so, when you open the program, for example you can scan a product and everything about that product will get entered different categories within the database. such as what is the name of the product, where is it coming from, what is the zip code of the country it comes from, who is in contact, how much is it worth, what is its weight, where is the instructions, is it valid, what is the expiration date all of this information get sorted into this database”

And when asked if the scanning process is done manually or in an automated process he answered:

“both, some products they have a scan, a barcode when you scan that a lot of information has already entered into the system at one point, by technology or somewhere manually, but the reason why it is important for a person to be there, is to validate that information, and that is the reason i said before with characteristics that someone needs to have in logistics, they have to be detail oriented, they have to be accurate and they have to think clearly because if you miss, let's say a shipment comes with a very expensive product and it needs to get shipped to a part of Asia what would happen is, if you don't correctly scan that item they may receive the wrong item so that means once again you have to take the steps backwards in order to correct that problem and there is money wasted”

Mister Stewart explained that the biggest challenges that he and his colleagues were facing is the lack of communication skills, he explained:

“there's a miscommunication and maybe something gets packaged wrong and a customer while is up having to wait two extra weeks in order to receive a shipment or um we were told in one department, hey you guys need to store this inside of our internal department and also update it in the database, but then the next department is like hey, where's our stuff”,

According to Mister Stewart this lack of communication between different departments can cause wasting resources:

“hey where's all the stuff you sort and every single day there's been more things that are sourced, so you have to go inside the database, you have to shuffle through all these small tiny packages that are filed from you know different days, you have to make sure you get all of them back, so you're working backwards and if there were smooth communication, there would be a lot more progress”.

he explained later on how lack of communication skills can affect members of the same team by explaining the situation with the team he worked at as “the attention was always high and I think more mistakes were caused due to the lack of communication between manager and co-workers”.

When asked about the important characteristics which he consider important for a person to conduct a successful work within the warehouse he explained:

“five to keep it simple, so the first training that I think is really necessary for a lager logistics to have is they need to be organized, the second thing that I would say they need to be somebody who can focus on simple work and keep a high level of focus, the third thing I will say is that they need to be self-starters, they have to be a person that when they come to work, they want to attack the work, Four, I would say it's very good to be accurate, somebody who let's say double checks their work would be really good in this line of work and the fifth thing I would say is you need to be a time conscious, you need to be aware of time.”.

The interviewer asked Mister Stewart about what he liked and disliked about his job and he mentioned three points for each:

“thing I like, I like the responsibility of having a lot of equipment that's worth a lot of money, something about it kind of wrecks power and if you handle that power correctly, then the whole company flourishes and I like being an important part of that and the third thing I would say I like or I like about

logistics or working in the warehouse, was the fact that you meet so many different people, you come across so many different experiences” he continued “really you don't have to think much, all you have to do is think clear, you know what you have to do every day, but you don't have to really think outside of the box, it's not creative so the second point where I guess would be it's not creative and the third thing is mistakes are very-very costly and make you retrace your steps, so you waste time going backwards instead of going forward with the same monotonous work.”

The interviewee elaborated that:

“...when stressed out, there were certain people that did not know how to manage their emotions and interfere with their ability to make sound judgment... tough situation”. He continued that “...to give you an example in the logistics field, there are many orders that need to be filled that are worth, let's say millions or a significant business transaction amount of money and if things get, let's say confused or the order does not get fulfilled on time...” that would cause the management to interfere in the warehouse, which would further demotivate employees. “... we can all avoid that with clear communication and people being able to separate their personal life from work to focus on the task at hand.”

The participant additionally noted that the experience in the military helped him to overcome certain challenges:

“That experience in the military gave me a very big advantage in any type of workplace, because I can be disciplined, I know how to think on my feet, I can show up on time, I like structure, I can follow orders, I can give orders. I was a sergeant in military, so I am used leading people, so you can easily put me in management, and I can relate to other people.”

Mister Stewart explained his own vision regarding the future of logistics by saying:

“logistics will always be something that I like, because as I mentioned before, it's very important for any business to have a functioning logistical system in order to be a flourishing company, so personally I just will always be let's say a fan and I will always try to learn the new things that are happening with logistics, so I'm pretty up to date as far as that industry is concerned, but the future of it, I would say is headed toward automation and logistics in every country will start to become also part of the globalization process. So, logistics will rely more on robots and humans that are robots and machines to do more accurate work, because companies can save money by not paying actual workers and they have a more reliable and fast output of their desired results.”

Jan-Phillip Hildenbrand

Jan Hildenbrand worked for 6 months at UPS in a warehouse and his tasks mainly consisted of loading trucks. He was asked to describe the technologies that he worked with, and he stated that:

“we do not have a lot of technologies, we own like basic Motorola scanners...” he elaborated about his tasks that “for the low-skilled workers, we just had to sometimes deal with the problems like errors on the machine...the only knowledge we had to have about the scanners were how to fix errors and get off.” Errors were shown when packages were dangerous or needed special care. The term error can be substitute with a warning or notification on the device. He stated “we had to load them, anyway, just put them in different corners...” inside the trucks. Errors could occur also when there were mistakes in the order itself and sometimes when the machines/devices did not work.”

Jan Hildenbrand was trained by the companies HR, but mainly

“guys who were more experienced in the warehouse they showed me how to get rid of error and kind of like the tricks.” The authors asked how long it took to really handle the work with the equipment, and the interviewee reported that he needed

“probably around one week or two weeks.” The main issue with the connection piece for the “augmented reality” is that the devices became “very hot, so they had a lot of connection issues...” the different parts were connected wirelessly “and so connection errors that was the main thing to check.”

Additionally, the participant explained other jobs in the warehouse:

“it was still sorted by hand, so people on top of the conveyor belt looking at the zip codes and scanning them but they had themselves, they had to move the packages in the right direction pretty much...”. He also explained that “the conveyor belts pretty much broke down, because there were too many packages and they would cross packages.” And there it was a benefit to have certain experience, for instance “some guys working on the conveyor belts who were in the military had some technical skills and they would... get it back to run...”, or “One guy... would jump on the conveyor, you know sometimes packages would be eaten by the machine, and they will just reap it out.” The labor was also very physical intensive “you know like up to 70 kilograms of packages, so very special and very expensive.”

He reported that:

“most people who are really slow workers they just... they have no motivation they are just doing the job to get money... not doing the job to get experience or even a... work-out, because it is extremely physical work. So, I think people who work slowly... were there because they wanted money and not because they saw anything in the work, they did not see a future.”

“Many devices can be used to interact with the virtual database, the augmented reality inside UPS had the form “like a little ring on our finger ... kind of like a laser... on our belt... we have like this big chunky Motorola piece with a big display.” When the device needed to be analyzed the ring would make a noise, and the employee would know that an “error” occurred.”

The interviewer and the interviewee focused the discussion to the basic skills on which Jan Hildenbrand stated that:

“younger people are more intuitive when it comes to technology and they can figure out how the thing works... and the other guys they just know what buttons to press and which row pretty much...” Jan Hildenbrand stated that “this place were broken and the plastics were worn out... I guess maybe like 10 years...”, however “their technology itself is understandable... it’s intuitive.” He continued

further that “one reason why I quit... because it was so frustrating working with that” due to the many break downs and the complex fixing process of the devices. “Every time you had to go up to the office and get a new machine and try to register it.” This whole process had to be done fast, because “the conveyor belt” was running fast. Inside the firm there was actually competition for the best devices, “you would always try to get early to work and to get the best devices”, due to the fact that the participant had to appear 30 minutes after the shift started “I had to change like three times maybe if I was lucky.”

The participant was asked about the reward system inside the company and he reported that:

“I would say we had a punishment system, because they gathered a lot of data as well because of the finger pieces, so they would know how many packages you scan, how many packages you scan per minute even and how many packages were wrong, if we made a lot of mistakes and pretty much they would give you less hours and less hours means less money.” Furthermore, he elaborated that “guys who were better and more motivated were allowed to start earlier... and kind of get the shift started and gather extra time.”

Participant B

Mister S worked for a medium sized freight forwarding company in the warehouse and worked there a total of 1,5 years. His tasks mainly consisted of scanning incoming and outgoing products. He reported about his education that he “was introduced by real warehouse employee. It is a relatively simple task, so you have a scanning device and scan products. There was not a lot of explanation. There are a few buttons, your education will last maybe one week.” He stated further that “when a truck is open, I get a list, with all the goods that are on this truck, those I can scan, and the scanner already knows what is on the list. My job is to check the validity of the list... I had to always carry a pen and I had to put the specifications of the missing items by hand into the list.” He concluded that “you could modernize the list-concept and incorporate it into your scanning device”

We asked him what problems he experienced inside the warehouse, which he replied with “yes, but those I noticed later. There were more effective and efficient methods that you learned with time and experience. So, they taught you a method, but the small tricks, that would have helped you to do your job better... you were everyday 4 hours connected with the device, and at some point you also learned the small tricks.” Furthermore, he stated that problems occurred “depending on the customers. Some shipments had 50% of their items not listed/registered, and those you had to manually put on a list.”

“The biggest problem though was the difference in quality of the lasers. There were good scanners with a good laser that could capture the things well and those were of course directly chosen by the people who came first to work. If you came 5 minutes late you only got the bad once that did not work properly. I would say it was a big problem because the bad scanners almost didn’t work.” Mister S reported that “in the first place our boss decides what gets stored where and some customers have their special designated places, but if something came in between we had to do it according to our gut-feeling and eyesight, which often led to complications.”

We asked the participant what makes a good warehouse employee. “Simply the motivation. The more motivated you were the better you worked and the more popular you are in the warehouse and the better your results. If you did not put effort in your work, you got quickly rid of your job. They treated you bad... It was like a sub-society and you needed time to adapt... Another barrier was clearly the language, because Winner-Spedition worked with a lot of sub-companies in Europe, and the truck drivers from Poland or Hungary did not exactly understand what to do.”

Mister Baraa

Mister Baraa is a 27-year-old team leader that works in the warehouse of a leading international company within producing foams, mattresses and beds called Recticel he described:

“exactly I work at the end of the production line in the warehouse of the factory where the finished products are being stored, and in this department, we receive our customer’s orders and kind of collect the different ordered items and prepare them to be transported by Schenker transportation company”

“As for the SAP system as a whole system, no one uses it beside me and the managers above me, the other co-workers they interact with the system only to collect the order number and then type it in the scanners, so every time we hire a new worker/order collector we team him up with the oldest collector within the warehouse for 2 or 3 days to show him the process of the job, within this three days and up to one week we keep an eye on the worker and evaluate his capability to learn how to use this technology, there have been some situations where we hired workers that they had a very little background with technology so he is not able to learn or catch up how to use those scanners which make really hard for us to teach him so we assign him to a different department such as the production department since it is almost fully automated and he only needs to watch out for the machine and there is no need for him to make any individual decisions, now we are living and working in 2020 the right way of how to use the technology is critical for us.”

He further explained in detail the tasks of the worker as follow:

“SAP system which is on computers is connected to mobile scanners which the workers use it, let us say the worker started the working day in which we have received an order to be shipped the next day, the worker will take the number of the order from the computer screen and write it in the scanner, the scanner then will show the different items within the order, I forgot to mention that our warehouse is divided into blocks and corridors and in every corridor there is huge containers where the mattresses and bed are sorted out in it like (A21,A22,A23 ; B21 and so on), the scanner will tell the worker to collect the ordered item from let us say A23, so the worker will use the specially made trucks with a pall to go to A23 location, the scanner will automatically show the worker let us assume the order need 5 mattresses from this container, then the worker will scan a barcode on the container to verify that he is at the right container, then the worker will scan every mattress he will collect which we call it in-code, the scanner will then ask the worker to verify that he collected 5 mattresses from A23 after verifying multiple times, the scanner will tell the worker what item to collect next and where to find it like let us say C21 4 mattresses. And after collecting all the ordered items and organizing them in a certain way on the pall, the scanner will tell the worker that he is done with this order, then the worker need to print a paper that is kind of a bill that shows in detail every item within the order”

Then mister Baraa stated the issues and difficulties that faced the workers as:

“now as you know mattresses exist in different shapes and sizes so the worker needs to have a planning mentality to be able to plan in his head and implement the right way of placing the mattresses on the pall so he could use every space of the pall in an efficient way so he doesn’t leave an empty place as a waste” he explained further more issues as “ but even though there are difficulties like the width of the pall is 120 cm but we have some items that are 140 cm in this case the worker must find a way to make the item fit within this 120 cm, this is one of the biggest difficulties that are facing us and the only way to tackle it is with the experience and by seeing how the co-workers are organizing their palls. Another issue we face if you ever bought an item like a table or a bed from IKEA the item will be in two or three boxes, our beds are being produced in the same style with the boxes so the worker needs to collect the right boxes to make a complete bed and how to place them so it will not be damaged by transporting and since we are the last point at the factory we function as a quality controller for the

previous stages the worker need to give attention for the details to check if the mattresses are defected or damaged and if the packaging of the beds is defect-free or not.” and “the worker needs to notify the managers about the issue he is facing in good time and through proper channels.”

When asked about the ideal worker characteristics he replied:

“the perfect worker or the ideal worker is the worker that can deal with tense work with no stress, he is self-aware so he would not harm himself by pushing himself beyond his capabilities and to be able to find ways to improve his working style, the worker should not consider the quantity target as his only concern because if the worker is only concerned about being fast and collect as many items as possible to compete with the co-workers and to try to keep the high quality at the same time then the worker will fail to deliver because we are humans we cannot be as fast and keep the quality one will sacrifice the other, for me as a person even if I give attention to the quantity am delivering but I give much more attention to the quality am delivering, some people don't care for the quality let us say the quality of the mattresses that will be sent, the worker should check it thoroughly, we have customers that are waiting for their beds and let us say we sent a defect item then the customer need to wait for an extra two weeks (the delivery time) this will be reflecting as unsatisfied customer which will lead to negative consequences on the entire company.”