

# CAREERS IN INDUSTRIAL ENGINEERING



"Industrial Engineers can go into a variety of environments, quickly identify the source of a problem, and work with the appropriate people to get it fixed. We have the capability to not only identify what's wrong and statistically validate it, but then generate the engineering disciplines to figure out how to get it fixed, develop cost estimates, prepare ROI (Return on Investment) payback analyses, and sell the project to management."

– Dr. Dave Sly, President and Founder of Proplanner & IMSE Professor at Iowa State University

"My education in IE has had relevance to every job I have held. Traditional engineering, engineering economics, simulation, time and motion studies, and psychology have all been applied in various stages of my career."

– Kevin Powell, CEO, Van Meter, Inc.

"IE has become even broader. Every engineering discipline is good and has its value and specialty. IE is very good with the initial intention of being a diverse and generalized engineering."

– Dr. Richard Stone, IMSE Professor at Iowa State University

*Industrial and Manufacturing Systems Engineering (IMSE)* is a degree program at Iowa State University (ISU) that presents a broad range of career opportunities while still facilitating the overlying goal of problem solving. More specifically, *industrial engineering* is defined as a technical way to structure, design, develop, and optimize processes in manufacturing or other types of businesses.

An industrial engineering (IE) degree comes with countless career opportunities. Contrary to the common misconception that industrial engineers only work in manufacturing, IMSE graduates go on to work in a variety of different fields. Many choose to pursue a career in one of the following areas: engineering Management, Human Factors, Process Engineering, Manufacturing Systems Engineering, and Enterprise Informatics.

**"Industrial engineers do more, with less money, quicker."**

– Ben Jensen, JCorp, Inc.



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# Engineering Management

*Engineering Management* is an IMSE career path that uses knowledge of general business practices and specific engineering disciplines to lead other engineers or workers within an organization or project. Industrial engineers are placed in these roles because of the management skills they possess in addition to their technical skills. The IMSE program provides students with a solid background in project management, financial planning, and cost analysis. Along with these management qualities, IE's are well prepared for problem solving, process improvement, optimization, quality control, and many other vital areas of a business. In general, management roles suit industrial engineers well because of the overall understanding they have for every working part of a given organization. While there are many who oversee entire organizations, industrial engineers typically begin working on the floor. They then, move into different areas of project management, and oftentimes, move into management on an organizational level. This provides the opportunity to develop a thorough knowledge of operations from the ground up, adapt to the environment, and learn every aspect of the business. Industrial engineers make great managers as they are always seeking to improve working conditions for all. A great example of this is Kevin Powell, CEO of Van Meter Inc., who is continuously working on the culture of Van Meter Inc. with an ultimate goal of being the "Best Place to Work."

## Sales Engineering

*Sales Engineering* is an IMSE career path that focuses on the technical sales of a product while placing an emphasis on its capabilities. A sales engineer uses knowledge of engineering disciplines to completely understand the product being sold. A sales engineer possesses interpersonal skills and is able to sell a product in such a way that exhibits their expertise about the product. Someone with knowledge of engineering and business sales & marketing tactics is a crucial tool in technical sales success. Engineers are stereotyped with having more analytical personalities than others. However, with their ability to interact effectively and fluently with both business associates and engineers, industrial engineers tend to make successful sales engineers. Kevin Powell said in an interview, "Sales careers offer quick feedback of success and a variety of applications and environments." Powell went on to explain how technical sales is one of the highest paying engineering roles. In some cases a sales engineer will be paid a salary and make commission on their sales, which can be a large incentive. Kevin Powell says it best, "Industrial engineering is the best degree for a career in sales."



**Kevin Powell:** CEO of Van Meter Inc.

*Education:* B.S. in Industrial Engineering; M.B.A

Powell spent time in applications engineering, technical sales, and is currently the CEO of Van Meter Inc., one of the largest privately held distributors in the nation. Powell did not know much about industrial engineering until about six months before college, but he chose industrial engineering because he was a results oriented, visual person, who wanted to build things and be able to physically see the results of his hard work.

### We asked Kevin, "Why choose IMSE?"

"An IE degree can apply to many more opportunities than any other engineering degree. If you're like me and knew you wanted to be an engineer yet didn't know what your specific passion was, then IE is for you."

Industrial engineering has played a role in every job Powell has held. The roles that IE has played include but are not limited to: traditional engineering, engineering economics, simulation, time and motion studies, and psychology. Kevin Powell would like prospective students to know, "If you want to go to work in a large company with a specific task you *can* be an IE. If you want to work in a small company where you are tasked with solving a variety of problems and taking advantage of a variety of opportunities, you *should* be an IE."

# Human Factors & Ergonomics

*Human Factors & Ergonomics* is an IMSE career path that focuses on the functionality and comfort level of tasks and human interaction with machines. An industrial engineer studies movements and establishes new and safer means to complete work. For example, if a worker is repeatedly hunched over and lifting a heavy box with improper form, it may lead to an injury that could have been avoided. An industrial engineer will design work to eliminate these types of injuries. First, they analyze safety documents that have been filed to study reoccurring injuries. Then, they scrutinize the process, identify shortcomings, and develop solutions to prevent such injuries from happening again. Typically, these solutions not only prevent injuries, but also increase the efficiency of the work.

Dr. Stone (shown to the right), a professor at Iowa State University, is a prime example of someone who studies and designs work for humans. Industrial engineers focusing on human factors can be found in many places, including law enforcement and military. Human factors also deals directly with biomedical engineering such as: human capabilities, improving human-machine relationship, and designing work to be more efficient and safer. Dr. Stone said, "Human factors is specifically where they merge the ability to make stuff and the ability to make it better for the human." Iowa State University is currently doing research with police equipment. They are studying how/where it is worn, determining the load, and then trying to eliminate some of the heat involved with wearing body armor all day. The study will help improve the efficiency of the police officers, while improving posture and any health problems that could arise from the specific equipment being used currently.

**Dr. Richard Stone:**

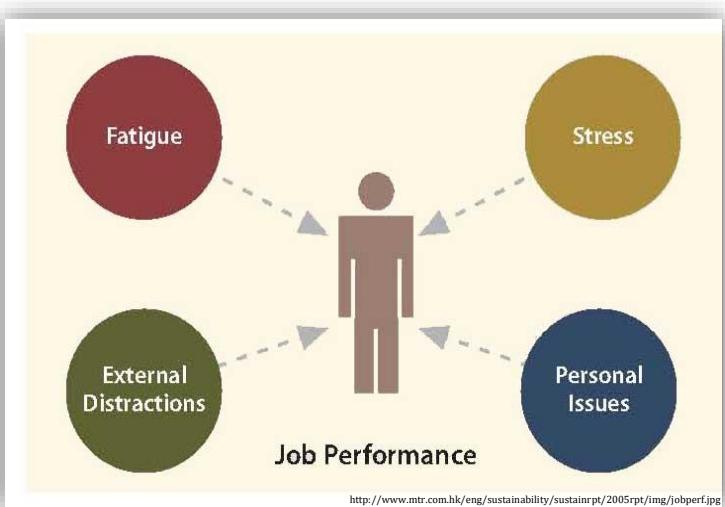
Industrial and Manufacturing Systems Professor at Iowa State University



*Education:* B.S. in Management Information Systems; M.S. in Information Technology; Ph.D. in Industrial engineering in 2008; advanced university certificates in robotics, computer-aided manufacturing, and environmental management science.

As an undergraduate student, Dr. Stone was undeclared and unsure about what he wanted to do. He didn't know what industrial engineering was, but said if he would have known he probably would have pursued it. "If students are anything like I was, where they don't know exactly what they want to do, but know they want to do engineering, I would encourage industrial engineering," he said. Dr. Stone went on to explain how he wants students to realize how diverse industrial engineering is and how you can use it make a difference in people's lives.

Dr. Stone believes that IE is the closest application of engineering to the actual worker (the person doing the work). He can enter an environment where he changes a process and interact with the people before and after. From his perspective, an industrial engineer has traditionally been the most social of the engineers. He went on to explain that socializing with the people doing the work both professionally and casually is an extremely rewarding part of being an industrial engineer. When asked if he is happy with his decision to pursue industrial engineering, Dr. Stone responded, "I am very happy with this area, and what I love about this job is that it never gets boring unless I let it get boring."



# Process Engineering

*Process Engineering* is an IMSE career path that focuses on improving the process and design of work, while reducing cost and improving quality. Determining the needs of the customer and developing a process that meets those needs is an important aspect of any industry process. The three main areas that a process engineer focuses on are process design, process control, and process operations. These three phases are present and relative in a variety of industries, including hospitals and logistics & transportation.

## Hospitals

An industrial engineer working in a hospital would typically work on optimizing the overall operational efficiency by designing the flow of work and implementing a system to locate equipment in an efficient manner. Operational efficiency will lower costs and increase the morale of patients and workers. An industrial engineer will examine a specific hospital, determine bottlenecks, and eliminate cost (time and money). They might have the opportunity to work in the pre-design phase of a building project and adopt the most efficient layout before the hospital is built. Eliminating waste is one of the main goals of an industrial engineer working in a hospital. One example would be designing the hospital in such a way that moving patients is less frequent or over shorter distances. The flow of patients, medication, doctors, and nurses can all be tracked with the help of industrial engineers. This leads to savings in time and money. Industrial engineers also improve surgeries in the operating room. Efficiency is essential to a successful operation and an industrial engineer contributes to improving the layout of the operating room, the location of equipment and tools, and the specific tasks during the surgery.

## Logistics & Transportation

*Logistics & Transportation* is an IMSE career path that focuses on improving the flow of goods from one location to the next, specifically focusing on the source of transportation of goods. An industrial engineer will work on improving and determining the most efficient path for the transportation. They will also examine processes used to load and unload transported goods. All types of transportation need industrial engineers: airlines, bus systems, ships, and freight. Overall the industrial engineer discovers ways to save money and improve the efficiency of transportation. Studies are conducted to identify patterns, which leads to the elimination of bottlenecks and/or process improvements.



### We asked Mike, "Why choose IMSE?"

"You get a technical foundation, a foundation for management in a variety of different areas, and it's a very flexible degree."

**Mike Kugel:** Senior Manager – Advanced Engineering & Smart Home Technology Products at Pella Corporation

*Education:* B.S. in Industrial Engineering from Iowa State University in 1987; M.S. in Industrial Engineering from Iowa State University in 1993.

Mike chose industrial engineering because of his interest in manufacturing engineering. Initially, this was his primary focus, but he later developed interest in the operations research side – simulations, event simulations, linear programming, and numerical programming. Over the course of his career, he has spent time with Boeing (Methods Analyst), Mitsubishi (Staff Engineer), and Pella Corporation, where he has spent the last fifteen years in management and product development.

In his current management role, he continues to leverage much of what he learned during his time in the IMSE program. "I still have manufacturing engineers on my team that develop the lines for products we're developing, so I still leverage what I've learned about manufacturing processes, plant layouts, ergonomics, and certainly engineering economics."

# Manufacturing Systems Engineering



**Ben Jensen:**

Project Manager at  
JCorp, Inc.

**Education:** B.S. in Industrial and Manufacturing Systems Engineering from Iowa State University in 2011.

After graduating from Iowa State in 2011, Ben was offered a position with HNI HON in Muscatine, Iowa, where he began in an engineering rotational program, performing various engineering roles. Eventually, Ben worked as a manufacturing engineer for a plant producing desks. Within this position, Ben applied much of what he learned throughout his time in the IMSE Program including line balancing, time studies, ergonomics, and plant layout & safety. "Probably fifty percent of my time was spent on continuous improvement projects - spending a week working on a specific task and making it better."

Currently, Ben works as a project manager for JCorp Construction located in Huxley, Iowa. Much of what he does now consists of planning ahead and eliminating inefficiencies within the construction process. "There's always a print, and a way that things are supposed to be done, but that isn't how it's done in the real world. Solving those issues and keeping the project moving is important."

## We asked Ben to give one reason why students should choose Industrial Engineering:

"The broadness. If you don't know what industry you want to be in, but you like solving problems and making things better, then be an industrial engineer. You're a Jack of all trades."

*Manufacturing Systems Engineering* is an IMSE career path that focuses on the production of goods, specifically the processes, tools & equipment, plant layout, work design, and machines. Working environments typically emulate a manufacturing setting or plant creating and optimizing manufacturing processes. An industrial engineer works alongside business associates dealing with cost and budget, engineers dealing with systems requirements, and workers on the floor of a manufacturing facility. A manufacturing engineer performs time studies to evaluate and improve the overall process of work. They also use line balancing to find and eliminate bottlenecks.

## Operations Engineering

*Operations Engineering* is an IMSE career path that focuses on improving the overall operation of a system. For example, an operations engineer could work on improving the large-scale operation of an assembly line for a large manufacturing facility. Another example is operations work on a smaller scale such as the placement of tools relative to a work-station. The need for operations engineers is not limited to a manufacturing setting. It can be beneficial to evaluate the flow and efficiency of work in any environment. Overall, an operations engineer is very closely related to a process engineer. They are both essentially trying to improve a process.

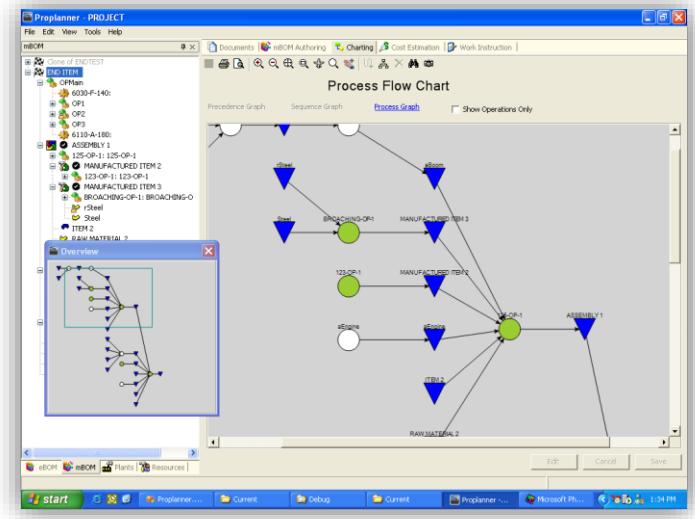


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# Enterprise Informatics

*Enterprise Informatics* is an IMSE career path that focuses on the implementation of computer information systems to assist in problem solving efforts within an organization. The purpose of this software is to improve productivity and efficiency by automating business processes with the use of data. There are many different forms of enterprise informatics such as manufacturing process management (MPM), product data management (PDM), and enterprise resource planning (ERP) systems. Once again, industrial engineers possess the necessary knowledge to implement a system of this nature to contribute to the end goal of optimizing a process within a given industry. Proplanner, the example described below, is specific to medium to large scale manufacturing. However, enterprise informatics can be applied in any environment and provides an interface between data gathering and decision making.

An example of enterprise informatics is **Proplanner** (shown on right), an MPM software firm founded by Iowa State IMSE Professor, Dr. Dave Sly. According to their website, “Proplanner offers products to engineer and manage the manufacturing process and plant, as well as engineer and execute the in-plant logistics system.” The products offered by Proplanner contribute to the efficiency of a manufacturing plant. Its products assist with determining operation times, developing plant designs, generating floor instructions, outlining materials placement and replenishment procedures, and much more.



**Dr. Dave Sly:** President and Founder of Proplanner; Industrial and Manufacturing Systems Engineering Professor at Iowa State University

**Education:** B.S. in Industrial Engineering from Iowa State University in 1985; M.S. in Industrial Engineering from Iowa State University in 1990; M.B.A from Iowa State University in 1994; Ph.D. in Industrial Engineering from Iowa State University in 2004.

Dr. Sly joined the IMSE program to pursue his interest in robotics. He believed the program would help him learn more about the implementation of robotics systems, but in his opinion, it went far beyond that. “I just wanted to set up automation. I loved the factory of the future concept. Also, the fact that industrial engineers are very flexible was attractive. They can make great managers. They can go into a lot of different professions. Technical sales is another strong area, along with business development and entrepreneurship. Those things didn’t mean a lot to me at that time because I was more interested in doing than managing, but they’ve served me well.”

## We asked Dr. Sly, “Why choose IMSE?”

“Flexibility. If you don’t like what you’re doing, there are so many other things you’re prepared, qualified, and educated to do.”

Dr. Sly is excited about the program’s growth and shared a few statistics that incoming students should strongly consider. “IMSE students have the highest jobs-before-graduation rate of any of the college departments right now at Iowa State. We have either the highest or the second highest (depending on the year) starting pay of any of the departments of engineering. I think that says it all right there.”

# Glossary

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**Bottleneck:** a point of congestion in a system that usually results from a build-up of work due to inefficiencies within the system.

**Engineering Management:** an IMSE career path that utilizes knowledge of general business practices and specific engineering disciplines to lead other engineers or workers within an organization or project.

**Enterprise Informatics:** an IMSE career path that focuses on the implementation of computer information systems to assist in problem solving efforts within an organization.

**Human Factors & Ergonomics:** an IMSE career path that focuses on the function and comfortability of tasks and human interaction with machines.

**Industrial and Manufacturing Systems Engineering (IMSE):** a degree program that presents a broad range of career opportunities while still facilitating the overlying goal of problem solving.

**Industrial Engineering:** a technical way to structure, design, develop, and optimize processes in manufacturing or other types of businesses.

**Line Balancing:** balancing an assembly line to a set rate of production in order to meet a production goal.

**Logistics & Transportation:** an IMSE career path that focuses on improving the flow of goods from one location to the next, specifically focusing on the source of transportation of the goods.

**Manufacturing Systems Engineering:** an IMSE career path that focuses on the production of goods, specifically the processes, tools & equipment, plant layout, work design, and machines.

**Operations Engineering:** an IMSE career path that focuses on improving the overall operation of a system.

**Process Engineer:** an IMSE career path that focuses on improving the process and design of work, while reducing cost and improving quality.

**Return on Investment:** a unit of measure used to evaluate the performance of an investment (net profit/net worth).

**Sales Engineering:** an IMSE career path that focuses on the technical sales of products with focus on the capabilities of the product itself, not the style associated with the product.

**Time Study:** observation of a repetitive work cycle to determine the standard time to complete the task.

*This document was created by Casey Robson and Tyler Oviatt, transfer students in Industrial and Manufacturing Systems Engineering at Iowa State University.*