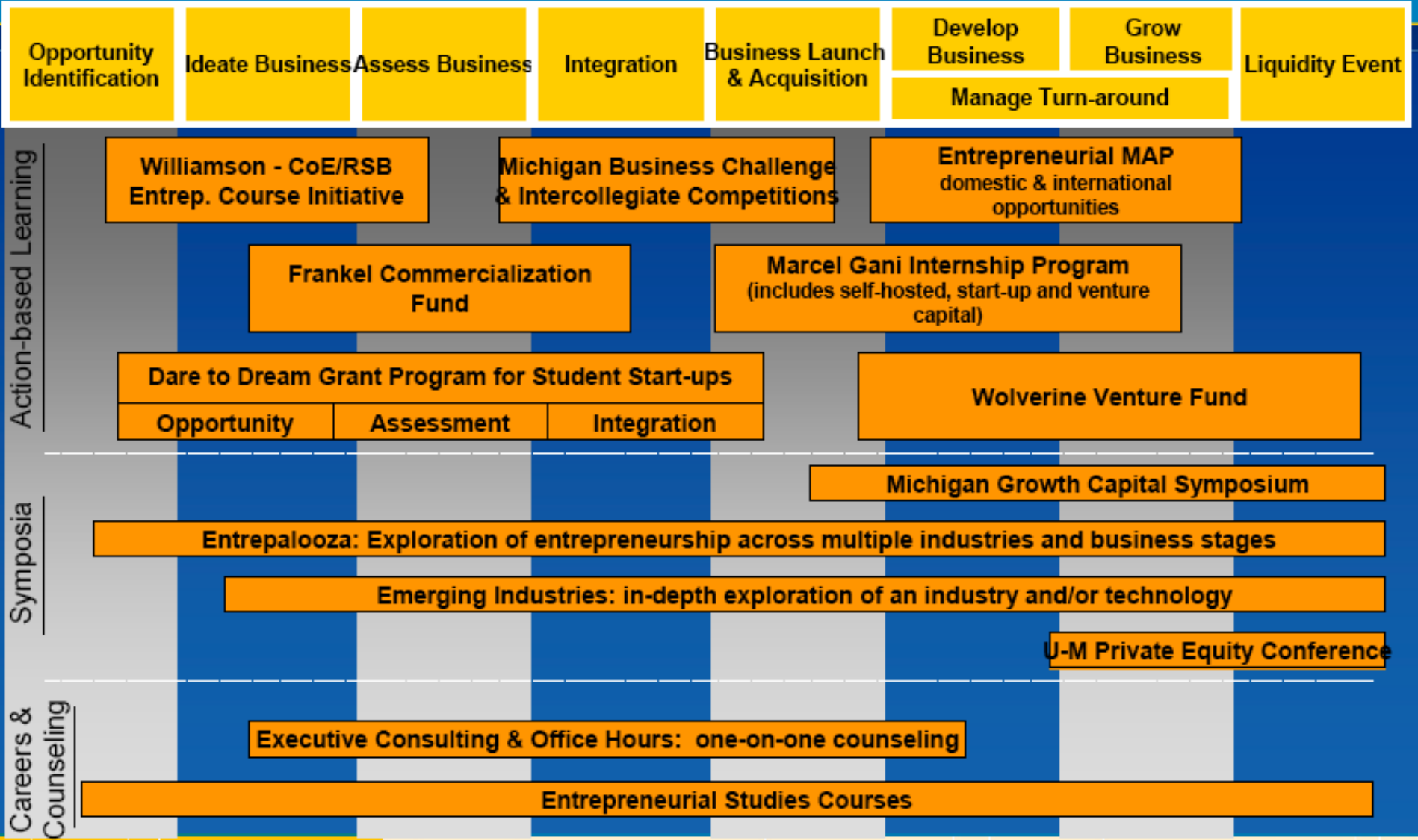




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Environmental CleanTech: *Assessing Value Chains and Venture Opportunities*

U-M ZLI Entrepreneurial & Venture Capital Offerings



Williamson Initiative, Wolverine, Frankel Funds



Programs:

1. Seed (Frankel) and 'A' round (Wolverine) investments
2. CleanTech Entrepreneurship Education (engineers + MBAs)
3. Venture grade assessment of technologies and products (Dare to Dream + funds)
4. Business plan competitions (Eng+ MBA; CleanTech Ventures)
5. CleanTech company turnaround (CleanTech Venture Assessment)



Strategic Opportunity Drivers:



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**



CleanTech's Competitive Advantage



1. Corporate (Esty & Winston, *Green to Gold*, 2006)

“...layering environmental factors into corporate strategies... As they look up and down the value chain, they keep environmental impacts/opportunities firmly in mind...”

“...new laws encourage value chain thinking by imposing a real cost on companies that do not design products with the end of life in mind.”

2. Entrepreneurial (Pernick & Wilder, *The CleanTech Revolution*, 2007):

“...the infrastructure challenges of energy, materials, and water mean that the cleantech revolution will be a lengthy one compared with the almost instant revolution of personal computers, the internet and WiFi”

“...investment opportunities track needs in existing corporate value chains or emerging transformational technologies and industries to address environmental challenges.”

Research to Ventures



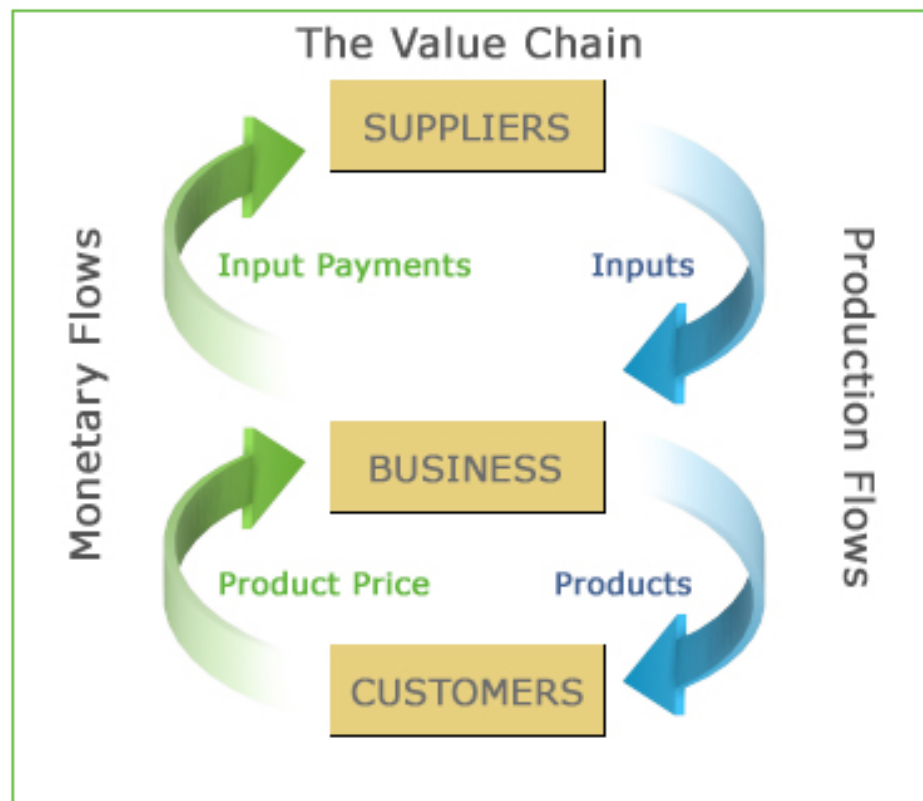
1. **Approximately 2% of the disclosures in the research university technology transfer pipeline results in the development of a business**
2. **For every successful company, there is a two order of magnitude of failed or unsuccessful ventures**
3. **on average \$30M of R&D expenditure results in a successful company**

“Failure is often driven by the overemphasis on technology, in the absence of understanding market needs, unawareness of strategic principles that help positioning the technology-based product in the context of existing industries in this innovation space, and a fiscally-sound value proposition for investors or partners to enable the venture.”

CleanTech and the Value Chain



- An organization's set of linked, value-creating activities, ranging from securing basic raw materials and energy to the ultimate delivery of products and services.



1. Value chain indicates which segment in the supply chain is capable of extracting value (\$ vs. product)
2. Operating margins are potential proxy indicator.
3. Use value chain analysis, supplemented by strategic and financial assessment frameworks to help position startups and restrategize companies.
4. Current application to bioenergy, wind, PV, batteries, water, and green building companies

Business Assessment Framework



Market Domain

Industry Domain

Large/growing?
Move from
Initial market segment to another

Macro-level

Feature, Product, Business
(Faley, 2007)

Market segment

Micro-level

Porter's
5 Forces

Market
Attractiveness

Industry
Attractiveness

Missions,
aspirations,
Propensity
for risk

Ability to
execute
CSFs

TEAM
DOMAIN

Connectedness up,
down, and across value
chain

Value-capture
position
(IA vs CA)
(Teece, 1986)

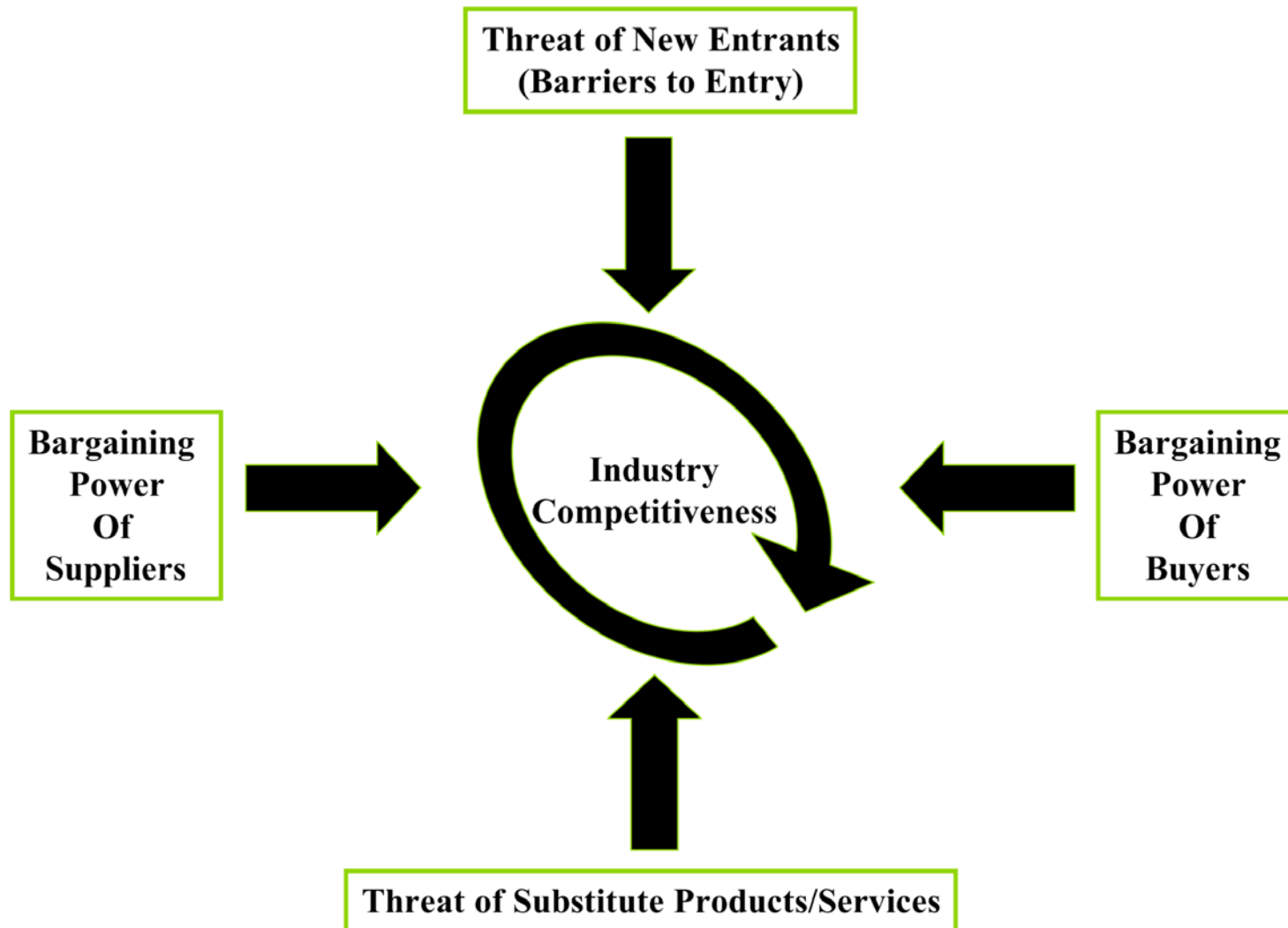
Target segments
benefits and
attractiveness

Sustainable
advantage

Product
Differentiation
(Intellectual
Assets)

REF: [The New Business Road Test](#), John Mullins © 2003.

Porter's 5 Forces: Industry Analysis



Determining the optimal value-capture vehicle for your Intellectual Asset



If control the IA and the CAs, then you have the potential to create an extremely well-positioned business.

Intellectual Asset Position is:

Strong

Weak

**Complementary Assets are:
Specialized Generic**

License to or Partner with CA holder	Strong New Business Potential
IAs have no capturable value	Niche Business Potential Or Development Co.

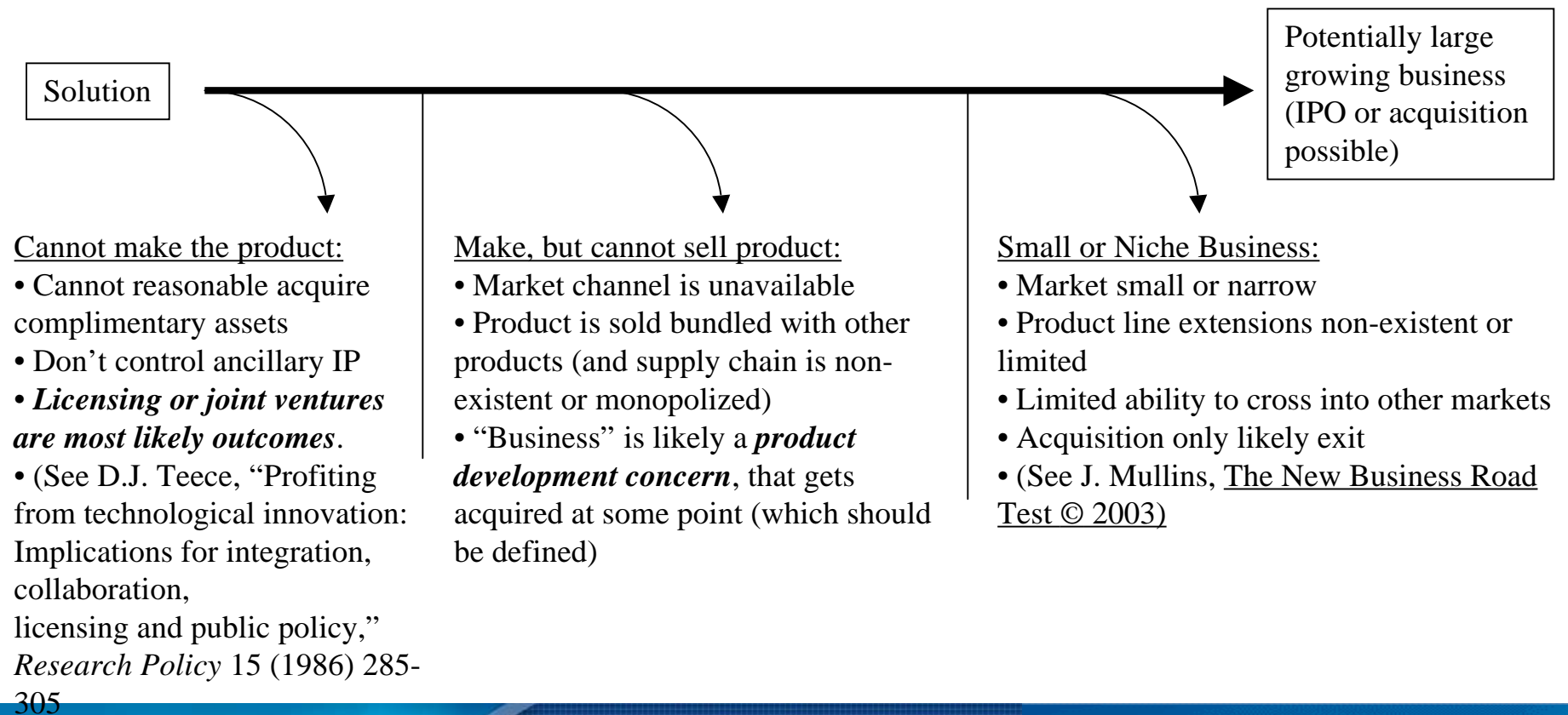
Note: This assessment assumes that you are the IA holder, but do not currently have the complimentary assets necessary to fully commercialize your IA.

Ref: David Teece, 1986

Commercialization Path: Business Environmental Influences



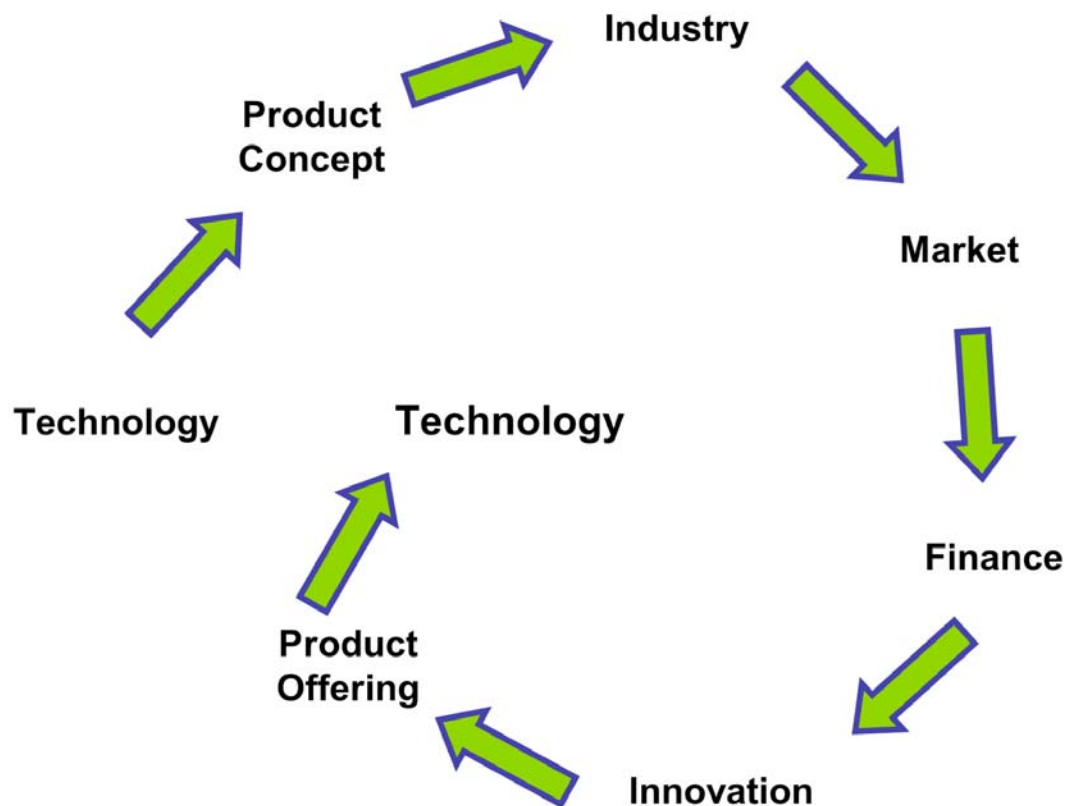
• Is it a Feature, Product, or Business?



Process



- **Strategic (IP, market/industry, Porter's), financial, and market screening**



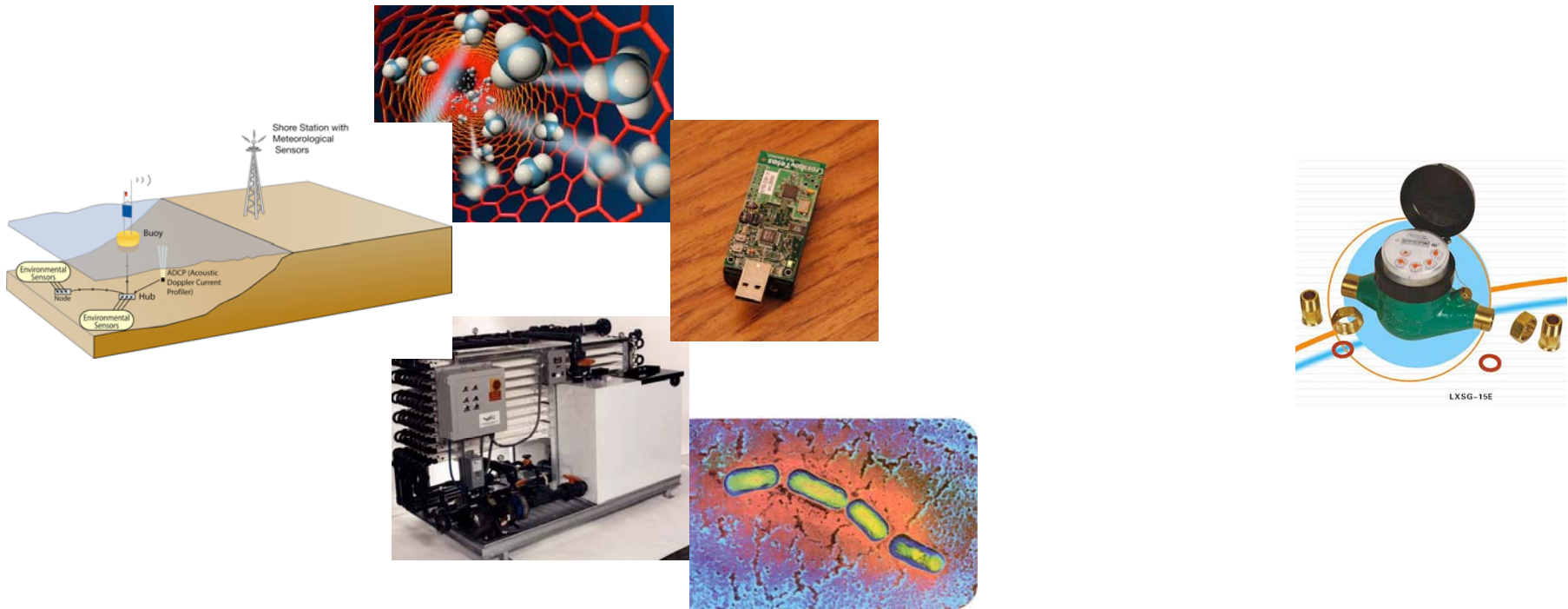
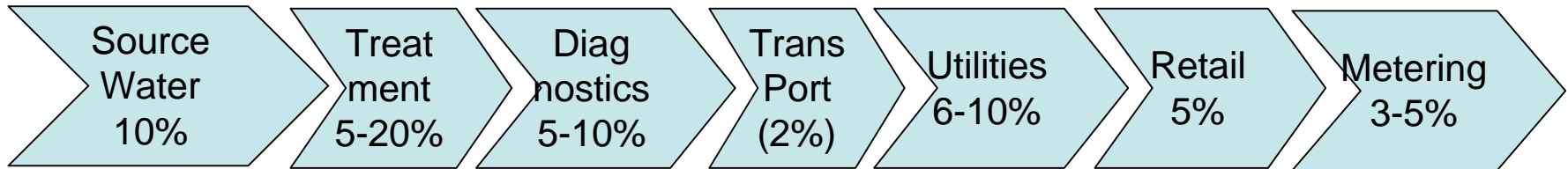
Industry: What is the competitive differentiator of the new technology or concept, and how are you positioned?

Market: What is the unmet target market need? Macro-markets?

Finance: Can you build a sustainable business on your product, and provide acceptable ROI?

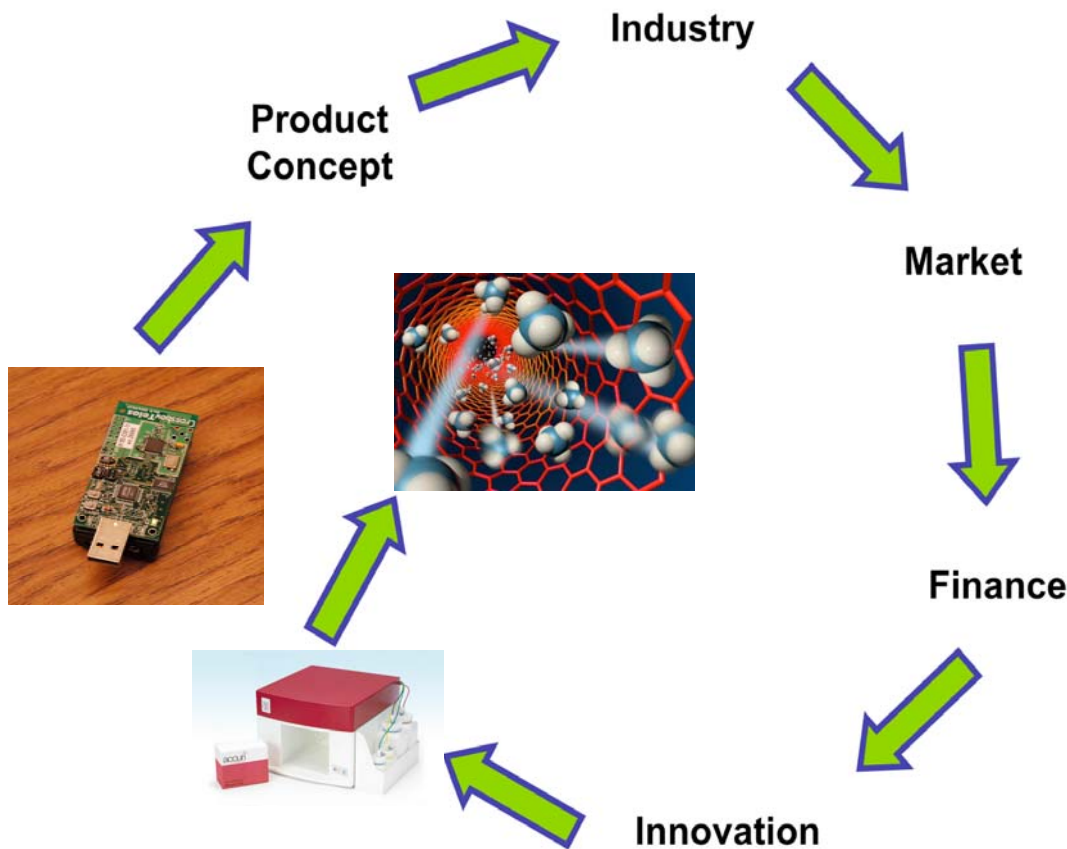
Innovation: What is your strategy to sustain new products?

Example 1: Water Value Chain



Percent based on operating margins or proxy industries in the segment

Impact of Value Assessment on Technology Focus



Product Concept: Miniaturized microbial sensor (using microfluidic and integrated opto-electronic technology)

Industry: Industry standards exist; strong incumbents; off-line analysis; price-elastic.

Market: Contract and research labs, (future: point of use?),

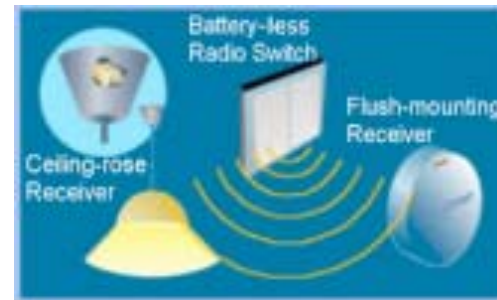
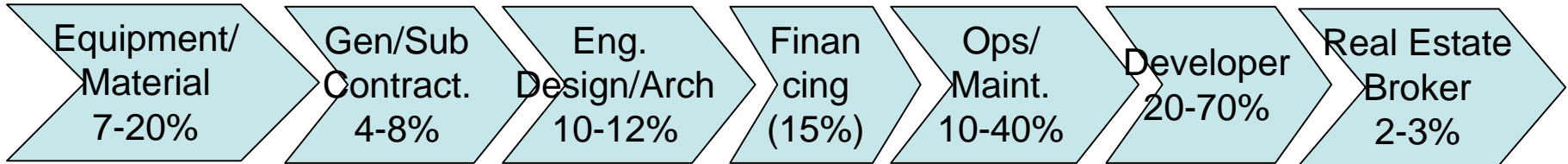
Finance: High cost for manufacturing, validation, maintenance, etc... Low volume sales.

Innovation/Need: Expand analytes, ease-of-use, and front-end sample preparation valued (time consuming)

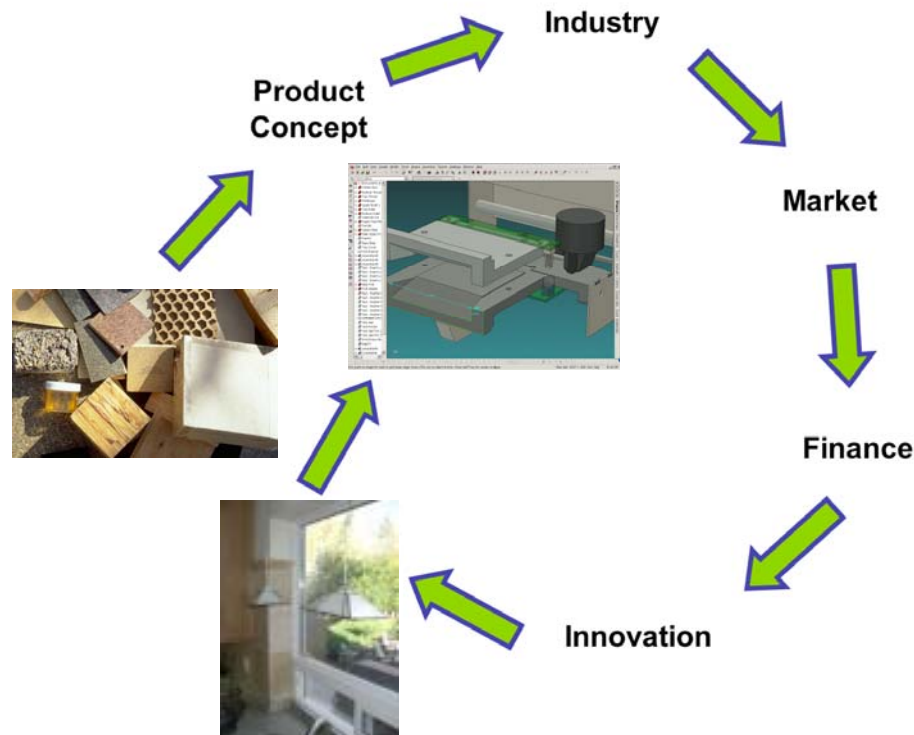
Result: Move sensor technology from 'detection' to 'sample preparation' focus.

The issue was not whether the technology is good or not, but whether the product that embeds this technology (miniaturized sensor vs. robust sample prep.) is properly targeted.

Example 2: Green Buildings



Impact of Value Assessment on Technology Focus



Product Concept: Plant-based construction materials

Industry: High established standards; strong incumbents-alternative materials. Price sensitive.

Market: LEED still poorly defined; driven by architects and environmentally-sensitive homeowners/developers

Finance: Low value; high volume-low cost; ROI impact

Innovation: focus on applications not encumbered by industry standards, and by providing the architect creative design opportunities for which customers are willing to pay more (i.e. not price sensitive)

Result: Move from 'construction' materials to 'creative design components'.

The issue is often not whether the technology is good or not, but whether the product that embeds this technology (construction materials vs. creative design components) is properly targeted.

Final Message



- Part of the endless debate in the formation of new technology-based businesses (including CleanTech) is whether one should start with the marketing side (so-called “market pull”) or the technology (so-called “technology-push”).
- It is like walking; it simply does not matter which foot you begin with—right or left—the important thing is which foot you move next (the opposite one). It is when you move the same one over and over without moving the other (left-left-left or right-right-right versus left-right, left-right....) that you get in trouble.
- Similarly 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.

Even if the opportunity is well-defined and strategy is well executed, you may still end up in the wrong place.

