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PHÂN TÍCH TỰ ĐỘNG HÓA KHO HÀNGTRONG VẬN HÀNH LOGISTICS CỦA VIETTEL POST

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Tóm tắt

Trong kỉ nguyên công nghệ số 4.0, các doanh nghiệp phải đối mặt với vô vàn những khó khăn, thách thức khi hội nhập toàn cầu cùng sự thay đổi chóng mặt của công nghệ. Các nhà quản lý thông minh sẽ tìm cho mình những giải pháp thích ứng cần thiết để tiết kiệm chi phí nhân sự, tiết kiệm thời gian, từ đó gia tăng lợi thế cạnh tranh và tối ưu hóa trải nghiệm cho người sử dụng. Tự động hóa kho hàng chính là một trong số những giải pháp được lựa chọn cho các doanh nghiệp trong lưu trữ và vận chuyển hàng hóa mang lại hiệu quả vượt trội. Bài nghiên cứu cung cấp những kiến thức tổng quan, cũng như phân tích những cơ hội và thách thức của Viettel Post khi tự động hóa kho hàng. Từ đó, nhóm tác giả đề xuất một số giải pháp theo định hướng phát triển của Viettel Post, nhằm tận dụng được tiềm năng và triển vọng mà tự động hóa mang lại cho hoạt động kinh doanh.

Từ khoá: Tự động hóa kho hàng, Viettel Post, các doanh nghiệp logistics

ANALYSIS OF WAREHOUSE AUTOMATION IN VIETTEL POST'S LOGISTICS OPERATIONS

Abstract

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In the era of digital technology 4.0, businesses face countless difficulties and challenges when integrating globally with rapidly changing technology. Smart managers will find the necessary adaptive solutions to reduce personnel costs and save time, thereby increasing competitive advantage and optimizing user experience. Warehouse automation is one of the solutions chosen for businesses in storing and transporting goods, bringing outstanding efficiency. The research provides general knowledge and analysis of the opportunities as well as challenges for Viettel Post when applying warehouse automation. From there, the authors proposed a number of solutions according to Viettel Post's development orientations, in order to take advantage of its potential and prospects that automation brings to business activities.

Keywords: warehouse automation, Viettel Post, logistics companies

1. Introduction

1.1. Rationale

Over the last few years, the worldwide e-commerce business, and particularly in Vietnam, has grown tremendously. This is a positive signal for the market economy's post-COVID-19 recovery and a great chance for the development of many other types of businesses, including transportation businesses. Besides good opportunities, there are also significant challenges in improving infrastructure and operating procedures to meet market needs as well as compete with other businesses. Through research and analysis, the authors found that developing warehouse automation systems in logistics operations is one of the major goals and development trends of transportation businesses in Vietnam. This is also a solid stepping stone for the development of the modern logistics industry in Vietnam and creates motivation for the development of domestic and foreign trade in goods.

However, warehouse automation is a modern system, so in order to develop and enhance this model, firms will face many difficulties. Therefore, it is crucial to do in-depth research to find out the difficulties and problems of businesses as well as make recommendations on directions for their future paths. Furthermore, Viettel Post is a pioneering company that has made significant advancements in warehouse automation. A closer analysis of Viettel Post will help other businesses gain a broader perspective and draw lessons for themselves. That's why the authors chose the topic: **"Analysis of warehouse automation in Viettel Post's Logistics operations"**.

1.2. Literature review

1.2.1. Domestic research

Through researching domestic topics on warehouse automation in the logistics operations of Vietnamese enterprises, the authors found several studies as a premise, which brought about a lot of valuable knowledge to serve the group's research. Among them, some authors have given conclusions and ideas for the development of warehouse automation.

Research by a group of students at Hanoi University of Industry (2020), Tran Xuan Bach (2014), Dinh Thanh Nam (2021) showed that the development of warehouse automation

systems in storing goods helped goods management become scientific, systematic, and highly flexible, promptly meeting the rapidly changing needs of the international market.

Besides, many authors have appreciated the benefits that technology brings in warehouse management such as a group of authors from the Institute of Mechanical Research (2022), Master Le Thuy Linh (2022), author Nghiem Thanh Huy and colleagues (2019).

1.2.2. Foreign research

Foreign research on warehouse automation in logistics operations has been viewed from many different aspects. Research related to this issue is mainly about the levels of warehouse automation, the types of technology and equipment applied at each level of automation, and the operating processes.

Author Zebra (2024) provided a definition as well as a vision for the future development of warehouse automation. Currently, businesses are facing a rapid increase in the number of online orders. To meet these orders while still maintaining low costs, the support of automation equipment is needed.

However, warehouse automation projects could have a negative impact on service availability in the short term, with "burn-in" challenges causing "a decline in service levels" (Naish & Baker, 2004). The main reason is from paying attention to demand, conducting trials, and snagging. Supply would be greatly affected in this early stage.

Good preparation and effective logistics operation will greatly benefit businesses today. This has put pressure on supply chain management to reduce product value, accept the trade-off of consumer satisfaction, and avoid supply shortages (Faber et al., 2017). Some indispensable elements in supply chains were warehouse management and maintaining inventory at a stable level to help prevent shortages (Burta, 2018).

1.3. Research objectives

The key objectives of this research are to:

– Gaining a basic understanding of warehouse automation through credible academic sources to create a strong theoretical foundation and reasoning to develop warehouse automation systems in the logistics operations of Viettel Post.

– Evaluate the warehouse automation application in Viettel Post to acquire a complete understanding of the potential and challenges for this business.

– Recommend some solutions for Viettel Post to develop a warehouse automation system with high practical applicability and suitable for the business's orientations.

1.4. Research methods

1.4.1. Research approach

To complete the paper, the research group chose an approach from a comparative and analytical perspective to come up with solutions to improve and develop a warehouse automation

model for Viettel Post.

1.4.2. Methodology

Our paper applied the qualitative approach. Specifically, to collect data and secondary information, the research group searched through articles on official websites about logistics businesses in Vietnam, especially the Viettel Post. After collecting the necessary amount of information, the authors used the classifying and synthesizing information method, thereby pointing out the key factors and providing appropriate solutions to the problem.

2. Theoretical framework

2.1. Warehouse automation

2.1.1. Definition

According to Abby Jenkins (2020), warehouse automation is the process of automating the management and movement of goods in and out of warehouses with the help of machinery, equipment, and technology while minimizing the amount of human intervention. An automation project can assist a logistic company in getting rid of labor-intensive tasks such as manual data entry and analysis and repetitive physical work.

2.1.2. Classification

Warehouse automation can range from being very basic to being highly complicated. Based on the level of automation, Abby Jenkins (2020) divided into 4 categories:

– **Basic warehouse automation:** Simple technology that aids workers in completing duties that would otherwise require more manual effort. For instance, a conveyor or carousel that transports items from one point to another.

– **Warehouse system automation:** This type uses software, robots, machine learning, and data analytics to automate jobs and processes. For example, a warehouse management system saves users from visiting the warehouse repeatedly by allowing them to choose comparable items to fulfill all of the orders needed to be filled in a single day at once.

– **Mechanized warehouse automation:** Robotic systems and equipment are used in this type to collaborate with people to streamline tasks and procedures in warehouse. One example is an autonomous mobile shelf loader robot that lifts product racks and delivers them to human pickers for retrieval and sorting processes.

– **Advanced warehouse automation**: Mechanized warehouse robotics and automation technologies like automated storage and retrieval systems (AS/RS), autonomous guided vehicles (AGVs), automated sortation systems,... are combined in this type to replace labor-intensive human activities. Consider a fleet of robotic forklifts that can navigate a warehouse autonomously and communicate each forklift's location for efficient tracking through an online portal with the support of advanced AI, cameras, and sensors. This is also the type of warehouse automation that Viettel Post chooses to apply.

2.1.3. Comparison of the operating process between a conventional warehouse and an automated warehouse

– **Conventional warehouse**

The conventional warehouse operational workflow encompasses seven pivotal steps, each contributing to the streamlined management and enhanced efficiency of the warehouse.

Step 1: Receiving

The process involves handling notifications for incoming goods and conducting meticulous inspections to promptly identify and address any irregularities in the received items.

Step 2: Sorting and storing goods

The warehouse management strategically plans and designates suitable storage locations, updating the system with relevant information for effective inventory management.

Step 3: Picking

Upon receiving an order, the warehouse extracts items from the designated location in the system. It's crucial to check the quantity and condition of the items before moving them. Efficient item arrangement is pivotal, influencing the time and accuracy of the picking process.

Step 4: Packaging

This step demands precision as warehouse management ensures adherence to specified standards for proper packaging, minimizing errors, and guaranteeing the safety of goods.

Step 5: Shipping

Synchronization between the readiness times of goods and the transportation unit is important, promoting seamless shipping operations.

Step 6: Handling returns

It is a complex facet requiring meticulous preparation and management to minimize the disruptive effects of returned goods on processes and costs. This involves a comprehensive approach to receiving, inspecting, and processing returned items.

Step 7: Inspection

Goods undergo regular scrutiny to verify their location, quality, and information accuracy. The integration of technology helps in facilitating efficient goods inspection and management within the warehouse.

– **Automated warehouse**

The automated warehouse process follows the same steps as the conventional. However, each step in the automated warehouse incorporates modern technologies as they are highlighted in the first four steps. For the last three steps, the information related to technology application is not

available so the authors cannot make objective assessment:

Step 1: Receiving

In optimizing the receiving process, solutions like using electric forklifts in conjunction with conveyor belts are employed to increase efficiency and reduce time during unloading. Automated dimension measuring devices and pallets are utilized to avoid inaccuracies in weight and size assessment. Warehouse management applies software to enhance personnel management, predict incoming shipments accurately, and efficiently allocate labor resources.

Step 2: Sorting and storing goods

This critical step, often consuming a significant portion of time and costs, is optimized through various software solutions like warehouse management system (WMS). The system aids in accurately determining storage locations, providing real-time updates, and offering guidance to optimize storage space. Mobile devices and applications are also utilized for employee guidance, minimizing search and retrieval time.

Step 3: Picking

Acknowledging that the movement of goods takes up a substantial portion of the picking process, warehouse management focuses on labor and equipment distribution to minimize picking time. WMS are essential for this stage because they offer precise lists of products that need to be picked, make labor allocation easier, and increase picking accuracy overall. Vertical lift systems and conveyors are two components of goods-to-person (GTP) technology that dramatically accelerate the picking process in automated warehouses.

Step 4: Packaging

To enhance productivity, businesses often implement automated sorting systems using RFID devices, automatic scanners, and sensors for quick and accurate classification of goods before packaging and shipping.

By incorporating technology into warehouse operations, the utilization of advanced equipment and inventory management software significantly enhances efficiency, reduces processing, storage, and delivery times. Moreover, technology optimizes storage capacity, allowing businesses to save costs, time, and allocate resources effectively. These contribute to efficient business operations, increased competitiveness, and the establishment of a strong brand presence in the logistics market.

3. Case study of Viettel Post

3.1. Overview of Viettel Post

In 7/1997, Viettel Post was founded as a part of the military telecommunications corporation Viettel. It specializes in both local and international express delivery. Viettel Post currently ranks among the top express delivery companies in Vietnam, with a fleet of 3,000 different kinds of

trucks that are in operation 24/7, owning a network of more than 2,000 post offices, more than 2,000 collecting agents, and approximately 40,000 professional staff members. The success rate for deliveries consistently reaches 95% (Viettel Post, 2023). The personnel, facilities, and network infrastructure can accommodate a wide range of customer needs, including international transportation, e-commerce, warehousing, fulfillment, express delivery services, logistics, and other services. The logistics center of Viettel Post acts as a comprehensive logistical infrastructure, offering clients in the e-commerce industry complete order fulfillment options. This helps customers to deliver their goods more affordably, safely, and quickly.

With a sustainable development perspective and the vision to become the fastest and most reliable express and logistics enterprise in Vietnam, Viettel Post is strategically investing in the express and logistics sector, establishing an extensive network covering all 63 provinces and cities nationwide, reaching even remote villages, communes, and islands. This extensive network has allowed Viettel Post to optimize the warehousing system. The warehousing system used by the company is currently distributed over all provinces and cities and is used for the transshipment and storage of commodities. Not only focusing on domestic service development, Viettel Post is also the first postal enterprise to operate in foreign markets, successfully connecting with all 23 provinces of Cambodia. Following Cambodia, Viettel Post continues to expand its services in Myanmar and connect with more than 200 countries worldwide (Viettel Post, 2023).

Viettel Post has the fastest growth rate in the delivery industry after 26 years of expansion and development. It has also won numerous awards and recognitions for its more forceful market position. It is the sole logistics entity globally to achieve the Gold Award at the IT World Awards 2023 (Viettel Post, 2023). Being the rare enterprise in Vietnam offering investment delivery services for foreign markets and global integration, Viettel Post is assessed as a sustainable development enterprise. It is always adapting to meet the expectations of consumers in an effort to satisfy them and provide the finest possible delivery service experience, with an aim to become the No.1 logistic enterprise based on a high-technology platform in 2025.

3.2. The situation of applying warehouse automation in Viettel Post

In this day and age, besides Telecommunications, Postal Services is also considered as a core business domain, making a substantial contribution to the revenue growth of Viettel Post. As reported in the Viettel Post Financial Report for the third quarter of 2023, the Postal Services sector, encompassing parcel delivery and logistics, witnessed a remarkable 39% increase in revenue compared to the corresponding period of the previous year, and a notable 11.5% surge compared to the preceding quarter. This robust growth facilitated Viettel Post in achieving its highest pre-tax revenue growth of the year. Being one of the leading companies in Vietnam's logistics and package delivery industry, Viettel Post relies heavily on warehousing to support its ongoing operations, which include processing, storing, and shipping massive volumes of goods to clients. Viettel Post possesses six operational centers, three 103,000-square-meter central warehouses, and almost 1,000 warehouses dispersed throughout communes and districts (Valoma, 2021). Thanks to this nationwide warehouse system, Viettel Post is able to provide customers with comprehensive order

fulfillment services (e-fulfillment) in addition to meeting the demands of express delivery operations. Currently, the company can process an average of 750,000 orders daily, accounting for a 30% increase compared to the same quarter last year. Viettel Post's services have experienced a rise in the number of new users, particularly in the latter half of 2022 - a 50% increase from May 2022. Furthermore, the average monthly revenue from new clients increased by roughly 5 to 10% from the previous month (Viettel Post, 2023). These impressive achievements can be partly attributed to Viettel Post's continuous investment and application of cutting-edge technologies in warehouse operations.

With the strategic goal of becoming the leading technology-driven logistics enterprise in Vietnam by 2025, Viettel Post has been making further investments in smart warehouses to optimize the costs associated with the logistics service chain and gain a competitive advantage over both domestic and international rivals. As a result, numerous warehouse operations stages are gradually being automated through the utilization of cutting-edge technologies, including the following:

3.2.1. Specific automation technologies implemented

- **Automated Storage and Retrieval Systems (ASRS)**

Automated Storage and Retrieval System (ASRS) refers to a computer-controlled system that is made to automatically store and retrieve goods from designated storage locations within a warehouse. The ASRS operates based on the smooth combination between software and hardware components. Typically, the hardware consists of automated machinery like robots or cranes, storage systems like racks or shelves, and transportation systems like conveyors or sorters. Meanwhile, the software is used to control the hardware and manage the inventory. It keeps track of the locations of stored items, manages the operation of the machines, and optimizes picking and placing operations (OTEC, 2020). The operational procedure of ASRS unfolds as follows: once items are introduced into storage positions within the warehouse by the hardware components, the system's software autonomously records pertinent information about the goods, including quantity, stored location, and type. When the retrieval of items is necessary, the software automatically issues commands to the hardware to transport the stored goods to the designated retrieval point.

In September 2020, Viettel Post integrated ASRS, which was the Smart Intralogistics Solution developed by IROCO (Intelligent Robotics Company), into the first three steps of the automated warehouse operation, including receiving, sorting, storing, and picking. The IROCO solution encompasses four key elements: the Smart Warehouse System, Autonomous Guided Vehicles (AGV), an Automated Receiving and Returning Station, and the IROCO SIS Management Software. Regarding the Smart Warehouse System, a 40% reduction in warehouse space and an astounding 70% improvement in warehouse transportation efficiency were achieved through the installation of robust rack systems and the deployment of Pallet Shuttle robots (IROCO, 2021). Concerning the utilization of Autonomous Guided Vehicles (AGV), they are employed for lifting, towing, or transporting goods within the warehouse under the directives of the IROCO SIS software. When there is a request for retrieving goods, this system governs

the AGVs to move the required goods to automated receiving and returning stations based on the goods' information automatically recorded in IROCO SIS software. The bidirectional interaction between the IROCO SIS software and other devices in the system is facilitated through WiFi connectivity (IROCO, 2021).

Figure 1: Autonomous Guided Vehicles (AGV) and IROCO SIS Software in Viettel Post's Warehouse

Source: IROCO website

- **Robotics and Picking Technologies**

At the Southern Logistics Center inaugurated in 2021, Viettel Post applied robots for phase three of its automated warehouse process, which is picking operations such as lifting and transporting goods from storage racks to picking stations, streamlining the order fulfillment process based on optimized pathways. This not only reduces labor intensity but also accelerates product turnover, with an average of one robot capable of replacing 5 to 10 human workers (Viettel Post, 2021).

In 2022, Viettel Post officially introduced the VMR-01 robot to replace human involvement in the process of transporting goods from the sorting conveyor to delivery trucks for onward transportation to customers. The VMR-01 is a warehouse logistics robot utilizing the first-of-its-kind computer vision navigation technology in Vietnam, developed by the Viettel Network Space Center (VTCC) (Phúc, 2022). Compared to other robots with similar functionalities employing radar or LiDAR technologies, VMR-01's visual perception technology makes it cost-effective, which is tenfold less than alternative models. Moreover, computer vision technology enables the robot to construct maps, reproduce landscapes, accurately delineate routes, and fulfill navigation tasks, providing precise guidance (Phúc, 2022). It autonomously recognizes obstacles and assesses collision risks during the movement, proposing solutions without human intervention. This has significantly enhanced work productivity, reduced warehouse operational costs, and, above all, minimized hazards related to conventional manual handling involving hand pallet trucks and

diesel-powered forklifts.

Figure 2: Robot VRM-01 in the warehouse of Viettel Post

Source: Website of Ministry of Information and Communication

- **Conveyor Belts and Sorting Systems**

Due to having to handle a substantial amount of parcels, besides robots, Viettel Post also adopted conveyor belts and sorting systems to transform steps two, three, and four of its warehouse system into automation. At its newly inaugurated logistics center in the Southern region in 2021, Viettel Post installed a state-of-the-art automated sorting conveyor system. This system incorporates barcode recognition and image analysis technologies, operating at high speed and precision, with a sorting capacity of up to 42,000 parcels per hour (Trang, 2021). Sorted materials are automatically directed to designated outputs that correspond to each district or ward. After sorting at this logistics hub, products are seamlessly connected to customers without any additional sorting required. Additionally, the Southern Logistics Center's entire security and monitoring procedure incorporated AI technology to supervise the unique one-way flow of operations, identify entering individuals and vehicles, and automatically alert in the event of smoke or explosions within the warehouse (Trang, 2021). Thanks to the adoption of advanced technology in the sorting conveyor system, Viettel Post could achieve both speed and accuracy in the flow of goods. It has almost eliminated sorting errors, cut down on the end-to-end connection time for parcels to six hours, and provided customers with an automated order completion solution.

In early January 2024, with the introduction of the country’s first highly automated smart sorting complex, developed through in-house research by the company, Viettel Post reaffirmed its status as Vietnam's leading technology-driven logistics enterprise. This complex comprises three components: Self-propelled robots (AGV robots), the Wheel Sorter Matrix, and the Cross-belt Sorter. Notably, Viettel Post stands at the forefront of logistics enterprises in Vietnam by deploying over 200 AGV self-propelled robots within its sorting system. (Quý, 2024)

Figure 3: Self-propelled goods sorting robots (AGV robots) of Viettel Post

Source: VNExpress

These AGV robots receive order information wirelessly, classify items, and autonomously transport goods to digitally mapped destinations within the system. Due to their compact size, AGVs are particularly effective for automated and precise sorting, especially for lightweight, thin, uniquely shaped, and round roll goods in the e-commerce sector. In addition to AGVs, the Wheel Sorter Matrix handles large cargo, while the Cross-belt Sorter, with active control and high capacity, is suitable for Cash on Delivery (COD) items and standard parcels. This smart sorting complex marks a significant technological breakthrough not only for Viettel Post but also for the entire logistics landscape in Vietnam. It elevates the entire Viettel Post system's processing capacity to 4,000,000 parcels per day, meeting half of Vietnam's e-commerce capacity. The error rate of the system is virtually negligible, aiding in an impressive 8 to 10-hour decrease in the overall delivery time and a substantial 3.5-fold increase in output (Hằng, 2024). The entire operation is monitored by the Network Operations Center (NOC), capable of real-time tracking of each parcel's journey.

Figure 4: Viettel Post's Network Operations Center (NOC)

Source: VNExpress

Utilizing technologies such as Digital Twin and AI-powered cameras, the system can monitor and manage the status of devices, detect and alert abnormal activities, ensuring timely resolution of arising issues (Quý, 2024).

3.2.2. Comparison of Viettel Post's automation strategy with other Vietnamese logistics companies

Besides Viettel Post, many companies are actively improving their warehouse systems to fulfill orders faster and gain an edge over competitors. Within the past three years, the logistics sector in Vietnam has witnessed noteworthy advancements in the utilization of information technology, as evidenced by the escalating deployment of technology-driven solutions within warehouses, notably the amalgamation of robotic systems and warehouse management software (Logistics Vietnam Report 2020, 2020).

- **TikiNOW Smart Logistics**

Since July 2021, Tiki has fully automated the entire picking process in the warehouse through a fleet of robots. These robots are equipped with sensor systems to avoid collisions during their movement of goods. They autonomously descend to the lower level, lift the shelves, and systematically transport them to the designated location, guided by the barcode system on the floor. Each robot has a maximum payload of 800 kg, and the robot system automatically returns to the charging station when the battery level is low.

Figure 5: Autonomous Shelf-Moving Robots in Tiki's Warehouse

Source: Tiki

Using this system, Tiki has doubled his picking speed in one hour, with an error rate close to zero. It has also enabled Tiki to improve work efficiency, speed up packaging and transportation processes, and allow human workers to focus on more complex tasks. Furthermore, the robots help employees pick fresh food directly from the cold storage, limiting their exposure to low temperatures. Both Viettel Post and Tiki incorporate robotics as an automation solution to handle repetitive and labor-intensive tasks within their warehouses.

- **J&T Express**

J&T Express is another logistics company that has invested in cutting-edge technology. Similar to Viettel Post's use of QR code technology at the initial sorting stage, J&T Express, in the order reception stage, encoded all customer information into intelligent barcodes and stored it in the cloud, ensuring that the initial stage of order handling takes as little time as possible. The company also operates an intelligent sorting system known as DWS, an automated conveyor system, and multi-level cross-belt systems, which contribute to the precise sorting of goods with up to 99.99% accuracy and result in a 50% reduction in labor costs for the enterprise.

Figure 6: The Automated Conveyor System of J&T Express

Source: Thanh Nien newspaper

- **Crystal International**

Crystal International currently operates a fabric storage warehouse in Vietnam. Like Viettel Post, the company has implemented an Automated Storage and Retrieval System (AS/RS) integrated with an internal warehouse management system and provides real-time data 24 hours a day, seven days a week to support inventory management. The warehouse has 24 high-rise rack modules that reach a height of 26 meters and can hold up to 4 million fabric rolls and 2 million finished garments. These intelligent solutions have helped the company increase productivity and improve logistics efficiency by allowing for more convenient inventory management.

Comparisons:

– **Strengths of Viettel Post:**

+ Viettel Post uses a comprehensive approach to automation, which includes receiving, sorting, storing, picking, and transportation processes. This comprehensive integration maximizes efficiency while minimizing manual intervention throughout the warehouse operation.

+ Viettel Post demonstrates leadership by implementing cutting-edge technologies such as computer vision navigation, AGV robots, and smart sorting complexes, which improve operational capabilities and set new standards in the logistics landscape.

+ With a processing capacity of 4,000,000 parcels per day and the ability to efficiently handle diverse parcel types, Viettel Post's infrastructure is scalable and adaptable to the growing demands of e-commerce, ensuring consistent and dependable service.

– **Weaknesses of other Logistics companies:**

+ While TikiNOW, J&T Express, and Crystal International have implemented automation in specific aspects of their warehouse operations, their scope may be limited when compared to Viettel Post's comprehensive approach. This limitation may result in inefficiencies and operational bottlenecks when handling a wide range of tasks.

+ Other logistics companies may trail Viettel Post in terms of technological innovation and adoption. This lag could impede their ability to optimize operations, improve efficiency, and meet changing customer expectations in the rapidly changing logistics landscape.

+ Despite their automation efforts, other logistics companies may face difficulty scaling their operations to meet the growing demands of e-commerce, resulting in capacity constraints, longer processing times, and potential service disruptions during peak periods.

Overall, businesses strive to apply technology to operational processes to enhance warehouse performance, mitigate risk, and achieve long-term cost savings. Successful implementation requires internal factors such as synchronized physical infrastructure and information systems, ample human resources, and consistent financial support. Favorable macro-level government policies are also crucial in fostering a business-friendly environment, including regulations protecting intellectual property rights and promoting software development. However, many businesses face constraints like limited investment funds and the time-intensive nature of labor training, preventing the widespread adoption of automated technologies in warehouses.

Viettel Post's automation warehouse technologies exemplify an innovative and comprehensive approach to optimizing warehouse operations. Their integration of self-propelled robots (AGV robots) and internally developed advanced sorting systems further solidifies their position as a technology-driven logistics enterprise. This enables them to efficiently handle large parcel volumes with enhanced speed, accuracy, and automation. These advancements provide Viettel Post with a competitive edge over other logistics companies in Vietnam.

3.3. Evaluation of warehouse automation application in Viettel Post

According to Viettel Post's financial statements, in the period from 2019 to 2022, the enterprise recorded rapid growth in total revenue. This growth came from Viettel Post's development of core businesses, expansion of scale, and a significant portion from the application of scientific and technological advances.

In 2020, despite the negative impact of the COVID-19 pandemic on the entire Vietnamese logistics industry, Viettel Post still recorded a record revenue of 17,234 billion dong, 2.2 times higher than in 2019. In particular, the express delivery and logistics segment increased by 7.2% year-on-year, with revenue reaching 6,617 billion dong.

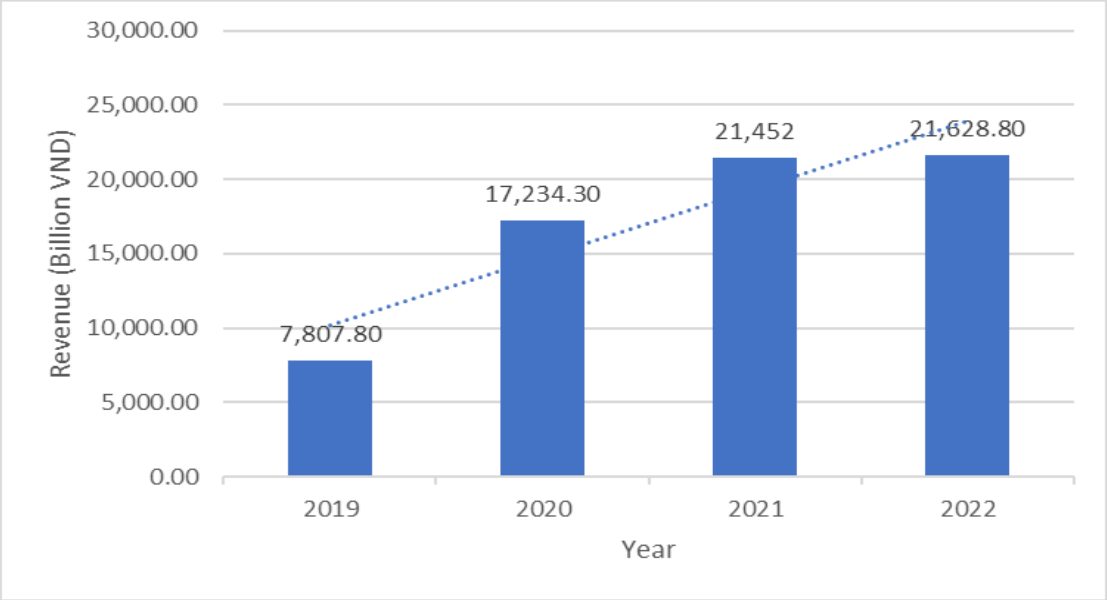

Figure 7: Total revenue of Viettel Post from 2019 to 2022

Source: Author's compilation and illustration

Viettel Post's revenue continued to grow strongly in 2021, with a major milestone being the opening of the Southern Automated Logistics Center. In 2022, despite the impact of several external factors, including China's zero-COVID policy and the volatility of oil prices, Viettel Post still maintained its revenue growth momentum.

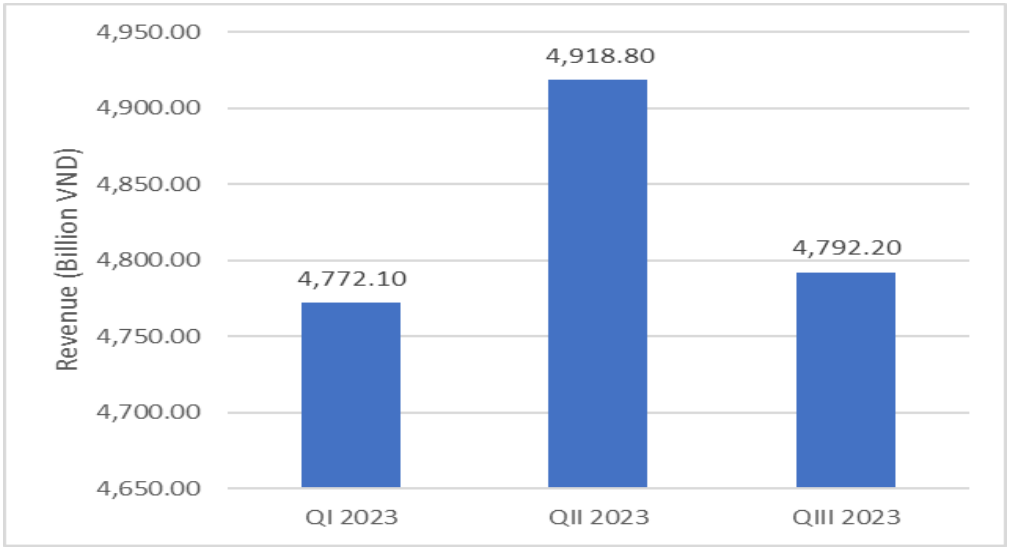

Figure 8: Total revenue of Viettel Post in the first three quarters of 2023

Source: Author's compilation and illustration

In 2023, Viettel Post's revenue saw a decline. Revenue for all three quarters of the year was below 5,000 billion dong, all of which were lower than the same period last year. However, Viettel Post's net profit rebounded strongly: Profit for the third quarter increased by 85% year-on-year

(Author's compilation). This was primarily due to reduced costs per order and improved productivity and management efficiency. With the effort to apply many modern technologies to warehouse automation, Viettel Post is expected to achieve even greater milestones in the future.

3.3.1. From the perspective of human resources

- **Reduced human error**

The operation of Viettel Post's automated warehouse applies a series of modern technologies such as ASRS, AGV, Robot VRM-01, etc. Many transportation stages have been transferred to high-tech devices and technologies, and are carried out in a smart, scientific manner, with the error rate nearly equaling 0, avoiding the significant errors often seen in manual labor. In addition, the operation of these systems is less affected by external factors, including weather, temperature, as well as mental factors in traditional workers.

This is considered to be the main goal and the biggest advantage of enterprise when carrying out warehouse automation, contributing to reducing costs and losses in the warehouse, and at the same time improving the competitiveness of enterprises.

- **Improved working safety**

In the warehouse operation process, there are many activities with high-risk factors such as handling heavy pallets and high racks and workers often have to work in a crowded environment and have to be exposed to dust and even many harmful products including chemicals, electronics, etc. Thanks to automation, modern technologies and equipment can help employees do most of the work, therefore minimizing human contact and eliminating risks for workers. The application of robot technology such as VRM or AGV not only reduces accidents associated with manual forklifts and oil-powered forklifts but also lets workers focus on other less laborious and dangerous tasks. As a result, individuals can focus on more complex tasks that require high levels of expertise and cognitive ability.

- **Changes in the demand for human resources**

The transformation of many stages to automation in warehouse management will reduce the need for manual labor and set new requirements for the skills of human resources.

According to statistics from Viettel Post, the application of Robot VMR-01 in the stage of delivering goods from the sorting line, selecting and sorting to the delivery trucks to customers has reduced 50% of the operating staff of the sorting system, equivalent to nearly 20 employees each system. Additionally, early in 2021, Viettel Post opened the Southern Automated Logistics Center, located in District 12, Ho Chi Minh City and uses a variety of modern technologies, which helped to save 91% of manpower. On January 17th 2024, Viettel Post inaugurated a smart sorting technology complex in a warehouse of 32,000 square meters in Quang Minh (Me Linh, Hanoi). This initiative aims to reduce labor by 60% in the process of sorting goods (Author's compilation and illustration).

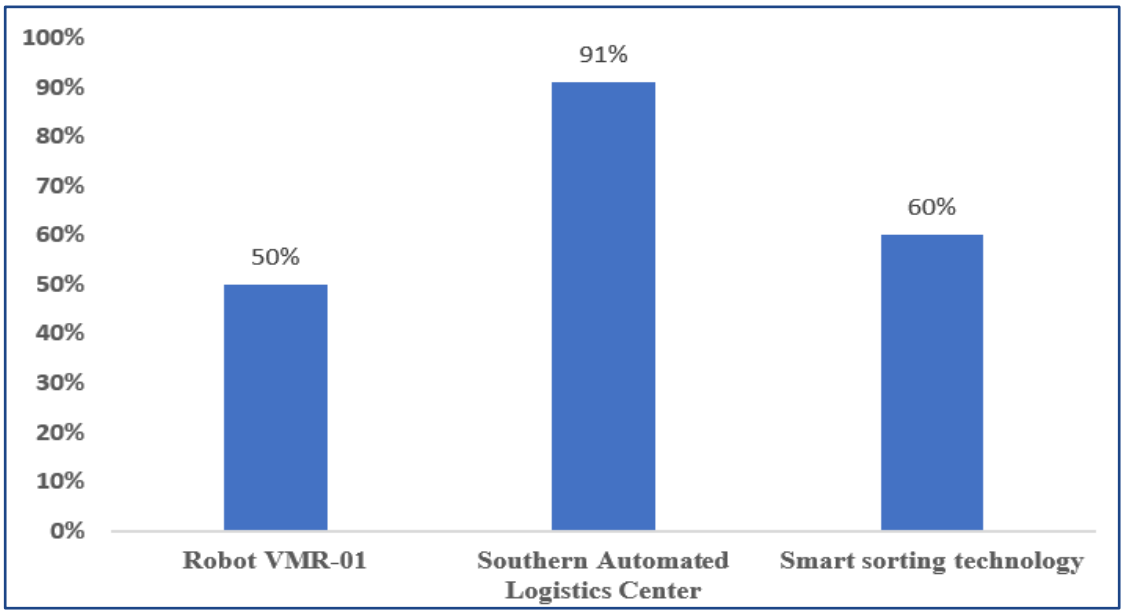

Figure 9: Human resources reduced by the application of technologies

Source: Author's compilation and illustration

The same change has happened and will happen to other stages in the future. This change may put workers with low labor skills at risk of unemployment, and most of the newly created jobs will be in fields such as maintenance and customer service.

The automation has also led to changes in the skills demanded for warehouse jobs. In the past, warehouse workers were primarily required to have strong physical skills. However, currently, that requirement has shifted to having a wider range of skills, including:

– Technical skills: Workers need to be able to operate and maintain automated equipment.

– Problem-solving skills: Workers need to be able to identify and troubleshoot problems with equipment.

– Data analysis skills: Workers need to be able to analyze data to identify areas for improvement.

Viettel Post has recognized the need for its employees to develop new skills and has implemented a number of training programs to help them.

3.3.2. From the perspective of Warehouse operation efficiency

– **Increased inventory throughput and productivity**

The implementation of high-tech solutions and automation in the processes of transportation, warehouse management, and sorting has significantly boosted the operational efficiency of the warehouse. The robots have high payload capacity, are able to work continuously for many consecutive hours and operate precisely according to pre-installed programs. Moreover, the use of software and computer systems to manage warehouse operations, with automated systems such as robots and conveyor belts (Viettel Post's AGV, Cross-belt Sorter, and NOC systems), makes

warehouse management easier and significantly reduces errors in the delivery process. All of these contribute substantially to increasing warehouse throughput and operational productivity.

The automated sorting technology system introduced by Viettel Post on January 17, 2024, boasts a processing capacity of up to 1.4 million parcels per day, marking a 40% increase compared to previous capabilities. With this substantial processing capacity, the entire Viettel Post system can handle 4 million parcels per day, meeting approximately 50% of Vietnam's cargo capacity demand (Viettel Post, 2024).

The implementation of warehouse automation enables Viettel Post to speed up and enhance the accuracy of the delivery of its goods, thereby improving customer experience and solidifying its position as a leading logistics company employing cutting-edge technology in Vietnam.

– **Reduced Costs**

Labor cost: Automating warehouses significantly reduces the need for manpower. The Company is not under as much pressure to compete on salary levels with others to attract labor. Additionally, smooth operations can be ensured even during peak periods without the need to hire seasonal staff, pay overtime, or run overnight shifts. Besides, enhancing workplace safety, as mentioned above, also helps reduce costs associated with addressing, supporting, and compensating for workplace accidents.

According to the representative of Viettel Post, the sorting system implemented on January 17th is estimated to reduce warehouse personnel costs by 60%.

Operational costs: Warehouse automation also helps reduce operational costs: Lowering the error rate in deliveries will not only enhance customer satisfaction but also mitigate the need for costly corrections and compensations due to inaccuracies in the delivered products.

Order picking is the single most expensive operation in a warehouse. It can account for over 55% of warehouse operational costs. Manual picking in warehouses is often restricted to filling one order at a time. Limited by paper pick lists and a lack of picking optimization software, workers may visit the same popular warehouse section multiple times in a day. Automated picking solutions, on the other hand, enable batch picking, where orders with common items are grouped and picked together, then sorted to appropriate orders. Moreover, it can also prioritize orders based on the arrangements of the items in the warehouse and their availability.

3.4. Challenges for Viettel Post

While Viettel Post's pursuit of automation holds immense promise for efficiency gains, the company faces several significant hurdles in its implementation. These challenges can be broadly categorized into technical, financial, and human resource obstacles.

[1] Technical complexities abound in automated warehouses, demanding seamless integration of various components like conveyor belts, robots, and intricate software systems. This intricate dance can be challenging to orchestrate, particularly for companies with limited automation experience ***(Vietnam Logistics Report, 2017)***. Furthermore, seamlessly integrating

post-delivery processes like returns and error handling remains a hurdle ***(Phuong, 2019)***. While technologies like IoT and AI hold potential, their current rudimentary adoption in Viettel Post's warehouses fails to significantly reduce operational costs or maximize their true benefits ***(My, 2021)***.

[2] Financial constraints pose another formidable challenge. Implementing automated warehouses requires substantial investments in equipment, software, and installation, often exceeding the budgets of enterprises of various sizes and within different sectors ***(VLI, 2021)***. This financial burden is further amplified by the limited availability of skilled personnel to operate and maintain these complex systems and the ambition to elevate the automation game by introducing AGV robots and smart sorting procedures. The current workforce in Viettel Post's warehouses often lacks the necessary technical expertise, making outsourcing a more viable choice, and hindering their smooth adaptation to the technology-driven environment ***(VLI, 2021)***.

[3] Human resource challenges add another layer of complexity. The transition to automation necessitates a shift in skillsets, demanding employees adept at operating and maintaining sophisticated machinery. This necessitates comprehensive training programs to equip the workforce with the necessary skills, which can be a significant investment in itself ***(VLI, 2021)***. Additionally, automation raises concerns about potential job displacement, potentially impacting social stability and requiring careful consideration from both the Viettel Post and regulatory bodies ***(VLI, 2021).***

Viettel Post's pursuit of automated warehouses, in essence, holds immense potential, but the company must navigate a complex landscape of technical, financial, and human resource challenges. Addressing these hurdles through strategic partnerships, comprehensive training programs, and responsible implementation will be crucial for Viettel Post to successfully unlock the full benefits of automation and solidify its position as a leader in Vietnam's logistics industry.

4. Recommendations

4.1. Orientation of Viettel Post

Prior to developing recommendations, we commence by examining the approach employed in Viettel Post's warehouse automation transition. Viettel Post's path to warehouse transformation is marked by a **holistic embrace of advanced automation technologies**, exemplifying a commitment to comprehensive efficiency. By incorporating autonomous sorting robots, large-scale sorting systems, and conveyor belt solutions, they have achieved an impressive fulfillment rate of daily parcels. The overarching strategy aims at holistic automation, minimizing errors, and accelerating delivery times to 8-10 hours, resulting in a substantial 3.5-fold boost in productivity ***(Vietnam Automation Association, 2024).***

Importantly, Viettel Post distinguishes itself through a "**Make-in-Vietnam**" ethos, with the entire logistics ecosystem, including software, app/web systems, and technology solutions, being developed by a dedicated team of 100% Vietnamese engineers and experts in just over six months.

This dual focus on comprehensive automation and indigenous innovation solidifies Viettel Post's leadership in the realm of logistics and parcel delivery in Vietnam ***(Vietnam Automation Association, 2024)***.

4.2. Solutions for Viettel Post

Acknowledging the holistic approach as the prominent vision of Viettel Post, specific recommendations need to be meticulously designed to tackle the nitty-gritty details of each challenge.

On the technical front, partnering with experienced automation providers grants Viettel Post access to invaluable expertise in system design, integration, and implementation. Piloting new technologies before full-scale deployment allows for identifying and addressing potential issues, akin to testing the waters before diving in. A phased rollout, starting small and scaling up gradually, provides invaluable learning opportunities and minimizes risks. Investing in training empowers IT and maintenance personnel with the skills to operate and troubleshoot these complex systems, ensuring smooth sailing. Funding for enhancing R&D initiatives on the automation transition also needs to be addressed to truly yield a competitive edge against other market players.

The financial aspect demands thoughtful navigation. Conducting a thorough cost-benefit analysis helps prioritize processes with the highest potential for efficiency gains and cost reduction. Exploring alternative funding options like grants, venture capital, or partnerships alleviates the financial burden and fosters collaboration. Optimizing existing infrastructure minimizes unnecessary investments by strategically integrating new automation systems with the existing resources. Focusing on high-impact areas maximizes the return on investment, ensuring automation delivers the biggest bang for the buck.

Human resource challenges call for empathy and proactive measures. Upskilling and reskilling programs bridge the skills gap, equipping employees with the tools they need to thrive in the automated environment. Redeployment strategies offer alternative roles to employees whose current jobs might be impacted, minimizing job displacement and maximizing retention. Open communication throughout the process fosters trust and understanding, ensuring employees feel involved and heard. Prioritizing retraining and redeployment options demonstrates Viettel Post's commitment to its workforce, solidifying its reputation as a responsible employer.

5. Conclusion

Based on the analysis above, Viettel Post's pursuit of automated warehouses holds immense promise for revolutionizing its logistics operations. With the highest level of automation and the latest technology, the smart sorting technology complex at Viettel Post's Exploitation Center 5 is expected to become a model of technology application in the delivery field, and logistics of Vietnam.

Viettel Post's automation ambitions are not just about technology; they represent a

transformative opportunity to reshape the logistician frontier. By embracing a holistic approach, tackling challenges head-on, and prioritizing human well-being, Viettel Post can navigate the complexities of automation and unlock its full potential, securing a bright and prosperous future for itself and the industry.

However, the path to automation is not a destination, but a continuous journey. Thus, Viettel Post's unwavering commitment to progress, adaptation, and responsible practices will be the compass guiding it toward a future of efficiency and growth.

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