What it takes to be a World Class Industrial Engineer

I have been asked to comment tonight on what it takes to be a World Class Industrial Engineer? Dr. Chen gave me a light assignment. Now I know what his students must go through. He gives tough assignments.

What does Industry want from Industrial Engineers? – Why do we hire them?

Wikipedia - Industrial engineering is a branch of engineering dealing with the optimization of complex processes or systems.

- Professor had to have written this part - It is concerned with the development, improvement, implementation and evaluation of integrated systems of people, money, knowledge, information, equipment, energy, materials, analysis and synthesis, as well as the mathematical, physical and social sciences together with the principles and methods of engineering design to specify, predict, and evaluate the results to be obtained from such systems or processes.

IIE Definition - Industrial Engineers Find a Better Way...

• A better way to make a product faster and easier
• A safer way
• A less expensive way
• They examine and analyze to find better ways to solve the problem

So why do we hire IE’s? simply - To find a better Way

I have identified 5 key things that seem to differentiate those that do well and those that do not. It is a combination of what you learn, how well you apply it, and on your character as an individual.

1. Learn how to really use the tools of Industrial Engineering

   a. The statistics, Operations Research, Lean layouts, time and motion standards, quality systems, process optimization, ergonomics, simulation, Lean Manufacturing, Engineering Econ, and People systems. This is what will set you apart in the work place.

   b. When you intern or start your first job you may be expecting someone to hand you a well structured problem and say – go solve it

      i. What they really say is – We need to save at least 10% in this part of our business – please bring me your recommendations in 2 weeks.

      1. This is what separates the Engineers from the Technicians - the engineers know where the formulas came from and how to use them to solve
problems. When they look at a mfg process they see opportunity everywhere (a Better way).

2. They apply their tools to quantify the magnitude of the problem and estimate the benefit of solving it. They may even simulate it to confirm they are right and use it to help get others on board

   1) Others – (even some Lazy engineers) will begin guessing and trying to get a quick answer because getting the right answer will be difficult. Since many of these problems do not have accurate data to pull from they make assumptions about what to do

   2) They will waste more time (theirs and Their managers with this approach then if they had just done the work upfront)

   3) Don’t be lazy and try to arrive at business conclusion without doing the work – Your professors will not allow it so why should you expect that when you graduate you suddenly get to take shortcuts

 This brings me to my next point

2. **Do the hard work and apply the Engineering science – Even if they don’t ask or require it.**

   a. Most Eng Mgrs will not ask you to apply the tools you know. Many Mgrs (since they do not have an IE background) will not know what to ask you to use. You will probably walk into an office called Engineering and may find little engineering work actually going on.

   b. This is how you stand apart from the others. You pull out your books and use the tools you have learned. And master the use of them.

   c. It does not take much to be a great success here – because most people will not do the hard work and few managers will demand it from them

   d. The US is losing its technological edge and much of it is due to lazy engineering and leaders that are too tolerate of poor engineering.

      i. Aside – We have unfortunately become a country that has a hard time thinking deeply about anything. It will be the great challenge of your generations

      ii. Neal Postman’s book – amusing ourselves to death explains the transition

         1. Daily debate in the Town Square

         2. Newspaper – One side of the story – no response

         3. Television – Information coming at you much faster – 7 seconds screen shots – theme moving fast to “keep us entertained”
I) His book was written in 1985 – It has only gotten worse.

4. Technology Age – Data available everywhere (Authoritative data and a lot of unsubstantiated opinion) – The information age has exponentially increased the rate of improvement but deepened this challenge of deep thinking among all of us.

5. Mobile device twitch – Facebook, twitter, texting, - Very rapid unrelated info coming at you with little context, heading nowhere – Just one line sound bites – a tweet!

6. We have become so addicted to it that if we have 2 minutes without something coming at us we grab our phones and hook up the IV. (guilty) How many of you have already disconnected and ready to grab a phone now and wish you were doing that instead of listening the bald guy.

7. How does this translate into the workplace? Few people are willing to take on the hard assignment that requires a long time (several weeks) to get the data to draw the conclusion.

8. Few people can stay focused on the goal long enough to get it done. Way too many distractions and “Perceived” demands on our time. Many Non important Urgent tasks – Some emails, some phone calls, office Drama – the list goes on.

c. The deadline arrives and they show up with incomplete work and are typically frustrated that no one ever does anything with the work are able to get done and they are often sent back to go do the real industrial Engineering work.

f. So how do you use this information to really learn the material you are being taught?

   i. Not just good grades – That should not be the goal – The goal is learning the material and the grades should follow

   ii. Learn in context – Ask your prof – why do I need to know this?

   iii. You are learning about Systems Thinking - The courses have been broken down into tools. It is your job to figure out when to use each tool and how to apply it. So ask your professors where does this tool fit in and how am I to use it?

   iv. As an IE you will be solving System problems – You must understand how the system works before you make recommendations on changing it. So always ask why things are the way they are. And think deeply about them.

g. Assuming you are not lazy and you do the hard work of learning the tools and know how to use them– Have you done what it takes to be a world class Industrial Engineer?– Almost
3. **Speak the language of Business – Money, and build confidence in your ability to deliver.**

   a. You have to translate it into a language that can be understood by those you will be presenting it to

   a. How many of you can speak Portuguese?

      i. Would you ever try to explain your project in English to an audience in Brazil? No - you would interpret it or have a translator

      ii. Same applies in business – Everyone in the room understands Money few understand Industrial Engineering – tell them

         1. Capital required

         2. People resources needed

         3. Return on the Investment

   b. One little hint – Don’t spend 30 minutes on a presentation explaining how you got the data and analyzed it and reached the conclusion that option number 4 was best (meaning you sat through 3 you didn’t need to know) and then at the very end tell them how much it cost and what it would save them – tell them up front

   c. This project is going to cost $6M in capital, requires that we hire 4 Engineers over a 3 year time frame and will save the company $25M in the first 4 years

   d. Be able to explain what your project brings to the bottom line. Most leaders do not have time to know all the details of your project – many may not know what to ask – it’s up to you to do the hard work – they will be looking for a few key points in your presentation

       1. **Have they done their homework?** - Do they know what they are talking about – Are they seeing the big Picture – Will other people believe and follow the course they are leading us down

       2. **What does this means to the business?** – Money, and People, and Time

          a. IRR, net return to the bottom line, Can we Afford all this?

       3. **Are they accountable to get the results?** - Are they talking about something they are going to do or something they want someone else to do,

          a. All Engr need leadership support and help at time – but don’t make your project their problem
b. So – most of you are saying I don’t ever see those slides in any presentation – your right – they are not there-- the story is as much about the presenter as it is what is being said. Leaders are looking at what you have prepared to see if they can draw these conclusions.

   i. When you have learned how to use the Tools and applied them and can speak the international business language (money) then you is well on your way – Just a few more things needed.

4. **Learn how to Lead and to create Culture— The ground work for future leaders**

   a. Since IE is systems engineering (man, machine, material) it will always have the human element as one of the most important component (as opposed to other disciplines of Engineering like EE, and Chem Eng). We are called on to provide engineering solutions where the most important element has the greatest degree of variability. People come in all sizes, various strengths and weaknesses and have very different motivations for doing what they do. We truly live in a wonderful world filled with great diversity.

   b. As much as we would like to minimize the human variation to make our engineering work easier it will always be there and we just need to understand it when designing solutions.

   c. These means we must understand the culture of the workforce we are working in

      i. Would we design the same system for a US workers as we would for a Chinese workforce? – I do not have the time to go into it but these processes are not going to be identical.

   d. So be a student of the motivations of the workforce you are designing processes for and learn the culture.

   e. As an IE – Much of your success is going to hinge on the cooperation and input you get from many people. Never design systems without getting the input from those that will be using them. This is the highest form of Arrogance and the fastest way to sabotage your own project. With all your background in IE you still have a lot to learn about the processes you are involved with. Those around you will be glad to tell you if you just humbly ask.

   f. If people know you care enough to get their input they expect you will do something with it and come back and tell them what you did.

   g. IE’s that do this are on the road to being leaders. Because this is the frame work of leadership – being able to get everyone of the same page and create a better outcome.

   h. **Leadership effectiveness boils down to 2 things**

      i. Business results

      ii. How people respond to your leadership
i. Your IE tools should help you deal with the Business Results. Learning how to improve your leadership is in large part how you treat people and whether you inspire them and can be trusted. These are personality characteristics that you don’t really learn much about in an IE degree but they are the essence of who you are as an individual – your world view and your belief system. These can all be improved on as you interact with teams each day, as you learn to lead peer groups you will get greater responsibility. If you have a desire to go into leadership it will start with being able to lead among your peers and gaining the respect of those on your team.

j. Many Top leaders and CEO's come from the IE discipline – When you combine great leadership with Systems thinking you have the key components for business success.

k. I have one final point that I will keep brief but I think it is very important.

5. **Demonstrate accountability – Don’t make excuses**

a. Own the project and be responsible for the implementation and the results.

b. There are many obstacles to getting things done – some are simply unavoidable – Acts of God – Suppliers that don’t deliver what they promised, etc. But many can be overcome with persistence and an accountable culture.

c. Get in the habit of assessing situations and finding ways to overcome them. Don’t stop at just knowing why they results did not turn out the way you wanted.

d. Many engineers find out what went wrong and stop at that thinking that if they can identify the point of failure they are ok. In reality what makes a world class engineer are those people that understand the problem and develop alternatives and options to overcome them and can present those options to management.

e. This was the last part of the key components I said leaders look for as you are presenting. You will not have it on any of your PowerPoint slides but it will be evident in the language you use and the way your respond to questions and challenges.

6. **So in Summary** – I have outlined what I think is required to be a world Class Industrial Engineer.

a. **Learn how to really use the tools of Industrial Engineering**

b. **Do the hard work and apply the Engineering science – Even if they don’t ask or require it**

c. **Speak the language of Business – Money, and build confidence in your ability to deliver.**

d. **Learn how to Lead and to create Culture – The ground work for future leaders**

e. **Demonstrate accountability – Don’t make excuses**
After leading organization in 2 large corporations these truths appear to be consistent across both of them. Ind. Engineering is an outstanding field – If I had it all to do over again I would still get this degree. The opportunities are limitless.