Design in Practical Application,

Creativity and Process to form an Expertise

April 2020 Johannes Schaede

Welcome to the last stretch!

We are now closing into the last steps to get you to your Master's degree. A n occasion to which I hope to see you eventually in person. If not, you are reading this now and may wonder what is in it for me at this point? Honestly, it is difficult to predict. However, I want to touch a few things you may want to consider when you think about what to do when leaving the cosy nest of this school.

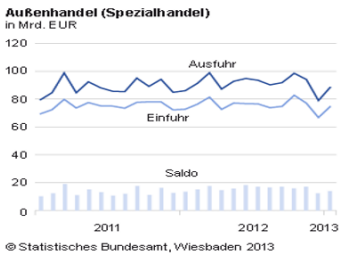
L4 Good to know

1. Career Planning
2. Chances and Threats
3. The larger picture
4. Task 4 and Book 4

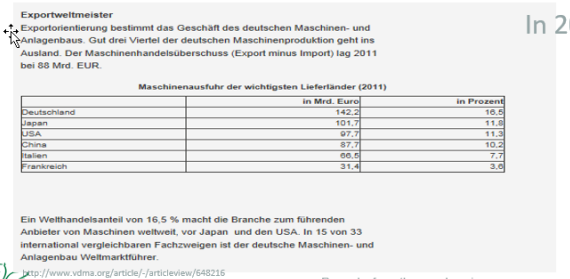
These are the topics of this lesson. When I address career planning, it is not the 101 guide to become CEO of Infineon, GOOGLE or Mercedes Benz. Any planning to such an end is more likely to fail than succeed. Most of the career managers with outstanding success attribute this mainly to their own making, energy, genius etc. They generously omit the factor of opportunity and luck. Also they forget how many people have contributed to their success, their family, teachers, supporters

and the many along their way they may have disappointed or pushed aside. Rather I want to explain some basic expectations and challenges you and your generation will inevitably face.

German machine industry



Germany exports 80 to 100 x 10^9 €/month



Exportweltmeister

Exportorientierung bestimmt das Geschäft des deutschen Maschinen- und Anlagenbaus. Gut drei Viertel der deutschen Maschinenproduktion geht ins Ausland. Der Maschinenhandelsüberschuss (Export minus Import) lag 2011 bei 88 Mrd. EUR.

Maschinenausfuhr der wichtigsten Lieferländer (2011)

	in Mrd. Euro	in Prozent
Deutschland	142,2	16,5
Japan	101,7	11,8
USA	97,7	11,3
China	87,7	10,2
Italien	66,6	7,7
Frankreich	31,4	3,6

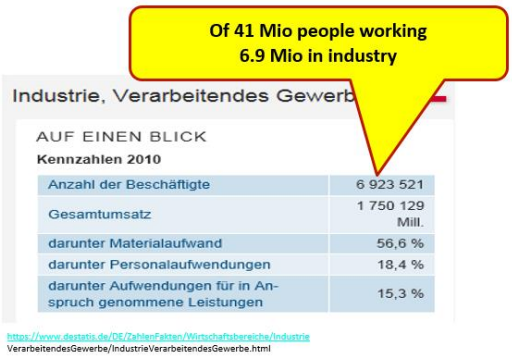
Ein Welthandelsanteil von 16,5 % macht die Branche zum führenden Anbieter von Maschinen weltweit, vor Japan und den USA. In 15 von 33 international vergleichbaren Fachzweigen ist der deutsche Maschinen- und Anlagenbau Weltmarktführer.

http://www.vdma.org/article/-/articleview/648216

In 2011 machine industry exported 142.2 x 10^9 €

The figures of this statistic are a little bit outdated, but the basics have not changed. In short, Germany as many other industrial countries (Japan, Northern European countries etc.) are dependent in their wealth form their export. What little natural resources hey have are not significant though mostly an exotic element of cultural identification (Swiss Cheese and Chocolate, French Champaign, Japanese Kobe Beef, German Beer, etc.)

German machine industry is «midsize»



https://www.destatis.de/DE/ZahlenFakten/WirtschaftsbereicheIndustrie/VerarbeitendesGewerbe/IndustrieVerarbeitendesGewerbe.html

Of the total German population about 50% are working. Of the 50% 17% are working in Industry or productive companies (which is less than 10% of the total) Q: what are the 50% non-working members of the population doing? What is the working force not in industry or production doing?

German machine industry is «midsize»

Of 6.9 Mio people in industry
1.8 Mio are in electro or machine

Die größten Industriezweige (2011)

Wirtschaftsgruppe	Unternehmen (2010)	Beschäftigte in Tsd.	Umsatz in Mrd. Euro
Maschinenbau	6.165	931	201
Elektrotechnik	4.291	842	178
Kraftwagen und -teile	1.041	694	270
Chemische Industrie	1.165	285	113

http://www.vdma.org/article/-/articleview/648216

Industrieller Mittelstand

Im Maschinenbau dominieren mittelständische Betriebs- und Entscheidungsstrukturen. 87 Prozent der Unternehmen beschäftigen weniger als 250, nur circa zwei Prozent mehr als 1000 Mitarbeiter. Zwei Drittel der Unternehmen haben sogar weniger als 100 Beschäftigte.

- 66% companies <100 employees
- 86% companies <250 employees
- 2% companies > 1.000

http://www.vdma.org/article/-/articleview/648216

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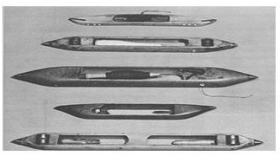
Remarks from the wooden siege

As the further detail shows, one major partition of the backbone of German export industry is supported by less than 2.5% of the work force. These people are mainly working in small to mid-size companies. This has interesting consequences for your career. Statistically you are much more likely to end up in a small to mid-size company than in one of the big corporations. The difference is basically that in a large company it will take a long time until you will have some responsibility and can influence for good or bad the results of your company. In a small company you will very soon have to take important decisions for the survival of your company. There will be few peers to challenge your ideas and to hone the decisions. You should not be afraid but be aware that you will carry a lot of responsibility. We hope to have contributed to your preparation.

Machine and Plant engineering in Germany (2)

Weak participants in world market
Textile Machines

- Important Inventions in history :
  - 1733 John Kay, Flying Shuttle
  - 1764 James Hargreaves, Spinning Jenny
  - 1764 Richard Arkwright, Waterframe
- Industry Kernel
  - 1783 Platt Broth., Saddleworth-Bolton
  - 1797 Dobson & Barlow, Bolton
  - 1803 Asa Lees on Greenacres Moor



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The crib of textile machines was in England. Germany and Switzerland were once the dominating centre of textile machine industry. They no longer are, but still there are lot of textile production machines in the world. Q: 1. Where has this industry gone? 2. Why did first England and then Germany lose their dominance?

Machine and Plant engineering in Germany (3)

Strong Participants in world market
Automotive

- Important Inventions in history :
  - Carl Benz Motorwagen
  - Diesel Motor
  - Wankel Motor
  - Porsche Boxer Motor
- Industry Kernel
  - Mercedes Benz
  - Horch / Audi
  - Volkswagen
  - Porsche

The inventions carry the prestigious names of the key inventors

The German car industry is still one of the most important industries in Germany with roughly 800.000 employees (counting all supply industries). Q: Why is it still so strong in a country of very high labour costs? What is the upcoming danger for this industry and Germany's economy?

Why are engineers needed ?

Svante Arrenhius,
Nobel Laureate Chemistry 1903

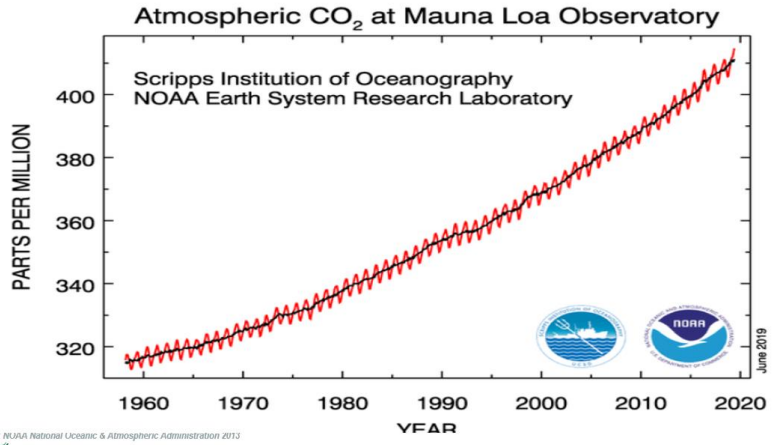
absorbed by the oceans. In view of this, a doubling of CO_2 that would have taken 3000 years if the earth was a single land-mass would occur in 500 years. During this latter period, temperatures would increase by 3–4°C. Arrhenius saw nothing adverse in such a development. It will "allow our descendants," he said, "even if they only be those of a distant future, to live under a warmer sky and in a less harsh environment than we were granted"(11). Such a view is consonant with the ideology of "optimistic evolutionism" embraced by Arrhenius and many of his contemporaries (22).

Source : Arrhenius' 1896 Model of the Greenhouse Effect in Context
Author(s): Elisabeth Crawford

- CO2 will create a «greenhouse» effect
- Average Temperature will raise 3-4°C
- Positive Effect for Scandinavia

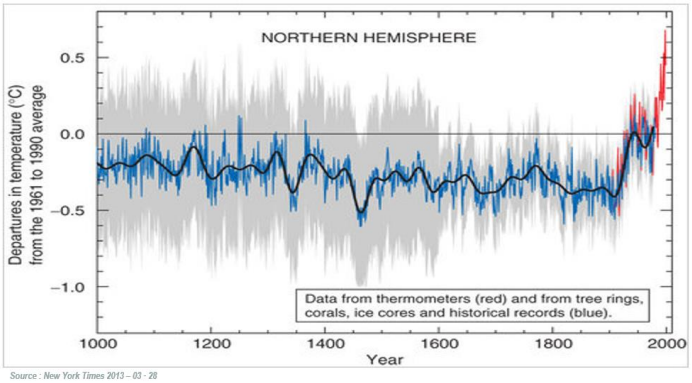
The expectation of a global warming by the green-house effect is not an invention of contemporary "green" alarmists, but was predicted by the Chemistry Nobel Prize Laureate Arrhenius at the begin of the last century! He thought it a good idea to have Apricot and Lemon plantations in his Scandinavian home country.

Why are engineers needed ?



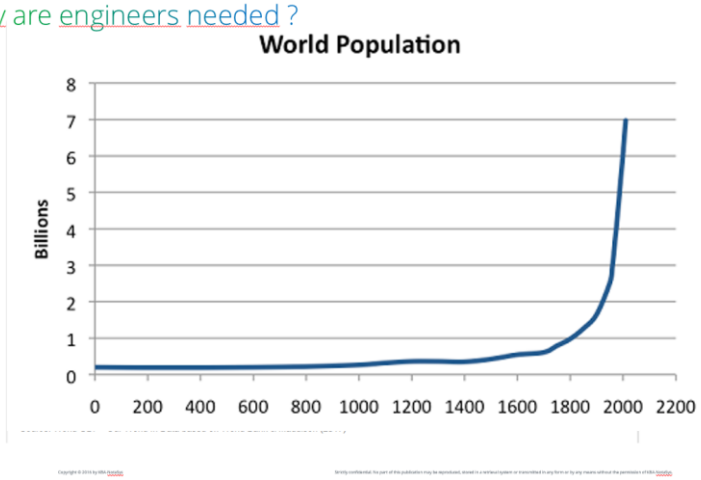
Source : NOAA National Oceanic & Atmospheric Administration 2013

Why are engineers needed ?



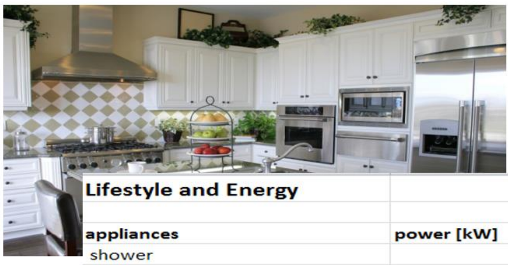
Source : New York Times 2013 – 03 - 28

Why are engineers needed ?



The facts are the facts and natural laws apply also to those who do not appreciate them. It will be your generation which has to deal with the consequences of the global warming. As it is not an appealing idea to reduce CO_2 emission sufficiently by cutting the world population by a factor of 8 to 10 you have no choice but to find relatively fast good (engineering) solutions to maintain civilization without further inflationary CO_2 emission.

Why are engineers needed ?



Lifestyle and Energy			
appliances	power [kW]	usage/(weekxp) [hrs]	kwh/week
shower	5.00	1.00	5.00
washing machine	1.50	1.00	1.50
dryer	2.50	1.00	2.50
dishwasher	1.80	0.40	0.72
refrigerator	0.18	168.00	30.24
internet	0.25	60.00	15.00
television	0.20	14.00	2.80
light	0.45	42.00	18.90
Total			**76.66**

source : http://energy.gov/energysaver/articles/estimating-appliance-and-home-electronic-energy-use

Remarks from the wooden siege

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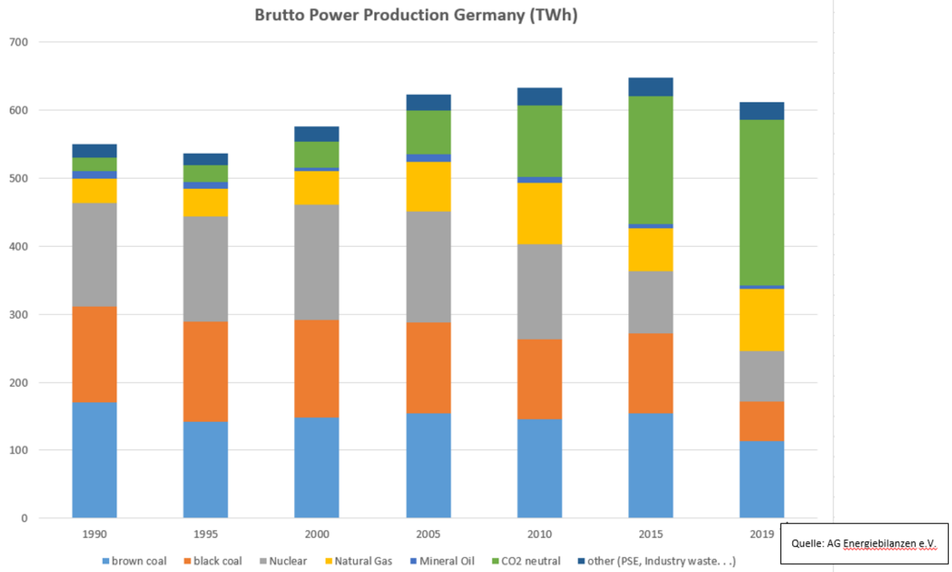
As an example of what you expect to be allowed to maintain only your basic needs, here is your average energy consumption: Q If we would assume that only 60% of the world population would have this luxury and the rest a meagre 50% of that, what would this mean for the world energy consumption? From which resources could this come without burning fossil energies?

Why are engineers needed ?



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Here you see how the energy mix in Germany has changed over the last 30 years have changed. Q: 1.What are the driving (political) decisions which have created this mix? 2. Given the same speed of change, when will Germany no longer be dependent on burning fossil energy? 3. If the goal is maintained to reach this instead 2030, what has to change in our infra structure?

Presentation sample 1. One column text slide

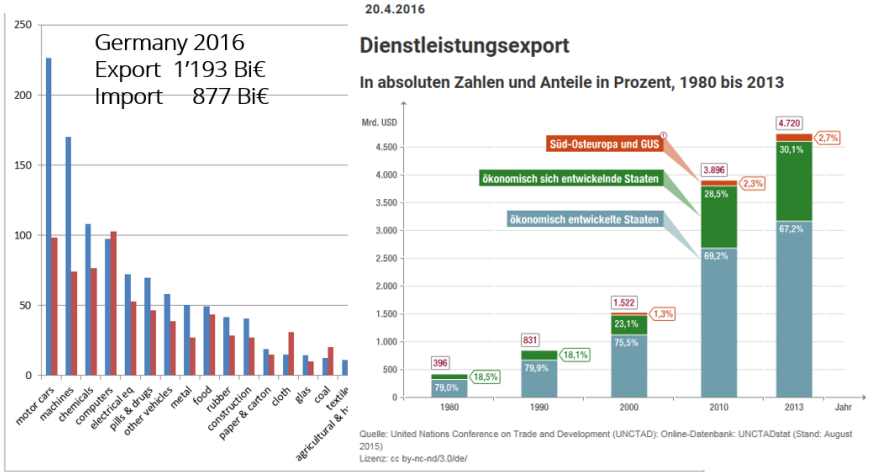
Here you find a stunning fact stated by one of the major German Newspapers. Q: 1.What is the danger of such misleading "facts"? 2. How often do you question facts which are presented by the media to you and get to the bottom of it?

Why does the industry need products ?

Remarks from the wooden siege

In this slide (normally it is animated) you see how an established player (DELL) can lose at least part of its value chain and business when the transfer to third party sources eliminates the in-house value chain.

Growing focus on “old” economy ?



Remarks from the wooden siege

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Here you find the at first glance contradictious comparison between service and “old economy” in their contribution to the (world) economy. Q: 1. Can a society survive on service export alone? 2. If not, what is a solid industry policy for a society?

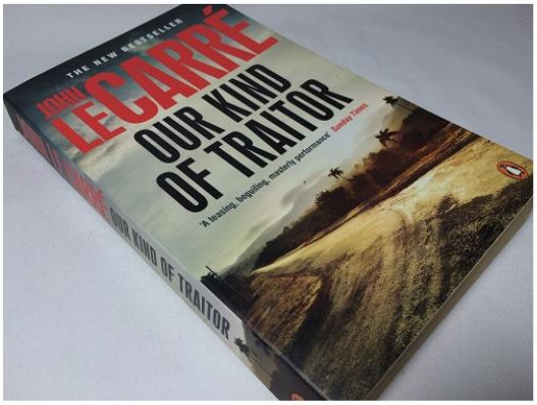
A small little exercise

A small little exercise for you :

You have learned about the importance to understand the market of your company.

- Select your favorite company where you want to develop your career
- Develop the food chain model for this company
- Make and assessment of the future of this company
- 5 min presentation

A reading recommendation



Finally, a last small exercise for you. Just in theory: try to identify a company you would like to work for and make your assessment on how solid your future will be on your decision.

The final reading recommendation shall demonstrate to you, that education can be entertaining.