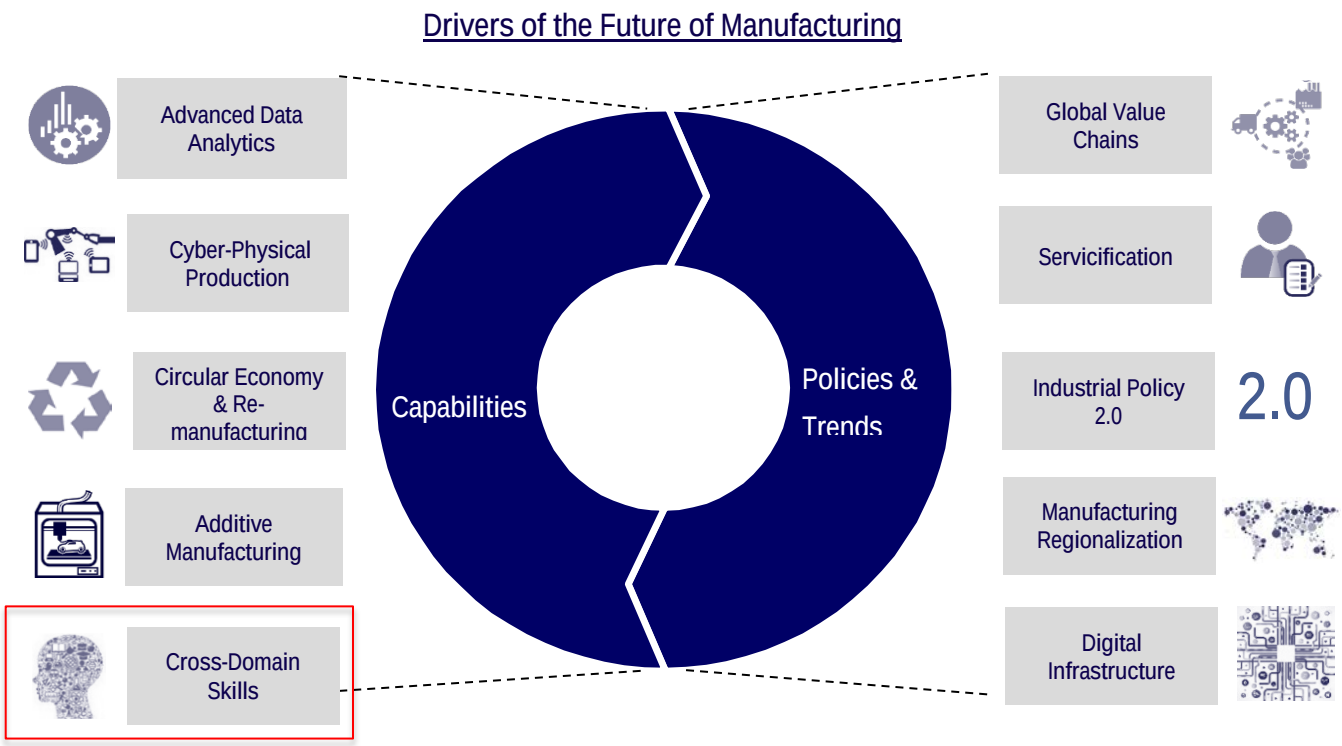
Case 17

Engineer in Residence Programme



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Executive Summary

Engineer in Residence Programme

Dates: 2009 – present

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Entities Involved: NIU, educational institution, private companies

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Key Facts:

- Manufacturing companies struggled in the aftermath of the recession in 2009
- Larger gap in the demand and supply of highly skilled engineers
- Engineer in Residence (EIR) programme aims at helping local manufacturing companies identify and eliminate process inefficiencies
- Secondary objective is to create a pipeline of highly skilled functional engineers
- EIR programme facilitated the highly skilled faculty members to partner with local manufacturing companies
- One or more faculty would mentor a group of undergraduate or graduate students to work with a company on a problem which is critical for the company's growth or survival (spend 10-20) hours per week at the company
- Significant costs savings and performance increases achieved

1. Challenge Confronted

The manufacturing companies in the Northern Illinois region suffered during the recent recession, similar to the national trends. Companies were reluctant to invest money on workforce expansion, research and development, modernizing machines and tools, etc. As the demand for their products eroded (due to outsourcing of manufacturing activities to low cost regions, inflation and other factors) the workforce shrank through layoffs and natural attrition. Although some companies started working with consultants to find solutions to their day-to-day productivity issues and considered hiring temporary workers at a cheaper rate, this was not cost effective and the quality of the products manufactured also suffered. These compounded the problems faced by the companies further and resulted in loss of customer goodwill, erosion of profit margins, etc. As larger companies scaled down their operations, smaller companies (subcontractors to larger companies) were forced to shut down, reduce the working week to three or four days, or take other extreme measures to stay afloat.

Many statistics point towards a larger gap in the demand and supply of highly skilled engineers. Many companies find it very difficult to hire functional engineers. The number of jobs in engineering is projected to grow by approximately 7%, but the number of students interested in pursuing an engineer degree was at a steady decline and has recently remained stable. However, only 50% of the students in the engineering programme actually graduate. The 21st century engineering curriculum should include an experiential learning component to attract, retain and graduate highly skilled engineers.

2. Solution Used

During the recent recession, the College of Engineering and Engineering Technology at Northern Illinois University came up with the Engineer in Residence (EIR) programme to help local manufacturing companies identify and eliminate process inefficiencies and to improve productivity through product and process innovation.

The programme was primarily developed to help local companies with a secondary objective to create a pipeline of highly skilled functional engineers. Faculty-mentored student groups were engaged in applied research projects at local companies to solve engineering problems. This helped the company, while they were hesitant to invest on expansion/innovation projects, and prepared the students to face everyday challenges in the real world. Knowing that the engineering programme would engage its students in real-life projects, high school students showed more interest towards engineering programmes. As the pool of engineering students grows, the quality of the engineers graduating will rise, and hence the companies will benefit.

3. Lessons Learned

1. Companies get to use the creative ideas of faculty and students to solve their problems at a small investment.

2. Engineering students gain valuable experience while at school and feel confident at the time of graduation.

3. Engineering students find it easy to compete while seeking jobs in the US and around the globe.

4. Engineering programmes grow as high school students get to see the benefits of the EIR programme and the opportunities that it facilitates during and after their school years.

Description of the Work Performed

The EIR programme facilitated the highly skilled faculty members to partner with local manufacturing companies in order to help them continue their efforts to innovate their process and product so that they can compete effectively in the global market. At the same time, the programme involved graduate and undergraduate students on these projects so they gain the valuable experience in practicing their engineering skills by solving real-life problems derived from the partnering industries. Under this programme, one or more faculty would mentor a group of undergraduate or graduate students to work with a company on a problem which is critical for the company's growth or survival.

The students would spend 10-20 hours per week at the company to interact with the engineers, operators and other personnel to understand the problem, develop solutions for the problem faced, seek approval for solution implementation, and work with their management to implement the solution. The faculty members would coach, guide and mentor the students on all technical and non-technical aspects for the project. The company representatives were involved in every stage of the project through weekly meetings, bi-weekly update presentations and quarterly management meetings. The goal of the team is to find cost-effective and implementable solutions for the problems and help the company achieve its mission.

In the past four years, the EIR programme has completed nearly 75 projects for local companies in the Northern Illinois region. For example, Caterpillar, Suncast Corporation, 3M, Dunlee Philips and SPX Hydraulic Technologies are some of the companies which greatly benefitted through this programme. Over 60 students benefitted through the EIR programme. Many of the students who participated in the programme were also offered full-time offers in the company where they performed their projects.

Key Outcomes

The companies benefitted greatly through these projects. In one company, there were five U-shaped cells to make two different product types. Under each product type there were 30-40 variants resulting in a total of approximately 70 different unique products. The combined throughput of these lines was 100 units/shift. A team of two graduate students and one faculty member worked with the company to identify component similarities between all the products and designed a new

line layout to increase the throughput to 210 units/shift. New benches, standard work instructions and modern material handling systems were designed and the line was balanced taking operator ergonomics into account. Analytical methods were used to determine how the parts should be supplied, when they should be supplied, how the communication between different entities should be facilitated, etc. As a result of this project, the company was able to eliminate all overtime hours (altogether 900 hours in overtime was eliminated when compared to the previous year), and quality issues were traced back to the individual workstations and eliminated by initiating additional projects.

In another project, the faculty along with three graduate students worked with a company on one of their new products. The team was given a green space and asked to design and develop an entire assembly line. The team proposed everything it took to build the product, from manpower to tools required. As a result of this project, the company was able to save over $100,000. The team helped to establish standard labour hours, balance the work content, identify and eliminate defects during the prototype builds, identify and eliminate safety concerns during the assembly, analyse material handling equipment, etc.

Drivers & Enablers

NIU faculty, undergraduate and graduate students, infrastructure (labs, equipment, etc.)

Local companies, problems from industry, mentors

- Process/product innovation
- Experiential learning
- Cost effective, implementable solutions
- Profitable business

Barriers

It may be a challenge for universities in Asia, especially India, to convince companies to partner on real-life projects. Although university-industry partnership agreements are made in India, these agreements are merely used to hire students who graduate from the programmes.