

AMAZON – OPERATIONS

AMAZON FULFILLMENT COUNT OPTIMIZATION AND DEFECT REDUCTION

Student Team:

Benjamin Lewis – EGL (BSE Mechanical Engineering/MSE Industrial & Operations Engineering)
Vikram Raghavan – Master of Supply Chain Management
Anand Vasudevan – EGP (MSE in Industrial & Operations Engineering)

Project Sponsors:

Dave Graybeal – Director, Quality, North American Customer Fulfillment (NACF)
Govind Singh – Principal Program Manager, ACES Quality

Faculty Advisors:

Jeff Alden – College of Engineering
Mohamed Mostagir – Ross School of Business

Amazon is the largest online-based retailer in the United States. To manage inventory owned by both Amazon and sellers in the Fulfillment by Amazon (FBA) program, Amazon operates 80+ Fulfillment Centers (FCs) across North America. As Amazon continues its steep trajectory of year-on-year growth, its fulfillment network also continues to expand at an exponential rate. Amazon plans to open up over 20 new FCs in the first three quarters of 2016 alone. With such rapid expansion, the cost of maintaining high levels of quality has also increased significantly.

To mitigate these rising costs, the Tauber team focused on two separate opportunities within quality — Count Optimization and Defect Reduction. Count optimization focused on improving productivity levels of Cycle Count, a non-value added, but necessary, process used to resolve inventory inaccuracies (defects) within a fulfillment center. Defect reduction addressed the root cause of these inaccuracies, specifically in the pick and stow processes, which together account for 47% of all defects across North American fulfillment. The facility selected for this project was BFI4, located in Kent, WA. BFI4 is an Amazon Robotics (AR) FC which opened in March 2016. It has a footprint of over 900,000 square feet and has over 18 million units of inventory.

The Amazon Operations Tauber team collaborated with the ACES (Amazon Customer Excellence System) Quality team and also participated in the strategic Lend Forward training program, which helped facilitate the problem-solving process. For count optimization, six sigma methodology helped the team determine that the top drivers for slow counting rates were hand scanner use, distance between bin and working surface, and ladder use. Collectively, these lead to poor productivity and ergonomic constraints at AR stations. For defect reduction, the team focused on identifying leading indicators or risk signatures, which were subsequently used to provide near real-time coaching and feedback to associates. Risk signatures are metrics captured real-time that indicate both a deviation from standard work as well as potential generation of defects. Due to feedback being delivered real-time, problems were identified at their source and resolved immediately before they propagated into large scale defects.

Using statistical hypothesis testing, the team was able to identify significant sources of waste in the counting process. The team then developed solutions to directly address each one of these opportunities. To validate these solutions, the team conducted a pilot which demonstrated a 70% improvement in productivity while showing no difference in quality. Certain aspects of the design also demonstrated potential safety improvements. For defect reduction, the team identified seven statistically significant risk signatures across pick and stow. Using an internally developed quality visualization tool, the team piloted a real-time quality management system for pick, for both BFI4 and the entire fulfillment network. The pilot saw a reduction in overall defects per million opportunities (DPMO) by 68% at BFI4 and 30% at all FCs combined. If implemented network-wide, potential cost savings for count optimization and defect reduction are projected at over \$10M.