Appropriability and Profiting from innovation

Terms

- *Appropriability*: Environmental factors that govern an innovator's ability to capture profits generated by an innovation
- *Codified Vs. Tacit knowledge:* The ability to formally communicate knowledge
- *paradigmatic stage:* when the dominant design has not be formalized (technologies and arch. are fluid)
- *Dominant Design:* The standard form, technology, and architecture
- *Complementary Assets:* Non technology assets that are needed to make a product successful

What makes enables a company to keep the profits from an innovation

- Myth of the first to market
- Legal protection
- Codified/tacit knowledge
- pre/post dominant design
- Complimentary assets

Myth of first to market

- First to market that failed
  - EMI - CatScan (GE won)
  - Xerox then Apple's user interface (Microsoft/PC won)
  - First Jet engines (DeHavaland) (Boeing/GE)
- First to market that succeeded
  - Nutrasweet
  - Teflon
  - Palm pilot

Success of innovator vs. follower

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- Innovator
  - First shot at legal protection
  - Tie up complimentary assets
  - Learning curve faster (profit on early adopters)
- Follower-imitator
  - Advantage of learning from customers
  - Seeing mistakes - learning about design
  - Understanding complimentary assets

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Legal protection

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- Patents
  - Patents don't give you the protection you expect
  - Design around
  - Legal challenges
- Trade secrets
  - Can't be "reverse engineered"
  - Have to be protected

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Type of knowledge

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- Codified - easy to transmit. Algorithms, recipes, formula dimensioned drawings
- Tacit - difficult to transmit. Expertise, design processes learning methods, Intel's rapid ramp process

	Patent		Trade secret		No enforcement	
	Product	Process	Product	Process	Product	Process
Codified	covers the exact form but not deviaitions (possible design around).	subject to theft and reverse engineering. Not easily enforced	easily copied	more easily controlled	no protection	
Tacit	Difficult to patent (i.e., design patents)	Difficult to patent. Risk of explaining it too well	Hard to enforce trade secret	easy enforceabi lity	minimial protection	good protection

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Dominant Design

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- First to design may not come up with the dominant design
  - Early computer developers
  - Automotive
  - Electronic calendars
- If the design requires significant assets, by the time the dominant design appears, the first to market may have already spent their assets
- Follower has the possibility of learning

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Complimentary assets

- Everything else required to bring a product to market
- Marketing, manufacturing, support,distribution channels, suppliers, learning, name,
- In pre-dominant design, complimentary assets are not as critical (i.e., EMI)
- In dominant design, costs, support, quality, and reliability (product, process, and delivery) dominate competitiveness.

Complimentary Assets

- Generic assets
  - LCD projectors
  - Benefit of low cost, low risk, typically contract based
  - Problem of appropriability
- Specialized assets
  - Unilateral dependence between innovation and asset
  - Equipment purchased for a single client
- Co-specialized assets
  - Bi-lateral dependence
  - Cannon/Kodak digital camera

Assets and dominant design

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	pre-dominant design	dominant design
Weak appropriability	Need to let design float, ensure that you generate the dominant design, low cost prototyping, good connection to market	Need to make strong connections to complimentary assets (tie up capability)
Tight appropriability	Take the time to find the correct complimentary assets	

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Beta Golf - Types of profitability

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- License
- OEM Supplier
- Acquisition
- Start-up
- Joint-Venture

- Level of control over revenues
- % of profits
- Complimentary assets
  - Manufacturing
  - Name
  - Distribution channel
  - Knowledge of the business
  - Marketing
- Possibility
- Financial commitment

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Information value theory

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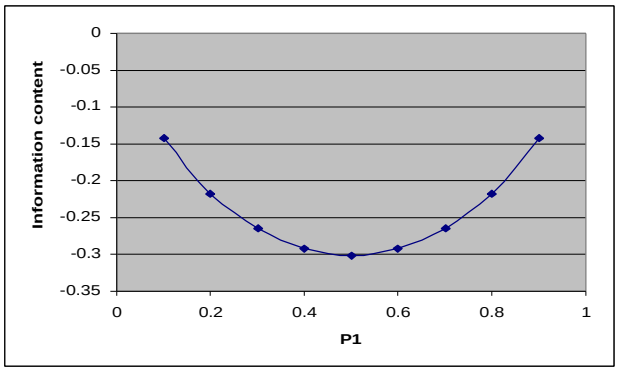
- Information has a value associated with it
- Information content = $\sum_i p_i \log(p_i)$
- Content is maximized with pi=1/n



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Value of information

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- Information has value
- Information reduces uncertainty about the expected loss.
- E(C)=C1*p1+C2*p2+…C3*p3
- Example:

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Utility of outcomes

- It is not enough to just calculate E(C) because loosing $100 may be more painful than not winning $100 (i.e., the utility of the lost $100 is higher than the utility of $100).
- The total utility is
- E(U(T))=U1*C1*P1+U2*C2*P2
- Risk tolerance sets the values of Ui (i.e., how much downside are you willing to put up with)

Innovation and information

- Innovation produces information (i.e., reduces uncertainties about outcomes)
- You can't sell information on the open market without legal protection because information can be copied at no cost
- You can increase appropriability through legal protections but it is not perfect in information because some always leaks out

Outcome tree

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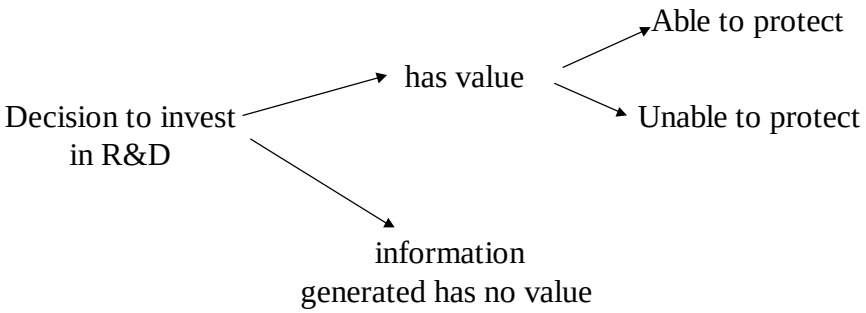

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Problem with Basic research

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- Difficult to appropriate
- I.e., how do you license basic research
- How does society invest in basic research?
  - Universities
  - Government grants
  - Consortia of companies that all benefit

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Methods for diversifying R&D risk

- Large R&D centers (diversify risk)
  - Each project is small investment
- Purchase R&D from other companies
  - Pay a higher price because reduced uncertainty
- Pay a lower cost (i.e., universities) for the right to have access and education