2013 Conference Program
&
Projects Portfolio
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 1992 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.

QUEST Honors Program
3335 Van Munching Hall
University of Maryland
College Park, MD 20742
December 2013

Dear QUEST Seniors:

Congratulations on the completion of your QUEST capstone course!

The QUEST Honors program is well known for its rigorous academic standards, so your success is one to be celebrated. Through your coursework with QUEST, you will be entering the professional world with extensive knowledge of teamwork, innovation, and real-world problem solving. These are essential skills for cultivating a bright future.

I am pleased to see that QUEST continues to build its vibrant alumni network and to prepare its students for international partnerships. QUEST’s active participation in study abroad trips to such places as Tunisia, China, and Brazil shows that QUEST students understand the criticality of establishing diverse, professional relationships across borders.

The University is proud of your achievements and wishes you the best in your conference presentations. I am confident that your experiences in the QUEST program will serve you well beyond the University of Maryland.

Sincerely,

Wallace D. Loh
President
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PROJECT SUMMARY

Alliant Techsystems Inc. (ATK) Defense Group is a global industrial company that develops and manufactures highly engineered materials and products that support mission-critical applications for defense, aerospace, and security customers. By developing affordable, innovative solutions, ATK has become an industry leader in missile defense systems, solid rocket propulsion, and sporting ammunition. The ATK Missile Products division is an industry leader in the development and production of tactical rocket motors and missile systems for various applications.

ATK Defense Group, Missile Products Division is looking to make their current Bid and Proposal (B&P) process more efficient. ATK requested that Rocket Power focus on streamlining this process at the Elkton, MD. Rocket Power focused on the process from when a Request for Proposal (RFP) is received until the proposal is delivered back to the client, developing recommendations that reduce time and cost without sacrificing quality. Ultimately, Rocket Power hopes to lay down the foundation for future QUEST teams hoping to streamline the B&P process at other ATK sites.

CONTRIBUTIONS AND RECOMMENDATIONS

The team conducted individual interviews with a variety of Bid and Proposal process stakeholders. Using the information collected, the team mapped the current process and identified key areas of inefficiency and bottlenecks. Next, the team shared their current findings with the stakeholders and made adjustments accordingly to the map through an iterative process. This analysis helped identify multiple recommendation areas, specifically within the proposal review process and how materials quotes are obtained for pricing. ATK has a tiered proposal review that elongates the process for accepting or rejecting a proposal. Our recommendations will eliminate up to two weeks of process time. Additionally, Rocket Power recommended that ATK distinguish between types of proposals, and thus the Program Manager should have discretion over estimating costs for them. Ultimately, these solutions will reduce the costs of proposal which will allow ATK to deliver more proposals and therefore win more business.
ROCKET POWER
Launching Successful Proposals To Fuel Business

Opportunity
Work with ATK Missile Products Division to improve the efficiency and cost-effectiveness of their Bid and Proposal Process at the Elkton Site

Eliminate Percentage Rule

Current
- x% of all quotes for every proposal must be valid
- Quotes only valid 30 days when contracts start a year later
- Often takes 2 weeks or longer to get quote

Proposed
- Fixed Price
  - x% of total cost
- Historical Actuals
- Rough Order of Magnitude (ROM)

Void the Rule
- Rough Order of Magnitude (ROM)
  - A preliminary, non-binding estimate of project costs for a prospective client
- More accountability

Simplify Delegation Levels

Current
- Too many levels
- No value added
- Numerous Meetings

Proposed
- Simplify
- Reduce hand-offs
- Save time

Streamline Delegation Package

Current
- The delegation package drives the current Bid and Proposal Process. At 28 slides, much information is non-value added and repetitive creating unnecessary work

Proposed
- Our solution condenses the delegation package to include elements essential to the proposal or bottom line. Reducing time and increasing quality and thoroughness

Company Information
Alliant Techsystems Inc. (ATK) Defense has become an industry leader in missile defense systems, solid rocket propulsion, and sporting ammunition by developing affordable, innovative, solutions for mission-critical applications.

Methodology
- Conduct Site Visit
- Analyze Process Map
- Create Current B&P Process Map
- Design Value-Stream Map
- Develop Solutions
- Present & Implement Solutions

Special Thanks To:
Project Champion: Kevin Schoonover, ATK
Faculty Advisor: David Ashley, Executive in Residence, QUEST
The Quality Guild
**The QUEST - ATK Defense Group (Procurement) Project**

**RECOMMENDING PROCUREMENT BEST PRACTICES**

**QUEST Student Team:**
**IBB Solutions**

<table>
<thead>
<tr>
<th>Steven Asifo</th>
<th>Sara Bleistein</th>
<th>Matt Sarna</th>
<th>Kyle Suess</th>
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<tr>
<td>Information Systems and Supply Chain Management</td>
<td>Accounting and Finance</td>
<td>Marketing and Supply Chain Management</td>
<td>Mechanical Engineering</td>
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</table>

**Project Champion:**
Brittany Brower

**Senior Purchasing Supervisor**

**Faculty Advisor:**
David Ashley

**Executive in Residence, QUEST Honors Program**

**PROJECT SUMMARY**

Alliant Techsystems Inc. (ATK) Defense Group is a global industrial company that develops and manufactures highly engineered materials and products that support mission-critical applications for defense, aerospace, and security customers. By developing affordable, innovative solutions, ATK has become an industry leader in missile defense systems, solid rocket propulsion, and sporting ammunition. The ATK Missile Products division is an industry leader in the development and production of tactical rocket motors and missile systems for various applications.

Procurement encompasses the process by which organizations acquire goods and services. Procurement models can range from fully decentralized, with separate locations handling their own purchases, to a fully centralized process, in which all purchases go through a central hub. Five years ago, ATK’s Missile Products Division transitioned from a decentralized procurement model to a centralized model, with their Baltimore office purchasing materials for the neighboring sites. ATK has presented us with the opportunity to evaluate whether their company should have a centralized or decentralized procurement model, and determine industry best-practices for cost savings and efficiency in the process. Supported by industry research and personnel interviews, IBB Solutions has provided recommendations related to organizational structure, processes and performance management.

**CONTRIBUTIONS AND RECOMMENDATIONS**

We recommend that ATK continue with a centralized procurement model. From our personnel interviews we learned ATK values cost savings and efficiency as part of their procurement strategy. Our research shows that centralization allows procurement to leverage volume buys and better align with corporate strategies and business units. With centralization recommended, IBB Solutions performed academic research and interviewed other defense firms to identify improvement opportunities and mitigate inefficiencies in ATK’s procurement. Our recommendations to improve ATK’s centralized structure includes increasing the visibility of upper management’s procurement goals, improving the information sharing process of cost performance, establishing an operational excellence team, and improving software training. These aforementioned recommendations will provide our client with greater cost savings, improved efficiency, and increased alignment with their corporate strategy.
ATK Missile Products Division Procurement

Recommend Procurement Best-Practices

1. Scope
To recommend a centralized or decentralized procurement model that aligns with ATK’s strategy, while determining best practices to improve cost savings and efficiency.

2. Methodology
- Define: Understand current state of procurement
- Measure: Interview competitors and compare to ATK
- Analyze: Identify best practices for ATK

3. Recommendations
A. Operational Excellence team to focus on continuous improvement
B. Improve software training to create subject matter experts
C. Continued growth through identified DMAIC opportunities

Visible goals from top management

ATK should continue with a centralized procurement structure

4. Process Improvement

Current Flow of Information vs. Ideal Flow of Information

Current Flow:
- Purchasing Manager
- Program Personnel
- Supply Chain Analyst

Ideal Flow:
- Senior Management
- Program Manager
- Buyer

5. Benefit
- Economic savings to receive better prices
- Improved coordination among functions
- Continuous improvement towards goals

Value Added
THE QUEST - BAKERY EXPRESS PROJECT

STREAMLINED SCHEDULES

QUEST STUDENT TEAM:
GO FOR THE DOUGH

<table>
<thead>
<tr>
<th>Jaimie Hsu</th>
<th>Paul Kelly</th>
<th>Addrenia Smith</th>
<th>Margaret Zheng</th>
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Project Champion: Jon Burns
Director of Quality Assurance

Faculty Advisor: Dr. Nicole M. Coomber
Associate Director, QUEST Honors Program

Faculty Advisor: Kylie Goodell
Assistant Director, QUEST Honors Program

PROJECT SUMMARY

Bakery Express is a mid-size wholesale baked goods manufacturer headquartered in Halethorpe, MD. The company specializes in producing fresh and frozen pastries for a variety of retailers, including 7-Eleven and Harris Teeter. Operations occur 24 hours per day, 365 days per year. Within the past decade, Bakery Express has experienced an average 10% annual growth rate.

This project focuses on improving the efficiency of scheduling frozen goods production at Bakery Express. To accomplish this objective, we hope to provide real-time updates of any changes made through a schedule format that is standardized across all of the company’s departments. We aim to minimize existing data gaps so that managers can more efficiently create and review production schedules, while floor employees can gain a better understanding of their daily and weekly tasks. Ultimately, the project will eliminate the variance in schedule format for frozen goods, ensuring the quality of information throughout the manufacturing process.

CONTRIBUTIONS AND RECOMMENDATIONS

Go for the Dough evaluated the schedule generation and attainment processes from a lean perspective. The team established an initial state using structured observation and process flow maps. Based on information obtained through focus groups and surveys, the team determined client preferences for the ideal solution. Preliminary recommendations were refined through discussion with subject matter experts, analysis of design requirements, and a candidate systems matrix. The team offers a few suggestions to minimize product and time waste: 1) standardization of schedule formats and generation process; 2) centralization of master schedule via Sharepoint; 3) Tracking of previous schedule versions and changes; and 4) Synchronization of sanitation schedule with production schedule. These recommendations could drastically reduce the cost per schedule change. Multiplying these savings across the average of thirty monthly schedule changes results in a significant economic benefit for Bakery Express, with minimal cost.
**OPPORTUNITY**

To improve the scheduling efficiency of frozen products.

- **Standardize format**
- **Share real-time**
- **Streamline communication**

**METHODOLOGY**

- **Initial**
  - Structured observation to establish starting point; guidance from subject matter experts

- **Refine**
  - Focus groups and surveys to determine client preferences; 1-week pilot program

- **Select**
  - Analysis of design requirements and creation of feasibility matrix to select the ideal

**RECOMMENDATIONS**

1. Synthesize basic product information and variance metrics into a single standard form

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<th>Description</th>
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<tr>
<td>Date</td>
<td>2023-03-15</td>
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<tr>
<td>Location</td>
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</tr>
<tr>
<td>Product Code</td>
<td>1234</td>
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<tr>
<td>Quantity</td>
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</table>

2. Install 50-inch screen at indicated point

3. Broadcast real-time schedule changes made through SharePoint

**INITIAL STATE**

- Schedule station with one paper copy
- Four unique schedule formats
- No floor-wide communication system
- Loss of $50 per schedule change

**PROCESS FLOW**

1. Manager/Creator Creates Schedule
2. Production Associate Arrives
3. Check Schedule
   - Extra Time?
   - Yes
   - No
4. Check Tracy
   - Enough Fresh Goods?
   - Yes
   - No
5. Receive P/T1 Order
6. Begin Production of Fresh Goods
7. Frozen Producing Frozen
8. (III) Broadcast real-time schedule
9. Changes made through SharePoint

**COST BENEFIT ANALYSIS**

- **Eliminate Schedule Format Variance**
- **Minimize Data/Communication Gaps**
- **Increased Batch Traceability**
- **~$1000 Monitor/Installation**
- **SharePoint Training Hours**

**TEAM**

- **Go For The Dough**
  - Jaime Hsu
  - Addrenia Smith
  - Paul Kelly
  - Margaret Zheng

**PROJECT CHAMPION**

- Jon Burns, Director of Quality Assurance

**FACULTY ADVISORS**

- Nicole M. Coomber, PhD, Associate Director QUEST Honors Program
- Kylie Goodell, Assistant Director QUEST Honors Program
THE QUEST - BD PROJECT

PROJECT TAGLINE

QUEST STUDENT TEAM:
STREAMline

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<tr>
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<td>Fire Protection Engineering</td>
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<th>Project Champion:</th>
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<tr>
<td>Dr. Adam Steel</td>
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<tr>
<td>Director of System Integration</td>
<td>Senior R&amp;D Manager</td>
<td>MDP Assembly Engineer</td>
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<tr>
<td>Associate Director, QUEST Honors Program</td>
<td>Assistant Director, QUEST Honors Program</td>
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PROJECT SUMMARY

Becton, Dickinson and Company provides medical supplies, devices, and technology to the healthcare industry. The BD Diagnostics sector specializes in manufacturing tools for collecting specimens and equipment for detecting diseases. BD Diagnostics is headquartered in Sparks, MD.

STREAMline’s opportunity with BD Diagnostics lies in automating the transfer process of various sexually transmitted infection (STI) specimens from a variety of form factors (containers) to a single downstream form factor used in diagnostic testing. With 20 million STI diagnoses in the US per year, BD aims to expand their medical device offerings within the high-throughput testing market to stay ahead of competitors. Successful completion of this project will decrease risk of incorrect diagnoses, create annual savings for BD customers, and secure BD’s position as a medical device industry leader.

CONTRIBUTIONS AND RECOMMENDATIONS

To better understand the STI transfer process, STREAMline conducted interviews with high-throughput testing laboratories. These labs receive 4,000 STI samples per day, and require 60 minutes to manually transfer 96 samples from original form factors to final diagnostic form factors. With this data, STREAMline designed an automated transfer machine that incorporates existing technologies such as robotic arms with different attachments to de-cap, transfer, and prepare final form factors for diagnosis. STREAMline designed a nested tray for all types of form factors to organize 96 specimen samples prior to the transfer process, which will take 30 minutes to automatically transfer. The team created CAD drawings of design components and provided a list of part manufacturers. The cost-benefit analysis shows the automated design decreases the risk of incorrect diagnoses and increases the profit to BD and their customers.
I. CLIENT
Becton, Dickinson and Company provides medical supplies, devices, and technology to the healthcare industry. The BD Diagnostics sector specializes in manufacturing tools for collecting specimens and equipment for detecting diseases in them.

II. CHALLENGE
Automate the transfer of sexually transmitted infection (STI) specimens from various upstream form factors to a single downstream form factor suitable for diagnosis.

Specimen Testing Process
- STI specimens collected from patients.
- Form factors sorted upstream.
- Specimens transferred to downstream form factors.
- Specimens diagnosed in downstream machine.
- Diagnosis is relayed to patients.

Goal: Design an automated transfer system to eliminate manual transfer of STI specimens.

III. METHODOLOGY
Data Collection
- Design Ideas
- Final Design & CAD Drawings
- Machine Components & Process Maps
- Reference Lab Interviews

IV. DATA
Specimen and Form Factor Breakdown
- Human Papilloma Virus (HPV): (2500 tests per day, 60%)
- Chlamydia (CT): (750 tests per day, 20%)
- Gonorrhea (GC): (750 tests per day, 20%)

SurePath (25%)
ThinPrep (37%)
ProbeTec (38%)

Final Form Factor

V. RECOMMENDATIONS
Transfer System Process Map
- Original Form Factor Tray
- Convoyer
- Transfer One at a time
- TO STORAGE

Transfer Arm Decapper
Specimen Transfer
Transfer Arm Decapper

Final Form Factor Tray
Convoyer
Transfer One at a time
TO TEST

Key Components
- Robotic Arms
- Chuck
- Pipette
- Nested Trays
- Pre-labeled Form Factors
- Barcode Scanner

Costs and Benefits
- $200,000.00 machine
- $320,000.00 NPV savings

+ Lower risk of incorrect diagnosis & less human interaction
+ Greater capacity for BD customers to conduct high throughput STI testing

STREAMline: Automated Specimen Transfer

QUEST Faculty Advisors
- Dr. Nicole Coomber, Associate Director
- Kyle Goodell, Assistant Director

BD Project Champions
- Dr. Adam Stoele, Director of Systems Engineering
- Dr. Michael Varićak, Senior R&D Manager
- Linda Rassenti, MDP Assembly Engineer

STREAMline Champions
- Catherine Ashley, Chemical and Biomolecular Engineering 2014
- Anja Gladding, Business Management/Pre-Medicine 2014
- Nupur Kohars, Chemical and Biomolecular Engineering 2014
- Aaron Rubinstein, Bioengineering 2014
- Alexa Rucinski, Fire Protection Engineering 2013
The QUEST - Bowles Fluidics Project
Optimizing the maintenance process at Bowles Fluidics

QUEST Student Team:
Team Fluid Thinking

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<th>Rochelle Samuel</th>
<th>Tom Sless</th>
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<td>Mihir Sanghavi</td>
<td>Dr. Joseph P. Bailey</td>
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<tr>
<td>Senior Engineer</td>
<td>Executive Director, QUEST Honors Program</td>
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Project Summary

Bowles Fluidics Corporation develops, designs, and manufactures fluid distribution products. The company is headquartered in Columbia, MD and emphasizes dedication to quality, competitive costs, and a customer focus. Their product line includes nozzles and systems for consumer spray, irrigation, showerhead, and automotive industries. Bowles Fluidics began in 1958 with the creation of the fluidic amplifier by Dr. R.E. Bowles. Seeing the potential in a family of similar devices, Bowles Fluidics was incorporated in 1961. Bowles Fluidics currently has 76 injection molding machines at its Columbia headquarters. A team of operators and a maintenance crew handle these machines to meet the company’s production schedule. Bowles Fluidics approached Team Fluid Thinking to investigate the maintenance management process at the company and, if appropriate, recommend a digital system to support the process.

Project considerations included: ability to archive maintenance history moving forward, preventative maintenance schedules, maintenance inventory management, and supporting maintenance management decision making.

Contributions and Recommendations

The team clarified the scope and learned through client site visits and individual interviews that the capture and relay of machine breakdown data was the biggest area for opportunity. In other words, how could we help Bowles Fluidics better capture the necessary machine breakdown information and communicate this information to the maintenance crew for corrective action? Through additional conversations with the client, our team discovered five key criteria that an ideal maintenance system for Bowles Fluidics would require: 1) ability for improved record-keeping of maintenance history, 2) low impedance on maintenance process, 3) visual appeal, 4) system sustainability into the future, and 5) promotion of better internal communication between operators and maintenance crew. After researching dozens of existing vendor solutions and evaluating them against a weighted criteria matrix, “Maintenance Assistant” computerized machine maintenance system was selected. The team then conducted a product demo day of Maintenance Assistant with Bowles Fluidics and ultimately the solution received high regard from Bowles Fluidics. The team created a product implementation roadmap and control systems to ensure solution sustainability into the future.
EFFECTIVE MAINTENANCE THROUGH FLUID THINKING
Optimizing the Maintenance Process at Bowles Fluidics

DEFINE PROJECT OPPORTUNITY

CLIENT BACKGROUND
Bowles Fluidics is a leading manufacturer of fluid distribution products. The headquarters facility in Columbia, MD houses 76 injection molding machines that are managed by the maintenance and operator crews.

OPPORTUNITY
Bowles Fluidics is looking for a fully searchable, user friendly, expandable, and customizable computerized machine maintenance system (CMMS) for plant and process equipment.

IMPLEMENT SOLUTION AND CONTROL SYSTEMS

PRODUCT DEMONSTRATION
We gauged client interest and receptiveness of our recommended vendor, MA CMMS, by providing a walkthrough trial of the product.

IMPLEMENTATION PLAN
MA CMMS Introduction
Management Pitch
Vendor Contact

IDENTIFY OPTIMAL SOLUTION

SOLUTION MATRIX
Through research of existing vendors, the team generated a matrix of which product most meets the client's needs, and concluded that MA CMMS was the optimal solution.

OBJECTIVE
Develop a simple and functional maintenance system to better relay and capture breakdown data

CONDUCT ANALYSIS

MAINTENANCE PROCESS FLOW
Through individual depth interviews (IDIs), the team discovered the bottleneck of the process.

Project Champions: Mihir Sanghavi & Gary Stehensson
Faculty Advisor: Dr. Joseph Bailey

Mark Penny • Rochelle Samuel • Austin Leo • Tom Siess
Contributors: Dr. Nicole Coomber
David Ashley
Kylie Goodell
Dr. Jeffrey Herrmann

Managing Machine

Team Fluid Thinking
The QUEST - McCormick Project

Spicing Up McCormick’s Club Channel Product Line

QUEST Student Team:
The Spice Girls

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<tr>
<th>Erika Carlstrom</th>
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<th>Benita Poon</th>
<th>Abi Shitta-Bey</th>
<th>Meenu Singh</th>
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<tr>
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<td>Finance and Environmental Science and Policy</td>
<td>Supply Chain Management and Marketing</td>
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Project Champions:
- Nancy Peper
- Deborah Stuiber

Senior Consumer and Sensory Scientist

Project Champion:
- Abi Shitta-Bey
- Marketing Manager

Faculty Advisor:
- Dr. Protiti Dastidar
- Tyser Teaching Fellow, Department of Management and Organization

Project Summary

Located in Sparks, Maryland, McCormick & Company is a Fortune 1000 company that manufactures spices, herbs, and flavorings for consumer and industrial markets. A major part of the consumer segment is the Club Channel, which refers to wholesale retailer’s Costco, BJ’s, and Sam’s Club. Currently, McCormick’s Club Channel market caters to thousands of customers; however, the Club Channel presents a unique set of challenges to the company’s growth.

McCormick presented the need to expand its product offerings within their Club Channel segment in order to drive sales growth and increase its overall market share in the spice and flavoring space. Within the Club Channel, McCormick faces fierce competition for shelf space from both brand names and private labels (such as Kirkland Signature), and relies on innovation to come up with exciting new products to keep the club customer returning to the brand. They have enlisted the help of The Spice Girls to identify a robust pipeline of new, innovative products to launch over the next 2-6 years.

Contributions and Recommendations

The Spice Girls contributed new consumer insights that will enable McCormick to better address the needs of the club member. Through extensive research, including a Consumer Advisory Group and mass quantitative survey, the team identified an overarching opportunity to increase consumer’s perception of product freshness within the club line. In addition, the innovations generated by the team reflect a need for simplicity, easy storage, and the overall food trend towards customization. These insights, in conjunction with the product ideas, will boost McCormick’s appeal to club members and will allow the brand to remain a staple in spice cabinets everywhere.
A Dash of Innovation
Spicing Up McCormick’s Club Channel Product Line

Company Background
McCormick & Company is located in Sparks, MD and is one of the world’s leading manufacturers of spices, herbs and flavorings for both consumer and industrial markets.

The Recipe
The Stanford Design School Method

Initial Insights
The team leveraged resources to understand food trends, which led to three key product target areas.

Data Grinder

<table>
<thead>
<tr>
<th></th>
<th>Potential for Impact</th>
<th>Innovation Opportunity</th>
<th>Growth Potential</th>
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</thead>
<tbody>
<tr>
<td>Easy Flavoring</td>
<td>Low</td>
<td>Medium</td>
<td>High</td>
</tr>
<tr>
<td>Table Top Flavoring</td>
<td>Low</td>
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</tr>
<tr>
<td>Bakery</td>
<td>Medium</td>
<td>High</td>
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Greatest potential lies in the need for quick & convenient flavor solutions

Opportunity
Create a pipeline of new, innovative products that:
- Drives growth in the Club Channel
- Contributes flavor
- Is based on a Club Consumer need
- Is actionable

Club Channel
- Wholesale retailers:
  - BJ's, Costco & Sam's Club
- Fierce competition from brand names and private labels

Consumer Advisory Group
Listening to the Voice of the Customer
Conducted a Consumer Advisory Group with eight club members.

Quantitative Survey
30 question survey completed by 443 club members

Once opened, how long do you believe this bottle of dry spices will remain fresh?

- Less than 6 months
- Between 6 months and 1 year
- Between 1 and 2 years
- Between 2 and 4 years
- More than 4 years

77% believe spices last less than a year

Our Flavor Solutions
Overarching opportunity to increase club member perception of club-sized spice products

FRESH GRIND
- Needs Addressed
  - Desire for simplicity
  - Trend towards customization

SPACE SAVORS
- Needs Addressed
  - Ease of storage
  - Demand for value

We Would Like To Thank:
- Nancy Peppe and Deborah Stulber
  - McCormick & Co.
- Proiti Dastidar
  - Faculty Champion
  - The Quality Guild

Abi Shitta-Rey
Marketing and Supply Chain Management

Benita Poon
Finance and Environmental Science and Policy

Meenu Singh
Civil Engineering

Jessica Gower
Bioengineering

Erika Carisstrom
International Business and Marketing
THE QUEST - MILLENNIUM ENGINEERING AND INTEGRATION COMPANY PROJECT

REDESIGNING A BID DECISION MATRIX

QUEST STUDENT TEAM:
TEAM FALCON

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<thead>
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<th>Josh Taylor</th>
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<td>Materials Science and Engineering</td>
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</table>

Project Champion:
Kajal Pancholi
Director, Business Development

Faculty Advisor:
Dr. Joseph P. Bailey
Executive Director, QUEST Honors Program

PROJECT SUMMARY

Incorporated in 1995, Millennium Engineering and Integration Company (Millennium) is a high-end engineering contractor specializing in defense technologies. Millennium has become one of the nation’s premier employee-owned small businesses, offering a wide range of subject matter and engineering expertise in all phases of the systems engineering lifecycle—from concept development to operational testing. Some of its mission partners have included NASA, Air Force, Department of Homeland Security, and the Office of the Secretary of Defense.

Since Millennium’s inception, the company has experienced rapid and substantial growth, doubling in size over a short span of time. With its expanding resources and expertise, the company is often in a position where they are overrun with opportunities. In order to keep pace with its growth and maximize its ability to win bids, Millennium wants to revamp its current bid proposal process. This includes redesigning its current bid/no-bid matrix, a tool they use to assess its probability of win for opportunities, and optimizing its current bid proposal process to maximize efficiency.

Our team was tasked with optimizing the bid/no-bid decision matrix and matrix processes in order to better prioritize opportunities and increase the accuracy of probability of win calculations. This would allow Millennium to increase growth by bidding strategically on stronger opportunities.

CONTRIBUTIONS AND RECOMMENDATIONS

In order to maximize Millennium’s chances of winning a bid and optimizing their efficiency, we have suggested a dual bid/no-bid matrix approach and an idealized decision process. The dual matrix system allows for the earlier elimination of weak opportunities and subsequent prioritization. The idealized process allows for comparison of similar opportunities for better allocation of resources and additional prioritization. Additionally, the idealized process determines optimal times of the implementation of the matrices.

Lastly, analyzing past matrix data enabled us to devise an analytical system that calculates a probability of win based on continuously updated database, furthering improvements into the future.
THE QUEST - PwC PROJECT

ENHANCED ORGANIZATIONAL LEARNING

QUEST STUDENT TEAM:
The Watch

<table>
<thead>
<tr>
<th>Jacob Wilkowsky</th>
<th>Mark Leybengrub</th>
<th>Jeremy Lefkowitch</th>
<th>Nelson Young</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accounting and Finance</td>
<td>Finance and Supply Chain Management</td>
<td>Finance and Operations Management</td>
<td>Finance</td>
</tr>
</tbody>
</table>

Project Champion: Joel Liebman
Senior Associate

Project Champion: Jon Saad
Partner

Faculty Advisor: David Ashley
Executive in Residence, QUEST Honors Program

PROJECT SUMMARY

PwC is a multinational professional services firm with over 180,000 employees and offices in 159 countries. The firm generates its revenues from assurance, advisory and tax services, and is the largest of the “Big Four” accountancy firms by 2012 revenues. PwC’s Homeland Security and Law Enforcement (HS&LE) Account Team delivers world class solutions to its clients within the Department of Homeland Security, the Department of Justice and Federal Advanced Programs.

In order to stay current with the dynamic federal environment, HS&LE professionals rely on the Federal and Legislative Watch Report for key knowledge. The Federal and Legislative Watch Report is a biweekly newsletter supported by an editorial team composed of 30 liaisons assigned to various project teams. We were given the opportunity to improve this critical knowledge sharing device.

CONTRIBUTIONS AND RECOMMENDATIONS

Our analysis pointed to several key areas for improvement: the delivery platform, the aggregation process, and the management of the team aggregating and editing the content. A move to PwC’s internal social business platform, SPARK, will allow readers to engage with content and provide feedback to contributors, and for news to be shared in real time, together making the news more relevant to the readers. An automatically generated weekly newsletter recapping the previous week’s important articles will meet the needs of readers who are slower to switch to SPARK, while cutting editing time nearly to zero. Finally, we developed a readership plan for communicating the changes to the readers and convincing them of the value they will get from adopting. We expect that these changes will transform the report into an indispensable market intelligence tool, empowering the entire account team to deliver more value to their clients.
THE WATCH INTELLIGENCE REPORT

Background
By: Nelson Young

PwC’s Federal Consulting practice has a group of 30 associates that comprise the Federal and Legislative Watch Team (F&LWT), which disseminates client relevant news to support the 380 members of the Homeland Security and Law Enforcement account team.

Opportunities
By implementing new processes and technologies, F&LWT can improve the relevance and timeliness of their report, making the F&LWT more efficient and effective.

Methodology
By: Jacob Wilkowski

Analysis
By: Robert Cobb

We investigated various options for new platforms. Given the identified criteria, we found that the best option was a combination of Spark and a third party email platform.

Recommendations
By: Jeremy Lefkovich

We recommend that the F&LWT change its delivery platform and editing process. We also recommend a readership adoption plan and the use of new feedback and analytic tools to guide the management of the F&LWT.

Impact
By: Mark Leybengrub

Our recommendations will eliminate 60 hours/year from the writing process and enable reader feedback. The readership adoption plan has a target of 90% adoption over the next 6 months. Armed with the best information, HS&LE will be able to deliver superior service to clients and generate more business.

Faculty Advisors:
Dr. David Ashley
Dr. Nicole Coomber

Project Champions:
Joel Liebmann, Senior Associate
John Saad, Partner

Editors (pictured left to right):
Nelson Young
Jacob Wilkowski
Mark Leybengrub
Jeremy Lefkovich
Robert Cobb

B.S. Finance
B.S. Finance/Accounting
B.S. Finance/Supply Chain Management
B.S. Finance/Operations Management
B.S. Entrepreneurship and Innovation in STEM Education

90% Readership Adoption Plan
Intranet Tool: Spark
HTML Newsletter through Access
Enhanced Team Management

90% of Federal Watch Team in New Process
70% of Federal Watch Team in New Process
2% of Readership Engaged on Daily Basis
6% of Readership Engaged on Daily Basis
12% of Federal Watch Team in New Process
8% of Federal Watch Team in New Process

Intricate Task: Spark
- Distribute Content Daily
- Interactive and Collaborative Feature

Intricate Task: Spark
- One-click Generation
- 3rd Party Analytics

Intricate Task: Spark
- Encourage Participation
- Use Feedback and View Rates to Improve Program

Rigorous Task: Spark
- Increased Customer Engagement
- Generation of Higher Quality Content
- Advances Public Prop. To Client

Rigorous Task: Spark
- Increased Reader Engagement
- Increases Article Ownership
- Creates Positive Ethos

Rigorous Task: Spark
- Creation of Feedback Loop
- Fosters Meaningful Discussion
- Generates Valuable Insights

Mark Leybengrub
B.S. Finance/Supply Chain Management
Jeremy Lefkovich
B.S. Finance/Operations Management
Robert Cobb
B.S. Entrepreneurship and Innovation in STEM Education
THE QUEST - SPECTRUM FOODS PROJECT
WAREHOUSE OPTIMIZATION

QUEST STUDENT TEAM:
5PM CONSULTING

<table>
<thead>
<tr>
<th>Elinor Chang</th>
<th>Ehson Kashfipour</th>
<th>Danny Laurence</th>
<th>Melinda Pandiangan</th>
<th>Olivia Sulaeman</th>
</tr>
</thead>
<tbody>
<tr>
<td>Finance and Accounting</td>
<td>Operations Management and Information Systems</td>
<td>Computer Science</td>
<td>Marketing and Supply Chain Management</td>
<td>Mechanical Engineering</td>
</tr>
</tbody>
</table>

Project Champion: David Fanaroff
Founder and Owner

Faculty Advisor: Dr. Nicole M. Coomber
Associate Director, QUEST Honors Program

Faculty Advisor: Kylie Goodell
Assistant Director, QUEST Honors Program

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. 5PM Consulting’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, 5PM Consulting recommends the elimination of unprofitable items, the reduction of excess inventory levels, and the implementation of a racking system. Specifically, our team recommends 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.
WAREHOUSE OPTIMIZATION

Opportunity: Increased demand is “suffocating” the facility.

Spectrum Foods is a poultry and perishable foods wholesaler that delivers to restaurants, wholesalers, and ethnic grocery stores in a 60 mile radius from Landover, MD. With increased business, the company is hitting capacity in its warehouse and needs a space solution to support current operations as well as future growth. SPM Consulting had the opportunity to be part of the solution. These are our recommendations.

ELIMINATE LOSER ITEMS

STRATEGY
Eliminate items that do not produce substantial profit and have low demand.

IMPACT
Opportunity cost savings: $ 214,288

REDUCE EXCESS INVENTORY

STRATEGY
Reduce excess inventory by comparing actual inventory to optimal quantity levels, based on demand.

IMPACT
Opportunity cost savings: $ 321,482

IMPLEMENT RACKING SYSTEM

STRATEGY
The addition of racks to the dry goods area will create an additional 32 pallet spaces.

IMPACT
Potential revenue: $ 158,897

TOTAL IMPACT

$694,668
ANNUAL COST SAVINGS

IMPLEMENTATION

RACKS BUILT
JAN 2014
EXCESS INV REDUCED
JUN 2014
LOSER ITEMS PHASED OUT
JAN 2015
SUSTAINABLE IMPLEMENTATION
The QUEST - Thales Defense & Security, Inc. Project

Hot Technology that’s Cool to Hold

QUEST Student Team:
Radioactive

<table>
<thead>
<tr>
<th>Nate Adler</th>
<th>Sarah Cho</th>
<th>Becky Gagnon</th>
<th>Cole Parker</th>
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<tr>
<td>Accounting and Information Systems</td>
<td>Electrical Engineering</td>
<td>Electrical Engineering</td>
<td>Operations Management</td>
</tr>
</tbody>
</table>

Project Champion: Steve Kutchi
Mechanical Design Manager

Faculty Advisor: Dr. Jeffrey Herrmann
Associate Director, QUEST Honors Program

Project Summary

Thales Defense & Security, Inc. is a proxy company of the Thales Group, a leader in defense, security, aerospace, and transportation. Thales focuses on innovative communication solutions for size-, weight-, and power-constrained environments, and provides world-class support for those solutions. One of their main products is the AN/PRC-148: the smallest, lightest, and most power-efficient multiband, handheld radio in use today. Founded in 1964, the company headquarters is located in Clarksburg, Maryland.

Thales Defense & Security, Inc. has created a next generation radio called the MBITR2. This multiband inter/intra team radio provides warfighters with a single device that integrates narrow- and wideband channels, rather than forcing users to use two separate radios. As a result, this handheld radio is weighs less and provides more capabilities for warfighters; however, one common problem for Thales is the heat generated from the circuitry required to drive the antenna. Our team was tasked with reducing the heat output and surface temperature of the radio, while still providing the functionality of two handheld devices in one.

Contributions and Recommendations

Team Radioactive provided Thales Defense & Security, Inc. with an analysis of four different recommendations in order to reduce the surface temperature and heat output of the MBITR2 radio. Thales requested that our team focus on air-moving concepts and forced airflow, and our proposed solutions are evaluated based on various criteria such as performance, size, audible sound, power consumption, and costs, among several other factors. In addition to the recommendations, our team prototyped one of the solutions and evaluated its effect on cooling the radio. Included in our analysis are implementation proposals for our solutions, so that Thales can properly utilize and incorporate the designs into the MBITR2 and potentially other products as well. Since Thales competes in a $14 billion industry of telecommunication, we understand that improving the efficiency and effectiveness of the radio is significant to the company’s future success.
Opportunity
Thales has given team Radioactive the opportunity to provide four novel air-moving concept solutions to reduce the surface temperature of a military handheld radio.

Research Methodology
- Reviewing thermodynamics and heat transfer
- Affinity diagrams and brainstorming
- Consultation with field experts

Weighing Factors
Team Radioactive evaluated its concept solutions based on four categories as specified by Thales: Cooling Potential, User Acceptability, Durability and Costs.

RECOMMENDATION

Single-Blade Piezoelectric Fan
- A ceramic blade is sandwiched between two piezoelectric actuators which cause oscillations when voltage is applied.

EJET at UMD
- Electroactive polymer Jet Actuator produced by the UMD Aerospace Engineering Dept.

GE Piezoelectric DCJ
- Combines two oscillating piezoelectric materials, forming a small bellows which pumps out a stream of high-velocity air.

SynJet by Nuventix
- Oscillating diaphragm pumps air in and out of chamber, causing a jet stream of cool turbulent air to flow through a heat sink and spot-cool an electronic device.

Scores:
- Single-Blade Piezoelectric Fan: Score 197
- EJET at UMD: Score 225
- GE Piezoelectric DCJ: Score 296
- SynJet by Nuventix: Score 424
The QUEST - Tulkoff Food Products

Improving Food Quality Through Particle Detection

QUESTION STUDENT TEAM:
TEAM SAUCY

<table>
<thead>
<tr>
<th>Name</th>
<th>Role</th>
<th>Department</th>
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<tbody>
<tr>
<td>Mark Barbagallo</td>
<td>Project Champion</td>
<td>Bioengineering</td>
</tr>
<tr>
<td>Meaghan Potter</td>
<td>Project Champion</td>
<td>Neurophysiology</td>
</tr>
<tr>
<td>Savannah Vogel</td>
<td>Project Champion</td>
<td>Bioengineering</td>
</tr>
<tr>
<td>Justin Winslow</td>
<td>Faculty Advisor</td>
<td>Aerospace Engineering</td>
</tr>
<tr>
<td>Phil Tulkoff</td>
<td>V.P. of East Coast Operations</td>
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<tr>
<td>Brent Guyton</td>
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Project Summary

Tulkoff Food Products is a family-owned and operated business headquartered in Baltimore, Maryland that manufactures and sells condiments, sauces and dressings (e.g. cocktail sauce, aioli sauces, pestos, and steak sauce). Tulkoff started as a manufacturer of horseradish and almost 80 years later, it is still their top selling product. After 60 years of business in Maryland, Tulkoff opened a new manufacturing facility in Pittsburg, California. Tulkoff is committed to providing safe and high quality products to its customers.

On two occasions within the last ten years, Tulkoff has found low-density polyethylene (LDPE) in their horseradish product. Though this is not a health issue, it leads to an unsatisfactory product for consumers and has cost Tulkoff over $370,000 in damages. LDPE is a lightweight plastic used by farmers to cover their fields and protect their crops from extreme weather. Over time LDPE degrades, enters the soil, and becomes embedded in the horseradish root itself. Currently, LDPE cannot be detected by Tulkoff’s detection systems which specialize in metal and ferrous object detection. Therefore, the team was tasked with recommending and implementing a method to detect both black LDPE and other foreign non-ferrous objects (e.g. string, wood) as well as conduct a cost-benefit analysis of the detection system.

Contributions and Recommendations

The team identified detection system vendors and narrowed their options to three: Food Radar, Industrial Tomography Systems, and National Instruments. The team corresponded with representatives from these three companies to determine the feasibility of LDPE detection and to coordinate initial testing. After initial testing, Food Radar was able to provide the most reliable and effective detection system; however, the product is outside of Tulkoff’s budget. Food Radar will be making a site visit to Tulkoff’s facility to determine the absolute location and price for the detection system. The team’s final recommendation for Tulkoff at the moment is to implement Food Radar’s microwave dielectric spectroscopy system. However, if the testing with ITS demonstrates that the product will work as effectively as the Food Radar System, then the team would recommend ITS over Food Radar because it fits better within Tulkoff’s budget.
Opportunity
Introduce a detection system within Tulkoff’s horseradish manufacturing line to signal the presence of LDPE and other non-ferrous foreign materials.

III. Data Analysis

<table>
<thead>
<tr>
<th>Vendor</th>
<th>Foreign Particle Detection</th>
<th>Within Budget</th>
<th>Satisfy 100 GPM Flow Rate</th>
<th>Food Grade System</th>
<th>IF*</th>
</tr>
</thead>
<tbody>
<tr>
<td>National Instruments</td>
<td>Poor</td>
<td>Very Good</td>
<td>Poor</td>
<td>Very Good</td>
<td>Poor</td>
</tr>
<tr>
<td>Food Radar</td>
<td>Very Good</td>
<td>Poor</td>
<td>Good</td>
<td>Very Good</td>
<td>Very Good</td>
</tr>
<tr>
<td>ITS</td>
<td>Very Good</td>
<td>Good</td>
<td>Very Good</td>
<td>Very Good</td>
<td>Very Good</td>
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</tbody>
</table>

*Implementation Feasibility

V. Recommendations
We recommend that Tulkoff implement Food Radar's detection system, pending testing with ITS.

Team Saucy:
Mark Barbagallo  Meaghan Potter
Savannah Vogel  Justin Winslow

Project Champions:
Phil Tulkoff & Brent Guyton

Faculty Advisor: Dr. Jeffrey Herrmann
**PROJECT SUMMARY**

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, Oleo Logistics 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, Oleo Logistics concluded that shipments containing orders that request fewer cases than provided on a full pallet inflate average loading time by 50 minutes. Our team 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.
**Optimizing Outbound Shipment Processes**

**Scope**
To reduce average outbound truck loading duration

**Goal**
Achieve 90 minute turnover time to boost on-time delivery

**Current State**
- 15% Increased Loading Time After Atlanta Plant Closure
- 65% On-Time Delivery
- 70% Shipments Contain Partial Orders
- 3X Partial Load Time vs Full Load Time
- 35 Daily Outbound Shipments

**Current Process**

**Pick Line 2.0**
Pick Line 2.0 is the process of assembling and storing partial orders in Aisle 4 racks prior to their scheduled shipment

**Ideal Process**

**Pick Line 2.0 Implementation**
- Rack Staged Order [1 min]
- Retrieve Empty Pallet [30 sec]
- Wrap Staged Order [1.8 min]
- Retrieve Products [1.25 min]
- Restock Surplus [2.8 min]
- Casepick [6 min]

The time shown above portrays the average of the trials conducted while implementing Pick Line 2.0

**Impact**
- 7 minutes Additional Truck Turnover per Day
- 85 minutes New Average Truck Turnover Time
- 36% Reduction in Truck Turnover Time

**Acknowledgements**
- Brooke Fitzgerald
- Elaine McCleary
- Jonathan Jeff-Parmer
- Dr. Joseph Bailey
- Eric Homel
- Aditya Sridhar
- Aaron Tucker
- Mackenzie Cooper

**Unilever**
is a multinational corporation behind many of the world’s most widely acknowledged consumer product brands collectively used by over 2 billion people daily. The Baltimore Spreads and Dressings Site manufactures popular spreads including Country Crock, Promise, and I Can’t Believe It’s Not Butter.

**$62,270,800 Increase in Net Sales per Year**
PROJECT SUMMARY

Volvo first began producing trucks in the 1920s and today stands as one of the world’s leading manufacturers of trucks and drive systems for industrial purposes. Over the years, the Volvo Group has grown and is now comprised of eight business units, of which one is Volvo Powertrain. The 1.5 million-square-foot Hagerstown, MD Powertrain Facility supplies the entire Volvo Group with driveline components, such as diesel engines, transmissions, and in the near future, rear axles, as well.

The contract for third-party supply of rear axles to the Hagerstown Powertrain Facility will soon be ending, which gives Volvo the opportunity to bring production in-house. Not only will this investment cut down transportation costs, it will also allow for a new innovative design that is optimized for their facility. Team PHOENIQS has flown in to help Volvo’s project team conceptualize a lean rear-axle assembly line design. As a result of the recommended layout, the overall facility can recognize reduced man-hours, increased production capacity, and flexibility to adapt to Volvo’s evolving needs.

CONTRIBUTIONS AND RECOMMENDATIONS

Based on our research, the team determined that Volvo could maximize cost savings by implementing lean concepts surrounding inventory management, worker ergonomics, and assembly line shape. Keeping in mind Volvo’s allocated space and projected capacity needs, the team designed a layout for a rear axle assembly line that included dimensions for each station, considerations for point-of-use storage, and means for the transportation of parts. The layout separates the assembly process into three sub-assembly lines that feed into a main assembly line. The recommended layout, as compared the layout used by the previous supplier, results in a 31% reduction in hours per unit, a 61% saving in required space, and a 10% reduction in man-hours. Because the proposed layout is compact, it allows Volvo to build a second assembly line in the allocated space if demand for rear axles increases.
Volvo Group Trucks: Lean Design for an Assembly Line

Client Information
The Volvo Group is one of the world’s leading manufacturers of trucks, buses, and construction equipment and one of the world’s leading producers of heavy-diesel engines.

I. Opportunity
Volvo’s Hagerstown Powertrain Facility has outsourced the manufacturing of rear axles in the past. However, in the near future, Volvo will bring the process in-house, enabling production at lower costs.

II. Requirements
- Decreased Hours per Unit (HPU)
- 600 x 120 ft² allocated space
- Potential for increased capacity
- Flexible construction
- Time-sensitive implementation

Scope
To design a rear axle assembly line following Lean Concepts and World Class Manufacturing Standards

III. Methodology
Inventory Management, Ergonomics, Volvo Production System Handbook

Data Collection

Quality Tools
Process Map, Goes-Into, Spaghetti Diagram

Design Iterations

IV. Facility Layout

V. Impact

<table>
<thead>
<tr>
<th>Metric</th>
<th>New</th>
<th>Old</th>
<th>Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours per Unit</td>
<td>.322</td>
<td>.4718</td>
<td>31.8%</td>
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<tr>
<td>Man-hours</td>
<td>105,120</td>
<td>116,800</td>
<td>10.0%</td>
</tr>
<tr>
<td>Assembly Space</td>
<td>2,750 ft²</td>
<td>7,200 ft²</td>
<td>61.8%</td>
</tr>
</tbody>
</table>

Special Thanks To
Project Champion: Sam Watters, Adam White
Volvo Team: Kevin Bain, Doug Appleby
Faculty Advisor: Jeffrey Herrmann

Team PHOENIX: Corey Bloom, Sherry Feng
Emily Guerra, Matthew Kannan, Fay Yu
David Ashley is an adjunct professor and an Executive in Residence at the University of Maryland’s Smith School of Business. He is also 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. Additionally, he 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.

Joseph Bailey has been a faculty member at the University of Maryland since 1998 and with the QUEST Honors Program since 2009. In addition to advising three teams of QUEST seniors this semester, he teaches the required QUEST sophomore course on design and quality and the mentor class which it complements. Dr. Bailey also teaches in the Smith School’s Executive Program including a class on Strategic Information Systems in the EMBA program. His research focuses on Internet commerce and digital platform competition. Dr. Bailey has numerous peer-reviewed publications and was co-editor of the book “Internet Economics” from MIT Press. He 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.
Nicole Coomber is the Associate Director for the QUEST Honors Program and on the faculty in the Management & Organization area at the Robert H. Smith School of Business. As Associate Director, Dr. Coomber is the lead faculty member for the QUEST capstone course, BMGT/ENES490H, and aids in QUEST’s efforts in designing learning outcomes and assessments. Dr. Coomber completed her PhD in Education Policy and Leadership in May of 2012 at the University of Maryland’s College of Education. Her research interests include management education and experiential learning. Dr. Coomber teaches a variety of course outside of QUEST, including Managing People and Organizations, Non-Profit Consulting, and Cross-Cultural Challenges in Business. Before joining the faculty at Smith, she worked with the QUEST program as Assistant Director, leading efforts in curriculum and corporate development.

Dr. Protiti Dastidar is a Tyser Teaching Fellow at Robert H. Smith School of Business. Prior to joining the Smith School faculty in the Fall of 2011, she was Assistant Professor at Temple University, Philadelphia and the George Washington University, Washington DC. Dr. Dastidar earned her Ph.D. in Finance from The Ohio State University, her MBA in Marketing from Webster University, Austria and her B.A. in Economics from the University of Bombay, India. Her research interests include international diversification strategies and cross-border acquisitions. She has successfully taught in MBA and undergraduate programs, having won several teaching awards. Dr. Dastidar worked as an international management consultant (at KPMG) providing strategic advice for leading companies and government agencies in Europe.
**Kylie Goodell**  
**Assistant Director, QUEST Honors Program**  
**Projects Advised: Bakery Express, BD, and Spectrum Foods**

Kylie Goodell is the Assistant Director of QUEST. In this role, she teaches a course on scoping consulting projects and works with students to identify QUEST clients and outline capstone projects. Kylie is currently working on publications related to QUEST’s learning outcomes assessment and the use of criteria in evaluating and improving upon the scopes of action learning projects. Kylie is currently pursuing a Ph.D. in Quantitative Methodology in Maryland’s College of Education. Her research interests include evaluating admission metrics and outcomes of high-achieving student programs. Previously, Kylie served as a 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.

**Dr. Jeffrey W. Herrmann**  
**Assistant Director, QUEST Honors Program**  
**Associate Professor, Department of Mechanical Engineering and Institute for Systems Research**  
**A. James Clark School of Engineering**  
**Project Advised: Thales Communications, Tulkoff Food Products, and Volvo Group Trucks**

Jeffrey Herrmann is an Associate 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.
ROSE JACKSON
GRADUATE ASSISTANT, QUEST HONORS PROGRAM

Rose Jackson joins is the QUEST Graduate Assistant. She is currently pursuing her M.A. in Higher Education here at Maryland. She works as the Student Experience Coordinator on the QUEST team, working with the various student leadership groups in QUEST to help develop student leaders. Rose earned her B.S. in Business Administration with a concentration in Finance and a minor in Management from Frostburg State University. While at Frostburg, was very active in many scholastic organizations and served as a liaison between Frostburg State University and Hunan Normal University in Changsha, China.

DR. JAMES PURTILIO
ASSOCIATE PROFESSOR, COMPUTER SCIENCE DEPARTMENT
COLLEGE OF COMPUTER, MATHEMATICAL, AND NATURAL SCIENCES

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. J. Gerald Suarez
Professor of Practice of Practice in Systems Thinking and 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.
**NOTABLE PAST QUEST PROJECTS (2009-2012)**

**2012: THE QUEST – ATK Mergers and Acquisitions Project: A New Model for Mergers and Acquisitions**

Mathew Gold  
Amy Kalowitz  
Santiago Miret  
Melinda Song  
Dulany Wagner

**PROJECT SUMMARY**

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.
2012: The QUEST – BD Project
Project: Automation of BACTEC FX Blood Culture System
Elizabeth Blankenhorn
Hayley Brown
Jillian Buchheim
Karthik Menta
Garrett Wenger

Project Summary
Over the past century, automation has led to improvements in process efficiency and accuracy for many industries. In the field of microbiology, a great number of repetitive tasks need to be completed by a shrinking labor force, making automation both viable and necessary. As hospitals and laboratories consolidate, the number of blood samples to be processed at any one site will increase, making automation even more important. As part of BD’s move towards total lab automation, we were tasked with automating the blood culture process from specimen arrival to disposal or further subculture using the current BACTEC FX system as a foundation.

Contributions and Recommendations
Our key contributions included quantitative and qualitative primary research of BD’s customer base, design conceptualization and detailed sketches of automated blood culture system and Preliminary Requirements Document, “PRD” outlining design specifications for BD’s automated blood culture processing system. Our design recommendations included a queuing accumulation table, scanning and weighing 2D barcode and High Accuracy Check Weigher, a transport conveyor belt, and a cradle system for loading and unloading.
2012: THE QUEST – SAIC CYBERSECURITY PROJECT
PROJECT: IMPROVING FIRST RESPONSE TO CYBERSECURITY THREATS
Genna Gold
Bryan Huang
Josh Kohn
Eddie Stose
Angela Wu

PROJECT SUMMARY

SAIC, a defense contractor historically focused on the federal sector, has begun to establish their market footprint in the commercial cybersecurity industry. SAIC feels that their current approach and timeline for responding to requests for proposals (RFP) - while competitive in the federal sector - will not be sufficient in the private realm. Aegis Solutions, in collaboration with SAIC’s forensic analytics team, has developed a pricing tool that will allow SAIC to give their clients a more accurate estimation of the price of their services in a shorter time, decreasing the overall time required to respond to proposal requests. Aegis Solutions has also made several recommendations for SAIC to implement in the future, including a staffing optimization system to ensure that all obligations to a client can be met, a predictive pricing analysis tool, and a web-based form for potential clients to fill out to facilitate the initial point of contact with SAIC.

CONTRIBUTIONS AND RECOMMENDATIONS

Our main contribution is a pricing tool to simplify the creation of estimates for proposals. It codifies a list of questions to ask when developing a proposal and uses programming to generate a report for management. In addition, we have drafted the following recommendations for future development: implementing an employee availability system to ensure that current and future staffing obligations can be met before undertaking a new project, and storing and analyzing pricing tool data to generate better cost estimates for the services offered by SAIC.
2012: THE QUEST - TULKOFF FOOD PRODUCTS PROJECT

PROJECT: PRODUCTION SCHEDULING

Becca Brown
Shirley Qin
David Rosen
Neal Yaffe
Nick Yaraghi

PROJECT SUMMARY

Tulkoff Food Products presented the need for an increase in output per unit time (efficiency) of their production process. Specifically, the team was asked to look into the production scheduling process as a possible source for increased efficiency. For one of their manufacturing lines, the team worked to formulate a scheduling algorithm that would decrease the amount of overall changeovers, maximize run sizes, and ultimately accomplish the goal of increasing efficiency. Through situational research, statistical analysis, and trial runs, we were able to formulate a plan for improvement and move Tulkoff Food Products in the direction of increased efficiency for the future.

CONTRIBUTIONS AND RECOMMENDATIONS

Based on research, the team discovered that Tulkoff Food Products currently produces 47% of their maximum theoretical output. The team also found that the average number of daily changeovers was extremely high. From this data, the team was able to analyze the high moving SKUs that were responsible for 75% of overall production. This information led the team to develop an algorithm that would allow Tulkoff Food Products to focus on creating days in which the High Moving SKUS would be produced with greater run sizes, leading to a decrease in overall changeovers. The algorithm suggests two days a week that are dedicated to high moving SKUS. Also, the implementation of forward thinking in scheduling allows Tulkoff Food Inc. to use current open inventory capacity to allow for more efficient scheduling and use of the production lines.
2011: The QUEST – Bowles Fluidics Project

Project: Optimizing Packaging for Internal Shipping Process

Phil Anderson
Kate Hartinger
Aaron Pearl
Aparna Rao
Saul Shamash

Project Summary

Bowles Fluidics is a fluid distribution products manufacturer that operates out of two main facilities to meet their customers’ demands: one for manufacturing the individual components of the products, and the other to assemble these components into finished products. This requires internally shipping over 200 tons of product per year, which forces even small inefficiencies to quickly add up both from a financial and environmental perspective. By moving from the current disposable boxes for internal shipping to reusable containers, Bowles can potentially save a substantial amount of money and reduce their waste production. We sought to determine the most optimal shipping container for Bowles’s current internal shipping.

Contributions and Recommendations

Team H₂Optimized has researched three packaging alternatives for Bowles’s internal supply chain: corrugated plastic, double-walled cardboard, and nesting plastic. H₂Optimized has determined that the optimal alternative is corrugated plastic. In today’s economy, reducing cost is an increasingly difficult necessity. From an economic perspective, the corrugated plastic option will save Bowles 44.7% on the internal shipping packaging cost. This option will cost $0.63 per trip, compared to the current single use cardboard cost of $1.14 per trip, saving Bowles $0.51 per box per trip. From an environmental perspective, the corrugated plastic option will reduce their shipping waste by 96% over a ten-year period, from 156 tons down to 6 tons.
2011: THE QUEST – SAIC MACHINE READING PROJECT
PROJECT: A.I. PREDICTION OF FINANCIAL CRISIS
Shiran Beroukhim
Jason Felder
Jeff Jacobs
Ryan Murphy
Avi Prince

PROJECT SUMMARY
Team A.I.ideas is working synergistically with the DARPA Machine Reading Program at SAIC to investigate whether an analysis of ideas within financial news articles can allow for a better categorization than an analysis of words. In particular, we are exploring whether a machine can grasp the underlying ideas presented in an article and use them to predict an impending financial crisis. If such a system could be developed, international finance analysts could use it to gauge the current and future safety of a nation’s economy.

CONTRIBUTIONS AND RECOMMENDATIONS
To achieve the ideal article categorization process, we have created a novel method for encoding ideas in the articles in such a way that a machine can learn and draw conclusions from it. In addition, we have developed an experimental procedure allowing us to compare the efficacy of our idea-based analysis against a word-based analysis. This procedure takes advantage of our "gold standard", the results of human categorization of the articles. Based on a comparison between the two methods’ results and "gold standard", the effectiveness of the algorithms can be quantified.
2009: THE QUEST - LOCKHEED MARTIN (OCEAN WAVE) PROJECT
PROJECT: THE DEPLOYMENT OF OCEAN WAVE POWER-GENERATING BOUY FARMS
Suehyun Cho
Munaf Kachwala
Abhishek Kumar
Abby Widom
Gary Wu

PROJECT SUMMARY

Lockheed Martin contracted Team Nyquest to develop three processes of deploying massive buoys off the coast of Oregon at the most efficient level. Selection criteria and analysis exhibited that by implementing a Barge System of deploying the buoys, approximately twenty-times the current number of buoys could be deployed when compared to the current and original method.

CONTRIBUTIONS AND RECOMMENDATIONS

Three processes were devised and analyzed in-depth in order to make the best recommendation to LMCO: Cable System, Barge System, and Buoy Link System. The development of these systems allowed for Team Nyquest to fully comprehend all of the risks and constraints included when deploying masses of this size into the ocean. The Barge System is the recommended process so that higher numbers of buoys may be deployed at a lower cost in order to create energy-producing buoy fields off the coast of Oregon. The Barge System includes lifting the buoys onto a massive barge, driving them out to the placement site in the water, and then submerging the barge so that the buoys can be dragged and pulled into their final locations.
2009: THE QUEST - GE HEALTHCARE PROJECT
PROJECT TITLE: MICROENVIRONMENT CONNECTIVITY INITIATIVE
Michele Abbott
Joshua Davis
Schquita Goodwin
Karena Miller
Ami Trivedi

PROJECT SUMMARY
GE Healthcare manufactures high quality microenvironments used to treat premature babies. In a continued effort to improve their product, GE wants to introduce connectivity ports to allow for device networking and data capture. Team GEraffe has been asked to provide possible connectivity options, develop a cost-benefit analysis of the different options, and present a final decision recommendation and business case summarizing their results.

CONTRIBUTIONS AND RECOMMENDATIONS
Team GEraffe used quantitative and qualitative data derived from a financial model and Analytical Hierarchy Process to provide GE with a recommendation for future connectivity options for the Giraffe Omnibeds and Incubators. Team GEraffe recommends that the best decision is to implement a new Ethernet connectivity port. This background data generation and analysis will provide GE with the support necessary to move forward with the future implementation of Ethernet on the next generation of Giraffe products.
**Project Sponsors 2013**

The companies below have made a significant contribution to our QUEST Seniors as they complete their capstone learning project. In addition to a financial contribution, these sponsors have given an enormous amount of time and thought leadership to a team of students.
QUEST would like to thank and acknowledge all of the individuals, committees, and organizations who have contributed to this event.

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