

# EXECUTIVE SUMMARY

## The E-commerce Industry in China

E-commerce is the act of buying or selling products online over the internet. China has the largest e-commerce market in the world, having grown by 50 percent per year since 2011 and is expected to be worth USD one trillion in 2019. As the e-commerce, or online shopping, industry continues to grow larger and larger, businesses continue to turn to new technology to keep up with increasing demand.

## Warehousing and E-Commerce

The customer's demand and the pursuit of a better shopping experience puts tremendous pressure on the e-commerce companies forcing them to build better warehouses to satisfy the customer. Warehousing in the e-commerce industry has three purposes. They are storage, order fulfillment and product security. Companies can store their products in warehouse to ensure they have a surplus of merchandise to supply to their customers when demanded. This practice allows businesses to build inventory in anticipation of demand and satisfy the surge when it occurs.

## Our Project

Before arriving in Hangzhou, we anticipated our project would focus on warehouse practices and technology that are currently used in a local warehousing company called High Store Tech and provide them recommendations for improvement. Our plan was to collect operational data on High Store Tech and benchmark that data against other e-commerce warehousing companies. Once completed, we would have interpreted the data and identified best practices performed by each company.

Once we arrived in China, we learned that their automated warehouse would not be operational until January 1st, 2020 due to a change in business plans. This led us to shift the focus of our project to the future of warehousing technology while still analyzing the data High Store Tech collected during trial operations conducted before we arrived.

The purpose of our project is to research the technology used at High Store Tech and other warehouse logistics companies to observe warehouse practices, present an analysis and recommendations for the future of warehousing.



## Our Approach

Before the shift in our project, we collected efficiency data from other e-commerce companies. We categorized the other e-commerce companies based on their generated revenue. We then used the data to compare High Store Tech to each category of e-commerce companies and present an analysis. This study of current e-commerce warehousing companies inspired us to research future technology that experts believe will be developed in the near future. As young engineers, we took this opportunity to apply our problem-solving technical minds to think about current problems found in warehouses and brainstorm our own technological solutions. Inspired by our data collection, research and brainstorms, we provided a set of recommendations to the Smart City Research Institute to assist e-commerce warehousing companies prepare for future technology.

## Current Practices and Challenges

In our research on warehousing companies we found several practices common between many prominent companies. Some of these practices include technologies, like sensors and robots. Others focus on optimizing existing systems, like improving the layout of the warehouse floor and how pickers complete their routes. We also found multiple accounts of common problems faced by warehouse companies. These problems helped us to focus our work on areas which would make good candidates for us to improve. These problems included nonoptimal storage space and the frequency with which warehouse workers are injured at work. Knowing these issues and the current practices implemented by warehousing companies, we had a foundation to build our brainstorms and recommendations on.

## High Store Technologies

Our sponsor, Prof Zhou and the smart city research institute, has arranged for us to visit and study a Hangzhou based e-commerce warehousing company called High Store Technologies. During our two visits to their facilities, we observed the processes in their conventional warehouses and interviewed the managers as we toured the facilities. We also learned about their newly developed automated picking system called the Ferris Wheel.



## Other E-Commerce Companies

To understand how High Store Tech compares to other e-commerce companies, we analyzed performance data on High Store Tech's new automated picking system provided to us by Wenwu Ping. We were able to calculate order fulfillment rates, warehouse floor area, and revenue streams based on the provided data. We researched similar performance data on nine other e-commerce companies, classified them by revenue size and then compared them to High Store Tech.

We found that High Store Tech is a small revenue e-commerce warehousing company. Once High Store Tech has their automated picking machine operational, they will package orders at a rate faster than any of the small companies we researched. Not only that, but their rate of packages processed per unit area of the warehouse is comparable to the medium and large companies researched. Based on our data, High Store Tech is ready to make the jump to a medium revenue company and potentially a large revenue company in the future.

## Future Technology

Learning about current practices and comparing High Store Tech to other warehousing companies provided us with an understanding of how technology may advance in the future. Before developing our own ideas of what technology may emerge to solve current problems in warehouses, we researched what technology experts are expecting to develop.

## Our Ideas

After learning about current warehouse technology and researching what technology experts expect in the future, we were inspired to brainstorm some of our own technologies that provided solutions to problems we identified in the warehouse. As young engineers, we feel that we can provide a new perspective on how to solve problems in the warehouse. We categorized our brainstorms into three categories based on when we think they will emerge in the warehousing industry. The near future category we anticipate will be in the next five to ten years. The distant future technology category we anticipate emerging in the next ten to twenty years. Finally, we tried to think as abstract as possible and think of technology that will maybe be used someday.

## Recommendations

We provided recommendations to the Smart City Research Institute to assist e-commerce companies in adapting to the developing warehousing technology. The recommendations we came up with focus on three areas. These areas are technology, the environment and people.

