



Study Tour
Global Manufacturing and Supply
Zoetis, Inc.

May 17 – 18, 2017
Kalamazoo, MI



Columbia Business School faculty and graduate students outside Zoetis' GMS facility in Kalamazoo, MI, on May 18, 2017.

From Left to Right: Nelson Fraiman, Roger Mesznik, Vashist Avadhanula, Irene Lo, Nick Arnosti, Andrea van Ryzin, Zhe Liu & Gowtham Tangirala

**Photos courtesy of Vashist Avadhanula, Kalpana Kanthan & Zoetis*

Participants

Columbia Business School faculty and Ph.D. candidates from the divisions of Decision, Risk & Operations (DRO) and Finance & Economics were joined by graduate students from the department of Industrial Engineering and Operations Research (IEOR) at the Fu Foundation School of Engineering and Applied Science, and guests from Land O'Lakes, Inc.

Nick Arnosti, Assistant Professor, DRO, Columbia Business School

Vashist Avadhanula, Ph.D. Student, DRO, Columbia Business School

Nelson Fraiman, Professor & Director, The Deming Center, Columbia Business School

Kalpana Kanthan, Associate Director, The Deming Center, Columbia Business School

Amy Kolander, Business Optimization Manager, Land O'Lakes, Inc.

Zhe Liu, Ph.D. Student, DRO, Columbia Business School

Irene Lo, Ph.D. Student, IEOR, School of Engineering and Applied Science

Fei Long, Ph.D. Student, DRO, Columbia Business School

Roger Mesznik, Special Lecturer, Finance & Economics, Columbia Business School

Abby Rocca, Technical Sourcing Manager, Land O'Lakes, Inc.

Gowtham Tangirala, Ph.D. Student, DRO, Columbia Business School

Andrea van Ryzin, M.S. Student, IEOR, School of Engineering and Applied Science

Zoetis Study Tour

Zoetis, the leader in global animal health, was created in 2013 as a spinoff of Pfizer, the 60-year-old biopharmaceutical corporation for human and veterinary medicines. In 2016, it had revenues of \$4.9 billion and net income of \$821 million. Demand for animal health products is on the rise due to population and economic growth, as animal longevity, veterinary practices, and the food supply are all affected by animal health. To this end, the company's 9,000 employees work to provide vaccines, tests, products, and devices to both livestock and companion animals across 8 species to predict, prevent, and treat issues pertaining to animal wellbeing.

In May 2017, the Deming Center at Columbia Business School conducted a study tour to the Global Manufacturing & Supply facility of Zoetis in Kalamazoo, MI. The visit was organized in collaboration with Kristin Peck, Zoetis' executive vice president and president, US operations, who is an alumna of Columbia Business School (MBA '99), as well as a member of the Deming Center's Advisory Board.

The day's poster presentations provided an in-depth view of innovations implemented by the Zoetis team to increase operational efficiency in the facility. Additional areas of focus were customer excellence and the use of data analytics to enhance efficiency across all aspects of the company's functioning—from the back-end of supply chain to the front-end of consumer experience.

The objective was to broaden the exposure of faculty, students, and practitioners to industry examples of process improvement and build bridges between theory and practice in the area of operational excellence.





Products manufactured at GMS Kalamazoo



Nicole Johnson from Zoetis with Nelson Fraiman & Vashist Avadhanula



Examining product bottles on a packaging line



Columbia & Zoetis attendees suited up in Personal Protective Equipment (PPE) to enter the packaging area

Zoetis Global Manufacturing & Supply (GMS)

Kalamazoo, MI, is home to one of the largest and most important manufacturing sites in Zoetis' Global Manufacturing and Supply network. Zoetis manufactures many of its leading products here and, since 2003, this location has also served as the global headquarters for the company's Veterinary Medicine Research and Development organization, where it employs approximately 700 people.

The Kalamazoo GMS consists of two buildings—one sterile, the other non-sterile—which together house manufacturing and testing facilities for the site. The physical proximity between manufacturing and R&D teams facilitates communication and collaboration. Zoetis implements continuous improvement programs that equip employees to take charge of their own supply chain optimization processes and establish daily- and long-term goals.



View of Zoetis' Kalamazoo GMS facility

Driving Lean Operations Through Value Streams

In its constant focus to create more value for customers with fewer resources—and minimize waste without sacrificing performance—Zoetis applies lean principles to all aspects of its manufacturing and R&D processes.

A key component of their lean framework is the value stream model, in which the ownership of a new product or existing product batch lies with a specified team/site leader from inception to delivery. This mindset makes the team responsible for all aspects of that value stream’s efficiency, encourages employees at every level to take ownership of their work, and empowers all members to suggest and implement improvements to meet the team’s goals.

This is a significant change from the past, where management set the process-improvement agenda with very little input from the employees involved. Though the management-driven agenda appeared great on paper, the policies failed to take into account the distinct requirements for different teams. This disjuncture between idealistic goals and realistic constraints often led to dissatisfaction among the employees that their opinions were not given due weight.

The employees’ enthusiastic embrace of the value stream concept and their commitment to their team’s process-improvement agenda was notably visible, providing a glimpse into one of the reasons why Zoetis is considered to be one of America’s best mid-size employers.



Sarah Horton, Senior Manager for Operational Excellence, presenting on GMS’ Lean Boot Camp

Value Streams = Value Added: GMS Examples

The emphasis on lean principles and value streams has not only transformed Zoetis' working culture, but also has resulted in significant improvements to its bottom line.

- **Inventory Reduction**

Zoetis' inventory reduction initiatives run diagnostics to keep track of inventory status and provide feedback analyses that contribute to the competitiveness of each value stream.

Through supply chain agreements, Zoetis now uses vendors with shortest lead times and obtains minimum order quantities making procurement flexible and reducing inventory buildup. By taking ownership of the supply chain and warehouse management and carefully studying shipment contracts with various vendors, the warehouse team directly negotiated for improved contracts. These contracts resulted in drastic decreases in inventory held at their warehouses, releasing space that could be put to use for new products.

As a result, GMS Kalamazoo beat the goal for 2016 year-end inventory by \$4M and API (Active Pharmaceutical Ingredient) inventory by \$11M. They reduced overall inventory by \$10M through the analysis of lead times, releasing 48,000 sq. ft. for the new Oral Solid Dose facility.



- **Terminally Sterilized Value Stream: Quality Control in the Microbiology Lab**

A key bottleneck in the production of a terminally-sterilized product was the sterility test, which typically took 22 +/- 6 days. Given the length of the testing process, employees often did not follow up diligently on the intermediary processes. To eliminate these inefficiencies, the value stream leader undertook a thorough study of the entire process, which revealed that an old testing machine was the source of the bottleneck.

The solution to speed up the testing process was two-pronged: bringing in a new machine that was capable of simultaneously testing multiple samples and actively seeking the input of team members around how they could do things better to reduce the costs of delays. The result: reduction in testing time to 15 +/-2 days, inventory reduction of finished goods by over \$1M, and a team-wide embrace of collective responsibility and accountability in keeping the process efficient.

- **Packaging Lot Tracker**

To address the problem of poor lot traceability through the manufacturing plant—which resulted in product predictability issues for customers—Zoetis developed the Packaging Lot Tracker which used data directly from the SAP system to arrange reports tracking customer orders through the plant. Instead of a silo view, the Lot Tracker allowed for a cross-function view of the whole process, predicting when an order would be shipped based on real-time transactions, identifying bottlenecks in the production and distribution process, and highlighting slow-moving batches.

By providing a comprehensive view of each lot so that problems could be precisely identified and solutions could be strategically implemented at those points, the Lot Tracker reduced lead time and inventory, which translated into cost savings and marked improvements in efficiency.

- **Shipping**

The processing time to ship products to the US market was 9.6 days on average. To explore ways of reducing shipping time, employees attended a 3-day shipping workshop where they used process flow diagrams to study how to eliminate waste and how to switch from people-dependent processes to system-triggered processes. Through this collective, goal-based exploration, they recommended several process improvement measures, such as implementing a shipping wheel by market and improving communication flow and triggers. This not only resulted in highly-improved predictable shipping dates for customers, markets, and demand planners, but also reduced the average time-to-ship to 5.4 days, a 44% improvement.

Building 156: Process Improvement in Action

Balancing Packaging Line to Improve Efficiency

In Building 156, which houses the primary packaging line for Spectramast (mastitis treatment for cattle), the team on the floor rebalanced the line to drive greater efficiency, flexibility, and increased speed of packaging. In particular, the team found that putting two operators at different positions made them equally in charge of quality inspection, thus reducing the amount of redundant tasks performed by both. The increase in efficiency allowed for available labor to be reallocated to other lines. Furthermore, the team innovatively utilized their vision system which automated the inspection of critical printed items, hence allowing the line to complete packaging in less time.

By rebalancing the packaging line, the number of employee positions needed was reduced from 6 to 4 with all operators following a daily rotating schedule and hitting their target speed 89% of the time. These outcomes highlight how operator-led improvement created sustainable changes, and how eliminating waste operations resulted in a shorter cycle time.



Nate Klok presenting on the requirements that GMS follows for Building 156

Troubleshooting Improvement in Product Formulation

This employee-driven focus on driving operational efficiency is reflected in the area of troubleshooting in the aseptic value stream as well. When an unexpected deviation is observed in the aseptic value stream, a troubleshooting team consisting of operators who work on the line is formed. This team implements a hard stop when a deviation event occurs and carries out real-time investigations to identify the root cause of unplanned deviations (i.e., quality, cost, and supply issues). To pinpoint the process responsible for deviation, the operators use a fishbone diagram, which is used for finding possible problems in the chain of manufacturing.

With the floor-based depth of insight brought by operators, the accuracy in root-cause identification is greatly enhanced. Prior to this, when a deviation occurred, there was little input from operators. This caused an inefficiently long investigation time (up to 30 days) and many repeat occurrences of the deviation during that time, creating an undesirable—and unproductive—cycle of inefficiency and delays. Creating the operator-driven troubleshooting teams tasked with the ownership and responsibility to identify the solution reduced the investigation time from 30 days to less than 15 days.



Delores Thatcher, senior formulation operator, presenting the product formulation root cause investigation poster

Customer Excellence & Direction

Tamar Cohen, VP, Customer Excellence & Business Innovation

Zoetis wishes to build lifelong, emotionally-connected relationships with their animal health customers through consistent delivery of exceptional experiences at key moments of truth. Customer excellence is considered to be a high priority indicator of company performance and seeks to operationalize and map out customer journeys, identify KPIs (Key Performance Indicators), and integrate the voice of the customer in the company's day-to-day business.

Zoetis' customer experience strategy is built on the framework of key drivers, which include innovative and customizable products, information and transparency, and anticipating the customers' needs and meeting them proactively. The drivers are then operationalized by mapping customer journeys, creating detailed customer profiles (so they can be identified quickly and their needs can be anticipated and met promptly), and providing high-quality professional training to Zoetis' staff to improve their work ethic and help them consistently employ best practices in their interactions with customers.

Realizing the shortcoming of sales data in giving the full story around client satisfaction, Zoetis also focuses on customers' emotional experience and incorporates their feedback to improve processes. They make a concerted effort to know their customers, provide them with a level of service they wouldn't get elsewhere, support them by staying in touch proactively, and take measures to maintain their trust in the company and what it offers to them and their animals.



Business Analytics

Saba Belay, Manager, Business Analytics

Zoetis' business analytics group leverages techniques in data analytics and optimization to solve problems and enhance business development within their operations. The group consists of experts in subject matter and field force intelligence, statistics and quantitative analytics, programming, data science, and management, all of whom work together to develop tools to collect, visualize, model, and analyze data according to Zoetis' key performance metrics. Currently, the business analytics group is institutionalizing a four-part framework for approaching data-driven decisions: collecting and managing data; developing data models and visualization; harnessing the power of predictive analytics; and optimizing business decisions.

Business analytics is experiencing tremendous growth at Zoetis, with the potential to become an integral part of business decisions at all levels. To achieve this vision, they have laid out the following five-step strategy: to establish a strategy analytics advisory board comprising industry leaders outside of the company; to grow and develop Zoetis' vision for data-driven optimization; to develop programming to train an analytics team; to promote organizational maturity and change management; and to create analytic models for the US leadership team.



Saba Belay, center (in blue), with Columbia Business School attendees and Zoetis colleagues

Thank You

To everyone at Zoetis for facilitating this study tour

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Rebecca Benson, Scheduler/Planner II, GMS Kalamazoo
Nicole Bouman, Human Resources Business Partner, GMS Kalamazoo
Robert Boyes, Value Stream Leader – Terminally Sterilized, GMS Kalamazoo
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Mark Callahan, Director Engineering & EHS, GMS Kalamazoo
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Michael Doyle, Director, Quality Operations, GMS Kalamazoo
David Galarneau, Manager/Value Stream Leader, GMS Kalamazoo
Sarah Horton, Senior Manager, Operational Excellence, GMS Kalamazoo
Michael Jacobs, PMP Master Scheduler, Kalamazoo Cephalosporin Manufacturing, GMS Kalamazoo
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Study Tour attendees and the team from Zoetis at the Kalamazoo Global Manufacturing & Supply facility

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