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Identifying and Assessing Entrepreneurial Business Opportunities: Applications to the CleanTech Sector

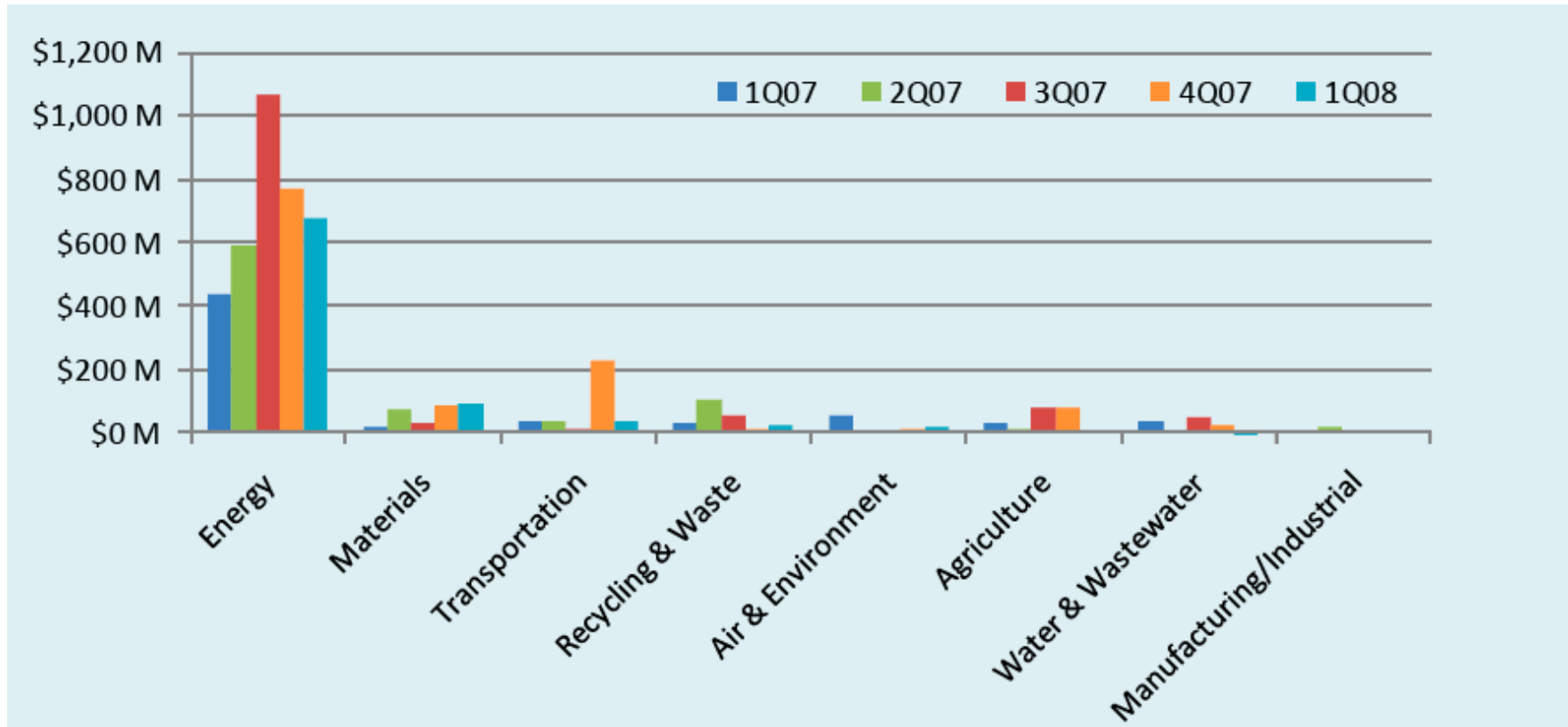
Strategic Opportunity Drivers for CleanTech



1. **Cost of scaling going down - fossil fuel costs going up**
2. **Influx of private capital**
3. **Governments compete to build regional economies and develop high-paying jobs**
4. **Shift of regulatory and financial support to more efficient technologies**
5. **Explosive demand for energy and water infrastructure in China, India, and other developing nations**
6. **Consumer demand for cleaner products and services**
7. **Certainty of climate change drives business innovation**
8. **Higher commodity prices for metals**



CleanTech Venture Investment Trends: Global, US, China

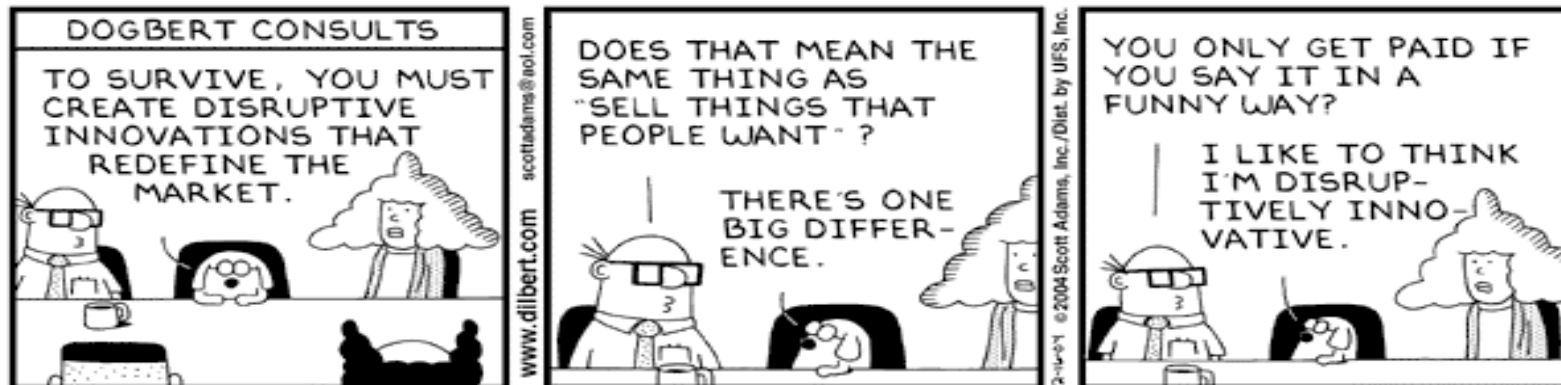


Global Cleantech venture investment reaches record of \$2.6 billion in 3Q08:
 Focus on Smart Grids (\$202 M.), Algae (\$84 M.), and Thin Film Solar (\$620 M.)

Problem Solvers v. Opportunity Identifiers



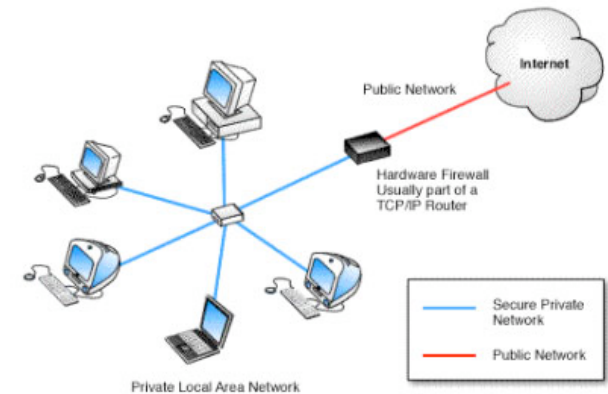
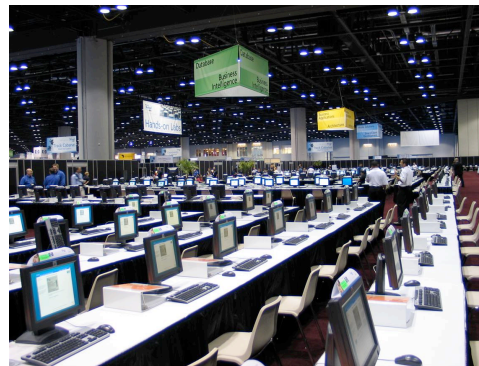
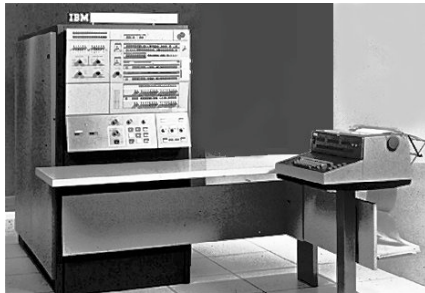
- **“Problem solvers are still worrying about the fruits that have already fallen, opportunity seekers look for the new ones that are ripe for the picking.” John Naisbitt, Mind Set! (© 2006)**



Disruptive Innovation: Learning from the Internet Experience



1. Watch out for 'myopia' (short-sightedness): Computing and communications; voice and video became data,...
2. Choosing 'laws': From centralized to distributed; from conserving to broadening bandwidth
3. Scale: Innovations start at the fringe before coming into the mainstream

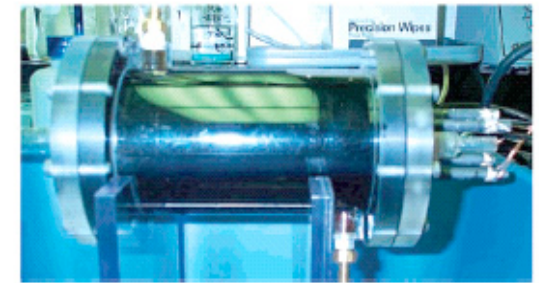
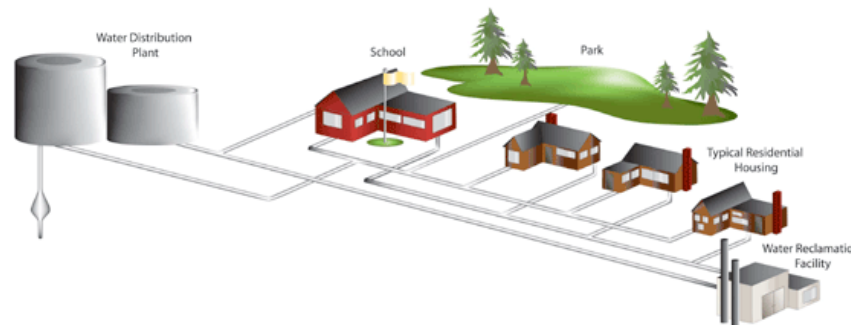


Few large computers --> many little computers ----> More networked computers
From computing innovations to communication innovations

From IT to CleanTech: Where is the Disruptive Innovation?



Centralized power stations --> many distributed power sources ---> Smart power grids
from energy conversion innovations to power management innovations



Centralized water treatment -> distributed water systems --> Energy from water
from water treatment innovation to energy-conserving water infrastructure systems

Research to Ventures: A Challenging Reality



- **Approximately 2% of the disclosures in the research university technology transfer pipeline results in the development of a business**
- **For every successful company, there is a two order of magnitude of failed or unsuccessful ventures**
- **On average \$30M of R&D expenditure results in a successful company**
- **Less than 1% of business plans submitted to investors will be successful in raising capital**

“Failure is often driven by

- 1. the overemphasis on technology,**
- 2. in the absence of understanding market needs,**
- 3. unawareness of strategic principles that help positioning**
- 4. the technology-based product in the context of existing industries,**
- 5. and a fiscally-sound value proposition for investors or partners to enable the venture.”**

The Missing Link: Technology and Value Creation



Engineer/Scientist

“I’ve got a great technology...”

Now I need a business plan to match, and I am off to the races. Everybody can use this!”

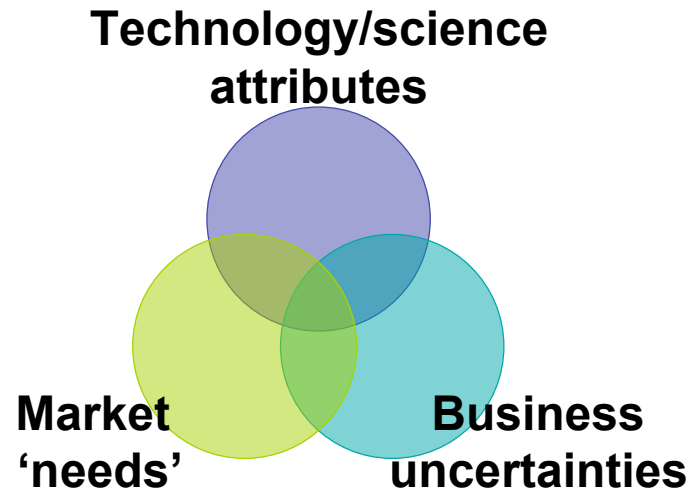
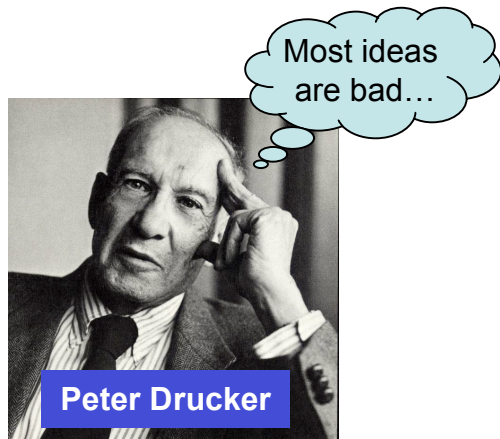


The MBA

“I’ve got a great business plan...”

Now I need a great technology to match and I am ready for venture investment.”

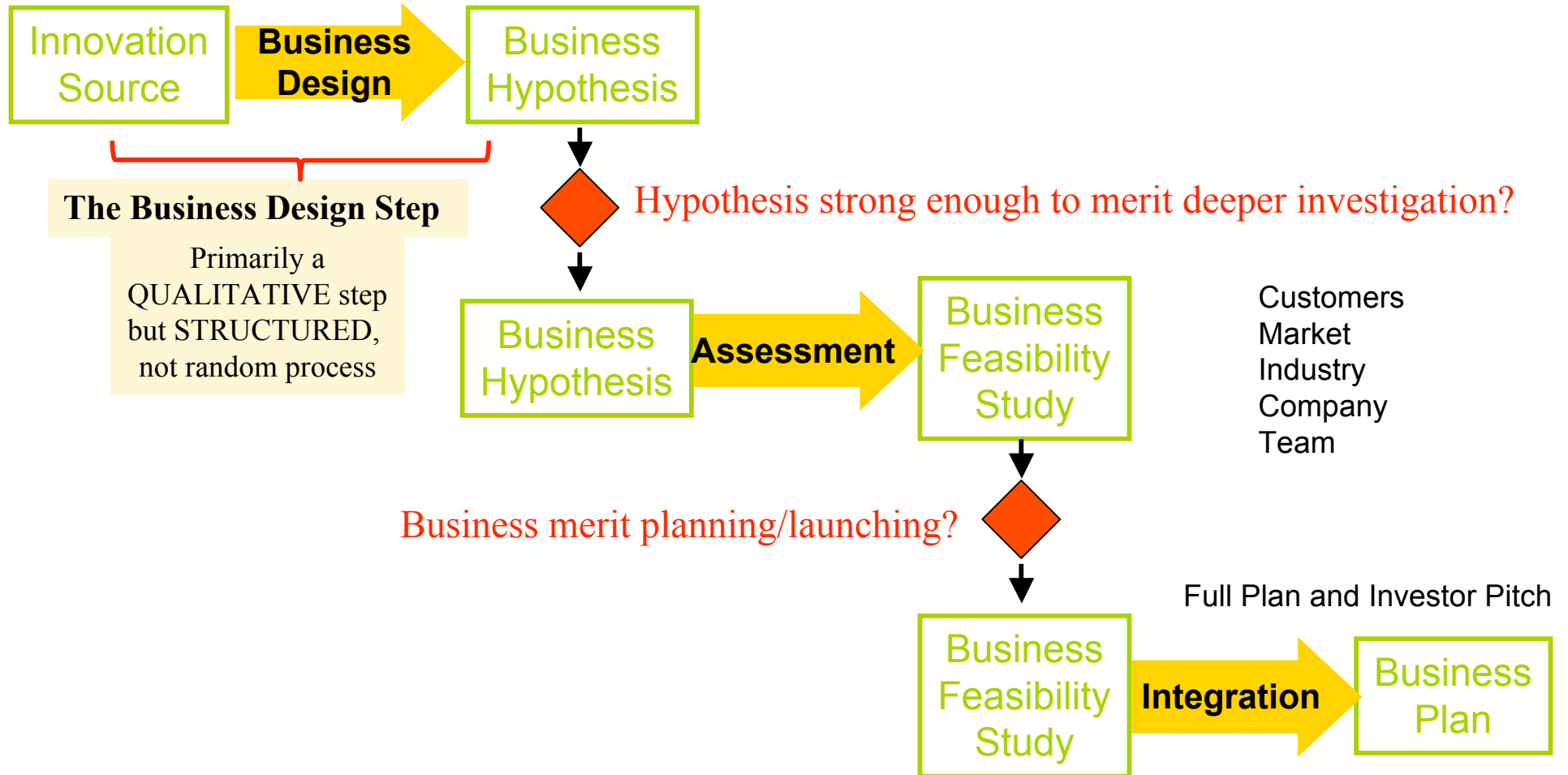
Entrepreneurship: Turning Ideas into Ventures



© Scott Adams, Inc./Dist. by UFS, Inc.

...how does the simultaneous addressing of technological, business and market uncertainties influence research priorities and product development?

Turning Ideas into Ventures: Steps to a Business Plan



Startup Companies & Business Hypothesis



1. **What** is the company's specific product or service?
2. **Who** are their customers?
3. **Why** will the customer use their product?
4. **How** does their business make money?



Green Barcodes



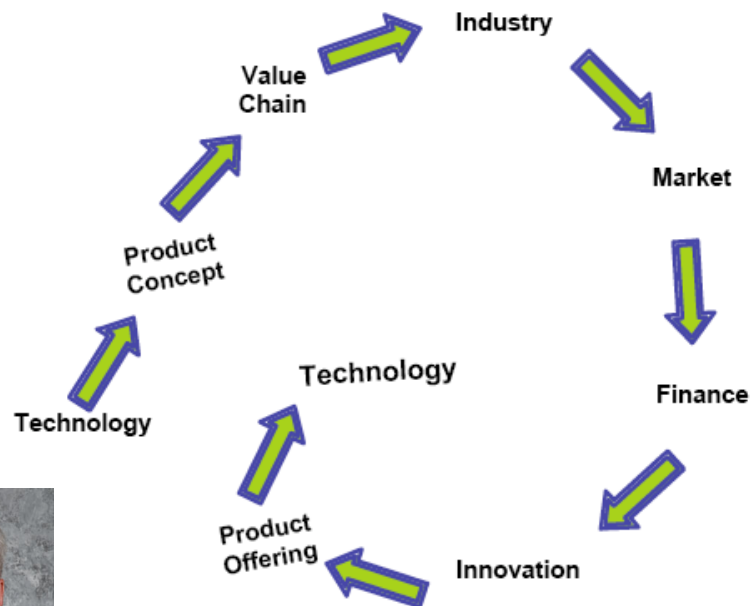
Energy Efficient Recycle®

WPS HOLDINGS, LLC

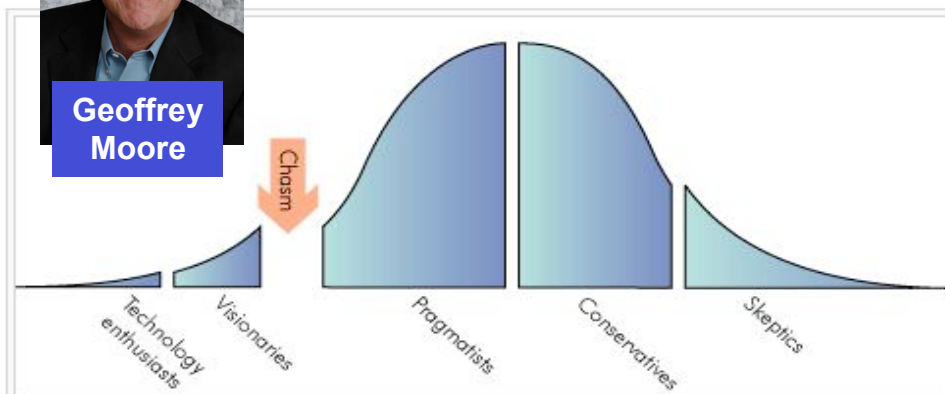
"Fuel for tomorrow"



Test the Business Hypothesis: Systematic but Very Nonlinear



Geoffrey Moore



The Technology Adoption Life Cycle

1. Value Chain: Are you operating in a segment where value can be captured?
2. Industry: What is the competitive differentiator of the technology? How is the product positioned vs. competition? (Teece IP, 1986; Porter's 5 Forces, 1987)
3. Market: What is the unmet target market need? Micro/macro-markets? (Mullins' "Business Road Test", 2003; Segmentation)
4. Finance: Can you build a sustainable business on your product, and provide acceptable returns? (Entrepreneurial finance framework - valuation methods)
5. Innovation: How will you sustain/increase new products and market share? (Moore's "Crossing the Chasm", 2001) (clip)

Recent Technologies Evaluated

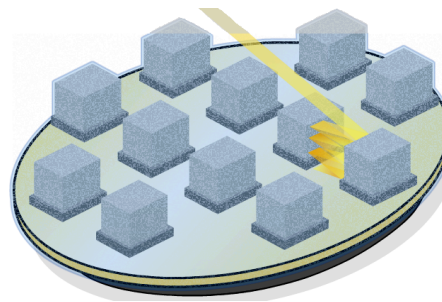


Microbial fuel cell to power sensors in remote areas



Shroud to increase small wind turbine efficiency

3D Solar silicon crystal cell
Adaptive PV materials



After market plug-in hybrid conversion kit; Company entry (EnDep) in U. Colorado and UT Austin
Bus. Plan. competition

Previous Company Analysis and Positioning



Wind, solar (thin film and crystalline), biofuels, battery and water technologies.



Final Message



- 1. Engineers/scientists can deliver the technology - Can the technology deliver the scale and disruption required to change the markets?**
- 2. Part of the endless debate in the formation of new technology-based businesses is whether one should start with the marketing side (so-called “market pull”) or the technology (so-called “technology-push”).**
- 3. If you start with the technology, you need to move to the market side next and vice versa. So-called “technology-push” companies get in trouble when they try to walk technology-technology-technology.**
- 4. Iterate around the curl; every data filter informs the business hypothesis.**

Course Details



- Office hours 1 hr. before class Tue/Thurs or via appointment (Zell-Lurie Institute)
- The CleanTech Revolution (Pernick and Wilder, 2008)
- Readings posted on C-Tools
- Additional cases and relevant papers will be available at Harvard Business OnLine (link to be submitted soon)
- Grading:
 - **In class participation: 30%**
 - **Homework: 10%**
 - **Interim and final report: 30%**
 - **Final presentation: 30%**