ABOUT QUEST

Quality Enhancement Systems and Teams (QUEST) is a multidisciplinary engineering, technology and management program at the University of Maryland. Students participate in a challenging course of study that focuses on quality management, process improvement, and system design. Funded in 1993 by a grant from IBM to establish total quality on university campuses, the University of Maryland has continued the program which has produced excellent graduates prepared to face the changing landscape of business, engineering, and technology.

A. JAMES CLARK
SCHOOL OF ENGINEERING

COLLEGE OF
COMPUTER, MATHEMATICAL,
& NATURAL SCIENCES

ROBERT H. SMITH
SCHOOL OF BUSINESS

QUEST Honors Program
1407 Van Munching Hall
University of Maryland
College Park, MD 20742
December 9, 2015

Dear QUEST Seniors:

Congratulations to each of you! All of us are very proud of your accomplishments.

You have put a great deal of energy and spirit into your projects, and it shows. Though the QUEST standards are academically rigorous and challenging, you have surpassed them.

I am very fond of this program because it prepares you to work collaboratively in multi-disciplinary teams— an experience you are likely to encounter after graduation. Hands-on experiences like this make great preparation. Please stay in touch through the QUEST alumni network so that we can know how you are doing.

We wish you all the best today in your conference presentations and great success in the next phase of your lives.

Sincerely,

Wallace D. Loh

President, University of Maryland
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PROJECT SUMMARY

The Advisory Board Company (ABC) is a global consulting, research, and technology firm, headquartered in Washington, D.C. With over thirty-five years of experience, ABC serves over 3,900 members, or clients, in the healthcare industry and over 600 members in the higher education industry. Alpha Bet worked with ABC’s Workforce Analytics team, led by QUEST alumnus Kevin Zhan, over the course of the semester to solve a pervasive employee management problem. One of the largest issues facing ABC over the past few years has been increasing workforce attrition. Moreover, a recent increase in employee turnover is both concerning and costly for ABC. Replacing departed employees is expensive for any organization, and ABC is no different. Given these increasing costs, ABC wants to combat workforce attrition proactively, that is, the Company aspires to directly address the departure issue rather than simply treat the symptoms. Toward this end, Alpha Bet was asked to architect a data-driven predictive engine capable of identifying the employees most likely to leave ABC.

CONTRIBUTIONS AND RECOMMENDATIONS

To search for meaningful trends and relationships in the data, Alpha Bet Consulting sifted through thousands of data types and tens of thousands of employee data points. After analyzing the available information and thoroughly cleansing the dataset, the team began the model construction process. Insights drawn from a review of industry research, data exploration, and client interactions drove the team’s decision making throughout the model building process. Experimentation with several different modeling methods and prediction parameters produced a classification model capable of predicting 85% of employee departures. Ultimately, Alpha Bet delivered the software model along with system implementation reports to facilitate turnover prediction, attrition analysis, and the company’s move towards a more robust proactive talent management system.
PROJECT SUMMARY

AT&T is a leading international technology solutions and product provider that works closely with businesses of all sizes. Customer service is very valuable to AT&T, and therefore, the larger companies are often given their own Service Managers (SM). SMs ensure that arising client problems are resolved in an efficient manner. Additionally, SMs proactively create positive client connections and associations with AT&T. AT&T's 2020 Vision entails further automating the company by 2020. Reaching that goal requires cost reduction. AT&T was tasked with finding cost drivers within the Service Manager department. To do so, the team was asked to develop a Time-Based Activity-Based Costing (ABC) Model for analyzing the SM department, and more specifically, the Service Delivery (SD) Function within the job. ABC is an accounting function that breaks down time distribution of activities to determine cost association. AT&T was able to develop this model through analyzing four months of Service Manager time tracking (OTIS) data and interviewing Service Managers.

CONTRIBUTIONS AND RECOMMENDATIONS

AT&T was able to use qualitative and quantitative data to develop recommendations. Qualitatively, the team conducted interviews with SMs. Then, AT&T used the interview results to interpret the quantitative OTIS data. The analysis yielded an ABC model, enabling AT&T to understand the cost drivers (types of orders) and assign the appropriate number of service managers based on product and activity. Thus, AT&T developed three core recommendations. The first is that AT&T should cease selling legacy architecture products, Local and TDM. Removing these products would save AT&T 12% of the total SD process cost in terms of SM time. Second, the qualitative data indicated that certain SD time benchmarks designated to fulfill tasks need revision. The third recommendation is redesigning the SM department structure. The research indicates that SMs should no longer be assigned to individual clients; instead, AT&T should pool the SMs who address arising client concerns.
Redefining Service Management
Cost Reallocation for AT&T’s 2020 Vision

Mission

AT&T has a vision to automate its service network by 2020. To fund this initiative, AT&T needs to identify how their money is being spent in order to more efficiently allocate resources. AT&T has been tasked with evaluating the cost drivers in the Service Delivery (SD) function of the Service Management department. Service Delivery concerns all the activities from a product order to its delivery and installation.

Current State of Service Delivery

Service Managers
Serve as the face of AT&T to big business clients. Address client concerns while fostering personal, long-term relationships with clients.

Product Offerings
AT&T has introduced a new type of product that is superior to both the TDM and Local product types in terms of amount of resources required.

Optimized State of Service Delivery

Service Managers
The face of AT&T to big business clients; assist with solving problems for any client that calls them. Rather than each client having a specified Service Manager, there would be a pool of Service Managers. At an extra charge, clients could request a personal Service Manager for assistance with all tasks.

Product Offerings
Continuing to offer legacy products TDM and Local is costing AT&T $378,089 per year. Encouraging clients to migrate over to the newer products faster will allow AT&T to save resources.

Impact

$378,089
Saved per year in Service Delivery

- Increase Customer Satisfaction
- Reduce Customer Cycles
- Save 5841 Hours

Approach

1. Clean Up Data
2. Conduct In-Depth Interviews
3. Analyze Data
4. Produce Recommendations

Recommendations

- Evaluate the Service Delivery Process
  Analyze current times allotted to complete tasks to see if standard intervals can be shortened for increased customer satisfaction.

- Define the role of Service Managers
  Differentiate between problem-solving and relationship-building tasks with call center model, where SMEs take calls from clients regarding specific problems.

- Reallocate resources
  Advocate the promotion of products that rely on Internet protocol (IP)* technology for their functionality to customers and cut back on production and advertisement of products that do not.

- Why IP? More efficient, enhances control over features using software rather than having to change hardware

Team Members:
- Ranwula Gwam
- Mechanical Engineering
- Naomi Lieberman
- Marketing / Info-Systems
- Joseph Rubinstein
- Marketing / Supply Chain
- Amy Shin
- Marketing / Finance

Faculty Advisor:
- Dr. Pragyan Basu

Project Champions:
- Bill Skulnis
  Director of Project Program Management
- Lisa Morales
  Lead Chief of Staff
- Greg Rose
  Senior Quality Manager
THE QUEST · BD PROJECT
IMPROVING THE EFFICIENCY OF QUALITY CONTROL TESTING ON A MEDICAL PLATFORM

PROJECT SUMMARY
Becton, Dickinson and Company (BD) is a Fortune 500 medical technology firm that produces medical supplies, medical technology, and diagnostic instruments for the healthcare industry. One of BD’s diagnostic products, the BD MAX System, is used to detect a variety of diseases contained within human blood samples. The BD MAX System is manufactured in Sparks, Maryland where it moves from research and development to instrument production before it is released to customers worldwide. The final manufacturing test, called the Final Acceptance Test (FAT), requires single-use components that are expensive and time-consuming to run. ACE Consulting worked with BD to develop a revised testing protocol for the BD MAX System. By providing a series of recommendations to improve the current testing protocol, ACE Consulting will streamline the FAT process and decrease the cost of instrument testing.

CONTRIBUTIONS AND RECOMMENDATIONS
ACE Consulting applied a DMAIC (Define, Measure, Analyze, Improve, Control) process improvement strategy to optimize the BD MAX System testing procedure. Our initial data collection consisted of site visits to BD’s manufacturing facility in Sparks, MD where we conducted interviews with key stakeholders. To support the qualitative data gathered, ACE Consulting analyzed one year of FAT data and established critical areas for improvement. ACE Consulting determined trends from the data and developed a series of core recommendations that optimize the testing process by minimizing time and money spent on testing. Our proposed test is 1/8 the cost of the current test and maintains the integrity of the current test. Our recommendations streamline the BD MAX System qualification process in a cost-effective manner to efficiently test BD MAX Systems while maintaining quality.
Becton, Dickinson and Company is a Fortune 500 medical technology manufacturer that provides medical supplies, devices, and technology for the healthcare industry. The BD Diagnostics unit specializes in manufacturing tools and equipment for specimen collection and disease detection.

**Current State:**
The BD MAX System is a disease detection instrument that has a costly and time-consuming quality control process.

<table>
<thead>
<tr>
<th>Manufacturing</th>
<th>Testing</th>
<th>Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>240 systems manufactured per year</td>
<td>8 tests per system 2-3 hours per test</td>
<td>$172 per test</td>
</tr>
</tbody>
</table>

$330,000 annual material costs

16-24 hours per system

$42,000 annual material costs

8 hours per system

Recommendation: Melt Test Analysis

- Maintain Manufacturing Quality
- Reduce Testing Time
- Lower Material Costs

The proposed melt test will maintain the integrity of the previous test while using cost-efficient components. This will allow BD to scale manufacturing of the BD MAX System to meet projected demand.

Unlike the current quality control process, which takes 2-3 hours per test, the melt test analyst takes 50 minutes per test. This leads to an overall time savings of approximately 8 hours.

One melt test kit costs $1,000. Each kit can test up to 6 BD MAX Systems. Therefore, BD only needs to purchase 40 kits annually to meet manufacturing demand.

Project Champion: Joel Krayer, Dr. Adam Steel
Faculty Advisor: Dr. Ian White
QUEST Faculty: Kylie King, Dr. Jeffrey Herrmann
PROJECT SUMMARY
Booz Allen Hamilton is an American management consulting firm that has more than 22,000 employees and is headquartered in McLean, Virginia. Its core business is the provision of management, technology, and security services to civil and commercial entities. As a consulting firm, the success of Booz Allen Hamilton is dependent on its ability to win client project bids and to optimize the use of its most important resource, human capital. However, Booz Allen Hamilton is not operating optimally. Firm-wide expertise is inaccurately represented and inefficiently identified, which causes resources to be overlooked or poorly allocated during the project staffing process. The tool used by the firm to capture, house, and search for expertise information, the Zone employee profile, does not meet project staffing needs. The goal of this project is to improve the ability of Booz Allen Hamilton to identify internal talent by reinventing the existing employee profile and search tool.

CONTRIBUTIONS AND RECOMMENDATIONS
BAND Advisors conducted interviews with management which revealed that the limitations of the Zone profile tool contribute to shortfalls in the staffing process. With these insights, the team designed surveys to gauge employee attitudes toward potential improvements to the tool. The team then iterated through Zone profile designs based on feedback from usability testing and ultimately developed an ideal prototype. Survey data from 48 employees revealed that about 98% feel that the team’s proposed improvements would shorten the process of finding expertise within the firm. Over 93% also claimed that they would keep their own profiles up-to-date because of these improvements. Assuming a conservative 7% reduction in external hiring and a 10% reduction in manager time spent on internal staffing, the team’s recommendations would save the firm $1.38 million per year. Increased accuracy of talent data would also enable executive leadership to make more informed decisions in line with Booz Allen Hamilton’s strategic goals.
Optimizing Expertise Utilization
Reinventing Booz Allen Hamilton’s Employee Profile Tool

BACKGROUND

As a consulting firm, Booz Allen Hamilton depends on its ability to win client project bids and to optimize the use of its most critical resource, human capital.

The goal is to improve the firm’s ability to identify internal expertise by reinventing the existing employee profile and search tool.

PROBLEM

Firm-wide expertise is inaccurately represented and inefficiently identified, resulting in overlooked and poorly allocated resources during project staffing.

OPPORTUNITY

The tool used to capture and search for expertise information is inefficient and does not meet project staffing needs.

APPROACH

1. Interviews with Stakeholders
   Revealed root causes of employee profile shortfalls

2. Firm-Wide Surveys
   Produced data on attitudes toward proposed improvements

3. SPSS Analysis
   Identified greatest opportunities for impact based on statistical significance of survey data

4. Employee Profile Prototypes
   Usability testing yields feedback used for iteration

SOLUTION

Profiles that better represent employee expertise and a search tool that yields accurate results.

IMPACT

98% of employees agree new profiles would speed expertise searches

Effective utilization of talent results in greater client satisfaction

$1,380,000 projected savings per year on project staffing

More reliable data improves capacity to make better strategic decisions

93% of employees would keep new profiles up to date

Project Champions: Kelly Shannon, Eric Hamel
Faculty Advisor: Dr. Jeffrey Herrmann
QUEST Faculty: Kylie King

Brendan Rowan
Arielle Bitton
Nicole Lech
Daniel Levine
Advisors
THE QUEST - BOOZ ALLEN HAMILTON PROJECT
STRATEGIC INVESTMENT ANALYSIS APP

QUEST STUDENT TEAM: BLOOZ BROTHERS CONSULTING

<table>
<thead>
<tr>
<th>Ryan Crowder</th>
<th>Josh Sarna</th>
<th>Michael Taft</th>
<th>Luka Zhupa</th>
</tr>
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<tbody>
<tr>
<td>Finance</td>
<td>Accounting, Finance</td>
<td>Mathematics, Economics</td>
<td>Computer Science</td>
</tr>
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</table>

Project Champions:
- Andreia Rauta, Lead Associate
- Laura Yu, Senior Consultant
- Eric Hamel, Consultant

Faculty Advisor:
- Dr. Joseph Bailey
  Associate Research Professor, Department of Decisions, Operations, and Information Technologies

PROJECT SUMMARY
Founded in 1914, Booz Allen Hamilton is one of the first, and oldest existing, consulting firms. Booz Allen primarily consults for public sector entities, including civilian and defense related agencies. The main services they provide are management, engineering, technology, and strategic innovation consulting. The firm consists of 22,000 employees, working in 13 different countries, and generated $5.45 billion in revenue in 2014. The mission of this project is to devise a means of monitoring the health of funded strategic investments. The task employs data analysis, standardization of the health criteria inputs, and develops a software prototype for cross-portfolio analysis. The purpose of this project is to enable Booz Allen Hamilton to be proactive instead of reactive in assessing project performance. In doing so, Booz Allen Hamilton will be able to take actions that lead them to maximize their return on investment.

CONTRIBUTIONS AND RECOMMENDATIONS
By employing data analysis and incorporating an iterative software development process, we developed a prototype to facilitate the health monitoring of funded strategic investments. This tool will enable Booz Allen Hamilton to standardize their health status inputs, identify trends, and compare projects at a portfolio level view. We recommend that the firm aggregates the standardized information deployed by our prototype in order to generate sufficient data for a machine-learning based model. In the long term, this model will provide Booz Allen Hamilton with higher confidence to leverage past data and to proactively reallocate funds from unhealthy investments to high-yield investments. Our recommendations will position the firm to remain a dominant force in public sector consulting.
**Strategic Investment Health Analysis**

**Booz | Allen | Hamilton**

A Global Management, Technology, and Engineering Consulting Firm

**Background**
Booz Allen Hamilton strategically invests in new ideas to create new products and services, gain new clients, and see returns on their investments.

**Mission**
Successfully monitor the health status of the investments to know when to take action to maximize return on investment.

- A standard way to Evaluate
- Increase data capture Efficiency
- Identify Trends and Insight

**CURRENT STATE**

<table>
<thead>
<tr>
<th>Strategic Investment Process</th>
<th>Health Evaluation Process</th>
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<tbody>
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<td></td>
<td>A</td>
</tr>
<tr>
<td></td>
<td>75</td>
</tr>
</tbody>
</table>

**Opportunity**
Evaluate the current health monitoring system and its existing data to develop a consistent, objective process that enables Booz Allen to proactively analyze strategic investment performance.

**ANALYSIS**

Through trend and process analysis, several project health indicators were identified. Also identified were several indicators of inefficient time usage in the data analysis process.

- Key Statistics: 97 Separate health assessment data sources
- 5 Data consolidation worksheets
- 75% Of health monitoring time spent updating and sorting through data

**Example Trend:**
The green budget line indicates the ideal level of investment for healthy projects. As distance from this investment amount increased in either direction (seen in red) project health declined.

**RECOMMENDATIONS**

**CONSISTENT**
Incorporate trend analysis to generate warning flags for at-risk projects

**CONSOLIDATED**
Utilize a dashboard prototype to consolidate data and visualize analytic insights

**PROACTIVE**
Leverage machine learning to develop a system that accurately projects future health and preemptively addresses risks

**IMPACT**
- 74% Increase in Time Allocation Efficiency
- 36% Increase in Available Budget for Reallocation
- 67% Increase in Analysis Efficiency
  - Market Leader in Dynamic Budget Reallocation Technology

**Acknowledgements**
Faculty Advisor: Dr. Joseph Bailey
Project Champions: Andreia Rauta, Laura Yu, Eric Hamel

**Raw Text**

- Ryan Crowder | B.S. Finance
- Josh Sarra | B.S. Accounting & Finance
- Michael Taft | B.S. Math & Economics
- Luka Zhupa | B.S. Computer Science
PROJECT SUMMARY

Constellation is a commercial energy company located in Baltimore, MD. Owned by Exelon Corporation, Constellation is a leading supplier of power, natural gas, renewable energy and energy management products and services for homes and businesses across the United States. Constellation and Exelon strive for the highest standards in power generation, delivery and wholesale marketing. Currently, Constellation is facing difficulties with their Commercial and Industrial Sales (C&I) division that sells energy and natural gas to major companies such as Walmart. Constellation would like to optimize their website-based platform to enhance customer engagement and improve lead generation.

CONTRIBUTIONS AND RECOMMENDATIONS

Through this project, we built a business case highlighting strategy to improve internal communication, depict a cohesive marketing message, and enhance the customer management portal. We created an accompanying wireframe to serve as a visual representation of our recommended changes. In conjunction with the wireframe, we provided a document that details our design rationale. Team Powerhouse matched qualitative research methods with comprehensive quantitative analysis to derive support for our argument and execute this project. By examining the website traffic, we determined how Constellation’s website compares to competitors in regards to number of views. We also spoke with the Commercial & Industrial Marketing team to gain a better understanding of their roles within the company and the types of information that would be most relevant for consumers. Additionally, the Digital Marketing team provided increased insight into the technological capabilities of the current website and the potential the website may have aesthetically and functionally. Through Google Analytics and inventive eye tracking software, we were able to not only assess existing practices and where it drives consumers but also test the intention of our recommendations.
Objective

Help Constellation improve their Commercial & Industrial website by creating a business case for improvement and designing a wireframe for a new website with the overall goal of improving lead generation through their online presence.

Data Analysis

- 2.63% of traffic reaches business pages
- 46% of traffic goes directly to MyAccount
- 2200 outdated items

Source: Google Analytics 2015 Web Audit

Our Observations

- Website is difficult to navigate and information is not displayed well

Source: Google Analytics

Recommendation

- Improved placement of MyAccount Login
- Upfront data entry point to search for information that determines services available in your area based on entered zip code
- Sidebar navigation integrated to title banner that moves with scroll
- Pop-out when a customer has been on the page for more than 60 seconds
- Customer testimonials on homepage
- Prominent placement of Energy4Business Blog
- Scrolling pictures to advertise important pages
- Large title banner with prominent picture
- Clearly displayed product pricing options

Team PowerHouse would like to thank our project champion Jessica May and our faculty advisor Dr. William Rand for their support this semester.
The Quest - Northrop Grumman Project
Counter-UAS Technology Deployment and Evaluation

Project Summary

Northrop Grumman (NGC) is one of the United States’ largest aerospace and defense companies. The firm conducts research, development, and contracting for commercial and government clients looking for solutions in the areas of electronic, information and aerospace systems, as well as technical services. Unmanned Aerial Systems (UAS) platforms are small, controlled, flying devices that carry payloads that have potential security repercussions. Detection and response systems for these UAS platforms are only in the early stages of research and development. Our objective was to research public domain technologies that detect Class 1 UAS Platforms for an inauguration event scenario and create a cost-effective analysis tool which evaluates multiple scenarios to design counter-UAS systems. This project helps NGC position itself to develop a multi-million dollar business opportunity.

Contributions and Recommendations

Our team started by researching public domain information regarding UAS detection technologies, Class 1 UAS capabilities, and factors affecting UAS detection. Culmination of our research resulted in eight different subject matter expert interviews with NGC, confirming and exploring UAS detection technologies and capabilities. With these interviews, our team assembled a scenario recommendation for sensors. This was based on our findings of cost ($70 - $90,000), sensor limitations (line-of-sight obstructions), and data processing of sensors. These recommendations include populating the detection area with acoustic sensors for thorough and cheap detection coverage and limiting total radar sensors to a maximum of two per system. We developed a tool to provide in-depth analysis for system detection options. This tool creates and evaluates system design for new and developing counter-UAS scenarios.
Counter-UAS Detection

Team Confidential
Evan Eisenberg - BS Computer Science
Chana Garbow - BS Mechanical Engineering
Peter Kruse - BS Electrical Engineering
Alex Wilson - BS Finance

Special Thanks to:
Project Champion - Jimmy Crockett
Executive Sponsor - Mindy Eckman
Faculty Advisor - Dr. Jeffrey Herrmann
Program Director - Kyle Ring

Northrop Grumman

Opportunity
Unmanned Aerial Systems (UAS) pose a threat to national security. This project helps Northrop Grumman position itself for a multi-million dollar business opportunity in providing counter-UAS services to government and commercial clients.

Research Approach
Northrop Grumman is a leading global security company providing innovative systems, products and solutions in unmanned systems, cyber, C4ISR, and logistics and modernization to government and commercial customers worldwide.

Cost-Analysis Tool
From our scenario research findings, we extrapolated scenario, sensor, and threat data to create our cost-effectiveness analysis application.

Features
1. Excel User Interface
2. Visual Basic Backend
3. Multi-Variable Optimization
4. Analysis for Custom Scenarios
5. Editable Library of Sensor Data

Tool Results
Creates: 1,500,000 System designs
Provides: Cost-effectiveness data To compare systems
Facilitates: Optimal system choice By Northrop Grumman

Cost vs 3D Radius

Determined Pareto efficient sensors

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Range (km)</th>
<th>Quality of Data</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Radar</td>
<td>6</td>
<td>3-D Tracking</td>
<td>$60,000-$650,000</td>
</tr>
<tr>
<td>EO/IR</td>
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<td>3-D</td>
<td>$10,000-$200,000</td>
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<tr>
<td>Acoustic</td>
<td>0.1-1</td>
<td>2-D</td>
<td>$70-$150</td>
</tr>
<tr>
<td>Sig Int</td>
<td>1</td>
<td>3-D</td>
<td>$2,000</td>
</tr>
</tbody>
</table>

Devised deployment protocol by sensor
The Gains Consulting team is working with Spectrum Foods, a small, family-owned poultry distributor located in Landover, Maryland. The client supplies a wide range of products to grocery stores and restaurants in the area, including District Taco and Sardi’s Pollo a la Brasa. These products range from dry goods such as charcoal, rice, and beans to refrigerated and frozen goods such as chicken, beef, and crinkle-cut french fries. Currently, Spectrum Foods is struggling to track both the physical flow and the data flow (in terms of inventory counts) of its inventory goods. As a result, Spectrum is experiencing waste due to incorrect shipments and a need for frequent, time-intensive visual inventory checks. More importantly, the company’s current state of inventory tracking is a clear impediment to future growth. A functional and complete inventory tracking system will enable them to keep track of their inventory flow while making room for expansion.

Contributions and Recommendations
Gains Consulting recommends that Spectrum Foods take two main actions to improve its inventory tracking. The first is to standardize processes by creating purchase orders for all incoming orders and by renegotiating with suppliers to ensure that most incoming products have barcodes. The second recommendation is to incorporate FoodConnex barcode scanning technology, featuring a SWAMI (Scan, Weigh, and Measure Instantly) station for each of the seven loading docks. The scanning solution also features a scale for weight-based product sales and three barcode printers for incoming products that arrive without barcodes. Alternative solutions that were considered, but not chosen, were handheld scanners and location-based barcodes. These solutions were eliminated due to the amount of change required to fit the technological solution as well as cost. The chosen recommendations will allow Spectrum Foods to reduce their time spent on physical inventory counts by 83% and increase their warehouse capacity by 4% and revenue by $3.6 million.
Making Gains on Inventory Tracking
with Spectrum Foods Poultry Distributor

Introduction
Spectrum is a behind-the-scenes food provider

Spectrum Foods is a small, family-owned food distributor located in Landover, MD. The company is rapidly growing, and has seen growth of 15-18% in the past 3 years. Currently, Spectrum’s lack of inventory tracking is impeding growth while leading to incorrect shipments and a need for constant, time-consuming visual inventory checks.

Analysis
Comparing providers, barcodes, and scanners using several decision factors

<table>
<thead>
<tr>
<th>Software Provider</th>
<th>Barcode Location</th>
<th>Scanner Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food Connex</td>
<td>Minimized Change</td>
<td>Stationary</td>
</tr>
<tr>
<td>New Provider</td>
<td>Higher Capability</td>
<td>Handheld</td>
</tr>
<tr>
<td></td>
<td>Lower Cost</td>
<td></td>
</tr>
</tbody>
</table>

Recommendations
A barcode scanning solution fueled by purchase orders and barcoded receivables

Process Standardization
- Create Purchase Orders for all Products
- Renegotiate with Suppliers for Barcoded Receivables

Scanning Software
- FoodConnex
  - Food Business Management System

Scanning Hardware
- 7 Scanning Stations
- 1 Weighing Station
- 3 Label Printers

Benefits
Generating more revenue through expected growth while saving time and money
- $3,600,000 in new revenue, due to an expected 4% growth in capacity, which is about 40x the cost of implementation
- Annual Cost Savings
  - $29,000 for Visual Counts
  - $51,000 for Verified Shipments
  - $22,000 for Annual Cost Savings
- Inventory Check Time Savings 83% less time

Costs
The price of investment and transition
- Total Cost
  - $45,000 Implementation
  - $90,000 Lost Productivity
  - $45,000 Total Cost
- Breakeven Point 1.75 years

Implementation
Spectrum’s next steps to ensure success
- Purchase and Installation
- Inbound Inventory Scanning
- Outbound Inventory Scanning
- Formal FC Training
- Inventory Update
- Informal Training and Visual Validation

Special Thanks to:
Spectrum Foods
David Fararoff
Ishf Fararoff

Dr. Hassan Ibrahim
Karie King
Yashi Mehta

Bragan Shafran, B.S. Mechanical Engineering
Ben Hwang, B.S. Operations Management, B.A. Spanish
Delarte Dessau, B.S. Computer Science
Alex Chieramonte, B.S. Mechanical Engineering
PROJECT SUMMARY
TAMKO Building Products, Inc. is a manufacturer of roofing products for residential and commercial use. In business since 1944, it has a commitment to creating quality products as well as continuously improving its manufacturing process. TAMKO’s Frederick, MD plant specializes in roofing shingles. An important aspect of delivering on-time, high-quality products is maintaining a high-efficiency factory with little to no downtime. The maintenance of manufacturing equipment keeps the factory running. Periodic inspections are required to make sure that preventive maintenance is done when needed. Currently, some inspections are done too frequently, wasting resources, and some are not done enough, increasing the risk of expensive equipment failure. Additionally, the current inspection cycle requires more time than the technicians can provide, causing delayed inspections and extensive recordkeeping of skipped inspections.

CONTRIBUTIONS AND RECOMMENDATIONS
In order to recommend a solution to TAMKO, we first needed to analyze the current state. We conducted a frequency analysis in Excel where, for each inspection point, the average and standard deviation of number of days between inspections and total number of inspections were calculated. In order to move from the current state to the ideal state, we created a model in Excel that would automatically create the inspection routes based on each inspection point’s criticality first and location second. Through data collection, interviews, and analysis, we developed an Excel model that accurately classified each inspection point according to its location and the frequency at which it should be inspected. The inspection frequency was determined by tags assigned to each inspection point that signified what it was and the equipment on which it was located. An importance rating was given to each tag based on how critical it was for operations to continue. All of these inputs were then used by the model to determine the inspection routes. Implementing our model will create efficient inspection routes that will save the technicians 2,050 inspection hours per year by eliminating over-checked points and will have a cost savings of $107,000. Overall, this will increase TAMKO’s route efficiency by 95%.
Thales Defense & Security Inc. is a U.S. defense company specializing in the production of tactical high frequency radios for military purposes. The main facility, headquartered in Clarksburg, MD, spans over 70,000 square feet and houses 5 engineering labs. Our project focuses on the Hesse Lab which contains 155 lab benches and 130 computers for over 100 multidisciplinary engineers. Within the Hesse Lab, Thales identified an opportunity to optimize its computer tracking and allocation processes. Currently, there are inefficiencies that result in substantial losses of managerial administrative time and engineering productivity. The potential impact of the project is considerable—streamlining the process can result in sizable increases in overall efficiency and cost savings for Thales. The objective of the project was to formulate recommendations to maximize these savings while streamlining computer allocation for optimal future performance. The finalized recommendations include implementation of an interactive tool and a long-term thin-client integration in the lab.

CONTRIBUTIONS AND RECOMMENDATIONS
Through conducting individual in-depth interviews, analyzing industry research and utilizing an iterative ideation process, Team QualIT adapted a unique approach to create viable solutions. By conducting interviews with multidisciplinary engineers and IT personnel, the team was able to identify areas of improvement in the current state. From there, the team conducted industry research to develop two key recommendations to improve the computer allocation process at Thales. The first recommendation is an interactive computer tracking tool and the second is a long-term implementation plan for thin clients. The solutions result in a cumulative impact of a 75% increase in efficiency for the lab manager, $26,000 savings in equipment costs, and 170,000 kWh saved in energy consumption. Additionally, qualitative benefits such as improved security and increased flexibility within the lab environment are also realized.
**BACKGROUND**

"LIVE DEPEND ON WHAT WE DO"

Thales Defense and Security Inc., headquartered in Clarksburg, MD, is a defense contractor specializing in the design and production of military communication hardware. Thales’ main facility houses 5 engineering labs and a full-scale manufacturing floor.

**CURRENT STATE**

PROCESS: COMPUTER ASSET REQUEST - TIME: 1-2 WEEKS

- Engineering
  - 1-2 Week Wait
  - 20-50 IT Tickets
- Lab Manager
  - Hours Searching
  - Physical Lab Map
- IT Personnel
  - 6-9 Hour Build
  - Tedious Approvals

**APPROACH**

INDUSTRY RESEARCH
- Feasibility & Cost Analysis
- Thin Client Research

IN-DEPTH INTERVIEWS
- IT Department
- Department Managers
- Hardware Engineers
- Software Engineers

ITERATIVE IDEATION
- Process Mapping tools
- Software List Analysis

**RECOMMENDATIONS**

VISUALIZATION SOFTWARE
100% custom web application integrates proposed and existing information sources and eliminates need for physical floor layout with manual editing.

THIN CLIENT COMPUTING SYSTEM
Transition to virtual systems on low cost platforms reduces IT load and eliminates build time. New operating systems and network connections can be repurposed without ever moving the machine.

**IMPACT**

IT ASSET REQUEST
75% EFFICIENCY
STRAIGHTLINED PROCESSES

MINIMUM SAVINGS
$50,000/yr
LABOR & EQUIPMENT

ENERGY SAVINGS
170,000 kWh
THIN CLIENT POWER DRAW

**Team QualiIT**

**PROJECT CHAMPION**
STEVEN KOTCHE - Q1
ENGINEERING LAB MANAGER

1 FL. SQ. FEET
ISO LABBERS
200+ COMPUTERS
4 NETWORKS
QUEST FACULTY AND LEADERSHIP

DR. PAMELA ARMSTRONG
ASSOCIATE DIRECTOR, QUEST HONORS PROGRAM
ASSOCIATE CLINICAL PROFESSOR OF MANAGEMENT SCIENCE
ROBERT H. SMITH SCHOOL OF BUSINESS
PROJECT ADVISED: TAMKO

Dr. Pamela Armstrong is a Clinical Associate Professor in the Decision, Operations and Information Technologies department at the Smith School. She teaches the introductory QUEST course on design and quality and the QUEST mentors course. Dr. Armstrong also teaches courses in operations management, operations strategy, decision analytics and project management. Her areas of interest include quality, performance excellence, and service operations. Prior to joining the Smith School, Dr. Armstrong ran a management consulting firm that provided operational analysis, strategic planning, and performance management services to federal clients. Before consulting, she served on the faculty at Georgetown University’s McDonough School of Business. Dr. Armstrong also worked as an engineer at IBM, AT&T Bell Laboratories & Hughes Aircraft Company. She earned her Ph.D. in Operations and Information Management at the Wharton School of the University of Pennsylvania, her M.S. in Operations Research and Industrial Engineering from the University of California, Berkeley, and her B.S. in Systems Engineering from the University of Arizona.

DAVID ASHLEY, M.B.A.
EXECUTIVE IN RESIDENCE, QUEST HONORS PROGRAM
ROBERT H. SMITH SCHOOL OF BUSINESS

David Ashley is an adjunct professor and an Executive in Residence at the University of Maryland’s Smith School of Business. He is currently the Human Capital Data Analytics Division Manager at the Department of Homeland Security. In that role, Mr. Ashley manages a division overseeing analytics and reporting of the DHS workforce that includes 230,000 people across the 10 DHS components. Before his current role at DHS, he was a program analyst for the Federal Emergency Management Agency (FEMA) within the Department of Homeland Security where his duties involve developing business models, performance measurement and survey work, and program management and program reviews. Before joining FEMA, Professor Ashley also worked at the Department of Homeland Security, Customs and Border Protection (CBP), the U.S. Small Business Administration (SBA), and the Small Business Development Center at the University of New Mexico. He also served as president of the University of Georgia’s Marketing Research Institute International and he served two terms as president of the Mid-Atlantic Chapter of the Marketing Research Association. Professor Ashley has many publications including a marketing research college textbook published by Kendall Hunt Publishing. He holds an undergraduate degree from the University of North Carolina and a graduate degree from the University of New Mexico.

DR. JOSEPH P. BAILEY
ASSOCIATE RESEARCH PROFESSOR, DEPARTMENT OF DECISIONS, OPERATIONS, AND INFORMATION TECHNOLOGIES
ROBERT H. SMITH SCHOOL OF BUSINESS
PROJECT ADVISED: BOOZ ALLEN HAMILTON (INVESTMENT)

Dr. Joseph Bailey has been a faculty member at the University of Maryland since 1998. His research focuses on the intersection of information technology and business. He has numerous peer-reviewed publications and co-edited the MIT Press book “Internet Economics.” Dr. Bailey directs the mQuest program – a graduate program that emphasizes design thinking by integrating business and technology. Dr. Bailey was an Edison Scholar at the United States Patent and Trademark Office from 2014-2015. He teaches a variety of undergraduate and graduate classes including Strategic Information Systems within the Smith School’s Executive MBA Program. Dr. Bailey has a Ph.D. from the Technology, Management and Policy Program at MIT, an M.S. in Engineering-Economic Systems from Stanford University, and a B.S. in Electrical Engineering and Engineering and Public Policy from Carnegie Mellon University.
Dr. Progyan Basu
Clinical Professor, Department of Accounting and Information Assurance
Robert H. Smith School of Business
Project Advised: AT&T

Dr. Progyan Basu has over 25 years of teaching a variety of accounting courses and seminars in the US and abroad at different levels. At the Smith School of Business, he teaches Financial and Managerial Accounting at the undergraduate, MBA, and EMBA levels. He has received several awards and distinctions for teaching excellence, including the Krowe Teaching Excellence Award, Distinguished Teaching Award, and Undergraduate Studies Faculty Fellowship. He serves as a Faculty Director for the PTMBA and EMBA program, as well as a Faculty Champion for the Undergraduate Accounting Teaching Scholars and Schilit Scholars programs.

Dr. Jeffrey Herrmann
Academic Director, QUEST Honors Program
Professor, Department of Mechanical Engineering and Institute for Systems Research
A. James Clark School of Engineering
Projects Advised: Booz Allen Hamilton (Expertise), Northrop Grumman

Dr. Jeffrey Herrmann is a Professor at the University of Maryland, where he holds a joint appointment with the Department of Mechanical Engineering and the Institute for Systems Research. Dr. Herrmann earned his B.S. in Applied Mathematics from Georgia Institute of Technology. As a National Science Foundation Graduate Research Fellow from 1990 to 1993, he received his Ph.D. in industrial and systems engineering from the University of Florida. His dissertation investigated production scheduling problems motivated by semiconductor manufacturing. He held a post-doctoral research position in the Institute for Systems Research from 1993 to 1995. His current research interests include operations research for homeland security and emergency preparedness, production scheduling, and improving decision-making processes.

Dr. Hassan Ibrahim
Clinical Professor, Department of Decisions, Operations, and Information Technologies
Robert H. Smith School of Business
Project Advised: Spectrum Foods

Dr. Hassan Ibrahim is a Clinical Professor at the Robert H Smith School of Business. Dr. Ibrahim received Doctor of Science (D.Sc.) and Master degree in Engineering Management from The George Washington University. He also has Bachelor degree in Electrical Engineering. Dr. Ibrahim areas of specializations are Project Management, Information Systems development, and Operations Strategy. Dr. Ibrahim’s research was published by Harvard Business School and the Production and Inventory Control Journal. Ibrahim served on the Editorial Review Board of the Journal of Operations Management. His primary teaching areas are: Project Management, Information Systems Analysis and Design, Data Communications, and Operations Management. He was nominated for the Outstanding Scholar of the Year Award in the Commonwealth of Virginia in 1996. Dr. Ibrahim is a twice recipient of both the Philip Merrill Award and the prestigious Krowe teaching Excellence Award. He has worked for and consulted with a number of industry leaders including the World Bank, McDonnell Douglas, Phillips Electronics, Hughes Networks Systems, and Siemens Medical Systems.
QUEST FACULTY AND LEADERSHIP

EMILY KELLY
GRADUATE ASSISTANT, QUEST HONORS PROGRAM

Emily Kelly is the Graduate Assistant for the QUEST Honors Program. She assists with daily operations, works with the QUEST Alumni Board, advises the QUEST student organization (QSO), and oversees the QUEST Alumni Mentoring Program. Emily received a B.A. in Psychology from the University of Iowa in 2015 and is a current student in the University of Maryland’s Higher Education M.A. program. Her research interests include quality assurance and learning outcomes assessment in higher education, high-achieving students, and federal policy in higher education.

KYLIE GOODELL KING, M.A.
PROGRAM DIRECTOR, QUEST HONORS PROGRAM
PROJECT ADVISED: ADVISORY BOARD COMPANY

Kylie King is QUEST’s Program Director and a co-instructor for BMGT/ENES 490H. Kylie teaches a related course, Defining Consulting and Innovation Projects, where she works with students to identify QUEST clients and outline capstone projects. She also leads a course about design and innovation in Silicon Valley. In addition to teaching, Kylie manages QUEST’s program operations, including learning outcomes assessment, program marketing, and alumni relations. Kylie is currently pursuing a Ph.D. in Quantitative Methodology in Maryland’s College of Education. Her research involves evaluating measurement techniques for team-level variables. Previously, Kylie served as an assistant director and graduate assistant with QUEST while earning her MA in higher education at the University of Maryland. Before joining QUEST, she received a BS in industrial and systems engineering from North Carolina State University and worked as an Industrial Engineer in the Tyco Electronics Leadership Development Program.

JESSICA MACKLIN, M.A.
PROGRAM COORDINATOR, QUEST HONORS PROGRAM

Jessica Macklin is the Program Coordinator for the QUEST Honors Program. She coordinates the program’s daily operations, assists QUEST professors, leads the program’s recruitment and admissions efforts, plans and executes conferences and orientation, and advises QUEST’s student organizations. Jessica received her BA in Psychology from the University of Maryland, College Park and her MA in Higher and Postsecondary Education from Teachers College, Columbia University. Jessica is an active member of the Teachers College National Research Team on College Educational Quality. Prior to joining QUEST, Jessica was the Graduate Assistant in Columbia University’s Office of Student Engagement.

DR. JAMES PURTILLO
ASSOCIATE PROFESSOR, COMPUTER SCIENCE DEPARTMENT
COLLEGE OF COMPUTER, MATHEMATICAL, AND NATURAL SCIENCES
PROJECT ADVISED: THALES DEFENSE & SECURITY, INC.

Dr. James Purtilo specializes in software development and product assurance, and his research is currently funded by the Office of Naval Research on a cyber security systems project. With prior support from the National Science Foundation, Department of Defense Advanced Research Projects Agency and various corporate sources, Purtilo has studied and published on topics of software producibility, formal methods, rapid prototyping and testing. Purtilo has served on the Defense Biometric Support Team (an advisory group to the Office of the Secretary of Defense), is a member of the Arrhythmia and Cardiology Imaging Group at the UM Medical Center in Baltimore, and has consulted with the Division of Civil Rights within the Department of Justice. At the University of Maryland, he has served as the Associate Dean for Undergraduate Education in the College of Computer, Mathematical and Physical Sciences, chaired the undergraduate Computer Science program and directed the Master’s of Software Engineering Program. He received his Ph.D. in Computer Science from the University of Illinois at Urbana in 1986.
Dr. William Rand
Assistant Professor and Director, Center for Complexity in Business
Robert H. Smith School of Business
Project Advised: Constellation Energy

William Rand examines the use of computational modeling techniques, like agent-based modeling, geographic information systems, social network analysis, and machine learning, to help understand and analyze complex systems, such as the diffusion of innovation, organizational learning, and economic markets. He serves as the Director of the Center for Complexity in Business, the first academic research center focused solely on the application of complex systems techniques to business applications and management science. He also has an appointment with the University of Maryland Institute for Advanced Computer Studies and affiliate appointments with the Departments of Decision, Operations & Information Technology and Computer Science. He received his doctorate in Computer Science from the University of Michigan in 2005 where he worked on the application of evolutionary computation techniques to dynamic environments and was a member of the Center for the Study of Complex Systems. Before coming to Maryland, he was awarded a postdoctoral research fellowship at Northwestern University in the Northwestern Institute on Complex Systems (NICO), where he worked with the NetLogo development team studying agent-based modeling, evolutionary computation and network science. Over the course of his research experience, he has used computer models to help understand a large variety of complex systems, such as the evolution of cooperation, suburban sprawl, traffic patterns, financial systems, etc. He has recently received research awards from Google / WPP, the National Science Foundation and the Marketing Science Institute.

Dr. J. Gerald Suarez
Professor of Practice in Systems Thinking
Design Fellow, Center for Leadership, Innovation, and Change
Senior Executive Coach
Robert H. Smith School of Business

Dr. J. Gerald Suarez is a premier educator, speaker and consultant in the fields of Organizational Design, Systems Thinking and Total Quality Management. He joined Smith in 2005 as Executive Director of the multidisciplinary Quality Enhancement Systems and Teams (QUEST) Honors program. Dr. Suarez currently teaches the required QUEST class on “Systems Thinking for Managerial Decisions.” Additionally, he teaches at the corporate, executive MBA, custom EMBA, international, and undergraduate levels. From 2008 to 2010 Dr. Suarez served as Associate Dean of External Strategy, leading the offices of marketing communications, recruitment and career services. Prior to joining the Smith School, he served under two administrations in the White House as the Director of Presidential Quality. Dr. Suarez holds a master's degree and a Ph.D. in Industrial-Organizational Psychology from the University of Puerto Rico.

Dr. Ian White
Associate Chair and Director of Undergraduate Studies
Fischell Department of Bioengineering
A. James Clark School of Engineering
Project Advised: BD

Ian White is an Associate Chair and the Director of Undergraduate Studies in the Fischell Department of Bioengineering at the University of Maryland. Dr. White received his Ph.D. in Electrical Engineering from Stanford University in 2002, where he developed next generation optical metropolitan area communication networks. He then served as a Member of Technical Staff at Sprint’s Advanced Technology Laboratories until 2005. At that time, Dr. White transitioned into the field of optical biosensors as a Postdoctoral Fellow in the University of Missouri Life Sciences Center. In 2008, Dr. White joined the faculty in the Fischell Department of Bioengineering at the University of Maryland, and was promoted to Associate Professor in 2014. His research group aims to develop novel microsystems for applications in chemical analytics and disease diagnosis. In particular, the group emphasizes sample preparation for ease-of-use and amplified transduction techniques to improve detection performance.
NOTABLE PAST PROJECTS

SPRING 2015: THE QUEST—CFR ENGINEERING PROJECT

PROJECT: STREAMLINING THE BID PROPOSAL PROCESS

TOMMY JOHNSON
AVI SILVERMETZ
AARON SIRKEN
HALLEY WEITZMAN

PROJECT SUMMARY

CFR Engineering provides comprehensive mechanical, plumbing, and electrical engineering design services for the building industry in various market sectors. They are small enough to accommodate different scopes and schedules yet large enough to take on small, medium and large projects. CFR has successfully performed critical design and development for numerous complex, multi-user projects for the National Institute of Health (NIH), National Institute for Standards and Technology (NIST), and a number of private firms. The many projects CFR develops come in the form of Requests for Proposals (RFPs). When CFR receives a new RFP, they must look through the many projects they have done in the past to find comparable projects in order to estimate costs more accurately in order to win the bid. Our team was tasked with improving this time-consuming process in order to increase efficiency during cost estimation. With improved efficiency and centralized data, CFR will make more accurate proposals.

CONTRIBUTIONS AND RECOMMENDATIONS

Our team created a searchable database for CFR Engineering, so that all of CFR's past project data is in one centralized location. The database can generate a unique report for the proposal at hand, saving the business development team 20% of their total hours worked, during which most of their time is spent looking through past project data. Ultimately, the business development team will have the time to read 16% more proposals. To further improve this process, we have recommended that CFR convert all of their old Excel data into one Access database. With this first step, CFR could be well on their way to creating an automated proposal generator. Through in-depth interviews, we were able to understand CFR’s current cost estimation algorithm. Conducting data analysis on CFR’s algorithm and the past project information, we tested the old model against competing new models. With the improved model, CFR will increase their RFP win rate and grow their revenue through the addition of extra projects, which in turn will increase their profits.
NOTABLE PAST PROJECTS

SPRING 2015: THE QUEST—TAMKO PROJECT

PROJECT: BUILDING A SMARTER MANUFACTURING SYSTEM

MICHAEL GOGLIA
AASHIMA GUPTA
ANTHONY TRINH
LIBBY WEI
AMANDA YARD

PROJECT SUMMARY

TAMKO Building Products, Inc. is a manufacturer of residential and commercial roofing products with over 70 years of customer satisfaction. TAMKO employs vertical integration by owning both raw material and manufacturing plants, enabling TAMKO to control the entire manufacturing process of their roofing products. Its mission is to consistently provide customers with the best roofing materials available. Embedded into the company’s name are the primary states in which they initially serviced: Texas Arkansas Missouri Kansas Oklahoma (TAMKO). We sought to increase the TAMKO warehouse inventory capacity by approximately 385 pallets, improve the efficiency of the inventory management process and recommend a fully managed warehouse system (FMW) software solution. The purpose of this project was to increase the overall efficiency of the TAMKO warehouse by adding storage space and utilizing a FMW to track data. The FMW system will also create a checking system for following First In First Out. This aligns with the overall strategic goals of TAMKO and its commitment to total quality management principles and extraordinary customer service.

CONTRIBUTIONS AND RECOMMENDATIONS

To increase capacity within the warehouse, we researched shelving solutions like drive-through racking and movable and stationary shelves. Each of these recommendations will utilize vertical space across the facility to increase capacity by a minimum of 385 pallets. To increase efficiency of inventory management, we conducted time studies to evaluate the feasibility of routes directly from the production line to peripheral storage points. From our results, we were able to rule out one storage location because the round trip time would back up the production line. At the same time, we confirmed that traveling from the line to two other locations would be within the time frame of the production line. These time studies helped us validate the feasibility of alternating between long and short trips from the production line. Finally, we researched multiple FMW software to propose two final solutions to TAMKO. After evaluating ten software solutions against our client’s requirements, we narrowed down our recommendations to two software vendors: HighJump Software, Inc. and TecSys, Inc.
NOTABLE PAST PROJECTS

FALL 2014: THE QUEST—TULKOFF FOODS AND T.W. GARNER PROJECT
PROJECT: DEER REPELLENT FROM WASTE PRODUCT

YONI KOZLOWSKI
KENNY LOPEZ
MARK NATHANSON
ISA OPORTO
GRACE ZHANG

PROJECT SUMMARY

Our team worked with two clients in the food industry, both of which primarily produce condiments. Tulkoff Food Products Inc., based in Baltimore, Maryland, is recognized as one of the nation's largest food manufacturers of horseradish products. T.W. Garner Food Company, located in Winston-Salem, North Carolina, is known for manufacturing a diverse portfolio of food products, including Texas Pete hot sauce. Our two clients currently spend $36,000 a year to remove a combined 500 tons of byproduct waste and are interested in repurposing the waste to turn this cost into a profit. Our clients have hypothesized that their byproduct wastes could be effective as deer repellents. We were tasked with conducting further research to test this hypothesis. This consisted of field-testing the byproducts to measure their effectiveness as deer repellents and an industry analysis to determine whether there was a meaningful market for deer repellents.

CONTRIBUTIONS AND RECOMMENDATIONS

To determine whether our client byproducts were feasible deer repellents, we conducted field-testing using the byproducts as repellents. First, we chemically extracted the active ingredient from each by-product. We coated deer feed with the extract and set up test sites in a residential area known for significant deer browsing. Deer visit times and feed consumption at each repellent site were analyzed using recorded video footage. Both repellents performed as effectively as the leading commercial repellent (Liquid Fence) in deterring deer browsing. Meaningful feed consumption was found only at the test site with no repellent added. These test results demonstrated the feasibility of using both byproducts as deer repellents. Thus, we recommend that our clients pursue commercialization of their byproducts. In addition, market research indicated that there is an unmet need for deer repellents. Moving forward, we suggest that our clients conduct further field-testing to optimize repellent concentrations and delivery methods. We estimate a 3 to 5 million dollar annual revenue from our clients’ expected repellent production.
NOTABLE PAST PROJECTS

FALL 2014: THE QUEST–BD PROJECT
PROJECT: MINIMIZING STOCK LOSS THROUGH SAFETY STOCK RECOMMENDATIONS

RAJA AYYAGARI
KATARINA BELINICHER
MATTHEW HENRICKS
PETER WENG
ERICA YINGLING

PROJECT SUMMARY

Beckton Dickinson (BD) is a Fortune 500 medical technology company. The Diagnostics division, headquartered in Baltimore, MD, is responsible for manufacturing single-use, disposable products known as consumables. Millions of patients across the world depend on these consumables for fast and reliable diagnostic testing. As a result of the critical nature of these products, it is imperative that BD is able to fulfill customer orders. To ensure that BD does not stock out, it manufactures extra units—known as safety stock—to mitigate the risk of underestimating demand. Although safety stock protects against a stock-out, it increases the risk of the stock expiring before reaching the end customer, resulting in stock loss. Our project goal is to provide safety stock recommendations that reduce the stock loss for the consumable products while maintaining high customer service levels. For the products in scope, BD experienced a stock loss in the order of hundreds of thousands of dollars in the past year.

CONTRIBUTIONS AND RECOMMENDATIONS

We took a streamlined approach in building and testing safety stock models. We first built a simulator that back-tested any given safety stock model and evaluated its effectiveness in reducing stock loss and improving customer service levels. We then built three models that provided safety stock recommendations based on a variety of factors, including forecast error, inventory levels, and shelf-life days. Finally, we ran a simulation to evaluate the three models and selected the best performing model, which led to a 24.5% reduction in stock loss and a 9.5% boost in customer service level. We believe that our strongest contribution is the incorporation of shelf-life days into the safety stock calculation because it provides a more granular understanding of inventory state. Our final deliverable to the client is a user-friendly tool that accepts SAP-generated reports as inputs and provides safety stock recommendations per product. To ensure a smooth implementation and boost adoption rates, we created and shared a job-aid, which provides step-by-step usage instructions. Moving forward, our recommendation is for BD to use this model on a monthly basis to determine safety stock levels.
NOTABLE PAST PROJECTS

FALL 2013: THE QUEST— SPECTRUM FOODS PROJECT
PROJECT: WAREHOUSE OPTIMIZATION

ELINOR CHANG
EHSON KASHFIPOUR
DANNY LAURENCE
MELINDA PANDIANGAN
OLIVIA SULAEMAN

PROJECT SUMMARY

Spectrum Foods is a poultry, meat, and food service distributor founded in 1989. Located in Landover, MD, the company mainly services average-to-low cost ethnic grocery stores, restaurants, and wholesalers in the Mid-Atlantic region. In recent years, Spectrum Foods has experienced exponential growth and generated upwards of $70 million in sales. Spectrum’s differentiating factors are flexibility, convenience, and an overall customer-oriented approach to business operations. Our client was looking to assess opportunities to optimize the capacity of their current warehouse. Our team’s primary goal has been to explore and determine the most feasible and effective methods for maximizing storage capacity and minimizing holding costs, both in the short- and long-term. Allowing for an increase in capacity would strategically position our client for future growth opportunities. Moreover, it would allow Spectrum Foods to reduce its internal and external holding costs, take on additional business, and lay the foundation for future expansion.

CONTRIBUTIONS AND RECOMMENDATIONS

To position our client for continued growth, our team recommends the elimination of unprofitable items, the reduction of excess inventory levels, and the implementation of a racking system. Specifically, we recommend eliminating approximately 90% of the product offerings with monthly sales of under 5 cases per month and/or that generate under $50 per month in profits. In addition, we have compared each item’s average inventory holdings to an optimal level for that item, based on demand and variation in demand, and recommend a reduction in inventory levels for 62 product offerings. Lastly, our team has designed a racking system for the dry goods space of the warehouse which will add an additional 32 pallet spaces by early 2014. These three strategies together would result in a total annual opportunity cost savings of nearly $700,000.
Unilever is a British-Dutch multinational corporation behind many of the world’s most widely acknowledged consumer product brands collectively used by over 2 billion people daily. Among the extensive range of Unilever’s food brands, the Baltimore Spreads and Dressings Site is one of three facilities that manufactures popular spreads including Country Crock, Promise, and I Can’t Believe It’s Not Butter for distribution across the United States. Since the closure of a similar facility in Atlanta, Unilever Baltimore’s demand has increased by 40% from shipping 700 to 1000 pallets daily. Outbound shipment turnover time has consequently increased by 15% to 135 minutes. Due to limited warehouse capacity, additional inventory is interfering with inbound and outbound flow of goods which is detrimental to on-time delivery. In order to successfully meet demand, accommodate increased shipments, and boost dock schedule compliance, our team is tasked with reducing the average outbound shipment turnover time to 90 minutes.

CONTRIBUTIONS AND RECOMMENDATIONS

Through statistical analysis of loading durations and process mapping, our team concluded that shipments containing orders that request fewer cases than provided on a full pallet inflate average loading time by 50 minutes. We determined that individual partial pallet orders take three times longer to load than full pallet orders. Because partial pallets are consolidated in a reserved area of the warehouse through a process called Pick Line, we recommend that a partial order staging process occur so that loading partial orders entails the same process as full orders. In accordance with in-depth interview feedback from loaders and implementation trials, Pick Line 2.0 requires 4 additional casepickers and 2 additional forklift operator to stage all partial orders two shifts prior to truck arrival. Coordinated with our proposed rollout plan, stock replenishment process by prioritized SKUs, and implementation of 5S standards in a specified casepicking warehouse area, Unilever Baltimore would experience a 36% reduction in average shipment loading duration to 85 minutes. By freeing the dock schedule for an estimated 9 more trucks per day, this site can generate an additional $62 million in net sales within one year.
Revenue growth for companies can occur in two ways; organically, through product or service sales, and inorganically, through mergers & acquisitions (M&A) transactions. In M&A transactions, corporate valuation models are essential tools that help the involved parties make informed decisions. These models evaluate and predict the financial well-being of an entity that would result from a merger or acquisition. Current valuation techniques at ATK require the creation of a new model for each deal, and extensive training for them to be used effectively. This inefficient process can delay important decisions and create unnecessary workloads. In our project, we have created an intuitive model that integrates standardized information to output unique valuation metrics and summarizes important information for enhanced decision-making.

CONTRIBUTIONS AND RECOMMENDATIONS

We have developed a Microsoft Excel-based valuation model that analyzes financial information from the Bloomberg database. Following the input of standardized financial statements, which is as simple as copying and pasting information from Bloomberg, the model then integrates the information into prepared financial statements and valuation methods. Our model includes a comprehensive instructions page for new users and is color-coded for intuitiveness. We have also included an output page that graphically summarizes desired information using intuitive graphical tools and tables that can easily be copied into presentations for further discussion. Our model will allow our client to make more informed decisions about mergers & acquisition transactions in a faster and more effective manner.
**PROJECT SPONSORS**

The companies below have made significant contributions to our students as they completed their capstone learning projects. In addition to financial contributions, these sponsors have given enormous amounts of time and thought leadership to our student teams.
QUEST would like to thank and acknowledge all of the individuals, committees, and organizations who have contributed to this event.

**QUEST STUDENTS**

**QUEST ALUMNI**

**FAMILY, FRIENDS, AND UNIVERSITY COLLEAGUES**

**QUEST PARTNER COLLEGES**

A. James Clark School of Engineering
College of Computer, Mathematical, and Natural Sciences
Robert H. Smith School of Business

**COURSE TEACHING ASSISTANT**

Hannah Buehler (Q20)

**QUEST OFFICE ASSISTANT**

Grace Cha (Q24)

**ROBERT H. SMITH EVENTS**

Kelley McKutchin

**RIGGS ALUMNI CENTER**

Alissandra Burding

**CATERING**

The Chef’s Table

**PHOTOGRAPHY**

Radhika Kshirsagar (Q23)

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