

AMAZON– OPERATIONS

AMAZON ROBOTICS STOW ERROR REDUCTION

Student Team:

Taabish Faraz – Master of Supply Chain Management

Aaron Silver – Dual (MBA/Master of Science in Natural Resources & Environment)

Project Sponsors:

Mike Fisher – Senior ACES Master Black Belt, North America

Dave Graybeal – Director, Quality, North American Fulfillment Centers

Govind Singh – Senior ACES Quality Program Manager

Faculty Advisors:

David Kaufman – College of Engineering

Amitabh Sinha – Ross School of Business

Amazon is a \$100 billion company that has established itself as the world leader in online retail. It has a complex logistics network that acquires, stores, packages, and sells its own products as well as those of third-party sellers. The Amazon Tauber project took place at the Ruskin, Florida Fulfillment Center; commonly referred to as TPA1. TPA1 opened in September 2014, coinciding with the early 2014 roll out of Amazon's proprietary Amazon Robotics fulfillment technology. TPA1 is a 1.2 million square foot Amazon Robotics fulfillment center that employs over 1600 Amazonian associates, processes 1.9 million inbound units weekly, has 11 million units in inventory, and processes 1.7 million outbound units weekly.

Amazon Robotics uses game-changing automation technology for its fulfillment centers that help simplify operations and reduce costs while increasing strategic flexibility. Using hundreds of autonomous mobile robots and sophisticated control software, the Amazon Robotics mobile-robotic fulfillment system enables extremely fast cycle times with reduced labor requirements and improved capacity. With the development of this new fulfillment application, best practices for human to robotic interface are still in their infancy and are a few iterations away from full optimization. Specifically, the stow department process of replenishing Amazon Robotics pods is subject to high levels of error injection. Currently, stow errors account for 43% of errors at TPA1 and 33% of errors within the Amazon Robotics Sortable network.

The Amazon Operations Tauber team partnered with the ACES (Amazon Customer Excellence System) quality team and was incorporated into their strategic Lend Forward initiative to solve the company's most complex problems. Using in-depth six sigma DMAIC methodology, the Tauber team determined that the top drivers of stow errors are items being stowed under wrong bar code, wrong quantity, and wrong location. All of these result in a physical-virtual mismatch that produce cascading cost impact to pick department productivity, problem solve maintenance, expedited delivery, and potentially, to customer experience and seller reimbursement.

Using statistical hypothesis testing, the team was able to identify the significant inputs to stow error introduction. The team focused on isolating all manual inputs that were contributing to the occurrence of stow errors and replaced them with mechanisms that preclude root cause error injection. The team then conducted a pilot with the improved mechanisms. The process improvement pilot netted a total reduction of wrong bar code, wrong quantity, and wrong location errors. With the changes, a 29% error reduction at TPA1 is expected. Additionally, the process improvement netted a 42% productivity improvement. The expected annual stow error reduction improvement cost savings is projected at \$1.6M at TPA1 alone and \$14.4M across the Amazon Robotics Sortable Network. If the productivity improvement proves scalable the cost savings are projected at an additional \$14.5M in annual savings across the Amazon Robotics Sortable Network.