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ỨNG DỤNG CỦA TỰ ĐỘNG HÓA ROBOT TRONG QUẢN LÝ KHO HÀNG NGHIÊN CỨU TRƯỜNG HỢP CỦA OCADO VÀ KHUYẾN NGHỊ CHO CÁC DOANH NGHIỆP THƯƠNG MẠI ĐIỆN TỬ VIỆT NAM

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Tóm tắt

Sự quan tâm ngày càng tăng đối với tự động hóa linh hoạt và robot thông minh trong quản lý kho hàng đã phản ánh tầm quan trọng ngày càng lớn của công nghệ như một yếu tố chủ chốt trong sự phát triển và thành công của doanh nghiệp. Bài nghiên cứu này tập trung vào việc sử dụng công nghệ tự động hóa robot của Tập đoàn công nghệ và siêu thị trực tuyến Ocado trong hoạt động quản lý kho hàng. Nhóm tác giả áp dụng phương pháp định tính, sử dụng dữ liệu thứ cấp từ các nguồn đáng tin cậy để tìm hiểu cách Ocado triển khai tự động hóa robot trong kho và đánh giá hiệu quả của các ứng dụng đó. Cuối cùng, nhóm đề xuất một số khuyến nghị cho việc áp dụng robot tại kho của các sàn thương mại điện tử ở Việt Nam nhằm thúc đẩy tăng trưởng bền vững.

Từ khóa: robot, Ocado, quản lý kho hàng.

APPLICATIONS OF ROBOTIC AUTOMATION IN WAREHOUSE MANAGEMENT - A CASE STUDY OF OCADO AND RECOMMENDATIONS FOR VIETNAMESE E-COMMERCE ENTERPRISES

Abstract

The increasing attention to flexible automation and intelligent robots in warehouse management reflects the growing importance of technology as a key factor in business development and success. This study focuses on the use of robotic automation technology by Ocado, a technology group and online supermarket, in its warehouse management operations. The group of authors

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apply a qualitative approach, utilizing secondary data from reliable sources to explore how Ocado implements robotic automation in its warehouses and assess the effectiveness of these applications. Finally, the study proposes several recommendations for the adoption of robots in the warehouses of e-commerce platforms in Vietnam to promote sustainable growth.

Keywords: robot, Ocado, warehouse management.

1. Introduction

Robotic automation has revolutionized warehouse management, especially in the e-commerce industry, where efficiency and scalability are indispensable parts. Leading the way in this revolution is Ocado, a UK-based online retailer that has implemented advanced robotics, AI, algorithms and Ocado Storage and Retrieval System to optimize its warehouse operations. This case study shall explore how Ocado's automation strategies have enhanced logistics, serving as a role model for other e-commerce businesses.

For Vietnamese e-commerce companies, understanding the key factors leading to Ocado's success will absolutely offer valuable lessons. As the e-commerce sector in Vietnam grows, adopting robotic technologies could help improve operational efficiency and meet rising consumer demand. This research examines the potential benefits and challenges of robotic automation in Vietnamese e-commerce, drawing insights from Ocado's experience to guide local enterprises in enhancing their warehouse management systems.

2. Theoretical framework

2.1. Warehouse management

2.1.1. Definition

Warehouse management is "a combination of the planning and control systems and the decision rules used for inbound, storage, and outbound flows" (Faber, et al., 2013, p. 1232). This involves the strategic coordination of all activities and processes within a warehouse to ensure efficiency and effectiveness. It includes both planning and control procedures that manage daily operations to fulfill customer needs. This dual approach consists of two main components:

Planning: The proactive process of deciding what actions to take and how to allocate resources to meet market demands efficiently.

Control: The reactive aspect that ensures the execution of plans achieves the intended results.

Warehouse management operates at two levels: tactical planning focuses on short-term resource management, while operational planning deals with the organization and scheduling of activities.

2.1.2. Importance of warehouse management in e-commerce industry

Warehouse management is essential to the success of e-commerce enterprises for several important reasons. Its impact goes beyond logistics, affecting operational efficiency, customer satisfaction, and the business's competitive edge in the marketplace. Below are the main factors that highlight its significance:

Operational Efficiency: In the e-commerce sector, effective warehouse management ensures streamlined processes for receiving, storing, and shipping products. This efficiency helps reduce order processing times, enabling businesses to meet the rapid delivery expectations of online shoppers.

Inventory Control: Real-time tracking of inventory is vital for e-commerce companies to maintain appropriate stock levels. By avoiding stockouts and excess inventory, e - commerce enterprises can ensure that sought-after items are consistently available, positively affecting sales and customer satisfaction.

Customer Satisfaction: Online customers increasingly expect quick and reliable deliveries. Strong warehouse management directly impacts the speed and accuracy of order fulfillment, which is essential for building trust and loyalty in a competitive landscape.

Cost Efficiency: Streamlining warehouse processes can result in significant cost savings, which is particularly important for e-commerce companies that operate with tight profit margins. Efficient resource utilization can enhance profitability while enabling competitive pricing strategies.

2.2. Robotic Automation warehouse

2.2.1. Definition

Robotic Automation Warehouse is the process of automating the movement of inventory into, within, and out of warehouses to customers (Jenkins, Abby, 2020) using a system of robots and machines combining with modern software to replace manual tasks and achieve higher levels of efficiency (Bowles, Ruthie, 2020). As part of a robotic automation initiative, a company can remove labor-intensive tasks that require repetitive physical labor work and manual data input and analysis.

2.2.2. Benefits

Enhanced Efficiency and Productivity: Robotic automation accelerates warehouse operations and improves accuracy, making business more competitive.

Reduced Error Rates: Human errors can be costly, especially when tasks need to be redone to fix mistakes. Robots help lower these costs by performing tasks correctly the first time, every time.

Improved Warehouse Safety: Robotics enhances safety by taking on dangerous tasks that could put human workers at risk. Robots can handle hazardous jobs, such as retrieving items from heights or carrying heavy loads, reducing the potential for accidents. This also boosts worker morale as robots do routine or risky tasks, leading to reduced stress and anxiety.

Increased Customer Satisfaction: Faster delivery times and fewer errors lead to greater customer satisfaction. Efficient operations and quick, accurate service ensure repeat business and give your company a competitive advantage when getting more and more loyal customers.

Enhanced Brand Image: Beyond improving customer satisfaction, adopting robotics can position your company as an innovative, cutting-edge brand. Promoting your use of advanced technology can attract customers who value efficiency and progress.

Cost Savings: By automating tasks, your company can save money on labor, operations, and handling, as well as reduce waste and make your supply chain sustainable.

Optimized Use of Space and Resources: Robotic systems can help maximize warehouse space, improving operational efficiency and reducing the need for additional real estate.

Better Inventory Management: Automated systems provide better tracking and control of inventory, reducing the risk of overstocking or understocking.

3. Analysis of Ocado's robotic automation in warehouse management

3.1. Overview of Ocado

3.1.1. General information

Ocado Group is a UK-based company that develops software, robotics, and automation systems. They also host an online supermarket where people can input their goods list, and the company will deliver it to them (Margaret Davis, 2021). Their products can range from personal care, drug to grocery stores. Their headquarters is located at Hatfield, East of England, England. When Jonathan Faiman, Jason Gissing, and Tim Steiner started Ocado in 2000, not many people thought about going to the supermarket online. By 2012, Ocado began looking for ways to make their services better. They decided to focus on new ideas to guarantee quick delivery of online goods, helping them stay ahead of their rivals. They also have many global partners that are famous worldwide; for example, Aeon, Kroger, Morrisons,...

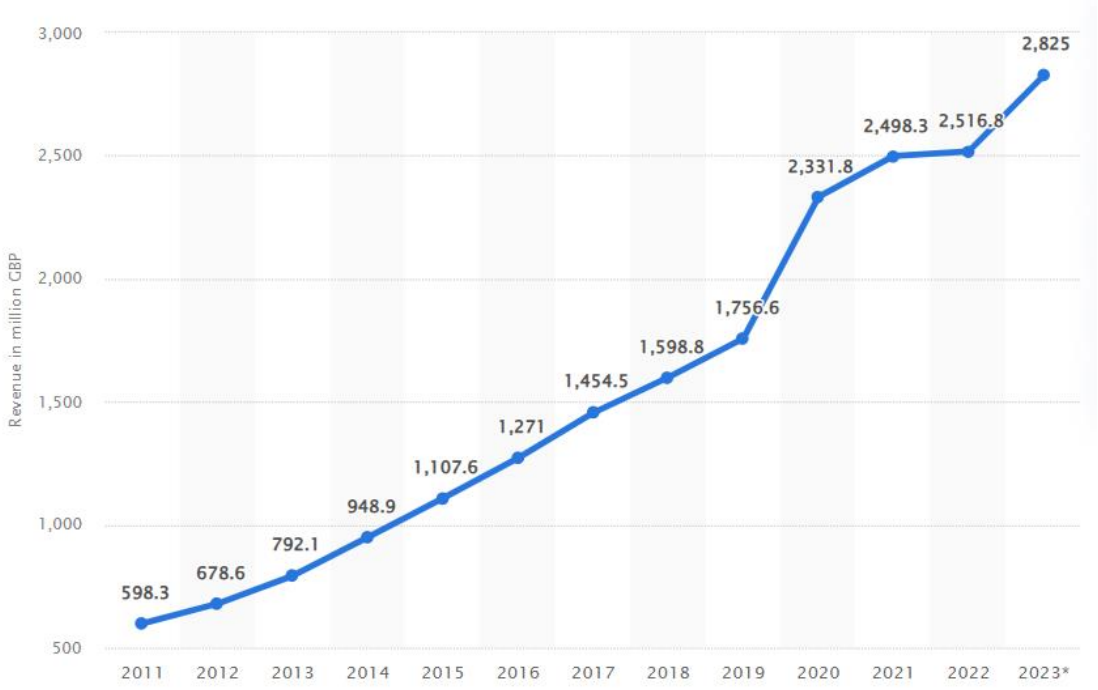

Figure 1. Revenue of Ocado Group worldwide from 2011 to 2023 (in million British pounds)

Source: Statista.com (2024)

As can be seen from the figure, Ocado Group's revenue has increased positively. In the e-commerce retail landscape in the UK, Ocado competes with big supermarket chains like Tesco, Sainsbury's, and Asda. As of April 2023, Ocado ranked fourth among the most popular grocery websites in the UK based on visit share (Lynn Beyrouthy, 2024).

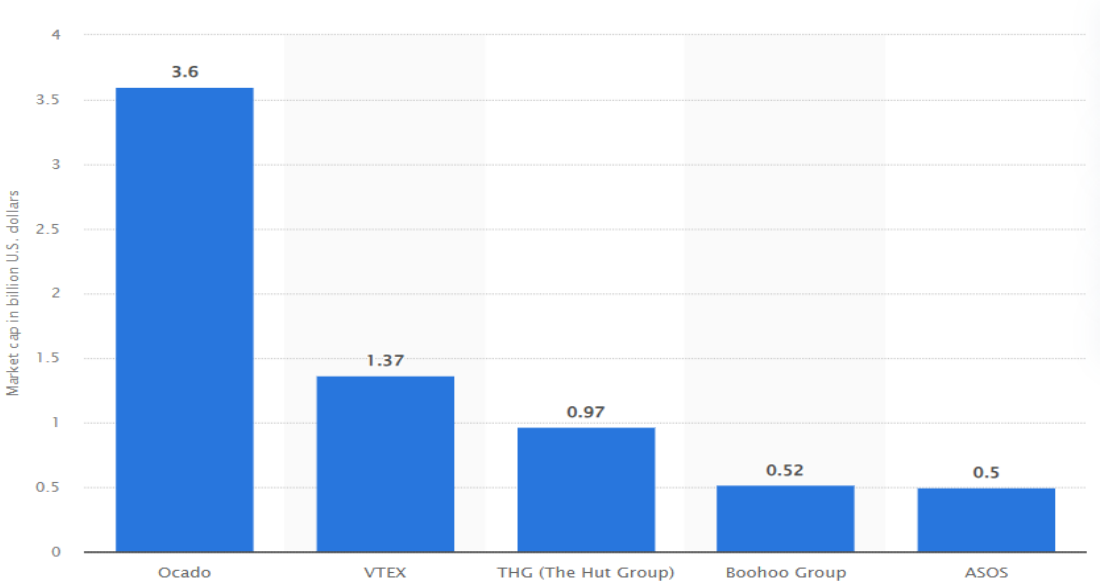

Figure 2. Market capitalization of the largest E-commerce companies based in the United Kingdom in 2024 (in billion U.S. dollars)

Source: Statista.com (2024)

As of April 1st, 2024, Ocado's was the largest e-commerce company by market cap in the UK. At 3.6 billion U.S. dollars, Ocado's stock market valuation exceeded that of fashion e-commerce companies Boohoo and Asos, which recorded around 0.52 and 0.5 billion U.S. dollars in market cap.

Ocado Group always states their mission is to change the way the world shops for good. Meanwhile, their vision is to align the interests of our customers, investors and other stakeholders to deliver long term shareholder value. Their values consists of "Learn fast: be curious, experiment and evolve", "Craft smart: innovate and create sustainable success for us and our partners", "Aligned autonomy: free to move with speed, aligned to act with purpose", "Build trust: we're on the same team" and "Collective potential: collaborate to achieve more".

Table 1. The number of robots and employees in Ocado Group (2023)

Number of robots	3000
Number of employees	19744
Ratio	15%

Source: Nikolai Savushkin calculated from the data of Knight (2023), Davis (2021), Duarte (2023) and Beyrouthy (2023).

In 2023, it was estimated that there were 3000 robots used in Ocado Group, which was 15% compared to the number of human employees. However, Ocado plans to reduce the number of human workers, which could lead to a higher percentage of robots in the future.

3.1.2. Overview of Ocado's warehouse management

In the early days of online shopping, when customers placed orders, company employees had to run around the warehouse or store to find the necessary products. However, for many years now, Ocado has completely relied on robots in warehouses to collect and distribute products, delivering items directly to staff, who are responsible for packing the products for delivery (Son Tran, 2024).

In 2023, Ocado Group launched Ocado Intelligent Automation (OIA), bringing fulfillment solutions to non-grocery industries such as pharmaceutical or auto parts. The system used to manage its own operations, from websites to warehouses is called "Ocado Storage and Retrieval System" (OSRS). This is a highly efficient cubic storage and retrieval system that integrates well-established automation with smart business analytics. OSRS makes it easier to tackle many of the complicated issues that contemporary supply chains encounter. It's the result of over 20 years of Research and Development (Ocado Group, 2024).

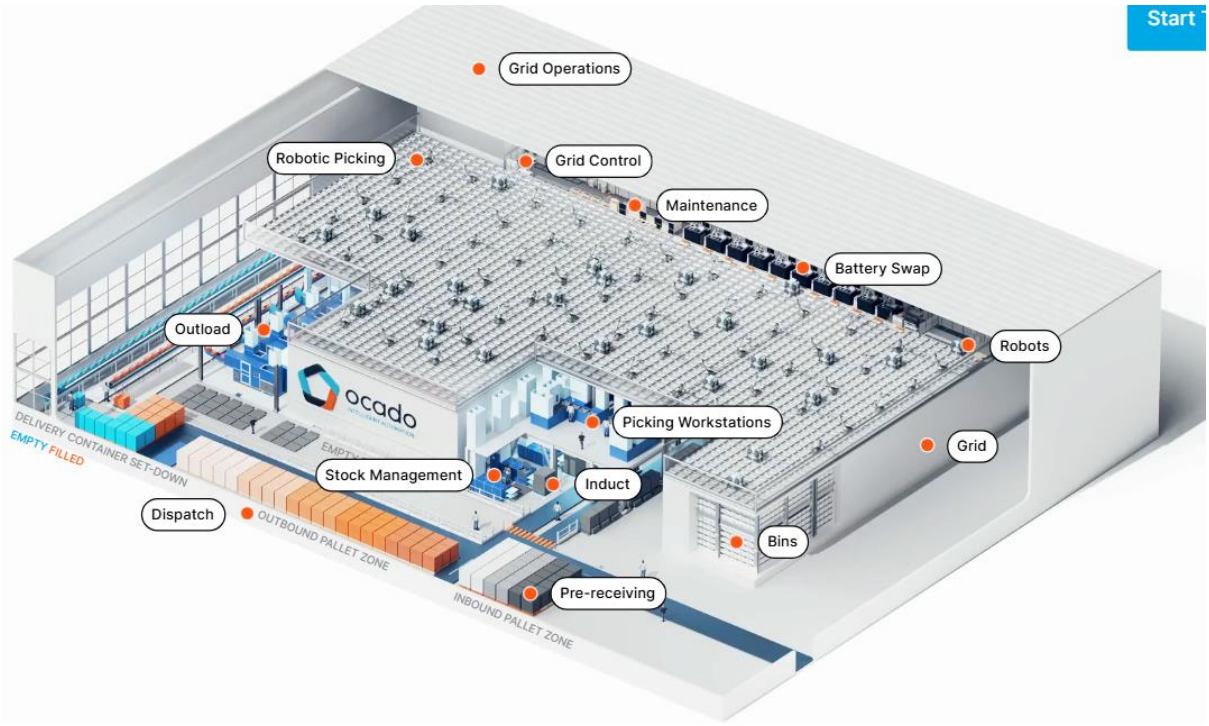

Figure 3. The layout of Ocado's warehouse

Source: Ocado Intelligence Automation (2023)

Their autonomous, grid-based bots minimize the physical space required and the amount of human supervision needed at both new and existing sites. This system can store and retrieve a variety of items, from refrigerated medicines to car components, all managed by their advanced warehouse execution system (WES) software. In summary, Ocado's warehouses consist of large, densely packed grids filled with storage containers containing various products.

Across the top of this grid, there are robots moving back and forth, retrieving the correct box containing the items for picking (Bennette, 2021).

3.2. The analysis of applying robotic automation in warehouse management of Ocado

3.2.1. The activities applying robotic automation in warehouse management of Ocado

Inbound

Inbound is the process of bringing stock into the warehouse and inducting it into the OSRS grid. Overall productivity is measured in the number of inducted items per hour. The process starts with palletized stock being delivered to the warehouse via a goods vehicle. Powered Pallet Trucks are used to remove the pallets from trailers and put them in the set-down area, labeled with a reusable License Plate Number. Pallets are stored in lanes within the set-down area. Ocado uses a First In First Out system to prioritize stock for induction. Once the OSRS is ready to receive stock, the Warehouse Execution System (WES), the software that governs every part of OSRS, informs a pallet truck operator to collect the pallet from a staging lane and deliver it to an induct station. In 2023, the Ocado WES inducted over 1.7 million pallets (Ocado Intelligence Automation, 2023).

Many warehouse operations face the challenge of time-consuming and labor-intensive tasks fatiguing operators, which results in a major decrease in productivity and the potential for inventory inaccuracies. Ocado's induct workstations streamline this process by efficiently decanting and logging inventory from pallets into storage bins, reducing heavy or repetitive tasks that often result in human errors. Induct workstations have a single interaction point where operators scan the pallet's License Plate Number and the product barcode, ensuring early detection of palletization errors. On-screen instructions simplify processes, allowing operators to get up to speed quickly. Advanced cubing algorithms optimize bin space and balance product weight, while multi-SKU bins maximize storage efficiency. Operators are prompted for additional product details like expiry date, helping prioritize picking and reduce waste. Once confirmed, bins are automatically weighed and checked before being moved by a conveyor to the grid. The system includes an automated waste removal, ensuring efficient operations with up to 99% uptime and a through-put of around 400 bins per hour, averaging under 9 seconds per presentation (Ocado Intelligence Automation, 2023).

Induct stations can also be used for management of inventory already stored in the grid. In the case of a product recall or damaged item packaging, an operator can summon the relevant bin from the grid and then manually adjust the stock as required. This process is also suitable for product returns. Once a product has been quality-checked to ensure it meets resale requirements, a human operator can summon the original bin and replenish it into the grid.

Storage

As the world's densest cubic storage system, OSRS stores all stock in uniform Plastic or Metal bins, depending on the partner's business requirement. Bins have been optimized to hold eaches, small cases and delivery assets such as containers, boxes, or polybags. Bins can hold up to 66 pounds or 30 kilograms and can be stacked up to 21 high, this means a single stack can hold up to 1300 pounds or 630 kilos of stock (Ocado Intelligence Automation, 2023). Due to their durable design, bins ensure stock is well protected within the grid. Ocado's metal bins are unique and have been designed to significantly reduce fire risk within the warehouse, while

enabling the reclamation of up to 20% of cubic storage space usually reserved for fire breaks (Ocado Intelligence Automation, 2023). A combination of both plastic and metal bins can be held within the grid to achieve the appropriate level of protection for application. Its Warehouse Execution System Software constantly orchestrates the movement of metal bins to designated areas to maintain firebreaks. They offer three configuration tiers: Classic being 20% metal and 80% plastic, Enhanced which provides a 55/45 split and Premium using all metal bins (Ocado Intelligence Automation, 2023). The Classic tier requires enhanced fire mitigations systems such as sprinkles, false ceilings and a 4-hour water supply and is only recommended for buildings with pre-existing and comprehensive fire mitigation. As well as storage of individual SKUs, bins can be used to store partial and completed customer orders, maximizing storage space available by buffering outbound orders.

The grid is the beating heart of OSRS - a towering three-dimensional structure housing hundreds of thousands of bins and potentially millions of dollars worth of stock items. Grids can be built up to 21 bins high, reaching 25 feet or 7.6 meters (Ocado Intelligence Automation, 2023). OSRS can also operate within a range of temperature zones. Warehouses are capable of maintaining strict thermal controls within closed environments with minimal penetration between different temperatures. The compact structure of the grid means the bins are inaccessible until they are presented at a pick station or out loaded from the system itself, ensuring maximum security and minimal stock shrinkage, especially essential with high value or hazardous items. Patented software algorithms continuously calculate where stock should be put away into the grid or consolidated to keep it optimally distributed. The most commonly ordered stock is stored near the surface and center, minimizing the time and number of robots needed to retrieve an order while slower moving stock settles deeper and further away. The software also maintains that SKUs are stored in multiple locations removing any single point of failure for common items and resulting in more consistent performance throughout the shift.

Picking

Ocado’s picking system consists of two main components: Robotic picking and picking workstation.

About robotic picking, to tackle modern challenges associated with human labor, such as inconsistent availability and rising wages, Ocado uses autonomous picking through robotic pick - arms positioned above the grid.

About the characteristics of robotic pick-arms, they work autonomously in fixed positions on top of the grid.The system utilizes AI-driven computer vision, deep reinforcement training, and advanced sensing technology to fully automate the picking process. Each arm can lift and handle individual products weighing up to 1.5 kilograms from bins within its surrounding eight cells, using a high - power suction cup known as an “end effector”. Additionally, machine vision sensors enhance picking accuracy by scanning items.

About picking workstation, it presents 660 storage bins per hour and has a step - by - step on - screen process. Workstation has human operators and necessary machinery. The workstation’s work flow can be described as below:

First, the operators log into the pick station screen.

Second, robots deliver bins to the workstation, presenting both storage and order bins. Operators can interact with one storage bin and up to three order bins at the same time. The screen displays an image of the product in the storage bin and indicates how many items need to be picked for each order bin.

An overhead high-speed camera scans items during the picking process. Additionally, specific packing instructions may be provided for items that require special handling, such as fragile or potentially leaky products.

Finally, operators verify the placement of items by pressing a button. After all items for an order have been picked, the order bin is released and sent back to the grid for temporary storage.

Outbound

Outbound process consists of two main activities, which are outload and dispatch.

First, regarding outloading, their outloading machines are crucial automation tools that insert empty delivery containers into bins for new orders and remove them for shipping. Once an order is ready, a robot retrieves the bin with the completed order and places it into the outloading machine. Inside the machine's separation module, a gripper takes the delivery container from its storage bin. The order remains in this container and is transported to the warehouse's outload zone via a conveyor. The warehouse execution software efficiently organizes and sequences these orders for shipment. Meanwhile, the empty bin transfers to the machine's combine module, where a new empty delivery container is added in preparation for upcoming orders

For dispatch, items are taken off the conveyor for further processing. Orders can be loaded directly into trailers, palletized, or placed onto slip sheets, frames, or roll-cages, depending on the situation. The packages then exit the warehouse to begin their last mile journey.

3.2.2. Benefits of applying robotic automation in warehouse management of Ocado

Inbound

First, robotic automation helps increase efficiency because clearly robots can do repetitive tasks and work continuously without the need for breaks, leading to a significant increase in throughput and faster inventory processing. Ocado's highly automated Warehouse Execution System (WES) software combines pick station logic with robot movement to ensure bins arrive at the right time, maximizing operator productivity. With an uptime of more than 99%, their high through-put workstations receive approximately 400 bins per hour, averaging under 9 seconds per presentation (Ocado Intelligence Automation, 2024).

Second, Ocado's warehouse system improves the accuracy, reduces human errors and improves inventory management. It offers comprehensive quality checks, ensuring timely and accurate order fulfillment timeliness, process transparency, and optimal labor efficiency.

Third, this system also reduces the demand for human workers, leading the warehouse to be faster, better and more accurate.

Moreover, OSRS significantly improves the working environment for human pickers by reducing physical strain and monotony. A cutting-edge warehouse environment, combined with

robotic support and the gamification of picking tasks through an intuitive User Interface (UI), improves job satisfaction and lowers the likelihood of workplace accidents.

And lastly, although initial investments can be high, long-term savings often outweigh the costs. Automation can help reduce labor costs, minimize errors and improve overall operational efficiency, resulting in a lower cost per unit for inbound activities.

Storage

First, robotic systems can use space more efficiently. Unlike traditional shelving or racking systems that take up valuable floor space, the grid employs a dense, cubic structure extending to the ceiling of the building.

Second, this system puts the most commonly ordered stock near the surface and center, helping minimize the time and number of robots needed to retrieve an order while slower moving stock is settled deeper and further away.

Third, Ocado's warehouse can provide large storage capacity. Bins can hold up to 66 pounds or 30 kilograms and can be stacked up to 21 high. This means a single stack can hold up to 1300 pounds or 630 kilos of stock.

Moreover, the grid's scalable modular design means it can fit into greenfield and brownfield sites of all shapes and sizes and even over multiple floors, enabling future expansion as business grows. The flexibility in the height of the grid helps to boost vertical storage capacity per floor by 1.5 times compared to the leading alternative cubic ASRS. Also, inventory management with OSRS is safer for humans, being zero-touch by design. This approach ensures the highest levels of safety and security for high-value or hazardous items.

Last but not least, being able to chill large areas of a warehouse consistently means the grid provides ideal storage for perishable items such as pharmaceuticals, biotechnology, cosmetics, horticulture, food and more.

Picking

Ocado's use of robotic automation in its warehouse operations brings several significant benefits in terms of several aspects:

First, robotic picking arms automate a large fraction of the picking process, handling products up to 1.5 kilograms and working with multiple items simultaneously (Ocado Intelligent Automation, 2024). This enhances efficiency, with the system processing 660 storage bins per hour to fulfill customer orders quickly (Ocado Intelligent Automation, 2024).

Second, the autonomous characteristics of these robots minimizes the need for human intervention, leading to faster order processing without the fatigue that human workers may experience.

Third, by using robotic arms, Ocado decreases its dependence on human labor, addressing issues like workforce availability and rising wages. This switch can reduce labor costs, significantly influencing operational expenses.

Fourth, the design of the robotic system allows arms to operate above grid cells, optimizing floor space and improving inventory management without requiring physical expansion.

Finally, AI - driven computer vision and machine vision sensors enhance picking accuracy, reducing errors and lowering return rates, which improves overall customer satisfaction.

In summary, Ocado's robotic automation enhances efficiency, saves time, reduces labor costs, optimizes space, and improves accuracy, positioning the company to meet the demands of modern e-commerce.

Outbound

First, putting empty delivery containers into bins for new orders and taking them out for shipping has clear benefits. This process allows picked orders to be stored safely back in the grid for a while before they are sent out. This secure storage helps keep things organized, making it easier to prepare orders for delivery. Moreover, it uses space more efficiently in the warehouse, reduces mistakes, and speeds up the whole fulfillment process. Overall, this system makes the workflow smoother and improves service for customers.

Additionally, the gripper in the machines can be adapted to different types of containers, which may help Ocado Group increase their range of products delivered.

Table 2. Range of products - regular store vs Ocado

Metric	Conventional supermarket	Ocado - due to automated warehouse
Range of products	28 000	50 000

Source: Nikolai Savushkin calculated from data from Wainewright (2017) and Ocado Technology (2023)

Ocado managed to provide a larger range of products in comparison with a regular supermarket (Wainewright, 2017). It is clear that by using "robotic hives," Ocado can provide 78.57% more products than traditional supermarkets, allowing them to customize their product offerings to meet the needs of various customer groups. The ability to temporarily store picked orders in the grid greatly simplifies the outloading and dispatch process. This approach reduces costs and lowers the risks of system failures that can occur with separate buffer storage systems.

4. Recommendations for Vietnamese e-commerce enterprises

4.1. Current situation of warehouse management of Vietnamese e-commerce enterprises

Vietnam’s modern warehouse market is experiencing notable expansion, driven largely by international investors. According to FiinGroup Vietnam, by the end of 2023, foreign entities controlled over 75 percent of the warehouse and factory rental space, significantly outpacing domestic companies with approximately 25 percent of the market (Ban Mai, 2024). This dominance underscores the rapid growth and increasing importance of the warehousing sector within Vietnam’s logistics industry.

Vietnam warehouse robotics market size was at USD 12.07 million in 2022, approximately 0.002% of global warehouse robotics market size (Fortune Business Insights, 2024). During the forecast period between 2023 and 2029, Report Ocean expects Vietnam warehouse robotics

market size to grow at a significant CAGR of 15.45% reaching a value of USD 32.82 million by 2029 (Report Ocean, 2023).

Currently, a lot of Vietnamese businesses hope to apply robotic technologies in their manufacturing practices; however, various barriers still hamper its effective application. (Nguyen Hang, 2018).

One major recent challenge for Vietnam warehouse management is the high cost of starting to use robotics solutions. Costs can cover robotics hardware, software, installation, and integration, which depend on the system's complexity and any custom features required. Businesses might also have to invest in training employees, improving their facilities, and ongoing maintenance. The high initial investment costs associated with warehouse robotics can be a significant barrier to adoption for many businesses, particularly SMEs operating on tight budgets (TechSci Research, 2023). The money needed to get started may be more than what they can afford right now, making it hard to see the investment as worthwhile.

Next, there exists shortage of highly specialized human resources in Vietnam warehouse management. Although many students pursue logistics, and companies annually recruit to find personnel to join their ranks, the essential need is for highly specialized staff (Eurorack, 2024). Dealing with low-skilled workers who do not fully understand proper warehouse management can lead to poor organization of items based on their characteristics then cause losses.

Regarding data privacy and security, it can be seen that the current situation of Vietnam is challenging, highlighted by a significant rise in cyber attacks due to potential lack of data privacy. The National Cyber Security Center (NCSC) reports that in 2023, there were 13,900 cyberattacks in Vietnam (Vietnam Plus, 2023). This alarming situation of data security can lead to severe effects on the application of robotic automation in warehouse management of E - commerce enterprises because automated systems rely heavily on the critical data provided by these enterprises. Therefore, data leakage or cyber attack on the robotic automation systems can hinder the growth of the Vietnamese E - commerce enterprises that use them. Concerns about cybersecurity can also slow down the process of applying robotic automation to warehouse management of Vietnam. Addressing the data privacy problems is essential to safeguard confidential information while enhancing the application of robotic automation in the warehouse management activities of E - commerce enterprises in Vietnam.

In conclusion, Vietnam’s E - commerce sector is experiencing rapid development, supported by significant growth in the logistics and warehousing industry. However, the challenges persist, including high initial costs of robotic solutions, a shortage of highly specialized human resources, and critical concerns about data privacy and cybersecurity. These barriers hinder the effective implementation of advanced technology in warehouse management. Therefore, addressing these issues is critical for fostering sustainability in the Vietnamese E - commerce ecosystem

4.2. Recommendations on improving warehouse management for Vietnamese e-commerce enterprises based on Ocado case study

Based on the Ocado case study and the current dynamics of the Vietnamese E - commerce enterprises’ warehouses, here are several recommendations for improving warehouse management among Vietnamese enterprises:

Prioritize incremental automation: To start, Vietnamese companies should prioritize incremental automation. Due to the lack of available funds and infrastructure capabilities, instead of a full - scale robotic system, E - commerce companies in Vietnam can start with smaller, more affordable automation solutions akin to Ocado's model. By incorporating robotic picking systems, businesses can boost efficiency, cut down labour costs, and reduce human error during the picking process. Moreover, before fully applying these new technologies within WMS, companies should also pilot test these systems to better assess the effectiveness and compatibility of the automation with their companies' needs.

Develop a skilled workforce: Second, it is crucial for E - commerce enterprises to develop a skilled workforce to effectively operate WMS with advanced technology like Ocado. The staff at Ocado are thoroughly trained to utilize advanced technology in warehouse management to achieve a high level of productivity (Ocado Intelligence Automation, 2023). For example, in the picking process, operators in Ocado's warehouse are trained carefully to use the picking workstation screen in order to monitor robots efficiently. According to the Vietnam Logistics Report 2023, the logistics sector is facing a significant skills gap, with a need for trained professionals in technology and management roles (Vu Minh Ngo, 2024). Therefore, these E - commerce enterprises can offer specialized training in aspects such as system administration, logistics management and data analysis to prepare their workforce to handle advanced WMS technologies more effectively. The Government should also introduce more policies to promote E - commerce and technology adoption, including providing incentives for businesses for better investment in employee training programs.

Invest in data privacy and security: Third, data privacy and security are also significant concerns of Vietnamese E - commerce businesses when applying robotic automation. In the case of Ocado, they are implementing a strong data protection system that has a Data Protection Officer (DPO), which is responsible for protecting data security of both Ocado and its clients (Ocado Intelligent Automation, 2023). Data security is an on - going process that requires constant monitoring and improvement to safeguard confidential information. Therefore, companies should implement strong data protection measures to protect against data thief and leakage. This includes conducting regular security testing, training employees on data handling, and implementing more data security programs, for example IBM Security Guardian Insights.

In short, the integration of robotic automation into Vietnamese E - commerce companies' warehouses is beneficial for the growth and competitiveness of these enterprises. By focusing on incremental automation, workforce training and ensuring data privacy, businesses can build a solid foundation for the successful implementation of robotic automation in E - commerce's warehouses.

5. Conclusion

In summary, the case study of Ocado's implementation of robotic automation in warehouse management provides valuable insights for Vietnamese E - commerce enterprises. Ocado's advanced technology, marked by high levels of automation and streamline processes, illustrate how technology can transform warehouse operations, enhance productivity, accuracy and overall effectiveness.

As the Vietnamese E - commerce sector continues to expand, highlighted by the increasing demand for warehouse robotic automation, local enterprises face both opportunities and challenges. Therefore, to grow more effectively, Vietnamese E - commerce enterprises should prioritize incremental automation, allowing for gradually integrating robotic automation into their current systems. Additionally, focusing on developing a skilled workforce will ensure that employees are equipped to optimize these new technologies, and investing in robust data privacy and security measures will be essential to protect confidential information and reduce the risks of using robotic automation in warehouses.

By adopting these methods inspired by Ocado, Vietnamese E - commerce can create a more solid foundation for successful robotic automation in their warehouses. This shift not only boosts operational efficiency but also positions these enterprises to thrive in a competitive market, contributing to the overall growth of Vietnam's E - commerce industry.

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