

CASE 2 | Amazon's Order Fulfillment, Automation, and Technological Unemployment

“Work Hard. Have Fun. Make History.” So reads a sign above the entrance to many of Amazon’s fulfillment centers throughout the world. Inside these massive fulfillment centers, millions of products are waiting to be shipped to the doorsteps of customers. Historically, human pickers walked the aisles of these warehouses, pushing carts with baskets as they deposited items that were awaiting to be shipped to someone, from somewhere, who ordered the product online. More and more, robots are being used to support and many times replace these human workers.

While the data are constantly changing, in May 2016, Amazon operated nearly 300 centers across the world to handle order fulfillment, sorting, and delivery for Amazon and Amazon Prime customers. In addition to the United States, fulfillment centers are located in Canada, Mexico, the United Kingdom, Germany, France, Italy, Spain, Czech Republic, Poland, China, Japan, India, and Brazil. The United States alone has more than 160 facilities, with many larger than 1 million square feet. With such a network, Amazon provides same-day delivery to an increasing number of cities including New York City, Atlanta, Baltimore, Boston, Chicago, Indianapolis, Philadelphia, Washington, DC, Dallas, Los Angeles, Phoenix, San Francisco, and Seattle. Amazon has been very strategic about where it places centers. For example, in late 2015, it was estimated that its current centers bring it within 20 miles of 31 percent of the U.S. population. Clearly, Amazon is now competing with many local businesses that always had the advantage of same-day delivery.

As Amazon races for fast order fulfillment and reducing costs, it is very actively integrating robots into the order fulfillment process. An average human picker at a fulfillment center can pick around 1,000 items a day. While humans have fueled Amazon’s success in the order fulfillment process, humans are becoming the weak link as facilities get bigger and competition necessitates faster and less costly processes. Robots don’t get tired, don’t need to take lunch or toilet breaks, can work 24 hours per day, and will only make mistakes if the databases driving their operations contain an error. There are, however, many tasks that humans can perform better than robots, at least at this time. For example, robots are still incapable of tasks that require fine manipulation or improvisation. Because of this, Amazon and other large retailers are exploring ways for robots to collaborate with humans in more effective ways.

One approach for utilizing robots is to fundamentally change the picking process. Rather than have workers walk the aisles of these massive warehouses, why not have the shelves come to the pickers? These robotic shelves, sitting atop a small robot about the size of a footstool, know which products are on its shelves. Computer control guides these shelves to a particular picker, who can select the next product needed for an order, and can simultaneously optimize the movement and sequence of a countless numbers of shelves. The shelves can be kept very close to one another as they wait for inventory replenishments or to deliver a product to a picker. Shelves can also be packed tighter. The process is much more efficient than having humans walk around massive warehouses.

Historically, automation has often been viewed as a double-edged sword, providing both benefits and problems for society. Benefits could include the elimination of dangerous jobs, but at the same time, the technology also creates unemployment. Over the years, while technology eliminated some jobs, it often was the catalyst for the creation of new types of jobs, often with better pay. When automation was brought to family farms, for example, a single farmer could work much larger farms, producing enough food for many families. Such productivity gains resulted in the elimination of many farming jobs. These displaced farmers often then moved to the city to work in factories to produce even greater productivity gains in farming and other industries.

As the digital world accelerates change, emerging technologies like industrial robots, artificial intelligence, 3D printing, and machine learning are forecasted to eliminate a variety of jobs at a pace faster than ever before. When automation kills more jobs than it produces in other industries, this is called *technological unemployment*. Historically, such widespread fears of technological unemployment have been viewed as a Luddite fallacy, but now, many fear that a tipping point has been reached where technology will rapidly eliminate not only blue-collar jobs needing manual labor but also many jobs where humans make decisions, so-called white-collar jobs. In fact, some 47 percent of present jobs in the United States could be computerized in the next 10 to 20 years, according to an Oxford University study. How far and how fast this change appears will have a tremendous impact on the digital world.