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Adoption of next generation robotics: A case study on Amazon

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Abstract

Robotics has opened up as a new business opportunity for both entrepreneurs and enterprises in the modern era. Most of the developed countries including Japan and the US have emphasizing on the use of robots to enhance productivity and improve the quality of products and processes. Changing life-style of people, exponential advancements in technology and retail innovation are encouraging both small and big enterprises to adopt robots to perform their day to day operations in a proficient manner. The following case talks about the use of the robotic muscle and computer- vision at Amazon. The retailer started its business as an online bookstore and later enhanced its product portfolio in order to meet the needs of a diverse population throughout the world. The case discusses the major issues faced by the US giant including the time spent on customer orders and preparation for shipping. The time spent was high leading to severe deficiencies and a created negative image of the enterprise in the minds of the customers. The present case also identifies the significant causes of deploying robotics by Amazon in its next generation warehouses for speedy product delivery. The case study also emphasizes the drastic changes occurring after the use of innovative technologies at the workplace. The study concludes with a brief note on the rise of the robots and its impact on bringing extreme changes in terms of improving the shipping network and quick delivery of its products to the customers.

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Introduction

Would the third generation Kiva robots be able to provide solution of timely order delivery for fulfilment and reduce customer experience related problems at Amazon?

In the increasingly digitised economies, retail enterprises have been adapting advancements in technology for successfully carrying out front-end and back-end operations. In order to accelerate the pace thereby triggering retail innovation, many companies have been concentrating on using robots throughout the retail value chain in understanding stores layout, making product recommendations and providing information about real-time product availability to their customers, and the like. The biggest influence of the use of robots beyond the realm of traditional jobs has been clearly being seen at Amazon- the biggest online retail store the world knows.

The idea behind thinking and implementing robots and new innovative technologies was started at Amazon after the failure of managing inventory and the stocking of stores with large collection. During Christmas in 2013, the company had disappointed its customers by late delivery of products and last-minute shipping. The US based e-commerce giant overpromised consumers to deliver gifts and other products under the Christmas tree (Bishop, 2013). Due to a sudden increase in orders, the courier companies UPS and FedEx were overwhelmed and due to mismanagement failed to meet the expectations of their customers within the stipulated time. This incidence forced the firm to refund its customers who failed to receive their Christmas orders on time. It created a negative impact in the mind of the customers. In order to solve the problem enhanced usage of robots in the warehouse and the supply chain management process was planned. Secondary data was collected from various authentic sources and different authors' views were considered for the study. The present case concludes with a brief note on the rise of robots and its impact on bringing extreme changes in terms of improving shipping network and quick delivery of its products to the customers.

Background of the study

The study revolves around the robotic muscle and the computer-vision at Amazon- a US based base electronic commerce firm. Amazon is one of the largest internet-based retailers in the United States offering domestic and international shipping services to its customers. Its main targeted customers were the internet base retailers (Heaney and Minkara, 2014). Since the past couple of years, the company was facing several issues regarding product delivery, labour shortage and several others. The present case concentrates on the major issues faced by the US giant like the excessive time spent on customer orders and preparing them for shipping. After the emergence of artificial intelligence and related new technologies new technologies, innovation has started triggering various e-commerce and the other related sectors(Cardinal, 2014) significantly and is causing disruptive changes. On the other side, building loyalty and show rooming effect has put a severe pressure on the profit margin of the firm and

forced them for effective utilization of its resources to meet the demands of the people by quick delivery of products within the stipulated time.

The present case describes how the management of the firm is concentrating on expanding their robotic workforce in other areas like warehouses and supply chain to grab the emerging business opportunities. Furthermore, the case provides an overview on the role of developing a robotics system to actually eliminate order errors and meet the expectation of the customers which the organisation has faced since long. The present case also explores the causes behind the excessive use of robotics so as to reduce labour costs and set-up automated systems to carry out the work effectively. On the other hand, the present case takes a look on the different challenges faced by Amazon regarding quick delivery of products and better performance as compared to the other competitors in the global arena. At the end some areas of concern have been discussed where new generation robotics could significantly be helpful for the company.

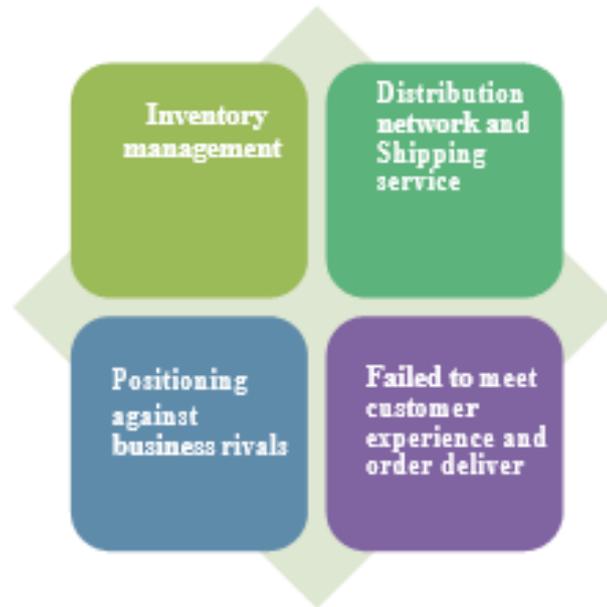
Problems faced by Amazon

It is a big challenge for e-commerce and retail enterprises like Amazon to develop meaningful insights about their customers and invoke predictive data about what the customers want so that their changing demands could be meet effectively (Paul, 2015). New generation robotics and artificial intelligence are completely changing the way of doing business in terms of cutting down labour costs and have been streamlining production in a significant manner. Besides this, some specific problems faced by the US based e-commerce giant could significantly be understood as follows.

- 1. Inventory management:** In the holiday season of 2013 and 2014, many of the customers were disappointed by late deliveries of products and last-minute shipping by firms. As a result Amazon had opened more number of warehouses for trying to manage its inventory and stock the stores with large collections of almost every possible item. In advanced economies, it is very tough decision for the companies to invest in building warehouses and operate them profitably. On the other side, the size of the inventories and offering of more products on its sites had also become unmanageable. Most of the time of the store managers and the workers was spent on customers' orders and preparation for shipping. It had become very hectic for the US base retail giant(Backer, 2015) and on the other hand, it was a big challenge for the e-commerce giant to pick two to three miles faster and deliver products to its customers. Furthermore, the enterprise had opened more shipping centers and hired more seasonal workers for improving their shipping services which helped them reduce the disappointment of the customers only upto an extent. But this reduction in the disappointment of the customers was only up to an extent and the further reduction could not be stalled

and the company was unable to solve the problem of quick delivery of products and services completely.

Figure 1: Problems faced by Amazon



2. **Distribution network and Shipping service:** Earlier the workers of the online retailer walked for miles to pick up items ordered by online customers and in the entire process of when an order was placed and when it arrived on the a doorstep involved a lot of time. Wallace (2014) stated that this kind of a problem led to the failure of the delivery of the orders in time for Christmas. It also created a negative image of the firm in the minds of the customers. Besides, the US base retailer spent several million Euros to determine the appropriate warehouse capacity and forecast the dynamic demands of customers which seemed inappropriate.(Gong 2013) described that in order to overcome such kinds of issues earlier enterprises adopted the Carousel and AS/RSs systems. But the online retail giant failed to meet the expectations of the people due to either overcapacity or shortage. It encouraged firms to use robots in its warehouses to help packaging and ship the orders effectively (Gong, 2013).As per the news of CNN Money (2015), the online mega-retailer focused on next-generation fulfilment centers with increasing speed of delivery at lower costs for customers (CNN Money, 2015).From reviewing the available different literature, it is clear that the US base retail giant had faced several issues that could be enlisted as follows:

- Failed to deliver the products on time
- Overcapacity and shortage of materials
- Lack of efficiency and productivity (Robin, 2016)
- The firm's largest warehouse was struggling to deliver heavy stacks of toys and others products to its stores employees and pack them within the stipulated time.

In such a kind of changing business scenario, Amazon was also looking for a new way for acquiring its products and service deliveries to its customers and it thought of doing them with the help of drones.

3. **Positioning against business rivals:** In the present time, enterprises and consumers are concentrating on adopting advancements in technology to reduce delay time and enhance efficiency. On the other hand, competitors of e-commerce US giants like eBay, and Netflix were concentrating on increasing the efficiency of moving materials within the warehouses and build all the warehouse operations automatically to enhance the experience of the customers and improve productivity (Tobe, 2015). Multi-channel and Internet retailers have created challenges for the US based retail giant by faster delivery of products and services to its customers. In order to better compete with online retailers like including eBay and Netflix the company is focused on increasing the efficiency of moving materials within the warehouses and build all the warehouse operations automatically. In addition, traditional retailers like Google and e-bay were creating a tough competition to Amazon by offering a variety of online services. The company had started to guarantee its services for improving the online shopping experiences and establish trust among its customers (Kumar, 2015). By maintaining customer loyalty for all its brands, the enterprises were able to better compete with other retailers in a proficient manner. Other reasons such as delivering books, toys and other products to the employees effectively etc. motivated the company to deploy 15000 wheeled robots.
4. **Failed to meet customer experience and order delivery:** According to Heaney and Minkara (2014), due to price point and offer better services, prime user of company in US switch to Alibaba and other retailers. On the other side, hard return policy and delay in product delivery are responsible for creating negative image of brand on the canvas of the mind of customers in changing era (Heaney and Minkara, 2014). Myriad supply chain challenges and introduction of free returns and buying online pickup facilities were also putting pressure on retail companies to engage their customers both in-store and elsewhere. In addition, many companies have started emphasizing on technological innovation in order to capitalize on the increased efficiency and thereby saving human effort.

Solutions offered

In order to adopt the technological advantages as soon as possible, enterprises in the United States and other advanced economies have started adopting robotic workforces to better deal with the fallout of its labour practices and enhance firm contributions in the consumer-dependent economy. The company was able to cut down operation cost and enable quicker delivery of its products to its

customers without any disruption by deploying more than 15,000 robots at its workplaces. The other main cause behind adopting the robotic technology was to avoid the mishaps like that of last year's holiday season (Seetharaman, 2014). The company installed Kiva robots at its warehouse in different locations like Ruskin, Florida, etc. In this regard, Amazon did one of the biggest acquisitions of Zappos.com to implement the future online fulfilment strategies in a significant manner (Ferrari, 2012). This change boosted the efficiency of the enterprise distribution network and made the job easier through adding newer technology.

Why did Amazon invest in the new Kiva systems?

There are several reasons which motivated Amazon to invest huge sums in the Kiva systems that could be described as follows:

- 1. Improving order picking and speeding up of order turnaround times:** In order to solve the problem the company tied up with Kiva, a high tech firm worth \$775 million to fulfil the demand of customers using robotics and a mobile order fulfilment system. (Griffiths, 2015) found that the company had 109 shipping centres which used squat robots to move heavy merchandise. The management of the US based retailer had adopted 15,000 Kiva robots across the U.S to deliver the entire warehouse racks to its employees. According to Amazon CEO Jeff Bezos, the enterprise had targeted an influx of 10,000 robots into the company's warehouses to help streamline efficiency and improve the workflow process.
- 2. Increase flexibility and scalability:** Adding more workstations, expanding the storage street grids and quickly updating information about the environment were the major features of Kiva that attracted the retailer to adapt it in its day to day operations. The robot design was based on parallel processing such that if at any time the robot went down, the redundant robot could take its place. Along restocking the shelves, the robots could perform picking operations also simultaneously.
- 3. Improving sales and customer satisfaction:** Besides this, in order to promote its sales, Amazon provided notifications and real-time tracking of its product facilities to their customers on order to boost customer loyalty and take advantage of the growing retail market opportunities in a proper manner. It was predicted that the online retailers would be able to automate warehouse operations and provide immediate gratification only after a purchase by the customers. According to Phil Hardin, Amazon's director of investor relation "The wider use of robots at fulfilment centres had a direct impact on the productivity. It was an investment that had an implication for a lot of elements of the cost structure, but we're happy with Kiva. It has been a great innovation for use, and we think it

makes the warehouse jobs better, and we think it makes our warehouse more productive.”

- 4. Other causes behind considering Kiva robots in operations:** Reduced electricity consumption (5 minute battery charges), increased level of inventory accuracy and movement of products with high security to specific workstations could reduce the probability of shrinkage and improve operating environment that involved people. Apart from this, reduced training time, no down-time and continuous order fulfilment benefits could be achieved by adapting Kiva systems.

Results and business benefits due to the adoption of new innovations at the workplace

The major impact of this innovation was on the logistic and the supply chain network which could be highlighted in terms of cutting the process from several hours to 30 minutes. In order to open up new business opportunities, the enterprise had doubled the number of robots working in its warehouses. The organization controlled its robots by a centralized computer using secured Wi-Fi network and floor cameras to read the QR codes on the ground.(Demaitre, 2015) argued that the main purpose behind this was to shift resources from the physical stores to the warehouses without any disruption and meeting the consumer demand for the ever-faster order fulfilment. Apart from this, it also provided an opportunity to the firm to retain its existing customers and attract newer customers for a longer period of time. According to (Kumar, 2015) robot could play an important role throughout the value chain and execute diversified activities in different areas like customer assistance, employee assistance, compliance audits at workplace and the like. In addition, firms could be able to grasp business benefits such that quicker fulfilment of online orders and loading them into carts to ensure faster fulfilment etc. The changes came only after the installation of robots at Amazon and had an impact on the overall performance and efficiency in different areas of the firm like:

- 1. Reduced delay in product delivery:**(Daniels, 2015)in one of his studies concluded that by using robotics and innovations at the workplace, firms got positive results. By using these systems, enterprises were able to retrieve items quickly thereby enabling quicker delivery of ordered items to their customers. It also enhanced their shopping experience and loyalty of customers in the hyper competitive arena (Daniels, 2015).The positive impact of this move taken by Amazon could be seen in the form of avoiding huge initial investments and filling orders effectively across nations. In addition, it helped enterprises build a strategic advantage over the other business rivals by adding robotic platforms to its warehouses in order to improve efficiency. Robotic usage is still facing several issues in areas such as shelving, packing and checking for damaged items etc. In addition, Amazon is thinking of delivering orders by drones to meet the significantly high festive demand. Apart from this, the Tracy centre was also able

to hold 20 million items and represent 3.5 million different products to customers in a significant manner. By using the robotic systems, the firm was able to ship 700,000 items in a day and reduce its operating costs by 20 % (Griffiths, 2015).

- 2. Increasing efficiency and financial gains:** Drastic changes arose after Amazon adopted the next generation robots in the form of increased efficiency and productivity and enabling employees to focus on high value-adding tasks such as better systems to unpack truckloads of inventory, cutting down the time spent by the employees in walking to collect items in an order and cut the process from several hours to 30 minutes etc. Apart from this, adoption of such technology helped the enterprise to enhance its sales from \$71 billion 10 years ago to \$4.5 trillion in the year 2014. In addition, its holiday sales hit \$89 billion which was 13% high as compared to 2013 (Tam, 2014). Since Kiva's acquisition, the US based retail giant was able to reduce the average amount of time it took to locate an item and enable the company to deliver millions of items to customers in the promised time. Amazon's robots might have travelled 93.2 million miles' distance to workstation still 2014 (Valerio, 2015). Besides, due to adapting next generation warehouse technology, the enterprise was able to meet the demand of UK customers on the Cyber Monday which was the busiest day of the year and worked out to be £7,000 a second. It was found that Kiva robots were able to pick products two to three times faster than manual workers (Griffiths, 2015).
- 3. Improve productivity:** In addition, the demands of the customers were rapidly changing and in order to attract them e-commerce companies across the world were focusing on delivering high-touch personalized experiences to attract and retain them with firms for a longer period of time. Because of the contribution of the robots in increasing productivity and efficiency, the management of the company installed 9,000 additional robots by the end of 2014 (Cardinal, 2014). On the other hand, there was a significant reduction in the number of workers required at a particular location and the provision of immediate gratification after a purchase could happen only after the adoption of the new generation robotics technology by Amazon. The company could also focus on developing partnerships with various national and international courier operators in order to deliver goods in the fastest possible time.
- 4. Customer assistance:** The other benefits of adopting and implementing Kiva robots at Amazon could be seen in the form of providing a range of value-added services like servicing customers at checkout counters and searching for the right product by guiding them (Bhasin and Clark, 2016). Kiva robots could hold up to 750 lbs (340kg) of merchandise and track items on each shelf as orders come in. After using Kiva Robots the company was able to help customers by picking a virtually endless variety of goods from warehouse shelves and delivering these selected items within the stipulated time. Due to shipping more than 700,000

items in a day, the firm would be in a better position to service its customers and meet the changing demands properly (Griffiths, 2015).

5. Labour reduction and cost saving: A wider selection of merchandise, eliminating the need of humans to walk down, cut processing times and automated material handling system could be seen as the major advantages of implementing robots at the workplace. However, Kiva-equipped facilities would also reduce staffing levels at newer warehouses by doing human tasks. According to Michael Pachter, an analyst at Wedbush Securities, due to an increased dependency on robots, “**Real life workers would be losing their jobs and they would have lesser less opportunity to do**”. In addition, Dave Clark, Amazon's senior vice president ensured that employees would not be negatively affected by Kiva (Chang, 2014).

Conclusion

It could be significantly identified that Amazon and other retailers have been seriously emphasizing on the use of robots in their distribution centres in order to enhance productivity and efficiency of business processes. Adoption of innovative technologies and robots have helped Amazon in bringing down the time needed to deliver the products and services to its customers. Looking in to the adoption and installation of robots in diverse areas, it is clear that their adoption improved productivity and enabled employees to focus on high value-added tasks. From the customers' point of view it could be said that by taking the help of robots, the firms could get the products to the consumers as fast as possible, reinvent customer experience, change the way consumers look at shipping and enhance awareness of the customers' interest in products and services of the firm. It is quite clear that along with the adoption of third generation robots, Amazon was also trying to address four the four key issues- price, selection, experience and convenience. However, in order to better compete with Walmart and other retailers, it is essential for firm to turn its stores into online pickup points and rethink how and where they distribute their products so that customer's convenience and brand loyalty could be enhanced. Hence, it could be said that after adopting robots, Amazon was able to fulfil better and more orders and improve customer experience in a significant manner.

The company could concentrate on creating a personalized shopping experience to derive participation from its users and solve their issues in a proper manner. The company could concentrate on adequate implementation of customer engagement strategies such that customer reviews and product reviews etc. and proper utilization of vast quantities of user-generated information strategies could be used to take appropriate business decisions. The management of Amazon could focus on integrating robotics with customer analytics and Robotics-As-A-Service to reduce upfront cost and improve their performance quickly (Kumar, 2015). By adopting

robots, Amazon will be able to aware customers about real-time product availability and make product selection recommendations similar to retail value chains. Newly adopted robots will be able to carry out different activities such that an auto-checkout when items are added or removed from shelf, serve as shopping assistants, and understand facial expressions, gestures, and body language of customers to know their attitudes about products and services etc. Along with this it could also be said that, robots could be beneficial for the US base e-commerce giant in terms of identifying suspicious activity based on motion and send alerts to the store manager to overcome chances of theft and other security related issues. Further the e-commerce giant could use robots to deliver a variety of value added services to its customers including price comparisons, gift-wrapping, dispensing loyalty coupons and currency exchange at different service counters in a significant manner.

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Appendix 1: Working of Robots at Amazon



Figure 2: Order fulfilment process
(Source: Seetharaman, 2014)



Figure 3: Warehouse at Amazon
(Source: Seetharaman, 2014)



Figure 4: Kiva robots
(Source: Demaitre, 2015)



Figure 5: Warehouse robots
(Source: Demaitre, 2015)



Figure 6: Warehouse shelves
(Source: Bhasin and Clark,2016)