

North Dakota State University
Department of Industrial and Manufacturing Engineering Programs
Preparing Students through Engagement in Business/Industry Projects

This is a Two-Part Document

Part 1




Preparing my students for engineering, and management practices and specifically for engaging in “real world” experiences has been a major focus of my teaching practices since the beginning of my career as an educator. In preparing my students for “real world” experiences, I incorporate different approaches. One is to simulate the real world environment by bringing it to students in the form of problems drawn from the context of academia or research labs. Another common approach has been, as part of regular course work, to connect students with real world clients who will make use of their results.

The most significant courses that require the business/industry project work is the Industrial and Manufacturing Engineering (IME) Capstone course. I have been working with students on capstone projects since the spring semester 2003. During the senior year students are required to participate in Capstone class which includes engagement of students in real world projects performed on behalf of real world business and industrial clients. Capstone students work with many regional firms in developing solutions for company problems that require them to draw upon the integral of the entire curriculum. Such projects involve analysis of client needs, determination of requirements, research, design, development, documentation, and presentations addressing clients’ needs.

The IME Capstone course is a multidisciplinary course that have included students from many programs including Accounting, Agricultural and Biosystems Engineering, Business Administration, Computer Science, Electrical and Computer Engineering, Facilities Management, Industrial Engineering and Management, Interior Design, Manufacturing Engineering, and Mechanical Engineering.

The process of performing the projects is carefully structured so that the project objectives and the course learning objectives are congruent. Company sponsors interact with student teams during the project work and participate in the evaluation of project teams’ work. This practice serves the dual purpose of injecting realism and interest into the coursework and added preparation of students for real engineering and management practices.

The following is a list of the Capstone projects that the IME students have conducted since spring semester 2003.

	<p>Barrel O’ Fun Snack Foods, Perham, Minnesota</p> <p>Project Objective: Study, analyze, and document proposals which can help improve the packaging operations through improved methods, layout, and product flow.</p> <p>Spring 2011</p>
	<p>Barrel O’ Fun Snack Foods, Perham, Minnesota</p> <p>Project Objective: Study, analyze, and document proposals which can help improve the packaging equipment utilization through the application of set up reduction techniques and standardized processes. Spring 2011</p>
	<p>Barrel O’ Fun Snack Foods, Perham, Minnesota</p> <p>Project Objective: To study and document showing various steps of frying operations and to identify specific pollutants that are given off in each step. The project also includes developing of proposals for elimination or reducing the negative environmental aspects of the pollutants. Spring 2011</p>



Case New Holland, Fargo, North Dakota

Project Objective: Document and analyze the tugger cart flow and staging areas and develop proposals that can help with reducing the number of carts as well as more efficient methods for delivery and returning of carts to and from assembly areas.

Spring 2011



Goodrich Interiors - Cargo Systems, Jamestown, North Dakota

Project Objective: Study and documents the requirements for developing a moving assembly line that supports the Boeing 777 Freighter Cargo System takt time. The requirements include increased labor efficiency, improved ergonomics, and provides for visual controls to highlight production issues. **Spring 2011**



Goodrich Interiors - Cargo Systems, Jamestown, North Dakota

Project Objective: Study and document the current paint system and develop proposals for improved system that can help with improved throughput and reduced cost. **Spring 2011**



North Dakota State University, Fargo, North Dakota

Project Objective: Perform a lean assessment of the Student Health Service and develop proposals for improved and increased patient access to the facility **Spring 2011**



SJE Rhombus, Inc., Detroit Lakes, Minnesota

Project Objective: Study, analysis, and documentation of the requirements for the purpose of establishing an Electro Static Discharge (ESD) control program which will be in compliance with ANSI/ESD S20.20 ESD Standard. **Spring 2011**



Tecton Products, LLC, Fargo, North Dakota

Project Objective: Study, analysis, and documentation of the requirements that can help Tecton with improved warehousing and distribution of APEX siding systems. This will include the determination of required space for storing the manufactured trims and vendor supplied components. Determining of the space for manufacturing of marketing kits as well as the packaging of siding systems is also included in the project. **Spring 2011**



Arctic Cat, Inc., Thief River Falls, Minnesota

Project Objective: Study, analyze, and document proposals which can help improve the Emissions Testing Facility Utilization through the application of set up reduction techniques and standardized processes. **Spring 2009**



Arctic Cat, Inc., Thief River Falls, Minnesota

Project Objective: Study and analyze the current engine emission testing facility and develop proposals that can help with increased testing throughput and potential inclusion of chassis testing. Another objective of the project is to develop a new layout that can accommodate the increased demand for emission testing of engines and introduction of chassis emission testing. **Spring 2009**

 Johnston Fargo Culvert, Inc.	Johnston Fargo Culvert, Inc. , Fargo, North Dakota Project Objective: Study, analyze, and propose new methods for improving the fabrication of the Manhole Assembly. Spring 2009
 Johnston Fargo Culvert, Inc.	Johnston Fargo Culvert, Inc. , Fargo, North Dakota Project Objective: The objective of this project is to test and document the performance of various gaskets for a watertight corrugated steel pipe (CSP) coupling system. Exploring opportunities for improving the design of the metal bands used in the coupling system is a secondary objective. Spring 2009
 MIDLAND GARAGE DOOR MFG. CO.	Midland Garage Door Manufacturing Company Project Objective: To study and analyze current layout and process flow to develop proposals for improving layout which will provide more efficient flow of product, reduced WIP, and improved manufacturing lead time. Spring 2009
 MIDLAND GARAGE DOOR MFG. CO.	Midland Garage Door Manufacturing Company Project Objective: Document, study, and analysis the capacity of the roll former and the laminated residential garage panel assembly line. Using the data gathered from these analyses, study the feasibility of a single line that combines the roll formers and a modified laminated residential garage panel assembly line that is capable of manufacturing both residential and commercial door panels. Spring 2009
	Neal's Industrial Painting, Inc. , West Fargo, North Dakota Project Objective: Study, document, analyze, and propose improvements for the facility layout and coating system. Spring 2009
 NORTHERN CONTOURS	Northern Contours , Fergus Falls, Minnesota Project Objective: The purpose of this project is to document, analyze, and propose improvements to the current dust collection system in the routing facility. These improvements will help to reduce the number of defects, and will allow for a cleaner work environment. Spring 2009
 aldevron Designed for you.	Aldevron , Fargo, North Dakota Project Objective: Study and analyze the current production processes and develop improved methods that can help with better utilization of space and also a reduction in production lead time. Spring 2008
 aldevron Designed for you.	Aldevron , Fargo, North Dakota Project Objective: Study and analyze the current production processes and based on the anticipated growth, develop a proposal for a new facility layout that includes spaces for production as well as spaces for all support activities and services. Spring 2008



BTD Manufacturing, Inc. Detroit Lakes, Minnesota

Project Objective: Study and analyze the current layouts of production facilities and develop proposals for improved layout that can help with improved manufacturing lead time. **Spring 2008**



BTD Manufacturing, Inc. Detroit Lakes, Minnesota

Project Objective: Study and analyze the current operations and layout of central warehouse and kitting areas and develop proposals for improved methods for order processing, component kitting, and kanban system. **Spring 2008**



Case New Holland. Fargo, North Dakota

Project Objective: Study and analyze the current reusable containers and racks shipping logistics. Develop proposals that can help with improved tracking and reduction of investment in reusable containers and racks. **Spring 2008**



SK Food Specialty Processing, Moorhead, Minnesota

Project Objective: Develop proposals for improved packaging and warehousing products. Warehouse redesign and economic analysis of implementing different automatic identification technologies are also integral to this project. **Spring 2008**



Sioux Manufacturing Corporation. Fort Totten, North Dakota

Project Objective: Develop proposed layout and operational procedures that can help with improvement in storage and warehousing activities including inventory tracking and management, product kitting and packaging, and ergonomics. **Spring 2008**



Vinylite Windows, LLC. Fergus Falls, Minnesota

Project Objective: Study and analyze the current material storage and flow and develop proposals for improved warehousing and manufacturing operations. **Spring 2008**



IR Bobcat Company, Bismarck, North Dakota

Project Objective: Design a test bench to verify the quality and functionality of a fully assembled undercarriage hydraulic system for a 435 excavator. The system needs to identify any leaks, verify component functionality and specifications in less than 5 minutes. **Spring 2007**



IR Bobcat Company, Bismarck, North Dakota

Project Objective: Research and document the design of a paint system for hydraulic cylinders components that offers safety and economics advantage over the current painting methods while meeting the production requirements. **Spring 2007**



Rapat Corporation, Hawley, Minnesota

Project Objective: Develop a document that reflects research and identification of a paint system that can adequately address the current and future needs of the Corporation. **Spring 2007**



Rapat Corporation, Hawley, Minnesota

Project Objective: Develop proposals for decreasing manufacturing lead-time through improved layout, production practices, and inventory management practices. **Spring 2007**



Wil-Rich LLC , Wahpeton, North Dakota

Project Objective: Study and analyze the paint system and develop proposals for improved throughput. **Spring 2007**



Wil-Rich LLC , Wahpeton, North Dakota

Project Objective: Analyze the current raw materials storage and delivery schedule and develop proposals for improved methods. **Spring 2007**



Swanson Health Products, Fargo, North Dakota

Project Objective: Study and analyze the current requirements for bottling and order fulfillment activities and develop an improved layout and move plan that will include the planned expansion into new addition. **Spring 2007**



Swanson Health Products, Fargo, North Dakota

Project Objective: Analyze the Pick-to-Light order picking system including operator interface, information flow, and inventory placement and develop proposals for improved order picking throughput. **Spring 2007**



Dee, Inc., Crookston, Minnesota

Project Objective: Study, analyze and improve the production line for the DD133A intake manifold including the layout, manufacturing processes and ergonomics. **Spring 2006**



Fargo Steel & Tank Company, Fargo, North Dakota

Project Objective: Document current layout and manufacturing processes, identify problems and make recommendations to decrease manufacturing lead time and increase throughput of tanks. **Spring 2006**



Fargo Steel & Tank Company, Fargo, North Dakota

Project Objective: Develop proposals for improving the current office layout that can help with effective utilization of space and anticipated staff growth. **Spring 2006**



Goodrich Cargo Systems, Jamestown, North Dakota

Project Objective: Redesign the A380LD manufacturing cell to help with reducing cycle time and increasing capacity. **Spring 2006.**



Goodrich Cargo Systems, Jamestown, North Dakota

Project Objective: Develop improved processes and procedures for the packaging and shipping logistics for the Airbus A380LD Cargo Handling System. **Spring 2006.**



Gremada Industries, Inc., West Fargo, North Dakota

Project Objective: Identifying what processes and procedures are affected, and determine what material number cross-references are required to support operations at Gremada Industries, Inc. due to Gremada transitioning to a new business model. **Spring 2006.**



IMAR Group LLC., Fargo, North Dakota

Project Objective: Develop a proposal for a new facility layout and proposal for an improved supply chain to help IMAR Group, LLC meet expected growth in demand **Spring 2006.**



Infinity Windows, Fargo, North Dakota

Project Objective: Analyze, refine, & document processes for maximizing Ultrex® yield and accurately measuring waste” **Spring 2006.**



Cloverdale Foods Company, Mandan, North Dakota

Project Objective: Provide Cloverdale Meats with documentation of current and proposed process flow and layout in the Kitchen Area. Another objective is to study and document operations for improved ergonomics in facility. **Spring 2005.**



Gremada Industries, West Fargo, North Dakota

Project Objectives: Analyze the current inventory management system and its impact on material handling, storage, and warehousing. Recommendations will be made to improve efficiency and cut material handling costs. **Spring 2005.**



Infinity Windows, Fargo, North Dakota

Project Objective: To develop a proposal for a new facility layout capable of meeting anticipated production needs and future expansion. **Spring 2005.**



North Dakota State University ADVANCE Committee, Fargo, North Dakota

Project Objective: Study and document the feasibility of establishing an on-site, full service childcare center for use by faculty, staff, and students at NDSU. **Spring 2005.**



Sioux Manufacturing Corporation, Fort Totten, North Dakota

Project Objective: Study, document and evaluate current layout, material and process flow and propose an improved plant layout that can contribute to increased throughput. **Spring 2005.**



Swanson Health Products, Fargo, North Dakota

Project Objective: Develop and document a proposal that can help with increased bottling operations throughput. **Spring 2005.**



White Earth Health Center, Ogema, Minnesota

Project Objective: Determine and propose methods to improve patient access by increasing the number of patients seen per provider through analysis, documentation, and recommendations. **Spring 2005.**



IR Bobcat Company, Gwinner, North Dakota

Project Objective: Design a centralized “supermarket” facility to be used for storing and distribution of Small Miscellaneous Parts (SMP). **Spring 2004.**



Braaten Cabinets, Kindred, North Dakota

Project Objective: Design a flexible holding device that will aid in improving the cabinet assembly processes. **Spring 2004.**



Dakota Growers Pasta Company, Carrington, North Dakota

Project Objective: Make recommendations for improved ergonomics through utilizing improved methods and equipment for material handling and packaging equipment loading. **Spring 2004.**



Integrity Windows and Doors, Fargo, North Dakota

Project Objective: Develop a proposal and make recommendations for material handling methods for loading, transferring, and unloading of wood sash to improve the overall productivity and quality of the paint line system. **Spring 2004.**



Lake Agassiz Regional Library, Detroit Lakes, Minnesota

Project Objective: Study, document, and analyze the existing methods for processing library materials and propose streamlined processes and workplace layout. **Spring 2004.**



MeritCare Health System, Fargo, North Dakota

Project Objective: Determine and propose methods to minimize the operating room downtime and recommend ways to improve efficiency and turnover rates. **Spring 2004.**



MeritCare Health System, Fargo, North Dakota

Project Objective: Analyze, document, and make recommendations for improving access to, mammography screening services. **Spring 2004.**



Noridian, Fargo, North Dakota

Project Objective: Analyze and document current processes for Service Work Order/Move. Documentation will be used to make a comparison between the existing and new processes with an emphasis on communication between departments and standard timeframes. **Spring 2004.**

 <p>WCCO Belting, Inc.</p>	<p>WCCO Belting Inc., Wahpeton, North Dakota</p> <p>Project Objective: Develop a proposal and make recommendations for improving the throughput of the press department while optimizing the number of operators through improved setup and operator interaction with the related equipment. Spring 2004. .</p>
 <p>SWANSON Health Products</p>	<p>Swanson Health Products, Fargo, North Dakota</p> <p>Project Objective: Research and document methods that can help to improve the quality inspection process for order picking. Spring 2004.</p>
 <p>MeritCare</p>	<p>MeritCare Health System, Fargo, North Dakota</p> <p>Project Objective: Improving the efficiency of the patient transportation department at MeritCare Medical Center. Spring 2003. .</p>
 <p>SJE Rhombus CONTROLS</p>	<p>SJE Rhombus, Inc., Detroit Lakes, Minnesota</p> <p>Project Objective: Research and test various conformal coating materials with the function to protect a printed circuit board from damage caused by environments such as high humidity, water, sewage, and chemical exposure. Spring 2003. .</p>
 <p>SJE Rhombus CONTROLS</p>	<p>SJE Rhombus, Inc., Detroit Lakes, Minnesota</p> <p>Project Objective: Determine the feasibility, cost benefits and requirements for incorporating Bar Coding System Applications to SJE-Rhombus's manufacturing and warehousing operations. Spring 2003. .</p>
 <p>SJE Rhombus CONTROLS</p>	<p>SJE Rhombus, Inc., Detroit Lakes, Minnesota</p> <p>Project Objective: Design an improved manufacturing layout incorporating operational efficiencies. Spring 2003. .</p>
 <p>SJE Rhombus CONTROLS</p>	<p>SJE Rhombus, Inc., Detroit Lakes, Minnesota</p> <p>Project Objective: To design the housing of a submersible sensor and to make recommendations on materials that would be suitable for the production of the housing for a variety of applications. Spring 2003. .</p>
 <p>WR</p>	<p>Wil-Rich, Wahpeton, North Dakota</p> <p>Project Objective: To design an improved manufacturing layout incorporating operational efficiencies. Spring 2003. .</p>

Preparing Students through Engagement in Business/Industry Projects

Part 2

In addition to Capstone projects, the students enrolled in IME480/680, Production and Inventory Control participate in industry projects as well. The major focus of IME480/680 projects is on topics related to production and inventory management. The student teams are required to conduct their project research and documentation by following specific templates. The research and documentation templates are designed so the students can better relate the course materials to the real-world challenges of production and inventory management. The templates include guideline for analysis of products/services, markets, competitive priorities, facility, forecasting, production planning, master scheduling, inventories, supply chain management, and information flow.

Both local and virtual businesses are used for IME480/680 projects. Members of each project team participate in preparing a summary report about the business of their choice and make class presentation. The following is a list of some of the **local businesses** that have been the subject of IME480/680 projects.

The following is the logos of some of the **virtual businesses** that have been the subject of IME480/680 projects.