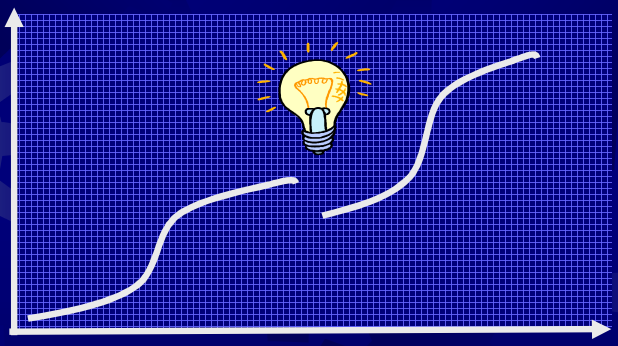
Session 1: Overview of Management of Technology Innovation



Donald A Coates

In this session, we will give a very general overview of the Management of Technology Innovation. The material reflects primarily the teaching and industrial experience of the instructors. This will be an opportunity for you to get your arms around the whole course and know what is expected. In subsequent sessions, we will drill down into more detail.

First let's start with some perspective on innovation and history.

- If we don't know what is ultimately possible, it can take us longer to get there.
- For instance, Bill Gates had a better vision of where PCs could go than IBM and so IBM never had his success.
- Also, if we know where we are going, we will know when we got there; otherwise we may never know whether we have achieved our goal.
- And by knowing of the mistakes and solutions of the past, it will take us less time to get there.
- Yet another beneficial perspective is that Innovation has allowed us to graduate from living in caves and clawing at the earth for food. This was by improving productivity and quality of life. Thus the study of innovation is a worthy pursuit.
- So in conclusion, history needs to be studied to educate ourselves on better ways to approach the future.

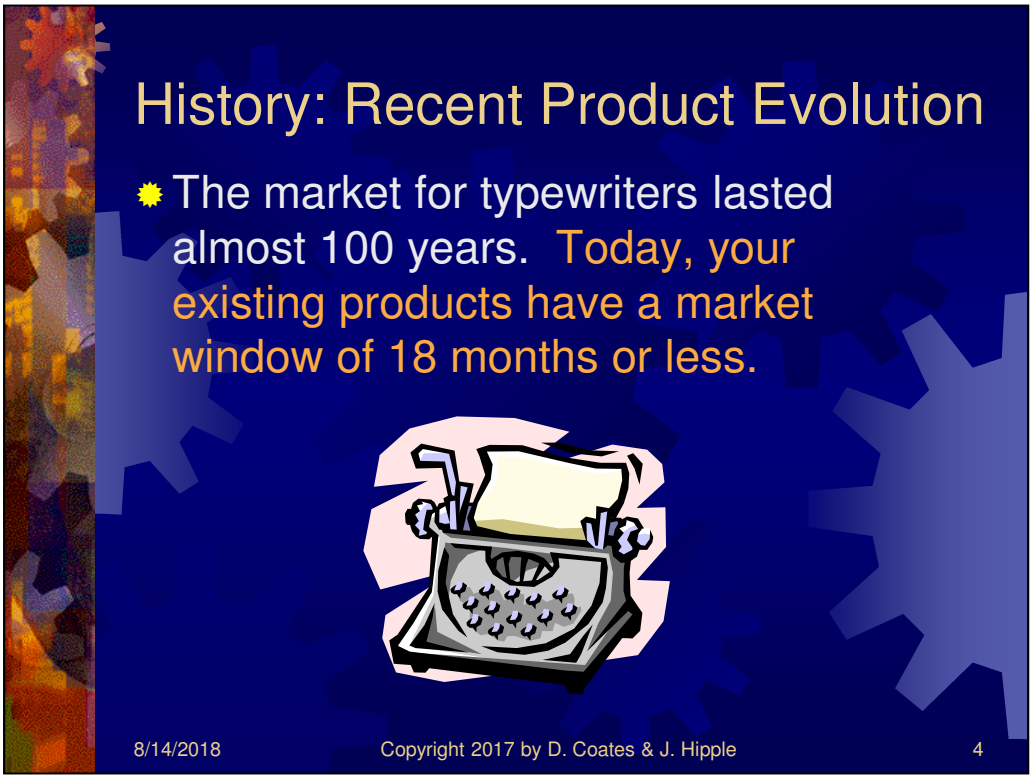
History: Past Product Evolution

- Bicycle Evolution
  - 1813 Running Machine
  - 1840 Pedals
  - 1845 Brakes
  - 1884 Transmission
  - 1890 Tires
  - 1897 Freewheeling clutch
- Did it have to require that much time?

•Continuing with our perspectives and history of innovation, let's talk about the pace of product evolution.

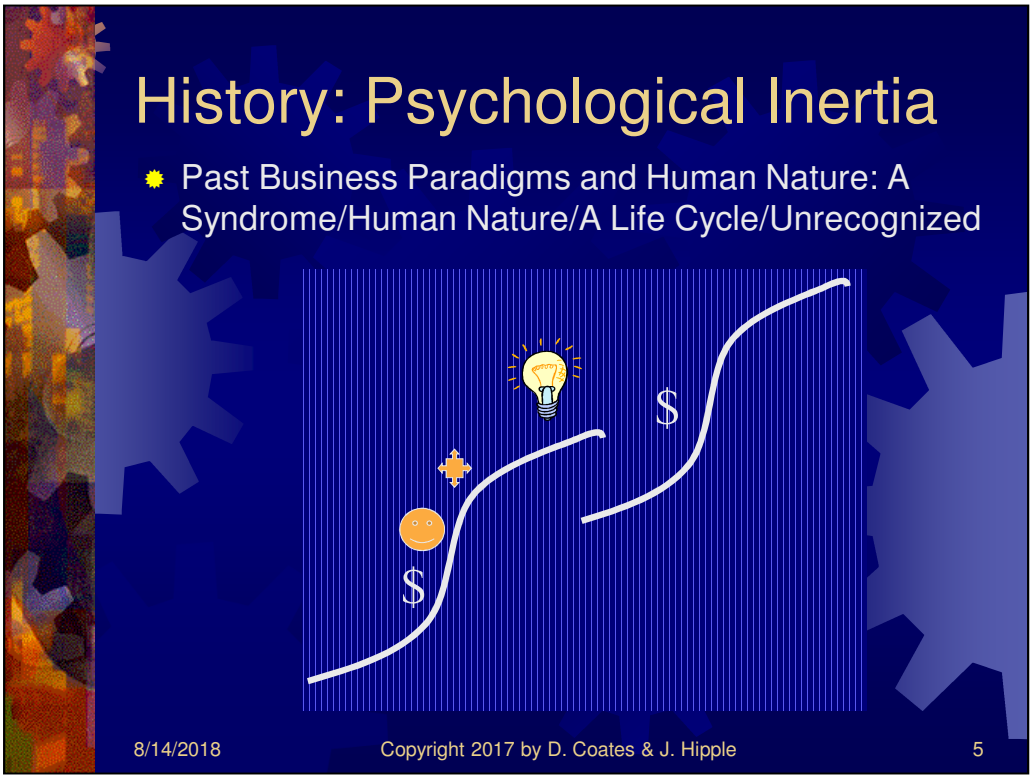
• Back in the 1800's it took a long time to develop something as simple as a bicycle. Consider the amount of time between key advancements shown in the slide.

•But did it have to take that long and can you identify the contradictions in design that were overcome at each of these stages?



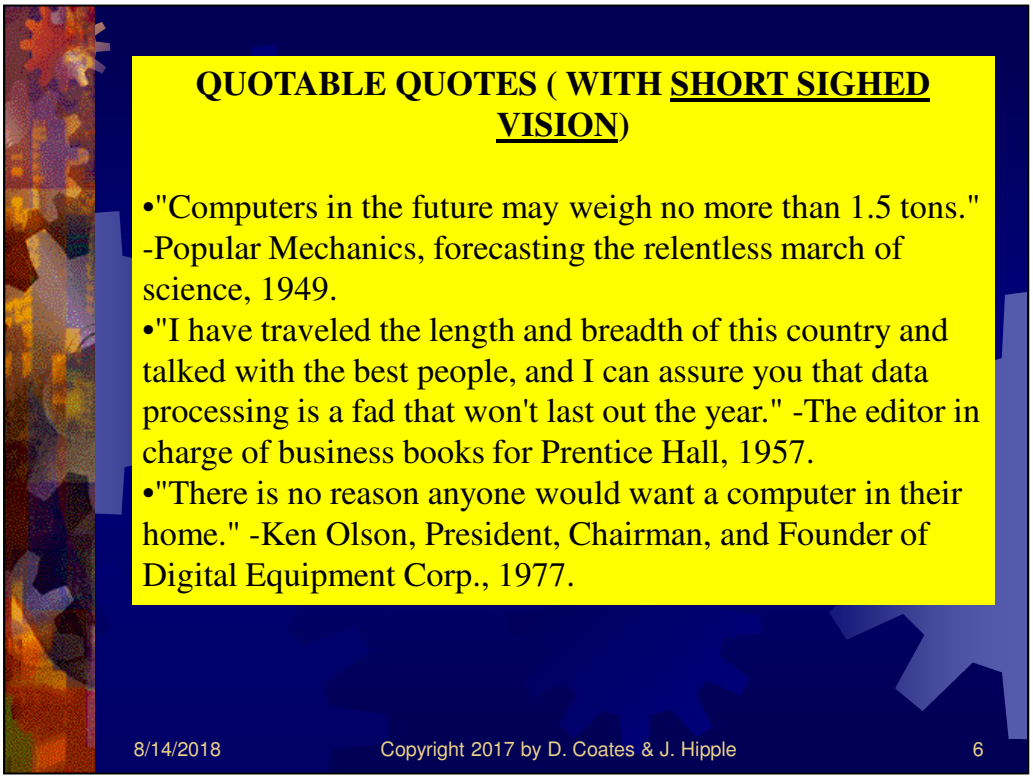
Consider the typewriter.

- The market for typewriters lasted almost 100 years. Today, competing products have a market window of 18 months or less.
- So the pace of innovation is faster but do we have the process and tools to do this?
- Question: Why are the keys laid out the way they are? The answer, after much study, this layout minimized, but didn't eliminate, the probability of the type arms from interfering with each other when they. Does this matter anymore?
- They are some of the main goals of this course.

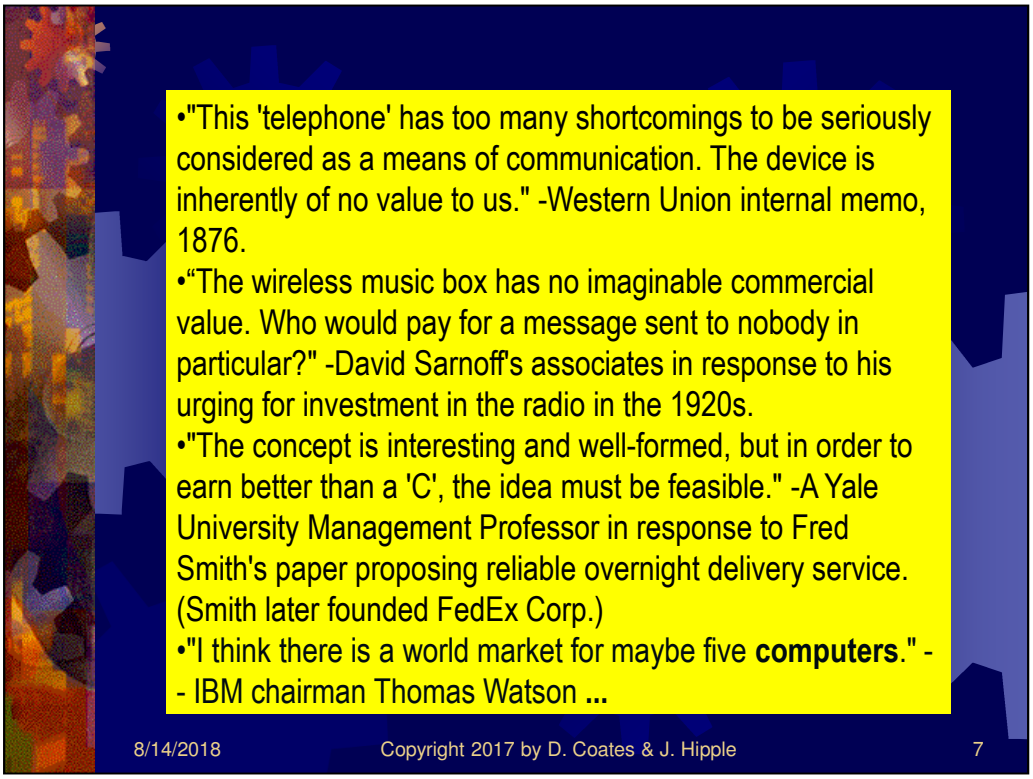


Now let's consider, also from history, what is psychological inertia:

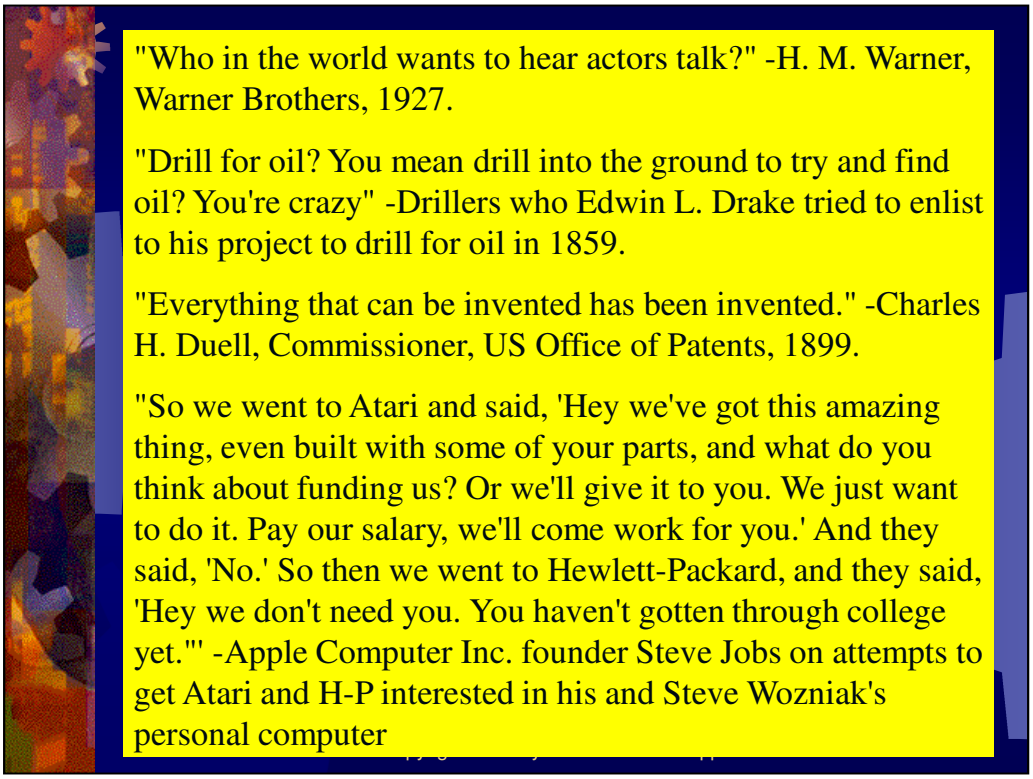
- In psychological inertia, A key word is PARADIGM
- The Etymology is Late Latin paradigma, also from Greek paradeigma, from to show side by side, from para- + deiknynai to show —
- Essentially it is a PATTERN such as a habit,
- More exactly a philosophical and theoretical framework of a scientific school or discipline within which theories, laws, and generalizations and the experiments performed in support of them are formulated; broadly : a philosophical or theoretical framework of any kind
- So with that explanation let's talk about why paradigms lead to psychological inertia.
- Looking at the slide, you can see a new product or service has a slow start, call it an embryonic stage, then accelerates during rapid adoption, and then slows as it becomes mature. Eventually the curve goes down as the thing is displaced due to another innovation.
- Unfortunately, when things are rapidly being adopted and another innovation is embryonic psychological inertia prevents people from quickly adjusting to the new normal. Many times the new innovation is from a new company and the older company dies or leaves that market. This happens in many walks of life as will be shown in the following few slides.



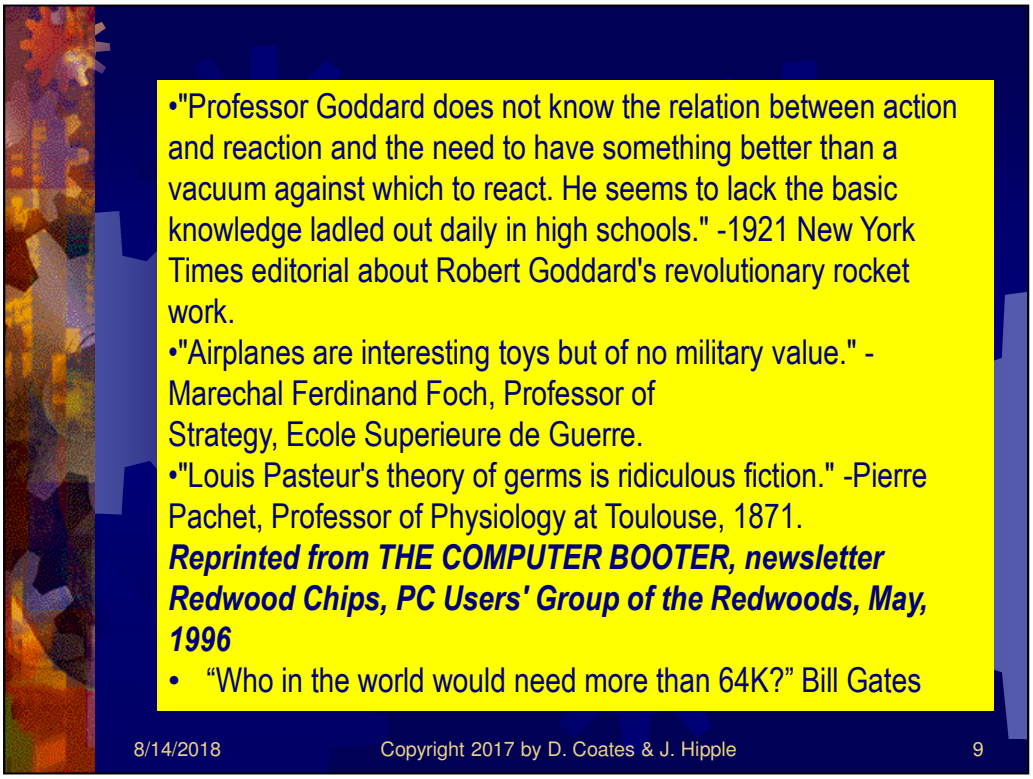
Let's consider some famous examples of psychological inertia from history. Reading from the slide above…



Here are some more. When you read these, you do not have to be afraid of the small amount of psychological inertia you may have had.

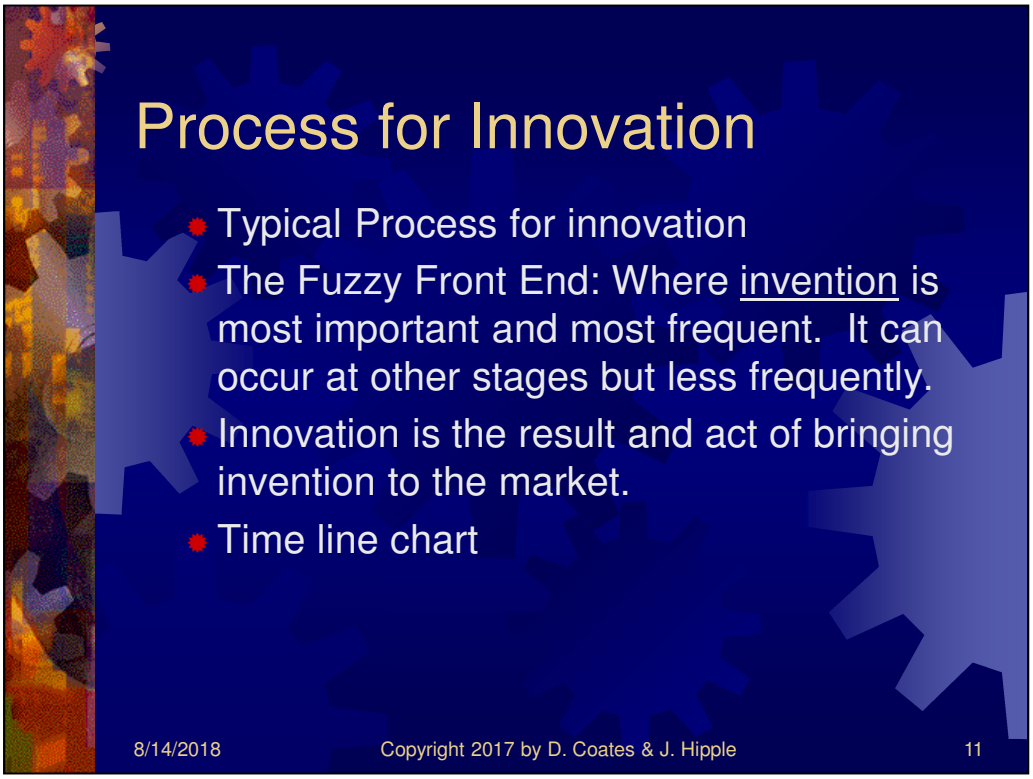


Keep reading…these quotes are incredible



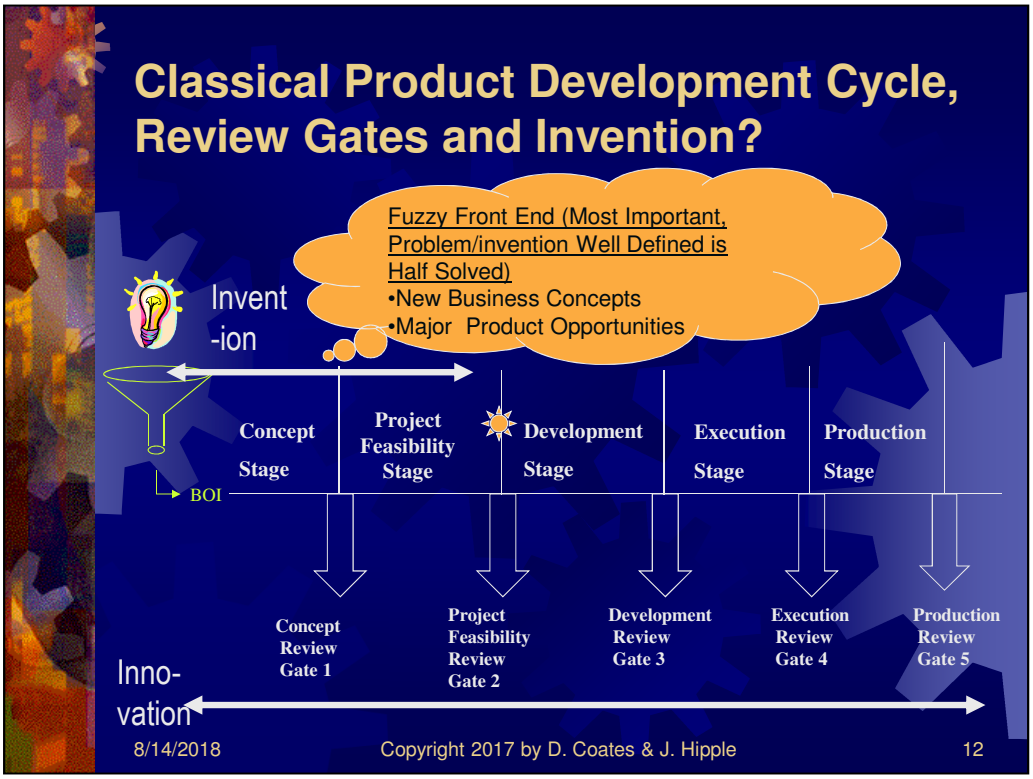
These people reflected the paradigms of their era.

- A receptive mind is a prepared mind, so history can prepare us for the future.
- The biggest history lessons will be case studies from the text Open Innovation by Chesbrough. He shows how important management and adjusting your paradigms are for innovation.
- First a distinction between Invention vs. Innovation
- Invention is creating new concepts
- Innovation is both invention and bringing it to the market.
- A Metaphor for this is: Science vs. Commercialization
- Innovation includes invention
- Note a metaphor: is a figure of speech in which a word or phrase literally denoting one kind of object or idea that is used in place of another to suggest a likeness or analogy between them (as in drowning in money); think about it.



Let's talk about the typical development process for innovation.

- The Fuzzy Front End is where invention is most important and most frequent. It can occur at other stages of development but usually less frequently.
- Innovation is achieved when an invention is brought to the market.
- Let's look at a time line chart



- The beginning of the time line is where the bright idea goes into a hopper and sometimes gets on the time line to commercialization.
- The Concept and Project Feasibility Stages are where most of the invention occurs. This is called the Fuzzy Front End . Why this name, because a lot of people have not turned this into a structured process. Also not a lot has been written about the fuzzy front end, although it is becoming popular. A Google search will reveal about 207K references to the Fuzzy Front End. Many mention some of the same items in this course but, I don't believe in as prescriptive a way. You may already have a process that you have been taught and I only ask that you compare what you know to this and try to use this approach in this course. Presenting a process for the Fuzzy Front End will be one of the key deliverables of the course.
- Typically the people responsible for the two stages of the Fuzzy Front End are called mad scientists or eccentric inventors.
- The rest of the development process has several stages as shown in the time line above. This overall timeline has usually been called a stage gate process since the gates will not let the project progress unless certain criteria are met. This process was first proposed by Robert Cooper and Scott Edgett (http://www.prod-dev.com/edgett_cooper.php or http://www.stage-gate.com/resources_stage-gate.php).
- Invention is most important at the front end of the process since invention later

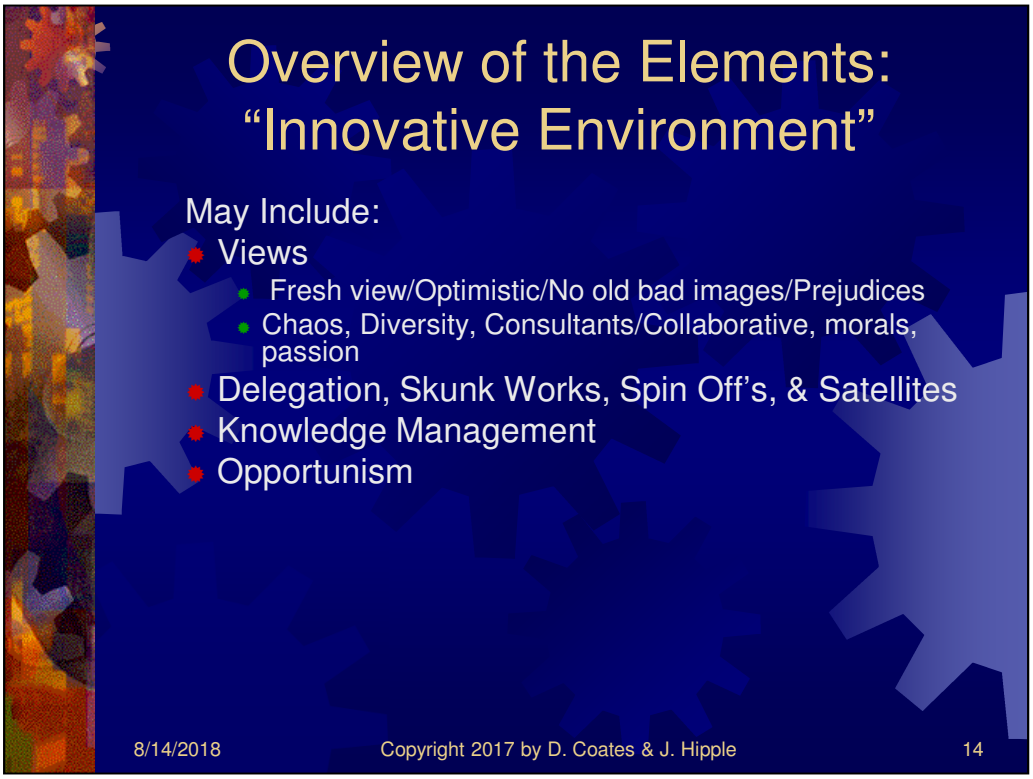
may require many expensive changes to work already done.

- Technology transfer to a manufacturing company or another group occurs frequently before the start at Development but can occur at other stages.
- Innovation is complete when the invention reaches public use which is usually at end of the time line but it starts at the Concept Stage.

As a researcher in innovation, Dr. Coates of Kent State proposed a new process for the Fuzzy Front End of Innovation. This overlays the Concept and Feasibility Stages. How it relates the them will be explained later in the course. But it is a holistic process, i.e., all four parts of the new process must be done together in the sequence that will be shown. This is frequently asked on quizzes so please take the time to understand this relation when it is later described.

- Consider the Etymology of holistic: hol- + -ism, a theory that the universe and especially living nature is correctly seen in terms of interacting individual wholes (as of living organisms) (and be viewed as a collective whole) that is more than the mere sum of elementary particles
- The process has four main elements.
    - Environment: Good Leadership & Management, Dynamism & Good organizations
    - Methods for Problem Solving
    - Business Analysis & Dynamic Bus. Modeling
    - Long Term Planning/Strategy and How to
- This is a Holistic approach , i.e., "Must hit on all cylinders to be successful"
- We will cover these in more detail in later slides and repeat them with even further detail later in the course.
- This process is another one of the reasons for this course. We do not want to

teach just problem solving methods, but also teach a process of using the problem solving methods.



Consider the "Innovative Environment" This includes:

- Views (Fresh view/Optimistic/No old bad images/Prejudices), passion (do what you enjoy and believe in; the money will follow);
- Chaos; Diversity; Consultants/Collaborative
- Delegation; Skunk Works; Spin Off's; & Satellites
- Knowledge Management
- Opportunism

Leadership is also part of the Environment:

- Classic attributes: technical, human, and conceptual skills (Article: "Skills of an Effective Administrator" Harvard Bus. Review Journal)
- Other standout attributes are:

  Vision-conceptual-technical

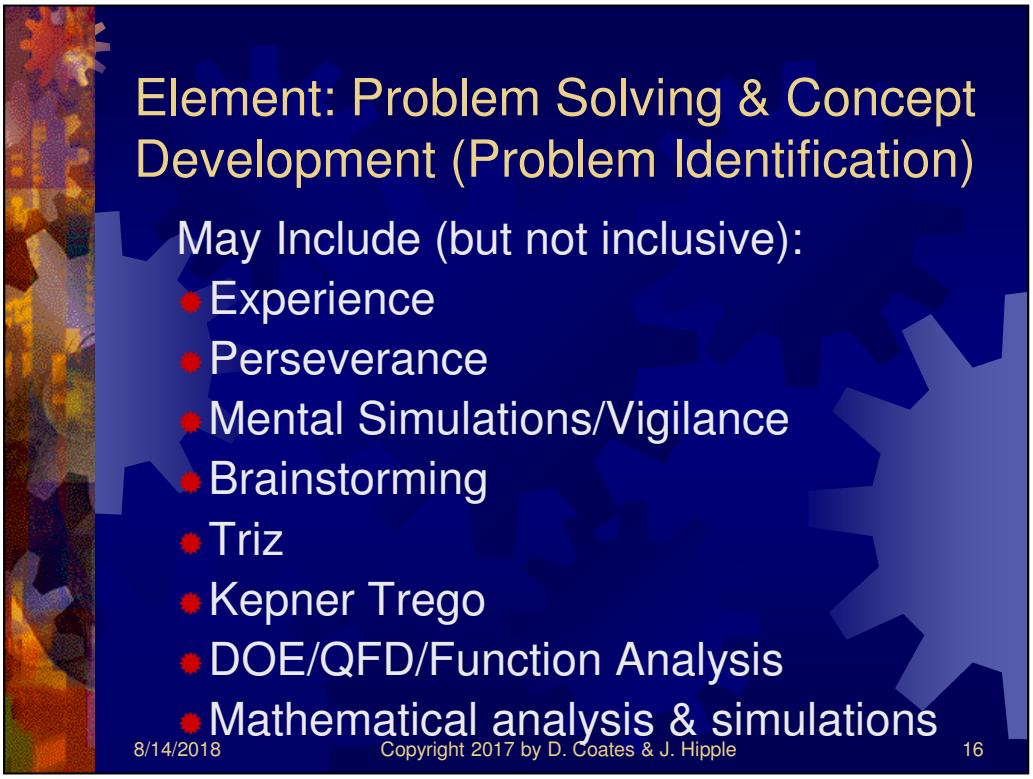
  Charisma-human

  Conviction-human

  Alacrity-human

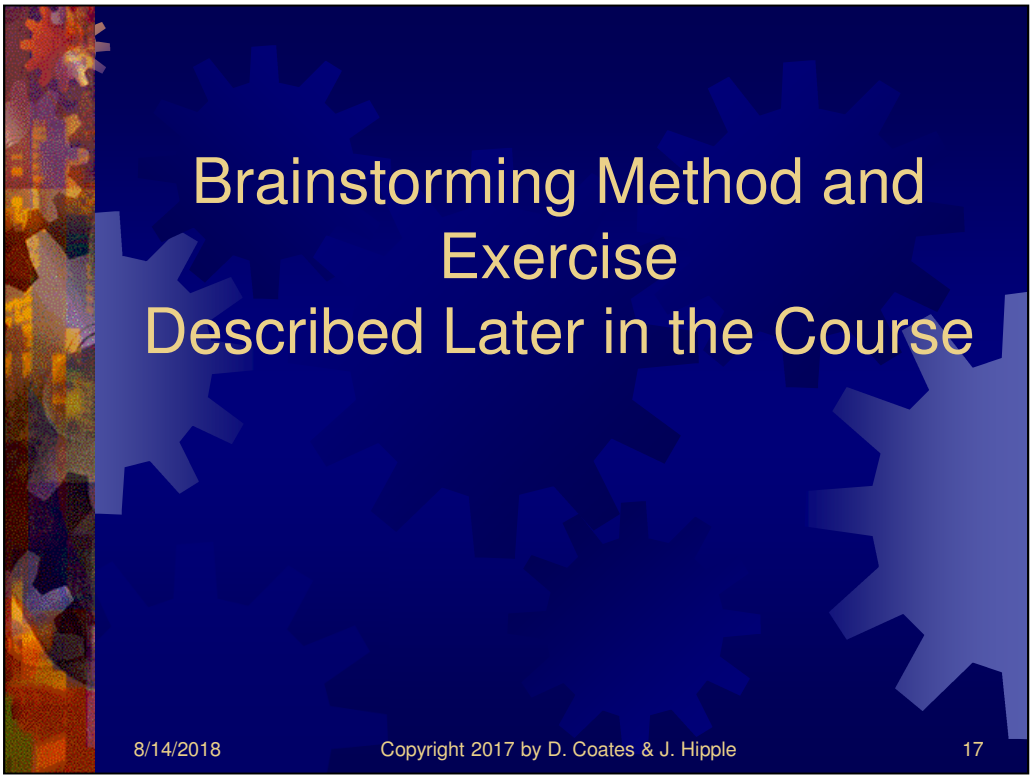
  Insight-technical

Entomology for Charisma: a personal magic of leadership arousing special popular loyalty or enthusiasm for a public figure (as a political leader)2 : a special magnetic charm or appeal *the charisma of a popular actor*

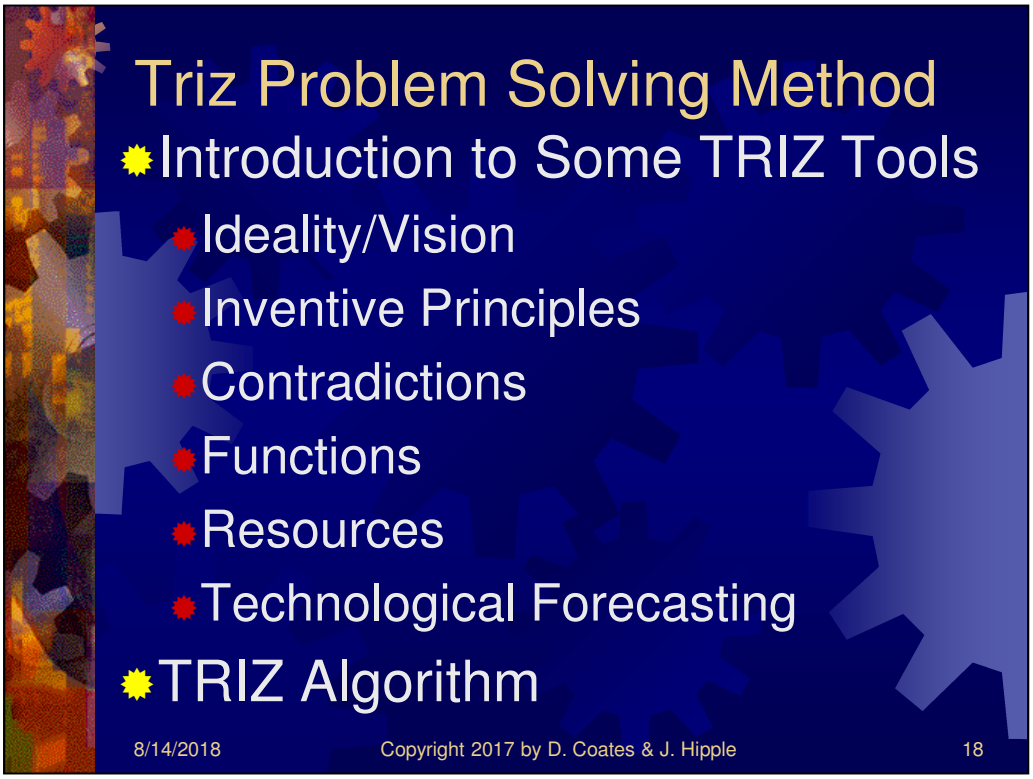


Let's consider component of the Problem Solving Element of the new front end process. This includes but not limited to items such as:

- Experience
- Perseverance
- Mental Simulations/Vigilance
- Brainstorming
- Triz
- Kepner Trego
- DOE/QFD/Function Analysis
- Mathematical analysis & simulations



In the class you will be asked to conduct a brain storming exercise…more on this later.

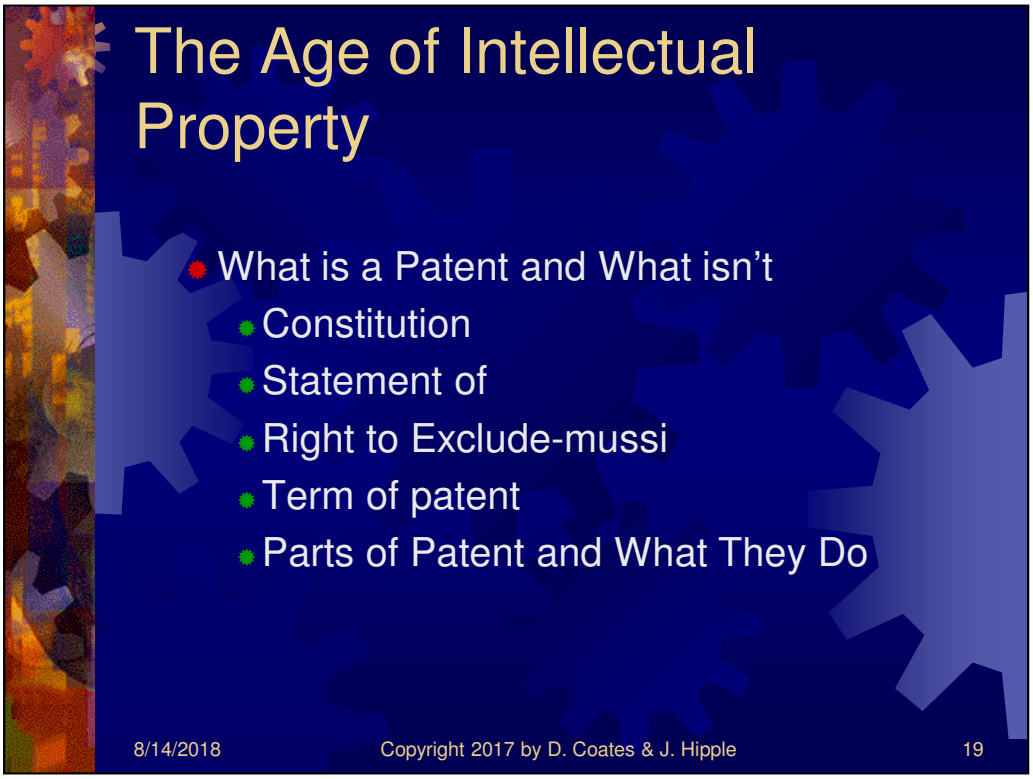


In the course you will be introduced to the Triz Problem Solving Method.

The main components of TRIZ are:

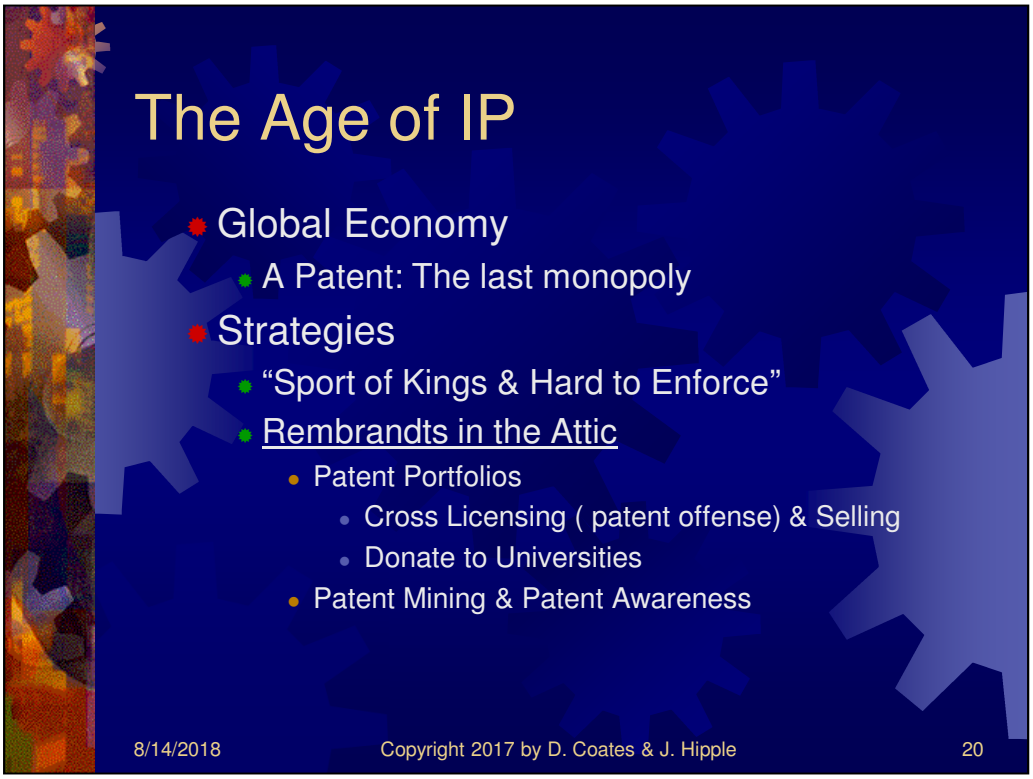
- Ideality/Vision
- Inventive Principles
- Contradictions
- Functions
- Resources
- Technological Forecasting

You will also be introduced to a TRIZ Algorithm



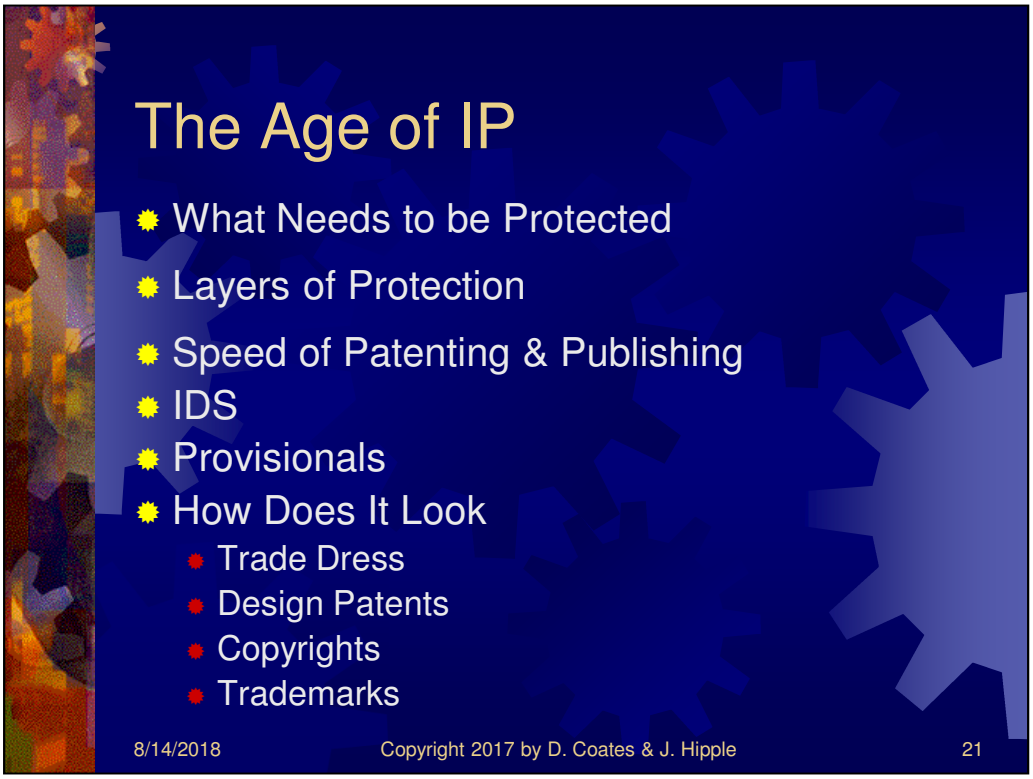
- In innovation what stops someone from just copying your idea? It is a legal concept called intellectual property. You can legally register the invention as yours just like purchasing a piece of land.

- As part of the Business Analysis, Intellectual Property should be considered. This includes patents, copyrights, trade secrets, etc.
    - Patents are part of the US Constitution and give the owner the right to prevent others from making, using, selling, offering for sale, or importing the product. I use the acronym MUSSI.
    - The term of the patent is 20 years from the date of the invention.
    - We will study the parts of a patent and what they do.



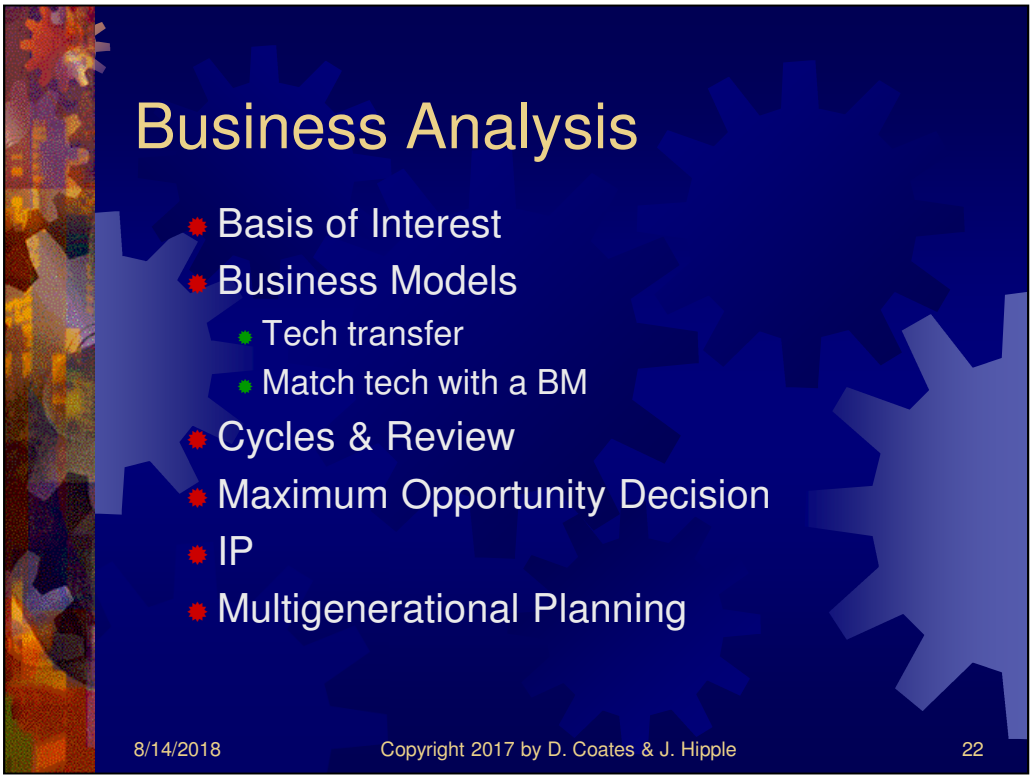
We are in an age of IP.

- In a global economy IP is the last monopoly.
- It is an important strategy for companies but it is hard to enforce and expensive to do so.
- One book Rembrandts in the Attic talks of Patent Portfolios, Cross Licensing (patent offense), Selling patents, Donating to Universities or Patent Mining & Patent Awareness. We will discuss it again.



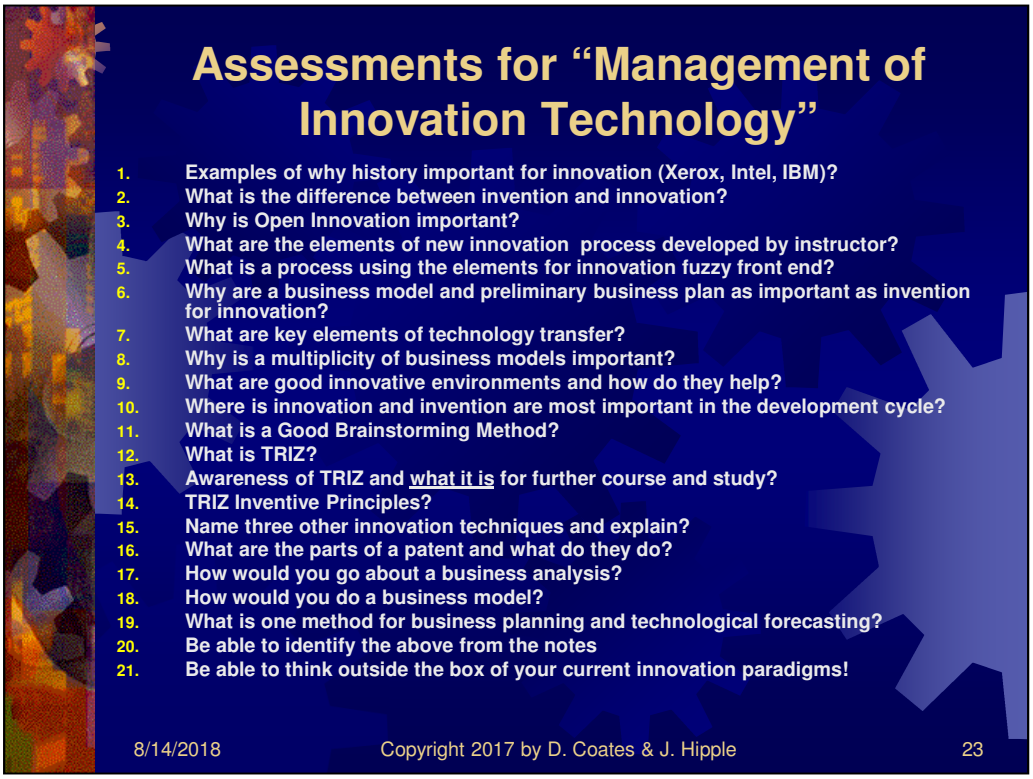
In the age of IP you need to consider:

- What Needs to be Protected, since it is expensive to do everything.
- Layers of Protection are needed for stronger defense of key patents
- Speed of Patenting & Publishing, sometimes competing patents are only minutes away from being filed vs. your time of filing.
- IDS (invention disclosures to identify invention date, otherwise invention is when patent application received.)
- Provisional patents to establish a priority date for invention interference proceedings.
- How Does It Look intellectual property
  - Trade Dress
  - Design Patents
  - Copyrights
  - Trademarks
- In this global economy, IP is very important.



The Business Analysis element of the Innovation Process has the following components:

- Basis of Interest and Opportunity review forms
- Business Models
    - Tech transfer for many different business models
    - Matching tech with the right BM
- Cycles & Review. BA may take many cycles and multiple reviews.
- Maximum Opportunity Decision
- IP as part of a BA
- Multigenerational Planning to stay alive and grow.



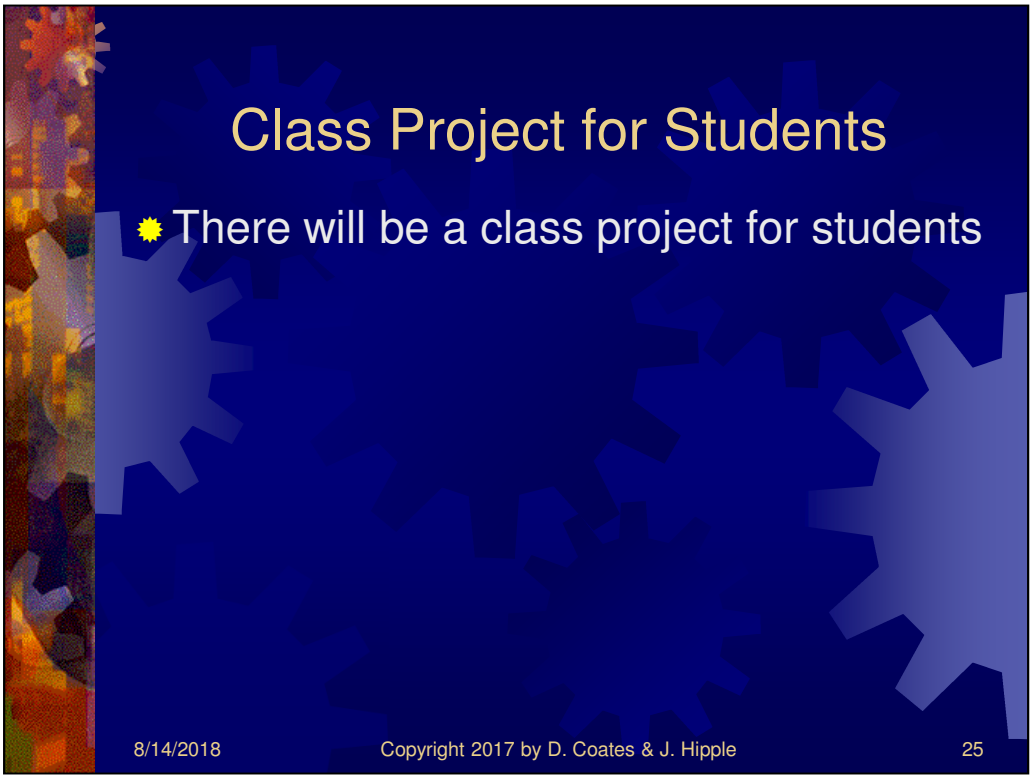
When you are finished with the course you will be expected to give and know:

1. Examples of why history important for innovation (Xerox, Intel, IBM)?
2. What is the difference between invention and innovation?
3. Why is Open Innovation important?
4. What are the elements of innovation fuzzy front end?
5. What is a process using the elements for innovation fuzzy front end?
6. Why are a business model and preliminary business plan as important as invention for innovation?
7. What are key elements of technology transfer?
8. Why is a multiplicity of business models important?
9. What are good innovative environments and how do they help?
10. Where is innovation most important in the development cycle?
11. What is a Good Brainstorming Method?
12. What is TRIZ?
13. Awareness of TRIZ and what it is for further course and study?
14. TRIZ Inventive Principles Method?
15. Name three other innovation techniques and explain?
16. What are the parts of a patent and what do they do?
17. How would you go about a business analysis?
18. How would you do a business model?
19. What is one method for business planning and technological forecasting?
20. Be able to identify the above from the notes

21. Be able to think outside the box of your current innovation paradigms!

This course is a unique opportunity for you to:

- Complements your specific skills and help you to utilize them,
- Take as a new course topic that should be desirable to employees & employers,
- To participate in a fertile area for continued research.



This is the end of the first session and later in the course, after we have covered the necessary material, you will be given a project that will be due at the end of the course. You should now go to the assessment tab in the Blackboard menu for a short quiz. In other sessions you may also have homework assignments that are accessed by the assignment tab. Check the syllabus for the designated quiz or assignment. Thank you