15.351 Managing Innovation and Entrepreneurship
Spring 2008

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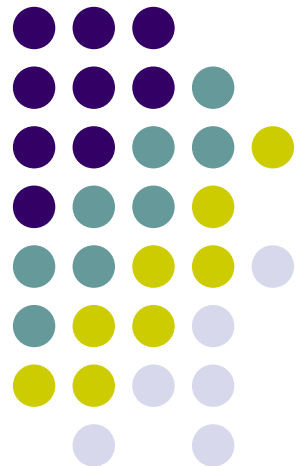
Class Five



No opportunity started out “fully formed”

Edison had a lot of ideas & identified lots of opportunities but ….

- They weren’t products until they were shaped by experimentation
- Experiments generate information & allow you to update & improve

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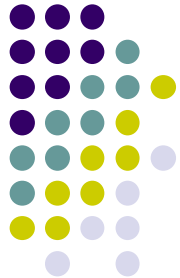
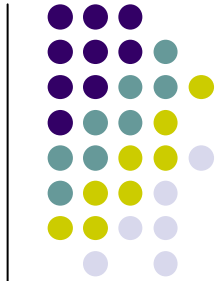
Experiments provide the discipline to transform invention into innovation



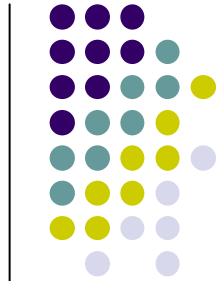
"*Imagination should give wings to our thoughts but we always need decisive experimental proof, and when the moment comes to draw conclusions and to interpret the gathered observations, imagination must be checked and documented by the factual results of the experiment*.“

(Louis Pasteur)

Key requirements for effective experimentation

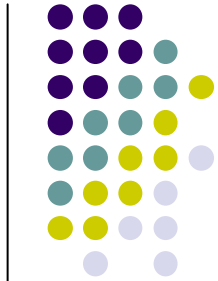


- Organization designed to experiment & to learn (early) from successful & failed experiments
- Plan to focus on experiments that resolve key uncertainties



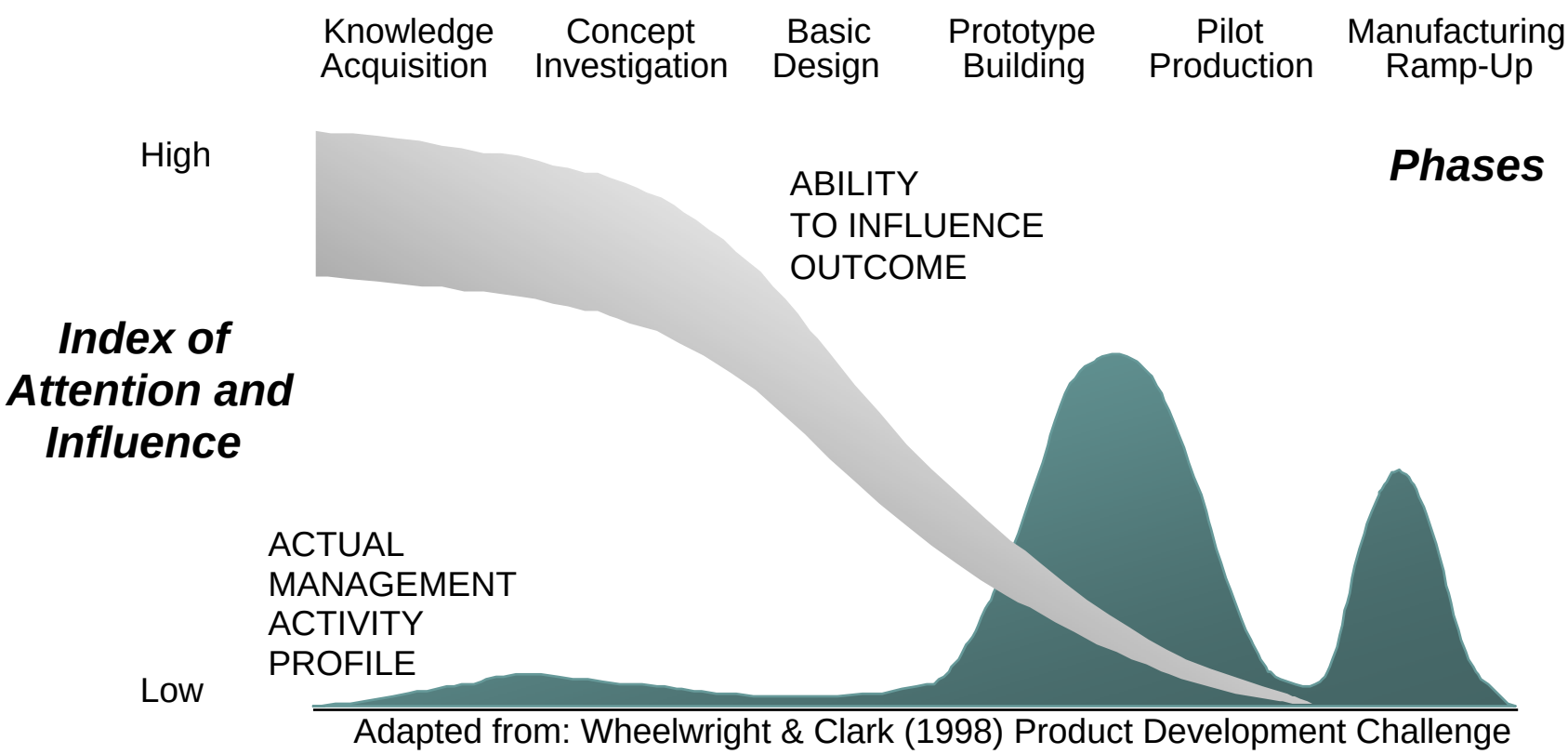
What transforms invention into innovation? Organization for Effective Experimentation

Processes that allow time for experimentation



- TIME: IDEOs development sequencing had time “built-in” for experimentation
- REWARDS: Is an experimental approach rewarded? That means tolerating failure…
- MONEY: Experiments can be costly (more on the experimental economy with Team New Zealand)

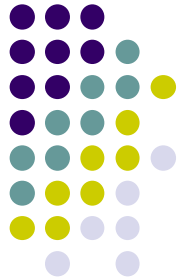
Learn Early - Early information is more valuable than information later on in the project…



Adapted from: Wheelwright & Clark (1998) Product Development Challenge

Key challenge of innovation projects is to generate most valuable information early on in the project - before its too late

Design to learn (early) from success & failure

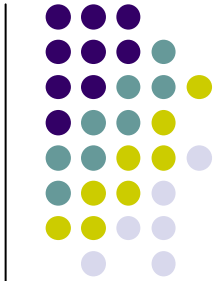


- Need to allow for failure -difficult to structure incentives appropriately e.g. Bank of America vs. IDEO
- Failure is NOT the same as mistakes
- More cost effective to fail early w/ a lot of diverse options

KNOWLEDGE CAPTURE: “standing on shoulders of giants” e.g. Tech Box, refrigerator, JAX

- Need to listen to failure – find a forum for learning – a lot of resistance e.g. pharmaceutical industry
- Need to listen to success & incorporate into plan

But this means we need an experimental strategy…can't do all experiments



It's very hard to kill projects/experiments without a strategy

- It's a "good" project!
- I need to build that prototype.
- "My Board [investor] wants me to do it…"
- "My founding scientist insists that these experiments are crucial"
- Making difficult decisions takes time & energy

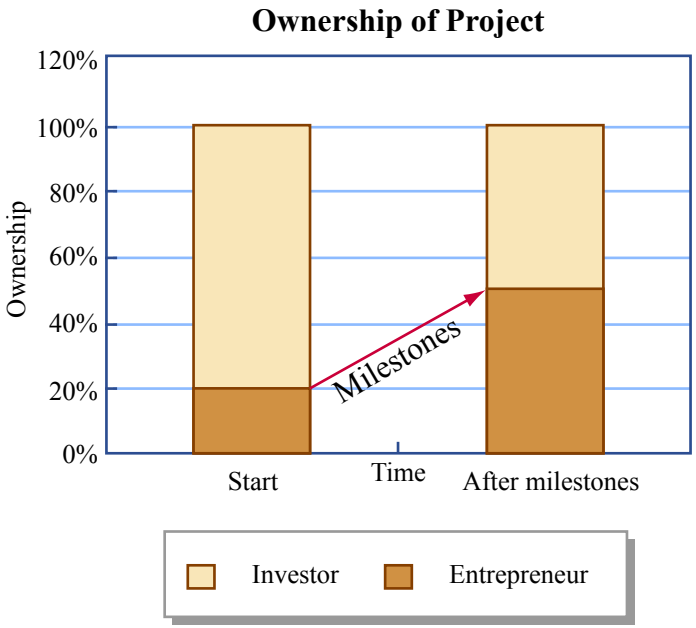
From opportunity to innovation

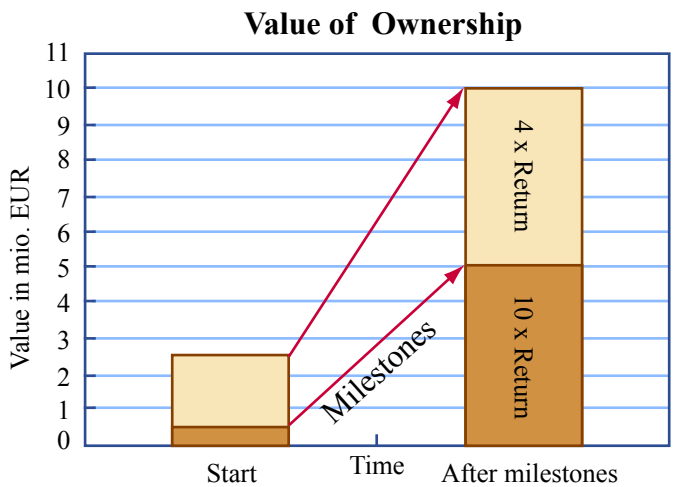
- Plan that takes your invested capital and uses it effectively to create value by decreasing uncertainty & risk:

Pre-Money Valuation + Invested Capital = Post-Money Valuation

How can you use your invested capital most effectively?

Experiments that meet milestones that create value





- Milestones that used your $$$ to create value…
- Link to four areas of uncertainty:
  - Technology
  - Markets/Users
  - Organization
  - Resources

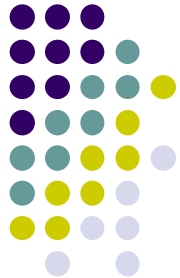
Typical way that teams proceed!

- Define the market
- Define the costs, pricing etc.
- Build a financial model

BUT

- Does not capture uncertainty
- Does not guide resource allocation of your first US$250,000
- Financials are always over optimistic & can say whatever you want!

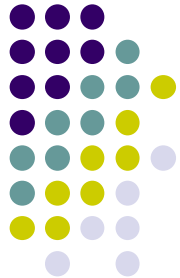
Alternative Approach
Creating value around innovations



- Define core uncertainties
- Create a set of strategic assumptions based on these uncertainties (hypotheses) – if true they provide the valuation you are proposing
- Design *experiments* & milestones that will test these assumptions & resolve key uncertainties most precisely…

Do the experiment that will “close” the project first (if the answer is  better to know early)

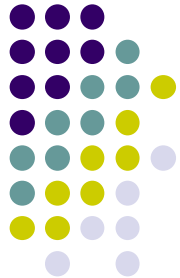
EXAMPLE: Advanced Inhalation Research



- MIT spin-out
- Idea for drug delivery from one of the most effective “idea generating engines” in the university – Langer Lab
- Still needs to transformed into an innovation

BEST PRACTICE – in mapping out experimental plan for milestones & uncertainty reduction…

Map different market choices to the risk profile & uncertainties of the firm



Drug Approved

On Patent

Off Patent

Drug Not Approved

Lower regulatory risk

Limits financial risk thru partnership

Allow for a focus on delivery system

Lower regulatory risk

Can limit financial risk thru partnership

Higher market risk - highly competitive market?

Opportunity to build market assets

In-house dev't requires risky additional technical resources

High regulatory risk

More potential to share upside

High potential rewards

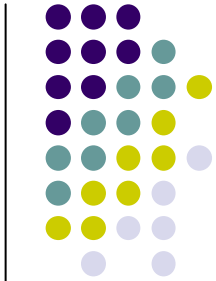
Long time horizon

Not Really Applicable !!

Advanced Inhalation Research Critical Risks & Key Experiments

RISKS	KEY Uncertainties	KEY EXPERIMENTS FOR RESOLUTION
Technical	Will the aerosols deliver drugs in humans?	Choose simple molecules to demonstrate delivery – not the ones that will be marketed - Science paper as Proof of Concept
	What range of molecules can be delivered?	Look at range of applicability – from hydrophobic to hydrophilic
	Can we design a delivery device?	Need an early prototype
	Can we scale up production?	Need to look at key manufacturability issues – found large-scale facility to test
Market	Size & Scope? Will people adopt?	Depends on choice of molecules & available alternatives
	What are the key determinants of adoption?	Depends on the economics – linked to absorption – if a lot is wasted it changes the economics
	Depends on type of market – chronic vs. acute	

Advanced Inhalation Research Critical Risks & Key Experiments



RISKS	KEY Uncertainties	KEY EXPERIMENTS FOR RESOLUTION
Organizational	Do we have a good team?	Langer + Edwards - Well known to McGuire
	Who do we need to add? Think about milestones.	Need manufacturing & “device” expertise – less than a focus on biology expertise
		Probably don’t need a sales force but DO need market insight – physician expert panel? (MAB)
Resources	Do we have the resources to prevent competition?	Need to protect delivery solution with intellectual property – less critical for the actual drug – use delivery IP as a way to extend the life of a partner’s drug.

Class 6
Monday 25th

More on experimentation – experimental methods

Team New Zealand Case

- The case revolves around the design and development of Team New Zealand's racing yacht for the America's Cup Challenge. The case explores different experimentation modes and methods.

Questions:

- How would you evaluate Team New Zealand's use of simulation technology in its development process? What are its advantages & disadvantages? How did their approach differ from that used by other syndicates?
- Decision point: Which of the three yacht construction strategies should Team New Zealand follow? (a) One boat now, one boat later? (b) Two identical boats now? (c) Or two different boats now? Why? How much improvement would you expect from each strategy?