Week 1 – day 1

S-Curves and personal transportation

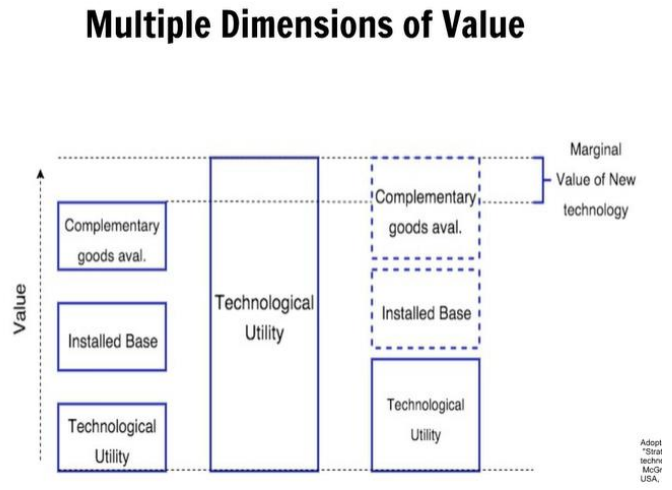
For thousands of years horse driven transportation. Only ~1900 the first cars started being made. Both total cars sold/world population and performance in HP show a exponential or S-curved pattern. The S-curve shows in all graphs of technology diffusion where performance VS effort/money invested. Slow first as it is unfamiliar, in the end it reaches limits and stops.

Technologies do not always reach their limits and may be displaced by new discontinuous technologies. New technologies can fulfill an existing market need in a better way, thus improving upon current S-curves, making the previous ones 'unfinished'. Those factors make incumbent firms eager to switch.

Multiple Dimensions

Customers compare the value of 2 or more competing technologies based on the

- **Technology's Stand-alone value** based on e.g.
    - Functions in can perform
    - Aesthetic quality
    - Ease of use
- **Network externality value** function of
    - The size of the installed base
    - The availability of complementary goods



Week 1 – Book chapter 3 – Types and Patterns of Innovation

The path a technology follows through time is termed its **technology trajectory**. This trajectory is usually used to represent a technology's rate of performance improvement/rate of adoption in the marketplace.

The 4 types of **dimensions** used to categorize innovations the most are:

- **Product VS Process innovation:** Product innovations are embodied in the outputs of an organization. Process innovations are in the way an organization conducts its business, often orientated towards effectiveness/efficiency. They usually happen together.
- **Radical VS Instrumental innovation:** radicalness can be defined in terms of
    - Newness/differentness
    - Risk
    - Relativeness: what is radical may change over time/with different observers
- **Competence enhancing VS Competence destroying innovation:** an innovation is competence enhancing when it builds on the existing knowledge base/competencies of the firm, making them more valuable. An innovation is competence destroying when it does not build on the firm's existing competencies or renders them obsolete, example calculators.
- **Architectural VS component/modular innovation:** an innovation is considered a component/modular innovation if it entails changes to one or more components, but does not significantly affect the overall configuration of the system, e.g. innovation in bike seat doesn't require any changes in the rest of the bike architecture. In contrast architectural innovation entails changing the overall design of the system or the way components interact with each other, without changing the components itself. For a firm to initiate component innovation knowledge about that component only is enough. For architectural innovation knowledge about the entire system is needed.

S-shaped curves in technology performance and technology diffusion are **related**, but they are fundamentally **different** processes.

S-curves in technological improvement are performance VS amount of effort/money. In early stages performance improvement is slow due to the fundamentals of technology being poorly understood. Furthermore until the technology has established a degree of legitimacy, it may be difficult to attract researchers. Eventually diminishing returns set in as cost of marginal improvement increases and the technology reaches its limits.

If performance is plotted against time and the effort invested is not constant over time, the S-curve might appear different.

Technologies do not always reach their limits, they may be rendered obsolete by new **discontinuous technologies**: they fulfill a similar market need but by building on an entirely new knowledge base.

If the disruptive technology has a steeper S-curve or an S-curve that increases to a higher performance limit, returns to effort invested are higher for the new than for the incumbent technology.

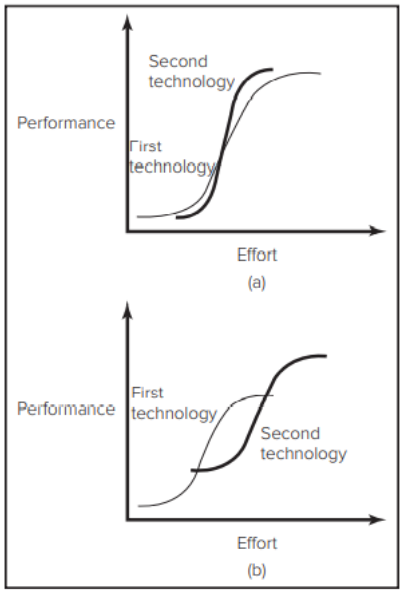


FIGURE 3.4
Technology S-Curves—Introduction of Discontinuous Technology

technology diffusion
The spread of a technology through a population.

S-curves in technology diffusion are obtained by plotting the cumulative number of adopters of the technology against time. This is S-shaped because more people adopt as it as better understood and eventually the market is saturated.

Technology diffusion generally takes far more time than information diffusion. This might be due to the complexity of knowledge and it being tacit, thus requiring person to person contact. Also many technologies only become available to users if there is a set of complementary resources too.

S-curves in diffusion are in part a **function of** s-curves in technology improvement: as technologies are better developed, they become more certain and useful to users and cheaper.

S-curves can also be used as a **prescriptive tool** to predict when a technology will reach its limits and if a firm should move to a new technology. There are however some limitations:

- It is rare that the **true limits** of a technology are known in advance
- The shape of a technology's S-curve is **undefined**
- Firms can **influence** the shape of a S-curve through development

Whether switching to a new technology will benefit a firm depends on:

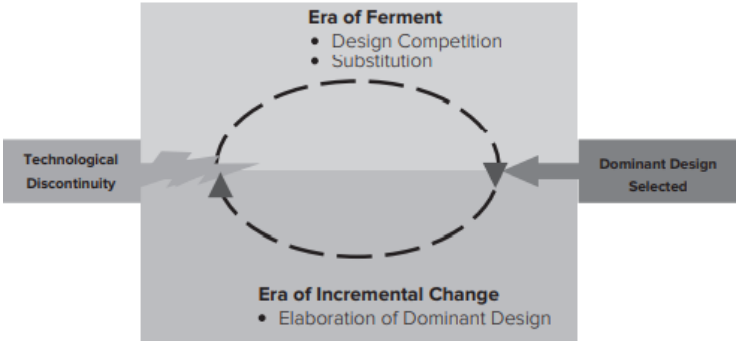
- The **advantages** offered by the new technology
- The new technology's fit with the **firm's current abilities**
- The new technology's fit with the **firm's position in complementary resources**
- The expected **rate of diffusion** of the new technology

The s-curve model suggests that **technological change is cyclical**. The emergence of a new technological discontinuity can overturn the existing competitive structure of an industry creating new winners and losers: what Schumpeter calls **creative destruction**. He argued this is the key driver of progress in a capitalist society.

One technology evolution model proposed by **Utterback and Abernathy** stated technology passes through several distinct phases:

1. **Fluid phase**: considerable uncertainty about both the technology and market. Firms but eventually a **dominant design** emerges.
2. **Specific phase**: the dominant design enables firms to focus their efforts on process innovations to increase efficiency.

Anderson and Tushman found that each technological discontinuity inaugurated a period of turbulence and uncertainty: the **era of ferment**. During this era different stakeholders might have different concepts of what purpose the technology should serve/what the business model is like. While **substitution** happens there is considerable design competition: a **dominant design** always arises unless the next discontinuity arrives too soon and disrupts the cycle. Anderson also found the dominant design is **never in the same form** as the original discontinuity and **never on the leading edge of the technology**. The dominant design is a combination of features.

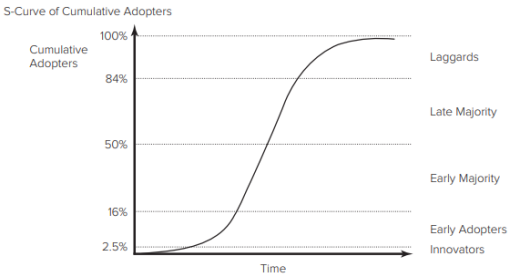


The rise of the dominant design signals the transition from the era of ferment to the **era of incremental change** where firms focus on

efficiency and market penetration and try to lower production costs. This continuous until the next cycle starts.

Most competition revolves around improving components rather than altering architecture. As everything starts to revolve around the dominant design, a firm becomes less able to react to a new architecture.

Rogers proposed 5 adopter strategies of the diffusion S-curve:



1. **Innovators**: typically have access to substantial financial resources. They bring new ideas into the social system. Approximately the **first 2,5%**
2. **Early adopters**: greatest potential for opinion leadership. Respected by their peers. Other adopters look to them for advice. Approximately next **13,5%**
3. **Early majority**: not opinion leaders but frequent interaction with peers. Next **34%**
4. **Late majority**: approach innovation skepticly, only adopt with peer pressure. Have scarce resources. Next **34%**
5. **Laggards**: base their decision mostly on past experience instead of social network. Highly skeptical. **Last 16%**

Chapter 4 – Standards Battles, Modularity and Platform Competition

Dominant design. A single product or process architecture that dominates a product category - usually 50 percent or more of the market. A dominant design is a de facto standard meaning that while it may not be officially enforced/acknowledged, it has become a standard for the industry.

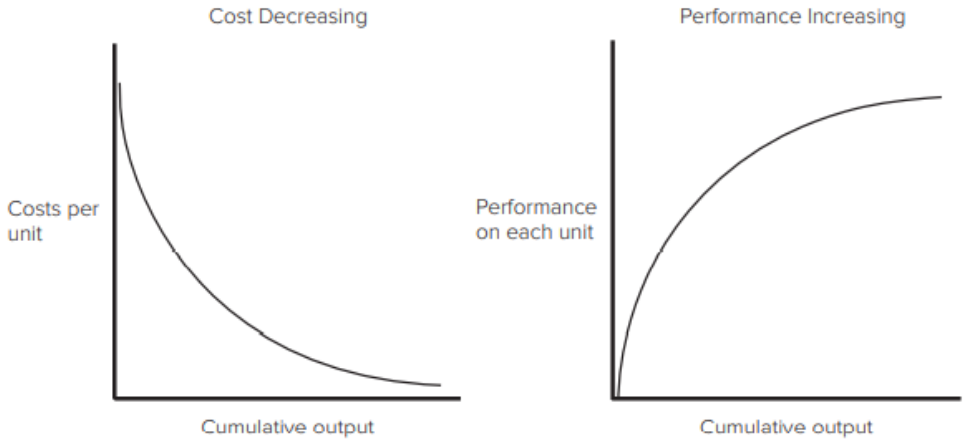
Increasing returns. When the rate of return (not just gross returns) from a product or process increases with the size of the installed base.

Markets coalesce around a single dominant design due to:

- **Increasing returns to adoption**, the more a technology is adopted, the more valuable it becomes
- As it is used, **greater understanding** of the design which enables improvements occurs
- As it is more widely adopted, **complementary assets** are developed

This results in a self-enforcing mechanism that increases dominance. **2 primary sources of increasing returns are:**

- **Learning effects**. The more a technology is used, the more it is developed and the more effective and efficient it becomes. One example of learning effects is shown in the impact of cumulative production on cost and productivity also known as the **learning curve**. Performance increases and cost decreases. The standard form of the learning curve is $y = ax^{-b}$ where y = #direct labour hours required to produce the xth unit, a is the #direct labour hours to produce the first unit, x the cumulative number of units produced and b the learning rate. The learning rate can be influenced by the nature of the task, firm strategy and the firm's prior experience
    - A firm's investment in **prior learning** can accelerate its rate of future learning by building the firm's **absorptive capacity**: the ability of an organization to recognize, assimilate and utilize new knowledge. The more firms that are using a given technology and refining it, the more absorptive capacity us being generated.



- **Network externalities,** also termed **positive consumption externalities**. This is when the value of a good to a user increases with the number of other users of the same or similar good e.g. railroads/telecommunications. The number of users of a particular technology is the **installed base**. Network externalities also arise when **complementary goods** are important: additional goods and services that enable/enhance the value of another good.

In some cases there is a legally induced adherence to a dominant design as compatibility is enforced.

When a firm's technology is chosen as the dominant design, not only does the firm have the potential to earn near-monopoly rents in the short run, it is also in good position to shape the evolution of the industry, greatly influencing what future products will look like. If a firm supports a different technology, it might eventually still forced into the dominant design or find itself locked out of the market.

Increasing returns to adoption imply **path dependency**: relatively small historical events may have a great impact on the final outcome. It is often impossible to reproduce the results that occur in such a situation. Such 'winner-takes-it-all markets' demonstrate different competitive dynamics than markets in which competitors coexist.

A **technology's stand-alone** value can be determined by the Buyer Utility Map model. The six **stages** consumers experience are:

1. Purchase
2. Delivery
3. Use
4. Supplements
5. Maintenance
6. Disposal

The six **utility levers** are

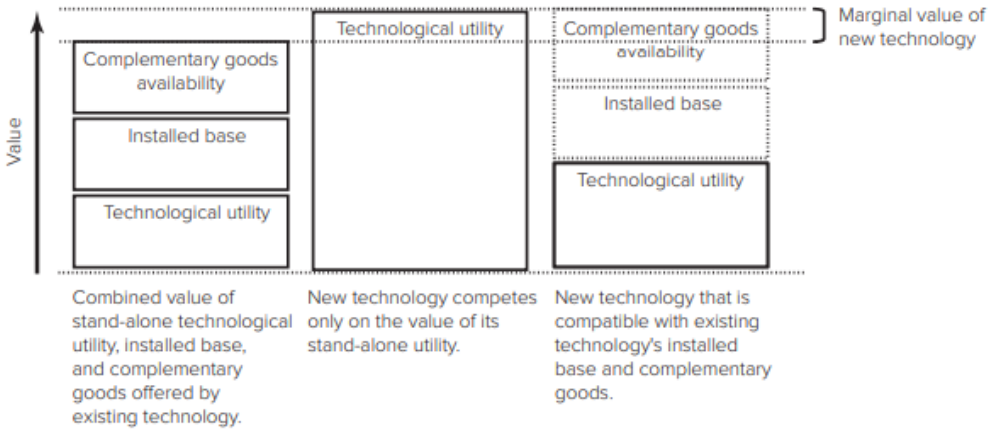
1. Costumer productivity
2. Simplicity
3. Convenience
4. Risk
5. Fun and image
6. Environmental friendliness

	Purchase	Delivery	Use	Supplements	Maintenance	Disposal
Customer productivity	Price of Prius slightly higher than comparable nonhybrid models		Offers speed and power comparable to nonhybrid models	Can stop less often for gas, saving money and time		
Simplicity	Buyer may feel less able to assess value of vehicle		Operates like a regular combustion engine vehicle	Refuels like a regular combustion engine vehicle		Hybrids have larger batteries that would have to be recycled and disposed of at end of life
Convenience		Will be sold through traditional dealer channels	Does not have to be plugged into electrical outlet	Can purchase fuel at regular gas stations	Maintenance is similar to regular combustion engine vehicle	
Risk			Buyer might face a higher risk of product failure because it embodies a new technology		Buyer might have difficulty finding replacement parts because of new technology	Prius might be more difficult to resell or have lower resell value
Fun and image		Connotes image of environmental responsibility				
Environmental friendliness	Buyers feel they are helping support the development of more environmentally friendly cars		Emits lower levels of pollutants	Requires less use of fossil fuels		

These together create a grid with stages and levers in the form of a 36 cell **utility map**. Each cell has the opportunity to offer a new value proposition to a customer.

In industries characterized by network externalities the value of a technological innovation to users is a function of

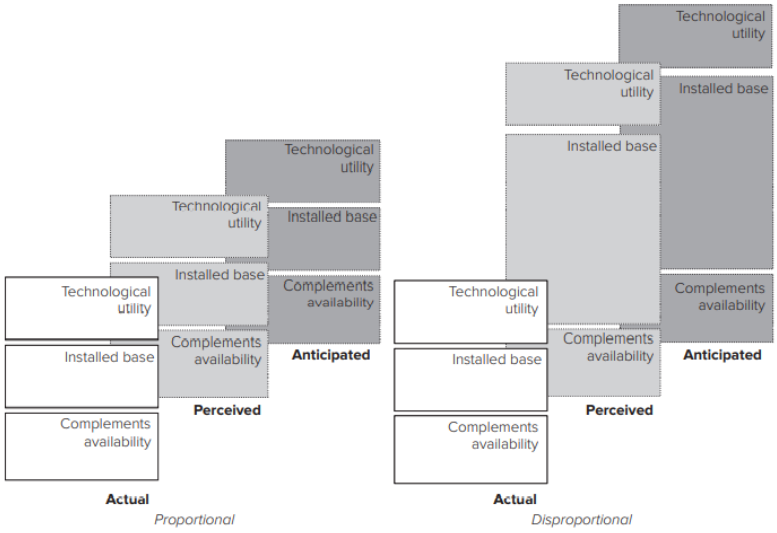
- The **stand-alone benefits and costs**
- The value created by the **size of its installed base**
- The availability of **complementary goods**

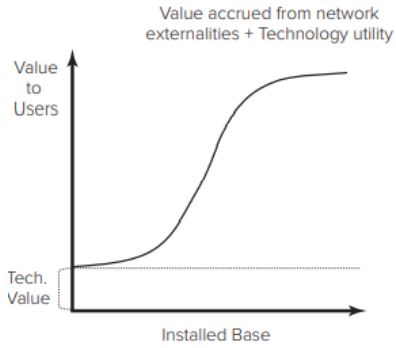


It is not enough for a new technology's stand-alone utility to exceed that of the incumbent standard. The new technology must be able to offer greater overall value than the installed base, utility and complementary goods together. In some cases the new technology is compatible with the existing technology as seen in the right above.

When users are comparing the value of a new technology to an existing technology, they are weighing a combination of **objective information**, **subjective information** and **expectations.** Firms can take advantage from the fact that users rely on both objective and subjective information, through heavy advertising for example. Such a tactic is also used for **vaporware** – products that are

not actually on the market and may not even exist but are still advertised. This may buy a firm valuable time to bring its product to the market.

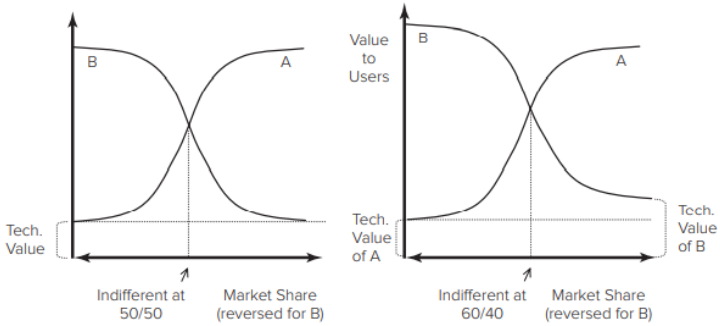




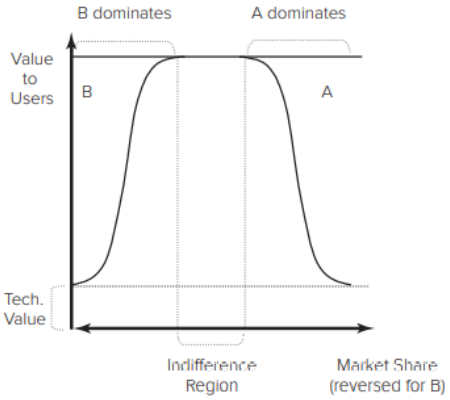
An industry with network externalities will have its value increased if the installed base is larger in the form of an S-shaped curve.

Additional stand-alone functionality will shift the entire graph up.

When 2 technologies compete for dominance, customers will compare the overall value yielded from each technology. Say technologies A and B offer similar technological utility and have similar shaped network externality return curves. Curve B is drawn with the market share reversed. If A has less than 50% market share, B will yield greater overall value. If both have the same network externalities, but one has greater stand-alone utility, this will shift the indifference point in its favor.



In the graph right, customers attain their desired level of network externality benefits at lower levels of market share. Here the graph flattens out sooner, implying that the max amount of network externality value is obtained at lower levels of market share. This creates a relatively large indifference region where neither technology dominates.



Modularity is the degree to which a system's components can be separated and recombined. Products can be made more modular by

- Expanding the range of compatible components
- Uncoupling integrated functions within components (making it modular at finer level).

A tightly integrated (non-modular) system may enable a level of performance more standardized components cannot achieve. The producer also has more control over the end-product, possibly giving more functionality and reliability.

Modular products on the other hand offer more choices. Also since components can be reused in different combinations, it can achieve product variety while still allowing scale economies in manufacturing the individual components: **economies of substitution**.

Modularity is more valuable when:

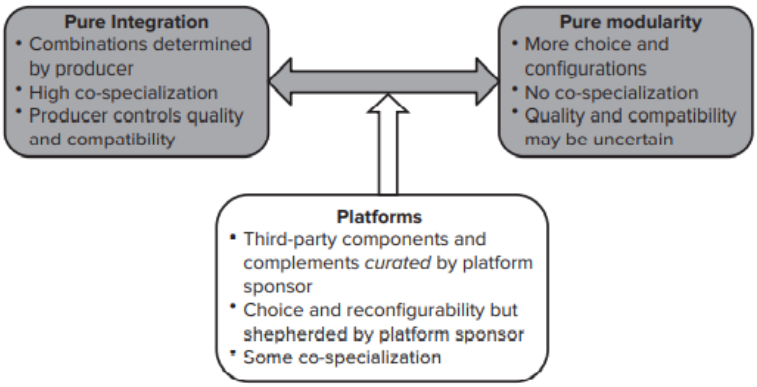
- Diverse technological options available can be recombined
- Customer preferences are heterogenous

Platform ecosystems. An ecosystem is a contraction of ecological and system and refers to a system where elements share some form of mutual dependence. A platform in this context is a stable core that mediates the relationship between a range of components, complements and end users. Thus platform ecosystem refers to a system of mutually dependent entities mediated by a stable core.

A platform's boundaries can be well-defined with a stable set of members or they can be amorphous and changing with members switching and participating in multiple platforms freely. However, switching costs may prohibit this.

A platform ecosystem is in its essence a hybrid organizational form. A compromise between the loose coupling of a purely modular and a traditional integrated product. Platforms are more valuable than a tightly integrated product when:

- Customers are diverse and want more choices than a single firm can provide
- Third-party options are diverse and high quality
- Compatibility with third-party products can be made seamless without integration
- The platform sponsor is powerful enough that it can retain control over quality and the overall product architecture without producing the complements itself



On the other hand platforms are more valuable than purely modular systems when

- Complements are nonroutine purchases with uncertainty
- Some integration between the platform and its complements provides performance advantages
- Important components of the ecosystem require subsidization

Week 2 – Chapter 5 – Timing of Entry

First movers are the first entrants to sell in a new product or service category. **Early followers** are entrants that are early to the market but not first and **late entrants** are entrants that do not enter until the time the product begins to penetrate the mass market or later.

First mover **advantages** are:

- **Brand loyalty and technological leadership**. The company that introduces a new technology may earn a long-lasting reputation as a leader in that domain, creating brand loyalty. The leader position may also help to shape the customers expectations. If these expectations are hard for competitors to imitate, the technology leader can yield sustained **monopoly rents**: additional returns (either higher revenue/lower cost) a firm can make from being a monopolist.
- **Preemption of scarce assets**. Firms that enter the market early can capture scarce resources.
- **Exploiting buyer switching costs**. Once buyers have a certain good they often face costs to switch to another good. E.g. QWERTY.
- **Reaping increasing returns advantage**. In an industry characterized by increasing returns to adoption, being an early riser may create self-reinforcing positive feedback mechanisms, boasting its dominant design.

However first movers are not always good: failure rate of 50%. Later entrants can capitalize on their R&D, fine-tune products, avoid mistakes made by the early entrant and exploit **incumbent inertia**: the tendency for incumbents to be slow to respond to changes in the industry environment due to their large size, established routines or prior strategic commitments to existing suppliers and customers.

First mover **disadvantages** are:

- **R&D expenses**. Not only of the development of that technology, but also of technological paths that didn't work, developing necessary processes and complementary goods.
- **Undeveloped supply and distribution channels**.
- **Immature enabling technologies and complements**. **Enabling technologies** are component technologies that are necessary for the performance or desirability of a given innovation.
- **Uncertainty of costumer requirements**. And how much they are willing to pay, even with market research.

Factors influencing the **optimal timing of entry** are:

- **How certain are customer preferences?** As producers and customers gain experience with the technology, features that initially seemed compelling may turn out unnecessary or the other way around.
- **How much improvement does the innovation provide over previous solutions?** The higher the degree of innovation, the more likely successful entry.
- **Does the innovation require enabling technologies, and are these technologies sufficiently mature?** E.g. high def television, but network unable to stream. More mature = earlier entry, less mature can better wait until enabling technologies are further developed.
- **Do complementary goods influence the value of the innovation and are they sufficiently available?**

- **How high is the threat of competitive entry?** If there are significant entry barriers or few potential competitors, firm may be able to wait until the technology evolves more. If barriers are low, it could quickly become too competitive.
- **Is the industry likely to experience increasing returns to adoption?** If so, due to strong learning curve or network externalities, allowing competitors to gain a head start is very risky. If there are forces encoring one dominant design, a competitors technology might be selected.
- **Can the firm withstand early losses?** First movers often need significant amounts of capital to sustain R&D and withstand a first period with little revenue (S-curve).
- **Does the firm have resources to accelerate market acceptance?** a firm with signicant capital not only withstands slow market takeoff, but can also invest in accelerating it.
- **Is the firm's reputation likely to reduce uncertainty of customers, suppliers and distributors?** A firm's reputation can send a strong signal about its likelihood to succeed.

Above it is assumed that a firm has a **choice** when to enter the market, whereas in reality the firm must also be capable to do this. Furthermore if a firm decides to refine an earlier entrant's technology faster it needs to have a **fast-cycle development process**. A firm with very fast development deployment should be able to take advantage of both first- and second-mover advantages. This research can be greatly shortened by **parallel development processes**: when multiple stages of the new product development process occur simultaneously.

Week 2 – Chapter 8 – Collaboration strategies

Reasons for going solo:

- **Availability of capabilities**. If a firm has all the necessary capabilities for a project in house, it has little need to collaborate.
- **Protecting proprietary technologies**. Working closely with a partner might expose the company's existing proprietary technologies to a would-be competitor.
- **Controlling technology development and use**. This might be for pragmatic reasons (e.g. high yield) or cultural reasons (company culture emphasizes independence).
- **Building and renewing capabilities**. Firms may choose to go solo even when partnering could save time/money if they believe development efforts are key to building and renewing their capabilities. The potential for creating and enhancing the organization's capabilities may be more valuable than the innovation itself.

Alliance is a general term that can refer to any type of relationship between firms. Alliances may be short or long term and may include formally contracted agreements or be entirely informal in nature.

Advantages of collaborating:

- **Acquiring capabilities and resources quickly**. A company can gain rapid access to important complementary assets by entering into v alliances/licensing arrangements.
- **Increasing flexibility**. Especially important in markets characterized by rapid technological change.
- **Learning from partners**. Close contact can facilitate both the transfer of knowledge and the creation of new knowledge that individual firms could not have created alone.
- **Resource and risk pooling**. Share costs and risks of a project.
- **Building a coalition around a shared standard**.

Collaboration can take many forms, from very informal alliances to highly structured **joint ventures** to a technology exchange agreement, **licensing**.

The most common forms of collaborative arrangements are:

- **Strategic alliances**. A **temporary relationship** that can take many forms, either formalized in a **contract or informal**. It can be **short – or long-term** and it can include an equity investment made by the partners in each other. Firms use strategic alliances to **access a critical capability** that is not possessed in-house or to more fully exploit their own capabilities. Even firms that have similar capabilities may collaborate to **share risk or speed up market development and penetration**. Large firms collaborate with smaller ones to take a stake in their development efforts while small firms form alliances with large ones to get their capital resources, distribution and marketing capabilities or credibility.
  Alliances are also used to enable partners to **learn from each other and develop new competencies**. However alliances often lack the shared language, routines and coordination that facilitates knowledge transfer, especially tacit knowledge. Thus it requires serious commitment. Alliances can also be costly and risk of a partner taking intellectual property for their own advantage. A firm's alliance can be categorized into 2 dimensions:
  - The degree to which alliances practice **capability complementation**: combining (pooling) the capabilities and other resources of partner firms, but not necessarily transferring those resources between partners
  - The degree to which they practice **capability transfer**: the exchange of capabilities across firms in such a manner that partners can internalize the capabilities and use them independently of the particular development project.

  In quadrant **A** are firms that forge an individual alliance to combine complementary technologies/skills needed for a project. In quadrant **B** are firms that use a network of alliances to combine complementary skills and resources. In quadrant **C** are firms that use individual alliances to transfer capabilities between them. In quadrant **D** are firms that use a network of alliances to exchange capabilities and jointly develop new capabilities.

	Individual Alliance	Network of Alliances
Capability Complementation	A GE-SNECMA alliance	B Corning Glass alliances
Capability Transfer	C Thomson-JVC alliance	D Aspla

  Managers should think carefully about their alliance portfolio:
  - If multiple alliances are serving the same strategic needs, there is a **risk of redundant resources** investment or **competitive conflict** between partners
  - Complementary alliances can be **super-additive** if carefully managed
  - Managers should consider how their portfolio of alliances **positions** them in the web of relationships that connects their firm, partners and partners' partners.
- **Joint ventures** are a particular type of strategic alliance that entails significant structure and commitment. A joint venture involves a **significant equity investment from each partner** and often results in establishment of a **new separate entity**. The capital and other resources to be committed by each partner are usually specified in carefully constructed **contractual arrangements**, as is the division of profits earned.
- **Licensing** is a contractual arrangement whereby one organization/individual, the **licensee**, obtains the rights to use the proprietary technology of another organization, the **licensor**. Licensing enables a firm to **rapidly acquire a technology** or other resource it doesn't possess itself. Its also much **less expensive**.

- **Outsourcing.** One common form of outsourcing is the use of **contract manufacturers**: when a firm hires another firm (often a specialized manufacturer) to manufacture its products. This allows firms to meet the scale of market demand without committing to long-term capital investments or an increase in labor force, giving greater flexibility and enabling firms to focus on activities central to their competitive advantage. It also has some downsides: it may cause a firm to forfeit important learning opportunities, which gives disadvantage in the long run. Outsourcing can also impose significant transaction costs.
- **Collective Research Organizations** is when multiple organizations establish cooperative R&D.

Summary of trade-offs between different modes of development:

	Speed	Cost	Control	Potential for Leveraging Existing Competencies	Potential for Developing New Competencies	Potential for Accessing Other Firms' Competencies
Solo Internal Development	Low	High	High	Yes	Yes	No
Strategic Alliances	Varies	Varies	Low	Yes	Yes	Sometimes
Joint Ventures	Low	Shared	Shared	Yes	Yes	Yes
Licensing In	High	Medium	Low	Sometimes	Sometimes	Sometimes
Licensing Out	High	Low	Medium	Yes	No	Sometimes
Outsourcing	Medium/High	Medium	Medium	Sometimes	No	Yes
Collective Research Organizations	Low	Varies	Varies	Yes	Yes	Yes

Solo internal development is on average relatively slow and expensive, it might make sense however, for a firm that has strong competencies, access to capital and not under great time pressure. A joint venture is much more structured than a strategic alliance. Joint ventures are more appropriate than a strategic alliance when the firm places great important on access to other firms' competencies. Licensing in is particularly helpful in medical/pharmaceutical context. Outsourcing might be appropriate for:

- Firm activities that are not central to its competitive advantage
- Activities that would cause the firm to give up crucial flexibility if performed in-house
- Activities in which the firm is at a cost or quality disadvantage

A number of factors influence how well suited partners are to each other, including relative size and strength, the complementarity of their resources, the alignment of their objectives and the similarity of their values and culture. Those factors can be boiled down to 2 dimensions:

- **Resource fit** refers to the degree to which partners have resources that can be effectively integrated into a strategy that creates value, either complementary or supplementary.
- **Strategic fit** refers to the degree to which partners have compatible objectives and styles.

Successful collaboration agreements often have clear, flexible monitoring and **governance** mechanism. The more resource put at risk, the more governance structure created. There are 3 main types of governance mechanisms to manage collaborative partners:

- **Alliance contracts** are legally binding contracts to ensure partners are fully aware of their rights and obligations and have legal remedies if a partners violates a agreement.
- **Equity ownership** each partner contributes capital and owns a share of the equity in the alliance. It helps to incentivize partners and provides a sense of ownership.
- **Relational governance** is the self-enforcing governance based on goodwill, trust and reputation of the partners.

Chapter 13 – crafting a deployment strategy

Five key elements in the deployment process are:

- **Launch timing**. A firm can strategically use launch time to take advantage of
    - Seasonal effects: e.g. just before Christmas
    - If it is launched to early it can be seen as 'same generation', too late and it can lose its base and lose image as leader
    - Timing must coincide with production capacity

  Entry timing for companies already in a strategy is also dependent on **cannibalization**: when a firm's sales of one product (or at one location) diminish its sales of another of its products. If a firm's current product is very profitable, it will delay the next generation.
- **Licensing and compatibility**. Problems if a firm makes a technology completely open are;
    - Other producers might drive the price down
    - May cause its underlying platform to become fragmented

  A firm can avoid losing its installed base by making other products incompatible. Firms must also decide whether or not to make their products **backwards compatible** with their own.
- **Pricing** simultaneously influences the product's positioning, rate of adoption and cash flow. There are several strategies:
    - **Survival pricing** prices goods to cover variable costs and some fixed costs, only works in the short-run.
    - **Maximize current profits**, may sacrifice long term performance
    - **Maximum market skimming/share** initially sets high prices on new products
    - **Penetration pricing** to maximize market share: set lowest price, driving up volume and down production cost. Often in industries with increasing returns
    - **Leasing** 'pay as you go'
    - **Freemium model** where a base product or service is free, but a premium is added for additional features.
- **Distribution**. Firms can sell directly or through **manufacturers' representatives** (independent agents that promote and sell the product lines of a few manufacturers, used when direct selling is appropriate but manufacturer doesn't have large enough sales force), **wholesalers** (companies that buy products in bulk and resell them to other supply channel members such as retailers) and **retailers** companies that sell goods to the public. Weakness of direct selling is that manufacturers prefer to sell in bulk: valuable bulk-breaking services. **Original equipment manufacturers (OEMs)** or **value-added resellers (VARs)** buy products and assemble them or customize them into a product that is sold under their own name. In some industries **disintermediation**, where the number of intermediaries is reduces, happens due to advances in technology. A firm can use a variety of strategies to accelerate distribution:
    - **Alliances with distributors** firms can use strategic alliances or exclusivity contracts
    - **Building relationships** bundling with another product already widely in use
    - **Contracts and sponsorship** to ensure a technology is used in exchange for something

- **Guarantees and consignment** such as taking back unsold stock, or paying the manufacturer only after sales

- **Marketing**. The three most commonly used marketing methods are
  - **Advertising** often a balance between entertaining and information
  - **Promotions** at either consumer or distributor level
  - **Publicity and public relations** free form of marketing. **Viral marketing** stimulates word-of-mouth advertising.

Some advantages and disadvantages of major advertising media are:

Media	Advantages	Disadvantages
Online Advertising: Pay-per-click (search engines)	Can be highly targeted to a particular audience; pay only for results (clicks); fast to deploy—can gain immediate visibility, and can be adjusted or deleted just as quickly; enables rapid and efficient tracking of responses for analyzing effectiveness of the ad	Vulnerable to click-through fraud (e.g., clicks by a competitor or an unhappy customer or employee), which could result in wasted advertising spend
Online Advertising: Social Media	Can connect with customers in a rich way; potential for broad reach and viral marketing; can be highly targeted to a particular audience; relatively inexpensive; can be quickly deployed and adjusted; can track visitors in real-time	Conversion of visitors to customers is often low; can be difficult to build awareness and traffic to social media site
Television	High sensory richness that combines sight, sound, and motion; high geographic and demographic reach; independent stations offer new opportunities to more directly target-specific audiences	Increasingly fragmented audience due to proliferation of stations; increasing use of DVR's enables viewers to skip the advertising; high absolute cost; fleeting exposure
Radio	High geographic and demographic selectivity; medium reach; relatively low cost	Audio presentation only; advertisers may need to buy ads with multiple stations to achieve desired audience reach; fleeting exposure
Newspaper	Timeliness; good local market coverage; broad acceptance; high believability; audience can keep or revisit the advertisement; wide price ranges available	Newspaper audiences are decreasing; easy for audience to skip over ad; relatively poor production quality; high advertising clutter; may be difficult to selectively target a particular audience
Magazine	High geographic and demographic selectivity; high quality visual production; long life; can enable significant technical content; good pass-along readership	Slow deployment (long ad purchase lead times); some waste circulation; may require advertising in multiple magazines to achieve desired reach
Direct Mail	High audience selectivity; no ad competition within the same medium; personalization; enables communication of significant technical content; may be passed along to others; responses can usually be efficiently tracked	Relatively high cost; "junk mail" image; requires access to good mailing lists; requires relatively long lead times for printing and mailing
Outdoor (e.g., billboards, banners)	High repeat exposure; low cost; low competition	Limited audience selectivity; very limited technical content
Telephone	High audience selectivity; can give personalized message	Relatively high cost; can be perceived as an annoyance

There are various stages of adoption, which are responsive to different marketing strategies. Often difficult to go from the early adopters to the early majority > chasm in the diffusion curve: sales drop off as the early adopters are saturated but early majority is not yet ready. Even products with a small installed base can obtain large mindshare through advertising (large perceived installed base). **Vaporware** are pre-advertised products that are not actually on the market yet and may not even exist. It may buy a firm valuable time. Firms can use **preannouncements and press releases, reputation** and **credible commitments** to shape perceptions.

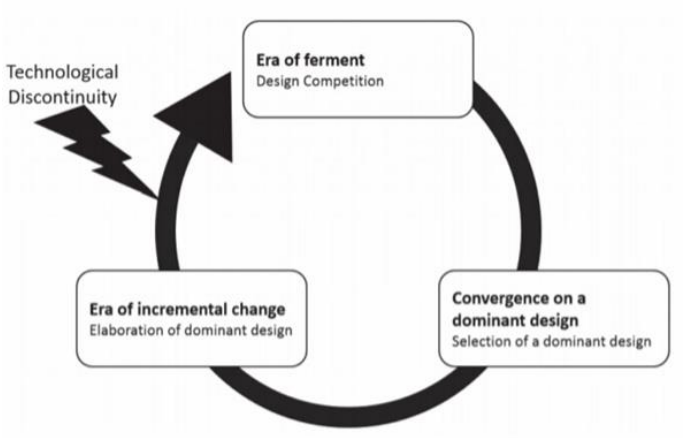
There are 3 types of individuals who have a disproportionate amount of influence:

- **Connectors** are individuals who form an exceptionally large circle of acquaintances, and belong to multiple social worlds: they can bring together people who are unlikely to meet. Likely to expose a great number and diversity of people
- **Mavens** are individuals driven to obtain and disseminate knowledge about one or more interests. Will frequently volunteer information and derive great pleasure out of helping. Likely to convey information to fewer people but more convincing in detail
- **Salespersons** are naturally talented persuaders, they can infect others with their mood. Transmits information they are likely to find irresistible.

Week 2 – teacher video Market-based standardization

According to **evolutionary economics** technology evolves through periods of incremental change until a significant breakthrough is introduced. These so called technological discontinuities increase the industries uncertainty and usually change it considerably. As a result a new technological paradigm emerges, consisting of its own concept of progress, based on its specific economic and technologic tradeoffs. Different technological paths can be developed within a new paradigm, resulting in designs that compete until a dominant design emerges.

In **industrial economics** the dynamics of industries and the role of standards in the emerging of new markets is studied. They developed a **three-stage life-cycle model of technology** in which after the first **fluid phase** a standard emerges which remains stable over time. They combined these stages into a **cyclical model of technological change.** They also argue that the technological discontinuity does not always become the dominant design. They show that competence destroying discontinuities are introduced by new firms, while existing firms use competence enhancing discontinuities.



Many markets are characterized by demands and economies of scale. In these markets products increase in value the more consumers adopt them, e.g. mobile phones. This phenomenon is the **network effect**. Under the influence of network effects, actors benefit from using a standard that is related to the number of other actors that use that standard: its **installed base**.

In 1989 the notion of **path dependency** was introduced. When different companies are competing, some small random events may by chance give one of them a lead. Other technologies may become locked out under the influence of network effects. People may become locked in to incorrect choices, e.g. QWERTY. This shows the importance of building an installed base quickly to achieve standard success.

Various strategies have been developed for firms that are engaged in a standards battle. Strategies include:

- Open systems strategy
- Penetration pricing
- Marketing in the form of pre-announcements
- Organizational learning
- Flexibility
- Characteristics of the inter-organizational networks supporting the standard

Scholars also looked at characteristics of organizations that make them adopt standards such as:

- Organizational readiness
- External pressures
- Perceived benefits
- Network effects

- Adoption costs

These factors together form buttons we can push to influence the outcome of a market-based standardization process. Policy makers can jump in on time to avoid that incorrect choices are made and e.g. technological inferior standards are chosen.

Most markets with network effects are **two- or multiple sided markets**. This means that 2 distinct user groups provide each other with benefits coming from network effects. These groups interact via platforms. (examples gaming consoles and credit cards). Later scholars build upon this and introduced the notion of two- or multi sided network effects, where the value of a technology increases the more users adopt other, complementary technologies.

Week 2 – video Keyboards

Switching costs from locked-in technologies can outweigh the benefits. These costs include brainpower, re-training, money and time. The 3 main features that caused QWERTY to become locked in are:

1. **Technical interrelatedness** physical remembrance of where the keys are
2. **Economies of scale** when the overall user cost (training) declined compared to other systems
3. **Quasi-irreversibility** cost to retrain was higher than to train to simpler versions

Week 2 – teacher video Factors for standard dominance

A firm's ability to win a standard battle depends on its control over an installed base of users. The strength of the effect of an installed base on technological dominance is determined by the strength of network effects. These occur when the value of a technology increases with a number of other consumers that have adopted that technology. It is therefore imperative to increase the installed base as much as possible and there are various ways of doing so. Most markets in which standards battles are fought include **complementary goods**, whose availability in part determines the success of the technology. The installed base is positively associated with the availability of complementary goods.

Important strategies for increasing the installed base are:

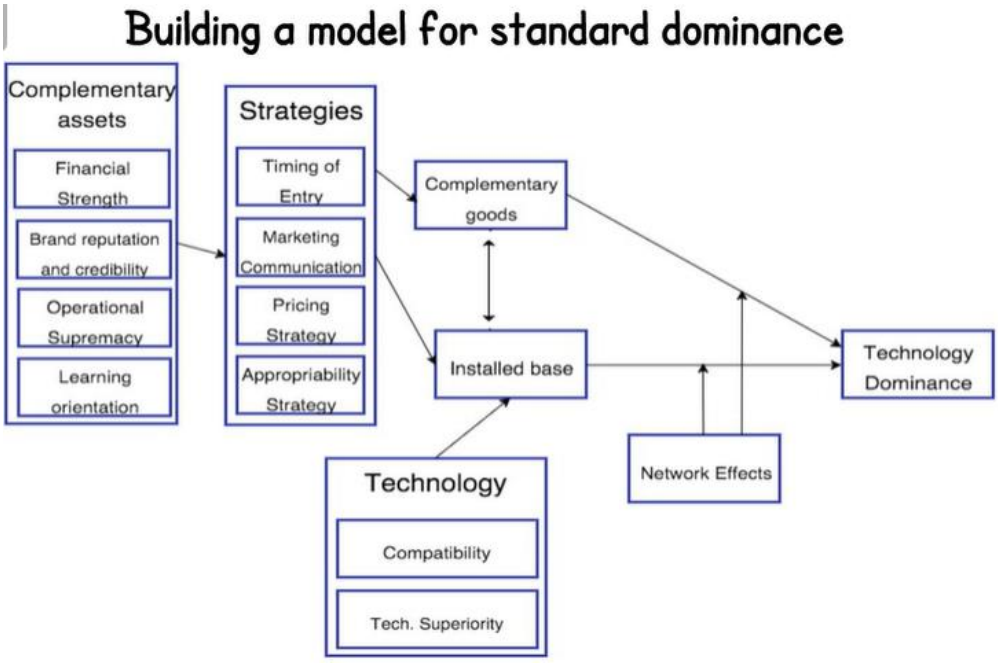
- **Timing of entry**. Being a first mover has the advantages of brand loyalty and technology leadership, preemption of scarce assets, exploiting buyer switching cost and reaping increasing returns advantages.
- **Marketing communication**. Advertising, promotions and publicity will all play an important part in shaping the markets expectation about a product, the installed base and the availability of complementary goods. Aggressively promoting existing and planned products can increase the actual and perceived installed base. Both may drive future adoptions.
- **Pricing strategies**. Influence a products position in a market, the rate of adoption and a firm's cash flow. If the goal is to maximize installed base, it is recommended to prize as low as possible, to increase customers, increase volume and decrease production cost. This is called **penetration pricing** and it is a common strategy when competing for a dominant standard.
- **Appropriability strategy**. Firms must also decide why and how to protect their standard. Protecting standards helps a firm retain control over it and appropriate rents? From it.

However sometimes not protecting a standard can be to the firm's advantage. It may encourage others to support the standard and increase its likelihood of becoming dominant.

A firm can only successfully apply such strategies when it has sufficient resources. These **complementary assets** are:

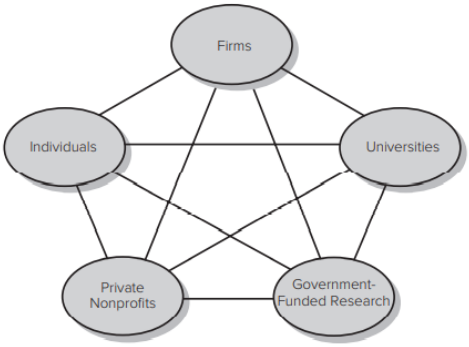
- **Financial strength**. Financial resources are needed to overcome initial losses and invest in marketing campaigns.
- **Brand reputation and credibility** is crucial in network markets where expectations are important. Previous victories count for a lot in these markets.
- **Operational supremacy**. Manufacturing capabilities are required to meet demand when it rises.
- **Learning orientation**. This can be learning the requirements from customers and learning from past experiences in similar battles.

Thus it can be concluded that technological dominance is not solely determined by technological characteristics. However it does play a role e.g. apple's aesthetic and quality. Furthermore by making the standard compatible with an earlier generation a firm can make use of the previous installed base, but this can also decrease technological superiority. Finally, flexibility of the standard may increase it chances of achieving dominance as it can be changed to meet changing consumer requirements.



Week 3 – Chapter 2

Innovation is the practical implementation of an idea into a new device or process. Networks of innovators that leverage knowledge and other resources from multiple sources are one of the most powerful agents of technological advance. Sources of innovation are a complex system where any particular innovation may emerge primarily from one or more components of the system or linkages between them.



Idea is something imagined or pictured in the mind. **Creativity** is the ability to produce novel and useful work. A person's creative ability is a function of their intellectual abilities, knowledge, personality, motivation and environment. and e.g. technological inferior standards are chosen.

One important ability for creativity is a person's ability to let their mind engage in a visual mental activity called **primary process thinking**: combining things that are not typically related through **remote associations/divergent thinking**. Study showed that creative people follow the same associations, but exhaust them sooner.

The impact of **knowledge** on creativity is ambiguous: too little and meaningful contribution is unlikely, too much and stuck in existing knowledge. 'outsiders' however are not trapped in paradigms and assumptions, nor have existing investments in tools, expertise or relationships.

Important for creativity are:

- The most common personality trait associated with creativity is **openness to experience**
- Intrinsic **motivation**. Extrinsic motivation such as money can even work counter effective
- A supportive **environment**.

The creativity of an organization is a function of the creativity of its individuals and a variety of social processes and contextual factors, which can amplify it. The most known method for tapping into creativity of employees is the **suggestion box**. Such **idea collection systems** are easy to implement. Nowadays companies go further: have creativity training programs

The **intranet** is a private network, accessible only to authorized individuals. It is like the internet, but operates only within an organization.

The most successful inventors have the following characteristics:

- They mastered basic tools/operations in the field in which they invent, but are not specialized: instead they pursue 2/3 fields simultaneously
- They are curious and more interested in problems than solutions
- They question assumptions made in previous work
- They have the sense that all knowledge is unified: seek global rather than local solutions: generalists by nature

Though R&D is usually termed together, research can refer to both basic research and applied research. **Basic research** is effort directed at increasing understanding of a topic without a specific immediate commercial application in mind, it only advances scientific knowledge. **Applied research** is

targeted at increasing knowledge for a specific application/need, typically with commercial objectives. **Development** refers to activities that apply knowledge to produce useful devices, materials or processes.

During the sixties there was a **science-push approach** to R&D: innovation proceeded linearly from scientific discovery > invention. The primary sources of innovation were discoveries in basic science. Later the **demand-pull approach** started: innovation was driven by the perceived demand of users. Recent research suggests it is more complicated and multiple sources are used:

- **In-house R&D**, including basic research
- Linkages to **customers/users**
- Linkages to an **external network** of firms that may include competitors
- Linkages to other **external sources of scientific technical information** e.g. university

Complementors are producers of complementary goods/services. Firms can be competitors and complementors at the same time, creating complex relationships.

Firms that have in-house R&D are also the heaviest reliants on collaboration networks: external sources of information are more likely to be compliments rather than substitutes. Doing in-house R&D helps to build a firm's **absorptive capacity**: the ability to recognize, assimilate and utilize new knowledge.

To increase the degree to which university research leads to commercial innovation, many universities have established **technology transfer offices**: offices designed to facilitate the transfer of technology developed in a research environment to an environment where it can be commercially applied.

Science park is a regional district, typically set up by the government, to foster R&D collaboration between the government, universities and private firms. **Incubators** are institutions designed to nurture the development of new businesses that might otherwise lack access to adequate funding or advice.

Collaborations can be in the form of joint ventures, licensing and second-sourcing agreements, research associations, government-sponsored joint research programs, value-added networks for technical and scientific interchange and informal networks. Interfirm networks can achieve much more than individual and are more needed in high-tech sectors.

Technology clusters are regional clusters of firms that have a connection to a common technology and may engage in buyer, supplier and complementor relationships, as well as research collaboration.

Proximity and interaction can directly influence firms' ability and willingness to exchange knowledge:

- Knowledge that is **tacit/complex** may require frequent and close interaction to be meaningfully exchanged
- Closeness and frequency of interaction can influence a firm's **willingness** to exchange knowledge

The benefits firms reap from locating in close geographical proximity are known collectively as **agglomeration economies**.

Downsides to geographical clustering are:

- Proximity of competitors serving a local market can reduce pricing power
- Close proximity may increase likelihood of a firm's competitor gaining access to a firm's proprietary knowledge
- Clustering can potentially lead to traffic congestion, inordinate housing cost and higher concentrations of pollution

The degree to which geographic clustering is dependent depends on:

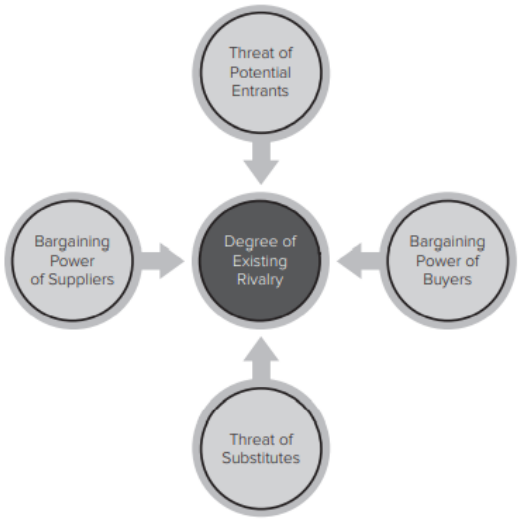
- The nature of the technology
- Industry characteristics
- Cultural context of the technology

Knowledge brokers are individuals/organizations that transfer information from one domain to another in which it can be usefully applied

Technological spillovers occur when the benefits from the research activities of one firm spill over to the next: a positive externality.

Chapter 6 – Defining the organization's strategic direction

The 2 most common used tools for analyzing the external environment of the firm are **Porter's five-force model** and **stakeholder analysis**.



Porter's five force model identifies the attractiveness of an industry and a firm's opportunities and threats. The five forces are:

1. **The degree of existing rivalry**. This is influenced by a number of factors, such as
    a. Number and relative size of competitors. An exception is **oligopolistic industries**, where few competitors can still be extremely competitive
    b. The degree to which competitors are differentiated.
    c. Demand conditions: higher demand, lower rivalry. In declining industries high **exit barriers** (fixed capital investment etc.) also intensify rivalry.
2. **Threat of potential entrants**. Influenced by the degree to which the industry is likely to attract new entrants and the height of **entry barriers** (large startup cost, brand loyalty, difficult access to suppliers, regulation etc.)
3. **Bargaining power of suppliers**. The degree to which a firm relies on one or more suppliers will influence its ability to negotiate good terms. Supplier bargaining power increases with:
    a. The amount of suppliers
    b. The amount a firm buys.
    c. If a firm faces **switching cost** that make it difficult to change suppliers

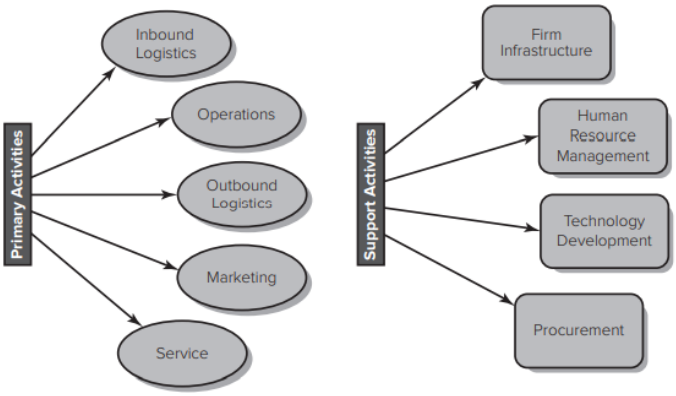
    d. If the firm can **vertically integrate**, getting into the business of the supplier, this will lessen supplier bargaining power.
4. **Bargaining power of buyers**. Depends on:
    a. Degree to which firm is reliant on few customers
    b. Whether the product is highly differentiated
    c. If buyers face switching cost
    d. Whether the buyer can threaten to vertically integrate
5. **Threat of substitutes**. Things that are not considered competitors, but fulfill a strategically equivalent role. The more there are and the closer they are in function, the more threatening.

The availability, quality and price of **complements** will also influence an industry. It is important to consider:

1. How important complements are in the industry
2. Whether they are differentially available for the products of rivals
3. Who captures the value offered by complements

A **strategic stakeholder analysis** emphasizes the stakeholder management issues that are likely to impact the firm's financial performance, while a **normative stakeholder analysis** emphasizes the stakeholder management issues the firm ought to attend due to their ethical/moral implications.

In Porter's model of a value chain, activities are divided into primary and support activities. **Primary activities** include inbound logistics (all activities required to reveice, store and disseminate inputs, operations (activities involved in the transformation of inputs into outputs) outbound logistics (activities required to collect, store and distribute outputs) marketings and sales, and service.

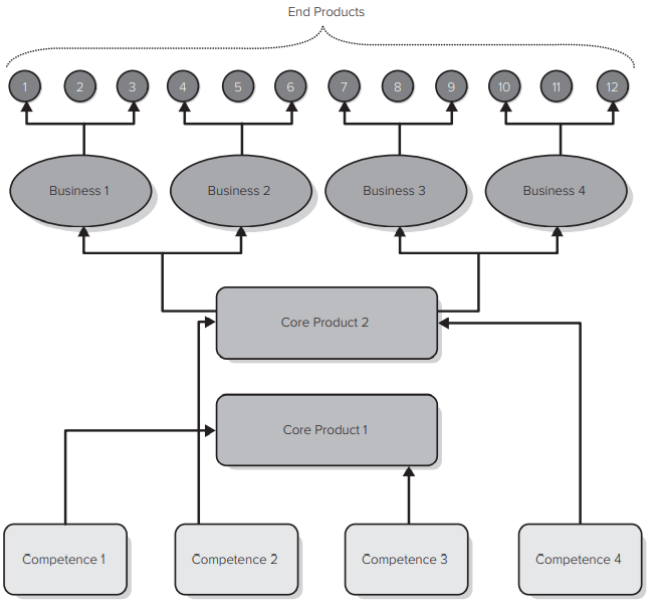


Support activities include procurement (acquisition of inputs, but not their physical transfer, that is inbound logistics), HR management, technology development and infrastructure. This generic model can be adapted to fit any firms needs.

Once key strengths and weaknesses have been identified, a firm can asses which strenghts hace the potential to be a source os sustainable competitive advantage. For this resources must be rare, durable and inimitable. Sources are not easily imitable if they are:

- Tacit
- Path dependent
- **Socially complex**, they arise through the complex interaction of multiple people
- **Causally ambiguous**, it is unclear how the resource gives rise to value

A company's core competencies are those that differentiate it strategically: it arises from a firm's ability to combine and harmonize multiple primary abilities in which the firm excels into a few key building blocks of specialized expertise.



Prahalad and Hamel offer the following tests to identify the firm's core competencies:

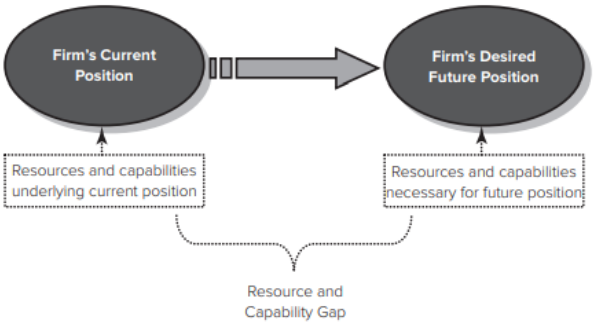
1. Is it a significant source of competitive differentiation? Does it provide a unique signature? Does it make a significant contribution to the value a customer perceives in the end product?
2. Does it transcend a single business?
3. Is it hard for competitors to imitate?

Few firms are likely to be leaders in more than 5/6 competencies.

Sometimes the very things a firm excels at can enslave it, making the firm rigid and overly committed to inappropriate skills and resources. Incentive systems will evolve that promote current core competencies, but inhibit the development of new ones.

It is also possible for a firm to develop core competencies that are not specific to any set of technologies/products, but make the firm more agile and responsive to change: **dynamic capabilities**

A company's **strategic intent** is a long-term goal that is ambituous, builds upon and stretches the firm's existing core competencies and draws from all levels of the organization. Typically strategic intent looks 10/20 years ahead and established clear milestones for employees.



A balanced scorecard emphasized 4 perspectives a firm should take in formulating goals that target critical success factors and in defining measures:

1. **Financial perspective**. Goals might include 'meet shareholder's expectations' or 'double our corporate value in seven years'. Measures might include return on capital, net cash flow and earnings growth
2. **Customer perspective**. Goals might include 'improve customer loyalty' 'increase customer satisfaction'. Measures might include market share, percentage of repeat purchases and customer satisfaction surveys
3. **Internal perspective**. Goals might include 'reduce internal safety incidents' 'build best in class franchise teams' measures might include number of safety incidents per month, franchise quality ratings, stockout rates and inventory costs
4. **Innovation and learning perspective**. Goals might include 'accelerate and improve new product development' 'improve employee skills' measures might include percentage of sales

from products developed past 5 years, average length of new product development cycle and employee training targets.

Chapter 9 – Protecting innovation

The degree to which a firm can capture the rents from its innovation is **appropriability**. This is determined by how quick competitors can imitate the innovation, which in turn is determined by the nature of the technology itself and mechanisms to protect it. If a knowledge base is **tacit** or **socially complex** (dependent on multiple individuals) it is more difficult to duplicate.

Ways of Intellectual Property Protection are; a **patent** protects an invention, a **trademark** protects words or symbols and a **copyright** protects an original artistic or literary work.

Each country has its own patent system and unless filed in a regional office, they only go for the country in which the patent is filed. The following criteria must be met for a **patent**: it must be **useful, novel** and **not obvious**. Not patentable are:

- Natural laws (e.g. gravity)
- Substituting one material for another
- Only changing size of an existing thing
- Making something more portable
- Substituting an element for an equivalent element
- Altering a shape

Times to patent are long (2-7 years) delaying usefulness in industries with short product lifecycles. Many countries also require that the invention is manufactured within a certain timeframe of the patent, the **working requirement**. 2 of the most significant treaties to harmonize patent laws around the world are:

- The **Paris convention for the Protection of Industrial Property** which 177 countries follow. Under this, an inventor can publicly disclose about an invention without losing right to patent in any of the other countries.
- **Patent cooperation treaty (PCT)** has numerous advantages:
    - It gives option to apply to multiple nations later without committing expense of those applications
    - Only having to pay 1 PCT application fee
    - Helps make the results of patent applications more uniform

Inventors and firms may monetize patents in a range of different ways:

- Make and sell it themselves
- Licensing to others
- Selling the rights to another firm that can better utilize it
- **Patent trolling** when an individual/firm misuses patents against other individuals/firms in an attempt to extract money in a lawsuit

Patent thickets are a dense web of overlapping patents that can make it difficult for firms to compete or innovate

A **trademark** is a word, phrase, symbol, design or other indicator to distinguish goods. Trademarks and service marks can be embodied in any indicator that can be perceived through 1 of 5 senses. Registration has several advantages:

- It provides public notice of the claim of ownership
- Marks must be registered before a suit can be brought in federal court
- Registration can be used to establish international rights over the trademark

To eliminate the need to register the World Intellectual Property Organization has a system of international registration of marks governed in 2 treaties.

Copyright is used to protect literary, dramatic, musical, artistic etc works. It is not a violation if copyrighted work is used in criticism, comment, news report, teaching, scholarship or research. Unlike in patents, copyright is secured automatically when created and fixed for the first time.

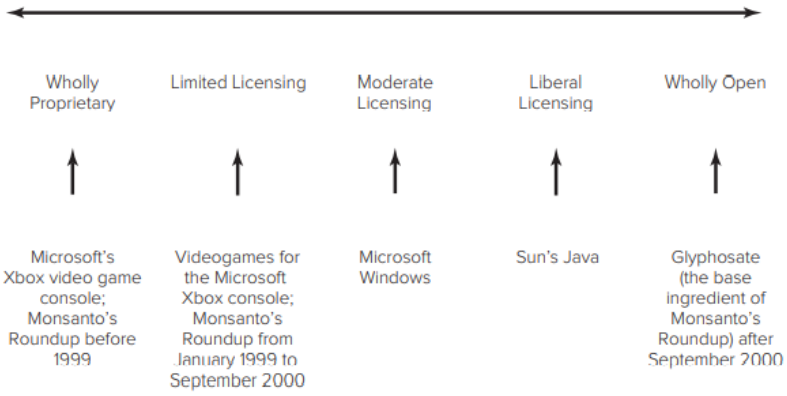
A **trade secret** is information that belongs to a business that is private, it can be information about customers, marketing strategies or processes, which are protected under trade secret law. It is a trade secret if it:

- Offers a distinctive advantage to the company in the form of economic rents
- Remains valuable only as long as the information remains private

If patents provide little protection, firms may have to rely on trade secrets. However in some industries learning curve effects and network externalities can cause increasing returns to adoption. Here a winner-takes-all market with natural monopoly can occur. This can be so profitable firms don't mind losing money in the short them by liberally diffusing their technologies (e.g. through **open source software**). Downsides are that monopoly rents are hard to regain and that diffusion can lead to fragmentation.

Wholly proprietary systems are goods based on technology that is owned and vigorously protected through patents, copyrights, secrecy or other mechanisms. Wholly proprietary technologies may be legally produced and augmented only by their developers.

Wholly open systems are goods based on technology that is not protected and that is freely available for production or augmentation by other producers.



Advantages of protection are:

- Developers of proprietary systems have **more money and incentive to invest**, a penetration pricing strategy may be used to rapidly build installed base
- **Monopoly rents** is the technology's position is secured as standard
- It gives the developing firm **architectural control**: the ability to determine the structure, operation, compatibility and development of a technology

Advantages of diffusion are:

- Open technologies stimulate the growth of the installed base and availability of complementary goods
- Competition among producers may drive the price of the technology down, making it more attractive to customers
- Both customers and complementary goods providers may perceive the technology as better if there are multiple companies backing the technology

Risks of external development are:

- External development efforts typically lack the coordination of internal development
- How improvements get incorporated into the technology can be very problematic

A firm must carefully consider the following factors in deciding whether and to what degree it should protect its innovation:

- **Product capabilities, marketing capabilities and capital** if a firm cannot provide sufficient volume, protecting too much will hinder adoption. If complementary goods influence the value of the technology, firms must
    - Be able to produce the complements in sufficient range and quantity
    - Sponsor their production by other firms
    - Encourage collective production of the complements through a more open technology strategy
- **Industry opposition against sole-source technology** if the industry is able to pose significant opposition, the firm may need to consider a more open technology strategy to improve the likelihood of being chosen as the dominant design
- **Resources for internal development** if there are too little, external development is better
- **Control over fragmentation** for technologies in which standardization and compatibility are important, external development can put it at risk
- **Incentives for architectural control** is particularly valuable if a firm is also significant producer of complements to the technology

Teacher videos week 3

Video 6

Technological innovation = creation of new knowledge applicable to practical problems. Innovations require **creativity** which is the ability to produce work that is useful and new. For an **individual** to be creative it is necessary that he looks at a problem in an **unconventional** way. Individual efforts require:

- Out of the box thinking
- Intrinsic motivation
- Risk-taking

Examples are Watt, Edison and Diesel

Changing creative ideas into successful products/services can be done in 3 ways:

1. Through **entrepreneurship** this is the traditional picture of creative people in small firms that are often established to commercialize a specific innovation
2. **Intrapreneurship** which means that ideas come from creative human beings inside existing firms.
3. **Outside the firm** companies produce products/services in an external environment that consists of:
    a. **Customers**
    b. **Suppliers**
    c. **Competitors**
    d. **Universities**

    The collaborate with these partners in order to be more successful in commercializing inventions or producing innovations than firms that do everything alone. If firms collaborate with external partners, the interaction between the actors is important. These interactions should transform an idea into a new product and are described by an innovation system.

Such an innovation system consists of the key players in an innovation process. **Scientists** are one of the key players. They do **basic research** which is research with a high value risk and therefore it is mostly executed at government funded universities. Another step is applying the insights of basic research with practical concepts with the help of **applied research** which is done in the R&D department of private funds. This leads to inventions which are concrete, practical, novel applications to real life problems that have to be shaped by **engineers** into a product. After this the **entrepreneurs** come in to commercialize the end result. All these actors interact with each other.

The effectiveness of basic R&D is often increased by collaboration between universities and firms or new business ventures. This relates to **agglomeration economies** which emerge if firms are closely related to each other in **technology clusters**. Agglomeration economies imply decline of the average total production cost of a firm due to access to the right suppliers and workers. A well known example of such a cluster is silicon valley.

Moreover, firms located closely to each other also experience **knowledge spill overs**. These are benefits generated by innovating firms that unintendedly flow to other firms in the same region/industry/technical sector.

An important cause of knowledge spill overs is the existence of **tacit/uncodified knowledge** which can only be acquired through the process of social interaction. Therefore its most easily transferable

at short distances. Opposite is codified knowledge which can be written in manuals and transported long distance.

For society as a whole, knowledge spill overs are positive as they make a firm more productive and hence leads to more economic growth. It is therefore that much attention in the literature is paid to the positive impact of outgoing knowledge spill overs from innovating firms to companies that enjoy the benefits of income spill overs. Much less attention is paid to firms that have invested much in R&D and experience the cost of outgoing spill overs.

For firms it is important to formulate a **technological innovation strategy**. Which deals with the question how to protect its innovations against outgoing knowledge spill overs. Important here is **appropriability** which is a degree to which innovative firms can capture rents from the innovation.

Protecting innovating firms or inventors through Ips such as patents, trademarks or copyrights is necessary to give them sufficient appropriability. This gives them opportunity to reach sufficient benefits and hence provides them with the incentive to continue innovating. This is not only relevant for the innovating firm, but also for society in order to gain a stream of sufficient innovation that increase welfare. The protection is temporary as this advantage, such as technology diffusion, grows stronger in the course of time.

Video: the 5 forces that make companies successful

Harvard business school professor Michael Porter: not about who is the biggest, but who is the most profitable. Profitability determined by 5 forces:

1. **Buyers**. Always want to pay less and get more
2. **Suppliers**. Ideally want to be paid more and deliver less. Powerful supplier will use their clout to raise prices or insist on other more favorable terms
3. **Substitutes**. That meet the same basic need you do. Not always apparent: toughest competitors may be from different industries.
4. **New entrants**.
5. **Existing rivals**. Intense competition reduces everyone's profitability.

These 5 forces define every industry's structure and define your companies future. Once understood better predictions, more competitive strategies and increase profits.

Teacher video 7

Strategy formulation is necessary to influence the outside world in a way that's beneficial for a company. The aim is to come to this strategy in a way that leads to sustained competitive advantage and with the **high return** on equity as a result.

Sustained competitive advantage means that a firm has a lasting strategic advantage over its competitors and therefore is expected to show a better performance. The performance can be **productivity improvement** or **profit maximization. Strategic action** is important to achieve sustained competitive advantage.

Before developing a strategic action one should know what the external environment of the company looks like. In the management literature, tools have been developed to do this: examples of tools are **Porters 5 forces** tool, and the **value net approach** proposed by brandenburger and nalebuff.

Porters 5 forces framework attempts to isolate the external factors that create threats and opportunities for the firm. It consists of a number of elements.

The first force is in the middle of the diagram: this is the degree of existing rivalry which is the competitiveness the firm encounters and hence its profit generating capacity in a relevant market. A high degree of existing rivalry leads to a low profit generating capacity.

There are four important forces that can influence the existing rivalry in a positive or negative way. These are:

- Entry
- Substitutes
- Complements
- Supplier bargaining power
- Buyer bargaining power

Entry is the ease of entering a market by new suppliers. If new suppliers can enter the relevant market easily the existing rivalry the focal firm experiences will increase and hence profit opportunities reduced.

If a firm operates in a market with many product substitutes it experiences less profit opportunities. More **compliments** on the other end lead to more profits as it boosts demand from the product on the firm. An example of complements is software that can be run on a specific dominant operating system such as windows .

Increased supplier power affects profit opportunities negatively. An example is fuel suppliers in the airline industry as aircrafts need kerosene to fly, in the short term the demand for kerosene by airliners cannot go down. Therefore if prices of kerosene increase, airlines profit opportunities are getting less.

More buyer power means that customers have power to reduce prices and it affects profits negatively. If a firms performance depends on the limited number of customers, bargaining power of customers is high which increases the existing degree of rivalry and hence profit opportunities are low. If customers experience high switching costs to other products the bargaining power is less and the existing degree of rivalry of the focal firm is going down, which leads to more profit opportunities.

Porters 5 forces tool is a **qualitative approach** that is particularly useful for assessing trends. It tells us that for incident threat of entry is high but the framework does not provide us with quantitative information such as the probability of more entry by new suppliers. The weakness of the five forces tool is that it considers all other firms as **potential threats** to profitability.

The **value net approach** to strategic thinking points out that interaction between firms can also **enhance** profit opportunities. It recognizes that both competitions coorporation are important for firms profits. The value net approach introduces the force **complementors** us as a kind of **6th force**. Complementors are businesses that directly sell a product or service that complements this product or service of another company by adding value to mutual customers.

Cooperation between firms and suppliers and improving the quality and increasing demand is in the value net approach expected to lead to a positive impact on profit opportunities. An example is Nintendo: it priced its Nintendo Entertainment System video games in such a way that software developers earned a higher profit per cartridge than Nintendo did but it led to more total sales.

Although practical tools are important for innovation strategy formulation it's good to think a bit deeper by focusing on theory. In this video the **resource based view theory** will be explained. This view considers the characteristic of a firm as the main determinant of achieving sustained competitive advantage.

Please note that the resource based view is dealing with the **characteristics of the firm** while porter's framework is dealing with the **characteristics of the external environment** of the firm

In porter's world, all firms resources are the same. In order to achieve sustained competitive advantage its necessary to implement a value creating strategy that is not simultaneously implemented by any current or potential competitors.

In the resource based view two assumptions are relevant:

- Within an industry firms are heterogeneous with regard to the strategic resources they control. This is called **resource heterogeneity**
- Resource is across firms are assumed to be immobile this is called **resource immobility**. This immobility provides the result that sustained competitive advantage is achieved

If strategic resources across firms are mobile they will flow from the focal firm to the firm that has a shortage of them. These companies are willing to pay in order to acquire them and so undermine the sustained competitive advantage of the focal firm.

The immobility of strategic resources leads to the so called **frame conditions**. These stand for 4 conditions that are necessary for sustained competitive advantage to emerge:

1. Resources are **valuable**: this means that resources contribute to value creation that is not simply implemented by another firm.
2. **Rarity** which means that resources at disposal of the focal firm have a unique character
3. Resources of the focal firm are **imperfectly imitative**: resources are hard to imitate for example due to tacit knowledge.
4. **Non-substitutability** which means that resources are hard to be substituted by other resources.

If these conditions are valid, a firm will gain sustained competitive advantage. In the resource based view the focus is on these VRIN conditions which can be fulfilled if the focal firm has fully control over its resources.

Due to globalization and increased complexity of technological innovations research and development collaboration between firms have gained importance

Three advantages of interfirm research and development collaboration need to be mentioned:

1. Interfirm collaboration leads to obtaining resources and capabilities more **quickly** than developing these in house
2. Through interfirm collaboration it is possible to **share costs and risks** that increase due to more complexity of technological innovations
3. Interfirm collaboration provides the opportunity to create a **shared standard**.

Introducing interfirm alliances or collaboration schemes means that firms cannot fully control their own resources and the VRIN conditions will be violated. Consequently the rents to be gained will be lower. Types of rents:

1. These are in the 1st place the **internal rent** which refer to rents caused by scarcity of the resource. In the resource based view this is only possible within the walls of the focal firm. In the focal firm and as an interfirm collaboration scheme, the resource will be shared with the partners and becomes less scarce. The internal rents will be driven down.
2. The second kind of rents are **appropriated relational rents** that are extracted from relation specific assets, knowledge sharing routines and complementary resources. These will also decline because interfirm collaboration schemes means that knowledge on these assets, routines and resources have to be shared.
3. **Inbound spillover rents** also occur as a result of entering an Inter firm collaboration scheme. Inbound spillover rents are in unintended gains accruing from the network partners to the focal firm
4. **Outbound spillover rents** are unintended gains from the focal firm to the alliance partners.

Inbound spillover rents increase the more the focal firm is opportunistic, the stronger its bargaining power and the larger its absorptive capacity. It **decreases** if the focal firm's alliance partners increased the strength of their isolating mechanisms, through for example intellectual property rights such as patents and trademarks.

Outbound spillover rent increase the more the focal firm's alliance partnership opportunitistic behavior, the stronger their bargaining power and the larger their absorptive capacity. It **decreases** is if the focal firm increases the strength of its isolating mechanisms.

Video - introduction balanced scorecard

Financial metrics can over-emphasize the short-term. On the long term you need to take a more balanced view. That's why Harvard Business School professor Robert S Kaplan and consultant David P Norton developed the **balanced scorecard.**

The scorecard uses four perspectives to measure your company's health:

- The **financial perspective**: are you doing well by your shareholders is only the first.
- The **customer perspective**: do they like your products and services?
- The **internal perspective:** can you efficiently deliver what your customers want?
- The **learning and growth perspective**: can you continue to improve and create value for each perspective?

You need to list both **goals** and **metrics**. Take one semiconductor company that was an early adopter of the balanced scorecard. Its financial goals were to survive, succeed and prosper. For assessment it used cash flow, orderly sales growth, market share and return on investment. Its customer goals were to develop innovative tailored products to get them to market faster and to become a supplier of choice.

To measure success managers used **percentage of sales** from new products, **on time delivery rates** and **popularity with key customers.** Looking internally, the company prioritized goals like **excellent manufacturing,** producing **new designs,** and introducing **new products** and again, developed operational measures for each goal.

Last for its learning and growth goals it decided to **focus on developing** new products **rather than improving** existing ones. The semiconductor company found that learning and innovation led to better competences and processes which in turn boosted customer satisfaction and ultimately generated better shareholder returns. In other words they learned that the **order of the balanced scorecard matters** when used correctly it reveals the real drivers of **long-term success**.

Video – Communicating strategy with the Balanced Scorecard

Short story to emphasize effectiveness. Example CEO asking employees about strategy and the pen with the strategy map

Video – Leadership and the Balanced Scorecard

Example marines who were early adopters of the balanced scorecard. Emphasizes the importance of communication.

Video – Porter's five forces

The five competitive forces start with the notion that competition is often looked at two narrowly by managers. The five forces say that yes, you're competing with your direct competitors but you're also in a fight for profits with a broader extended set of competitors: customers who have bargaining power, suppliers who can have bargaining power, new entrants who might come in and grab a piece of the action and substitute products or services that essentially place a constraint or a cap on your profitability and growth. So the five forces are kind of a holistic way of looking at any industry, understanding the structural underlying drivers of profitability.

Drivers of each of those forces that the model unveils and that you can apply to every industry are different: every industry will have a different set of economic fundamentals, but five forces help you home in on first of all, what's really causing profitability and what are the trends, where are the constraints which you can relax and might allow you to find a really strong competitive position.

Least profitable industry: airlines. If you look at five forces you see why: very competitive. Very hard to differentiate. Low entry barrier, you can rent everything. New entrants keep coming in. 'very sexy'. Customer is extremely price sensitive. Soft drinks is the opposite, very benign industry.

The framework is very robust, applies to all industries.

Zero sum competition is when the consumer gets low price, but it has no choice. Positive sum competition is where companies can compete on different attributes that are attractive for different customers. There is something for everyone.

It might be better for a market leader to expand the 'pie'/industry than to rival harder.

Identifying what the industry structure is, is important. The real question however is: how is the industry changing? How are the forces evolving and what implications does this have for strategy? How can you reshape the nature of the industry.

Everyone has got to know your strategy, it shouldn't be secret. Competition is not zero sum, multiple rivals can be successful. If your rivals know what you stand for, maybe they will make a different choice.

Week 4

Chapter 7 – Choosing innovation projects

Capital rationing is the allocation of a finite quantity of resources over different possible uses. Firms establish a fixed R&D budget and use rank ordering to determine which will be funded. The highest **R&D intensity**, ratio R&D expenditure to sales, is in the drugs industry.

Rank ordering in capital rationing can be established through a lot of methods, either quantitative such as discounted cash flow/option analysis or qualitative such as screening questions and portfolio mappings, or a combination of both.

Angel investors are private investors who fund projects without utilizing a venture capital limited partnership structure. They are often wealthy individuals who enjoy the thrill of entrepreneurship.

Venture capital funds are likely to be provided in a complex debt-equity hybrid contract that looks like equity if the firm performs well and debt if it performs poorly. If successful, venture capitalist can cash out by negotiating an initial public offering or buyout by another firm. Venture capitalist provides benefits to the startup such as credibility among investors and mentoring.

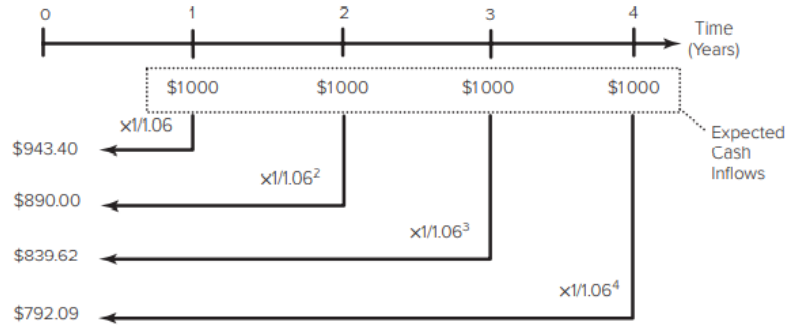
Quantitative methods for choosing projects convert projects into an estimate of future cash returns. Their accuracy can be questionable.

Discounted cash flow methods are used for assessing whether the anticipated future benefits are large enough to justify expenditure given the risk. The 2 most common forms are:

- **Net present value (NPV)** an estimate of costs and cash flows using 'what if' is made. Cost and cash flow that occur in the future must be discounted back to the current period to account for risk and the time value of money. Present value of cash inflows is compared to present value of cash outflow:

  NPV = present value of cash inflow – present value of cash outflow

  If greater than 0, it generates wealth. To find present values each cash flow must be discounted back to the current period using a discount rate.



$3465.11 Total present value, discount rate = 6%

If the cash inflow is expected to be the same each year, the formula for present annuity instead of counting each individually can be used. Here we have the present value of C dollars per period, for t periods, with discount rate r:

$$\text{Annuity present value} = C \times \frac{1 - \{1/(1+r)^1\}}{r}$$

If cash flows are expected forever, in perpetuity, the simpler perpetuity formula can be used:

Perpetuity present value = C x 1/r

Present value of cost and future cash flow can also be used to calculate **discounted payback period**, the time required to break even.

- **Internal rate of return (IRR)** is the discount rate that makes the net present value of the investment 0. You can compare the irr to the required rate of return to decide if an investment should be made. The calculation is usually done by trial and error. This measure should be used cautiously: if cash flows arrive in varying amount/period there can be multiple rates of return.

Both NPV and IRR are concrete financial estimates that explicitly consider timing of investment and cash flows. However they are only as accurate as the original estimates of profits, which are usually hard to determine. Also these methods discriminate heavily against long term or risky projects. Standard discounted cash flow analysis has the potential to severely undervalue a development project's contribution to a firm.

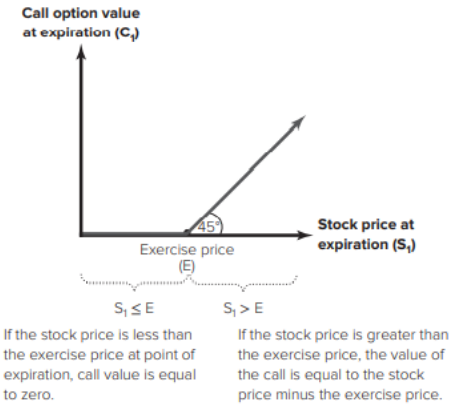
Even projects that appear unsuccessful may prove to be very valuable when considered from the perspective of the options they create for the future of a firm.

Real options are the application of stock option valuation methods to investments in non-financial assets. A **call option** on a stock enables an investor to purchase the right to buy stock at a specified price (the **exercise price**) in the future. The option holder will use the deal if the stock becomes worth more. If it doesn't, he will allow the deal to expire.

An investor who makes an initial investment in basic R&D or breakthrough technologies is buying a real call option to implement that technology should it prove to be valuable:

- The cost of the R&D program can be considered the price of a **call option**
- The cost of future investment required to capitalize on the R&D program can be considered the **exercise price**
- The returns to R&D investment are analogous to the value of a stock purchased with a call option

The value of a call stock option is 0 as long as the price of the stock remains less than the exercise price. If it rises above, the value of the call rises with the value of the stock at a 45 deg angle.



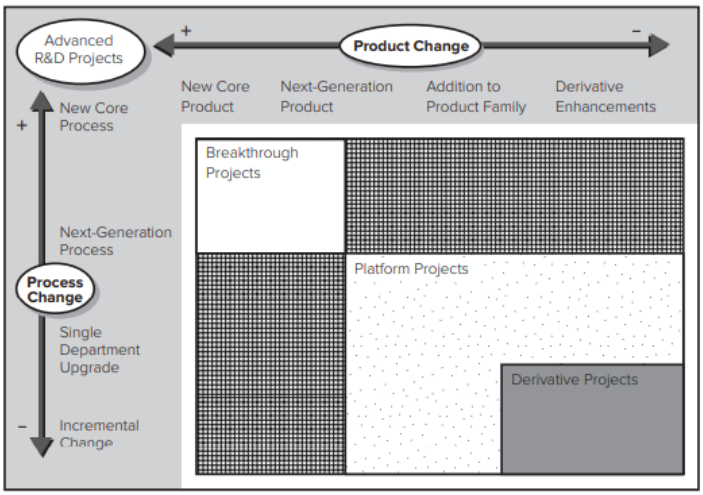
Options are valuable when there is uncertainty. Some evidence shows that options approach results in better investment than a cash flow analysis. On the other hand it may be based on the wrong assumptions: it assumes one can acquire or retain the option for a small price and wait for a signal to determine if the option should be exercised, which may be true for external firms investing but not necessarily within a firm.

Disadvantages of quantitative methods are:

- They are only as accurate as the original estimates of the profits
- They discriminate heavily against long term and risky projects
- They may fail to capture the strategic importance of the investment decision

Qualitative methods are screening methods and the aggregate project planning framework.

Screening questions can be organized into categories such as the role of the customer, the role of the firm's capabilities and the project's timing and cost. These can be used for the debate or as a scoring mechanism.



The aggregate project planning framework. An R&D portfolio can be mapped according to level of risk, resource management and timing of cash flow. Accordingly, 4 types of development appear:

- **Advanced R&D**, precursor to commercial development projects and necessary to develop cutting-edge strategic technologies
- **Breakthrough projects** involve development of products that incorporate revolutionary new product and process technologies
- **Platform projects** typically offer fundamental improvement in cost, quality and performance, designed to serve a core group of consumers
- **Derivative projects** involve incremental changes in products/processes, represents modifications of the basic platform to appeal to different niches within a core group

Companies that use the project map categorize their projects by the resources they require and how they contribute to the companies product line. It can then map the project types and identify gaps in the development strategy.

Mapping the company's R&D portfolio encourages the firm to consider both sort-term cash flow needs and long-term strategic momentum in its budgeting and planning.

Q-sort is a simple qualitative method for ranking objects/ideas on a number of different dimensions. Individuals are given a stack of cards with different ideas. Then a series of project selection criteria is presented and per criteria the individuals rank the cards. They then compare their rank orderings and debate to gain consensus over the best projects.

Combining qualitative and quantitative measures can be done through:

- **Conjoint analysis**, a family of techniques used to estimate the specific value individuals place on some attribute of choice, such as the relative value of features of a product or the relative importance of different outcomes of a development project.
  The most common use is to assess the relative importance to customers of different product attributes. Multiple regression is then used to assess each attributes influence to the overall rating, resulting in the assignment of specific weighs to individual criteria
- **Data envelopment analysis (DEA)** is a method of assessing a potential project using multiple criteria that may have different kinds of measurement units, such as cash flow estimates, a ranking of the project's potential for building desired future competencies etc. DEA uses linear programming to combine these measure to create a hypothetical **efficiency frontier**,

the range of hypothetical configurations that optimize a combination of features, that represents the best performance on each measure.

Chapter 10 – Organizing for innovation

Advantages of large firm size:

- Capital markets are imperfect and large firms are better able to obtain financing for R&D
- Firms with larger sales volume over which to spread cost have higher returns than low volume sales (Schumpeter)
- Likely to have better developed complementary activities (marketing/finance)
- Greater global reach to obtain information/resources
- Scale and learning effects: through investment in R&D firms develop competencies in the new product development process
- Better position to take on large/risky innovation projects

Disadvantages of large firms:

- R&D efficiency might decrease due to loss of managerial control and it becomes increasingly difficult for individual entrepreneurs to appropriate returns of the efforts > less incentive
- Less innovative as size makes them less responsive to change: more bureaucratic inertia

Advantages of small firms:

- More flexible and entrepreneurial
- More simple to monitor and reward employees
- More motivated to choose projects carefully due to less resources

To encourage entrepreneurial culture, big firms can break up into smaller subunits: **disaggregation**.

Key structural dimensions are:

- **Centralization** the degree to which decision-making authority is kept at top levels of the firm VS **decentralization**. Advantages of centralized R&D are:
    - It may maximize economies of scale, enabling greater division of labour, maximizing potential for learning curve
    - Enables the central R&D department to manage the deployment of new technologies, improving coherence

  Advantages of decentralized R&D are:
    - It enables division to develop products that closely meet their particular needs
    - The solutions are more likely to fit within operating structure
    - Firm can take advantage of diversity of knowledge from different divisions

  A highly centralized firm may be better able to make a bold change in overall direction. Decentralized firms may be better able to respond to change.
- **Formalization and standardization**. Formalization is the degree to which the firm utilizes rules, procedures and written documentation to structure the behaviors. Standardization is the degree to which activities in a firm are performed in a uniform manner. If a firm codifies all, it may stifle creativity

The combination of formalization and standardization results in a **mechanistic structure**, often associated with greater operational efficiency, especially in large volumes. Often deemed unsuitable for innovation.

Organic structures are characterized by low levels of formalization and standardization and often considered better for innovative and dynamic environments.

An **ambidextrous organization** is a firm with a complex organizational form that is composed of multiple internally inconsistent architectures that collectively achieve both short term efficiency and long term innovation. Use mechanistic structures in some parts and organic in others.

When multiple teams interact closely, there is a risk that a solution that appears to have an advantage will be too rapidly adopted by the other teams, causing them all to converge. To counter this **skunk works** can be used to gain significant from isolating from the rest of the organization to explore alternatives.

A single organization may have multiple structures, cultures and processes. This can also be achieved through alternating through different structures over time. Such firms can use **quasi-formal structures** in the form of teams, task forces and dotted-line relationships. An advantage is that they form interactions based on interest instead of hierarchy.

Another method in which firms find a balance between efficiency and flexibility is to adopt standardized manufacturing platforms/components that can be mixed and matched in a **modular production system**.

Modularity is achieved in product design through the specification of standard interfaces. Modularity can enable firms to upgrade their products without replacing their entire system. Modularity allows **heterogenous customers** to choose a configuration that meets their preferences.

Organizations can also be made modular through the adoption of **loosely coupled structures** where development and production are not tightly integrated, but share objectives and standards. Advances in information technology have enabled loosely coupled structures to be more common.

Less need for integration through loosely coupled structures allows firms to specialize more on their core competencies, while obtaining other activities through alliances/outsourcing. This can cause whole industries to be transformed as large vertically integrated firms are displaced by specialized producers. Disadvantages of loose coupling are:

- Activities that require tacit or explicit knowledge cannot be managed
- Neither firm may possess the authority to resolve a dispute

Innovation across borders for multinationals. The customization of products and processes to the local markets make them particularly difficult to transfer to divisions serving different markets. Divisions accustomed to their own innovations may be reluctant to share them with others for fear of giving away proprietary knowledge and by reluctant to adopt other innovations as they are not developed locally, the **not-invented-here syndrome**. However, much of the innovation potential from a multinational is the potential for innovation into multiple markets. There are 4 primary strategies used by multinational firms:

- **Center-for-global strategy** when all innovation activities are conducted at a central hub and innovations are diffused throughout the company. This centralization enables management to:
    - Tightly coordinate all R&D activities
    - Achieve greater specialization and economies of scale in R&D activities while avoiding duplication
    - Develop and protect core competencies

    - Ensure that innovations are standardized and implemented throughout

  This strategy is best when there's a strong desire to control a technology, strong concerns about protection, when development required close coordination or when there's a need to respond quickly to technological change. However, not very responsive to diverse demands of different markets
- **Local-for-local strategy** when each division of the firm conducts its own R&D, tailored for the needs of the local market, opposite of center-for-global. Best when divisions are very autonomous and markets are highly differentiated. Downsides are that it can result in 'reinventing the wheel'
- **Locally leveraged strategy** is when each division of the firm conducts its own R&D, but the firm attempts to leverage resulting innovations throughout the company. This enables a firm to take advantage of diverse ideas and resources, while leveraging innovations across the company. Very effective in if different markets have similar needs.
- **Globally linked strategy** when innovation activities are decentralized, but also centrally coordinated for the global needs. This strategy is powerful in its ability to tap into global resources, but also expensive in time and money as it requires intensive coordination.

In both locally leveraged and globally linked, R&D is decentralized and linked to each other. The difference is in the missions of the R&D: in locally leveraged, the divisions are independent and work on the full scope of development activities. In the globally linked strategy, R&D divisions are decentralized, but play a different role in the global strategy and specialize in a particular activity. The role of this division should exploit some local resource advantage.

Firms can take a **transnational approach** by:

- Each division must recognize its dependency on the other divisions of the firm
- Utilizing integration mechanisms across divisions such as division spanning teams
- Balancing the organizations identity between its national brands and global image.

Week 4 – Teacher videos

Teacher video 9

Implementation of a Technology Strategy requires knowledge on innovation projects. In the first place it's important to know how to choose relevant innovation projects and 2nd we need knowledge on what kind of organization is most conducive to implement technology successfully.

The question how to choose innovation projects deals with methods to select projects that contribute most to the firms competitive advantage. Companies have limited means to execute innovation projects and therefore have to choose what to do and what not to do .

The industrial sector to which the firm belongs is an important environmental characteristic that affects the innovativeness of the firm. The probability to be innovative and hence the budget available for innovation projects is higher if the firms is in pharmaceutics. If the firm is in textiles the probabilities lower

A number of methods to choose innovation project exists. Some of them are

- the net present value method
- the real options method
- the conjoint analysis method

Net present value is a standard technique to calculate the expected value of the net cash flows of a project. The cash flows of innovation projects can be highly uncertain and therefore the net present value method is **not preferred**.

Taking into account the uncertainty of innovation projects the **real options approach** provides more flexibility to change choices during the implementation of the project. A real life example is the option offered by aircraft producers to their airline customers to cancel or downsize orders.

Conjoint analysis is a technique used to estimate the value customers put on new attributes of newly innovative products or services.

In order to implement Technology Strategy successfully, strategic commitment is required. The aim of **strategic commitment** is to force competitors to alter their behavior such that it benefits the focal firms competitive advantage. In order to do so it is necessary that have strategic commitment **visible**, **understandable** and **credible.**

These requirements have a signaling function to competitors. That means they see strategic actions of the focal firm are serious and cannot easily be reversed. High upfront investment costs and non-redeployable investment in transactions specific assets show, that a commitment is irreversible.

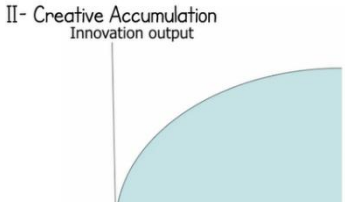
A strategic commitment example is the investment decision of Airbus to invest in the high capacity A380 project and the decision of Boeing to invest a lot of money in developing a smaller capacity Sony cruiser. While both firms were competing in the same market.

Airbus continued developing the A380 which is a high capacity aircraft although Boeing had much more experience in developing high capacity airplanes. The credibility of Airbus' commitment to build the aircraft was enhanced as it received over 60 early orders from high profile customers like Singapore Airlines and Qantas airlines. These orders increased visibility of the commitment and it showed that it was not possible to back down without reputation damage.

With respect to the question what kind of organization is most conducive to successful implementation of a Technology Strategy the **size of the firm** appears to be an important indicator.

The Austrian American economist Joseph Schumpeter developed two notions on the relationship between firm size and innovation output:

- his first notion is **creative destruction** leading to more competition through free entry of new firms which forces the entrepreneurs to continue innovating
- his second notion was developed 30 years later and is **creative accumulation** which is the idea that innovations arise mainly from large companies because these have more financial resources to deal with the uncertainty of innovation processes.



The second version is shown in the concave curve relating the size of a company to its innovation output. It implies that innovation output increases if the size of the firm increases. However the larger firms grow the less the innovation output will go up. The explanation of the concave shape of the curve is the increasing cost of bureaucratic procedures. if the employment size of an innovating firm is growing, more controls and cost unnecessary to monitor people.

Bureacratisation of larger innovating firms calls for different organizational forms than formalized, standardized and centralized organizations. An alternative is the **ambidextrous** organization which is composed of multiple internally inconsistent architectures that together can achieve short-term efficiency and long-term innovation. An example is a firm with small diverse specialized biotechnology units and a large pharmaceutical unit. The specialized units yield new combinations and the large unit is well equipped to deal with a lengthy process of regulatoral approval of new drugs, a large scale production and marketing of new products as well as the spread of risk across a portfolio of products.

Teacher video 10

Practical management tools such as Porter's 5 forces framework are static. These tools describe external threats against and opportunities in favor of profits at one moment in time. The formulation of a Technology Strategy also requires knowledge what strategic changes in the future might affect the choice of relevant innovation projects. In other words a more dynamic view is necessary.

As the future is difficult to predict, especially in the long term, strategic changes in the future can only be described broadly. Nevertheless it's important to pay attention to a broader view of the future. Particularly in present times of fast technological change.

Two future challenges are relevant for innovating firms these days

- The first one is to find solutions for the increased inefficiency of innovation processes
- The second challenge is to fulfill the needs of marginalized and poor groups in the world in a way that leads to sustained competitive advantage and hence profit opportunities for innovating firms.

Strategic innovation management is about control and reduction of the uncertainties of innovation processes by **routinization, standardization** and **organization.** Although it is rational for an innovating firm to reduce uncertainties that are inherent to the innovation process, it is at odds with flexibility that is required to adapt to show you challenges.

Innovating companies invest a lot of money in research and development and are keen not to lose that. For instance the 6 Sigma approach of Motorola is aiming at eliminating defects such that there is a statistical expectation that almost 100% of manufactured products are free of defects. This reduces the efficiency of innovation processes.

The external environment of innovating firms has grown increasingly complex in the last 25 years. **Fast technological change** in the field of information and communication technologies and **globalization** are the main causes of this increasing complexity.

ICT technologies have led to less homogeneous markets thereby increasing competition for existing innovating companies. Globalization has resulted in rising incomes in many developing and emerging economies, which has provided new market opportunities for many new technological firms that originate in non Western countries. Examples are Tata from India or Huawei from China and there are many more.

Two management theorists Prahalad and Hammond paid attention to the opportunities of western multinational firms to serve in a profitable way the needs of poor resource constrained consumers that have to live in the bottom of the pyramid.

Multinational corporations aim for capturing value that means creating and seizing profit opportunities in bottom of the pyramid market. However their size and access to superior technology and global resources allow them at the same time to contribute to value creation in the local economic environment.

From a strategic perspective doing business in bottom of pyramid markets requires rethinking technology strategies and business models that are able to deliver on both v**alue capturing** and **value creation.**

Resource constrained environments consist of customers that are willing but mostly not able to pay for new products and services. What is necessary are new designs reducing the costs as well as taking into account the different **local, cultural** and **institutional** environment in which bottom of pyramid customers have to live.

Multinational companies can contribute to value creation and hence poverty alleviation by building **polycentric supply chains.** That means that they collaborate in the development and production of the newly designed products services or systems with local actors such as local entrepreneurs, communities and non-governmental organizations.

The paper by Seelos and Mair provides 2 case studies of innovative products for bottom of the pyramid consumers by collaborating firms that try to find successful business models aimed at delivering on both value capturing and value creation. The British weekly the economist related in 2008 the discussion started by Prahalad and Hammond to the phenomenon of frugal innovations. **Frugal innovations** are designed or redesigned products services or systems that are produced at very low costs but without sacrificing user value. The two main characteristics are

- Affordability
- Being technologically achievable

An example is the frugal weather stations a technological system aimed at providing information on weather predictions at a very low price for low income farmers in Africa. Another example is the Nokia 1100 which is a high quality cell phone with only voice and text features and supplied at very low price.

Reversed innovations are frugal innovations that are redeployed from low income to high income markets in order to attract cost minded customers over there. An example is General Electric's logic book this is a portable ultrasound device for imaging which is relevant for diagnostics in remote rural areas in developing countries. Nowadays it is also used in Western countries in doctor's offices that are too small for the very expensive stationary machines.

Teacher video 11

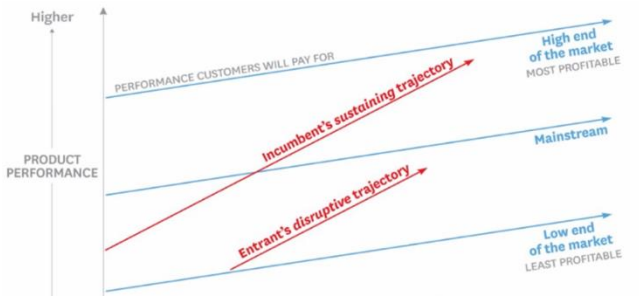
In video 3 (teacher video 8) the resource based view prescribed the conditions that help firms to become and remain successful by achieving sustained competitive advantage. This requires practical choices with regard to innovation projects and organizational structures that can deal with present and expected challenges in markets and society successfully as was explained in videos four and five.

In this video we go one step further by investigating what can happen when firms have fulfilled all conditions of successful sustained competitive advantage but still can lose it to unexpected competitors. It is described but in theory of disruptive innovation as developed by professor Clayton Christenson. It provides an explanation for the observation that well managed firms with sustained competitive advantage tend to overlook important things leading to disruptive innovations: that is the beginning of the decline as a market leader.

The disruptive innovation theory starts with an incumbent firm that aims to sustain its competitive advantage by focusing on the preferences of the existing customers. This is understandable as existing customers are only willing to pay for a product or service that fits their preferences. More precisely the **theoretical notion of disruptive innovations** consists of three components:

- The first one is the phenomenon that techn**ological change disturbs the existing customer preference trajectory** as it generates new technical attributes that do not fit the preferences of all existing customers. Incumbent firms start producing more advanced products than customers need. They are overserving the markets. But why do they do that? >
- The second component which focuses on the **difference between sustained and disruptive** innovations. Incumbent firms improve products and services they supply along the dimensions of performance that mainstream customers care about. These are **sustained innovations** which are offered to the best existing customers at higher prices and hence higher profit margins. Supplying these high ends of the existing one is a rational strategy to follow as it contributes to the incumbent firms profits. In contrast to sustained innovations, **disruptive innovations** deviate from the performance dimensions of mainstream customers. They are inferior to sustained innovations and do offer a new mix of attributes supplied at lower prices, that is attractive to **fringe customers.** These fringe customers consist of two groups:
    - The first group is a small number of existing customers that consider the price Fsustained innovations becoming too high
    - The second group are customers that were non customers to the incumbent firm before. Very often new opportunities for disruptive innovations arise at low end of existing market or in new markets. Why do incumbent firms not jump on these disruptive innovations? >
- The third component: the preferences of existing customers and established product models constrained the incumbent firms investments in new innovations, developing new disruptive innovations is always risky and expensive but they might come at the expense of the still

large group of existing customers that were happy with the established product or service and still are happy with the incumbents nearly developed sustained innovative product or service. New firm entrants do not have the risk of losing existing customers. Moreover as prices at the low end of the existing markets and new markets are lower, disruptive innovative product versions are less profitable and hence provide new barrier for the incumbent to join the low end of the market that new firm entrance do not experience.



The theory of disruptive innovation has been examined and validated by studies on several industries such as semiconductors, pharmaceuticals, printing and newspapers, and computers.

An example of disruptive innovation is the competition between computer giant IBM on the one hand and Microsoft and Apple on the other hand. IBM produced mainframe computing facilities in the 1970s and 1980s and missed the market for personal computers that Microsoft and Apple claimed and which were technically much simpler. Why was that? Because IBM listened mainly to its existing customers. These customers were large governments and industrial clients that saw no immediate use for personal computers. The personal computers also showed an inferior performance to mainframe computers. For new customers such as households that was fine. Households were non-customers in the mainframe computing power market, but now there were new customers it was served by the disruptive forces of Microsoft and Apple.

The theory of disruptive innovation has been criticized in the academic literature. For example in their paper in the MIT Sloan management review Andrew King and Baljir Baatartogtokh argued that many real life cases do fit the theories, key conditions and predictions well.

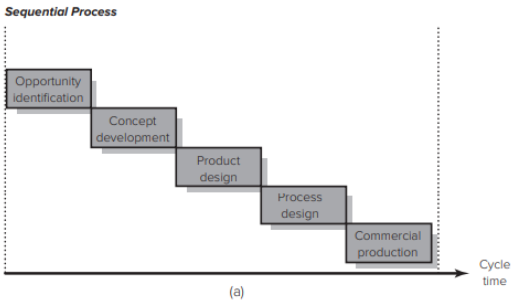
In their Harvard Business Review paper Christeson Raynir and mcdonald stated that the theorist core concepts often have been misunderstood and misapplied. The term disruptive innovation has become very popular meaning something like putting everything upside down. In the theory just explained disruptive innovations have a specific meaning and are driven by clearly distinctive mechanisms. That means that many innovations that might look pervasive as they turn everything upside down in an existing market are not necessarily disruptive. An example is Uber taxi services as discussed in the earlier mentioned Harvard Business Review paper.

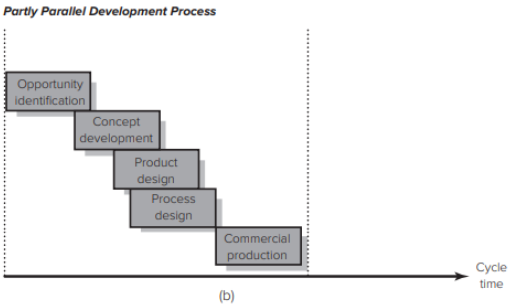
Week 5

Chapter 11 – Managing the New Product Development Process

For new development to be successful, it must achieve 3 sometimes conflicting goals:

- **Maximizing fit with customer requirements** for a new product to be successful it must offer more compelling features, greater quality or more attractive pricing. It may fail to achieve this because of:
    - The firm may not have a clear sense of which features customers value most
    - Firms may overestimate customers willingness to pay for some features
    - Firms may have difficulty resolving heterogeneity in customer demands
- **Minimizing development cycle time.** Many development costs are related to time, a company that is slow to market is unlikely to be able to fully regain fixed costs and faster companies can upgrade its design if there are flaws
- **Controlling development costs** if too high a firm cannot recoup expenses: development must not only be effective but also efficient.





To shorten development process many firms have **partly parallel development processes** enabling much closer coordination between the different stages and eliminating time consuming iterations.

One type of parallel development process is **concurrent engineering**, a design method in which stages of product development and planning for later stages of the product cycle occur simultaneously. It also has risks when significant changes are needed, mainly in industries with rapid change/uncertainty.

Senior executives have the power and authority to support and fight for a project: a **champion**. He can stimulate communication and cooperation between different functional groups, which can improve the effectiveness of the development process. It also has risks: A manager's role as champion may cloud judgement about the true value of a project. Firms may benefit from also developing 'anti-champions' who can be the devil's advocate. Some facts about champions are:

- While they improve likelihood of a project being completed, they don't improve market success
- They are more likely to support projects that benefit their own department
- They are equally likely to be involved in radical as in incremental innovation
- They may arise from any level of the organization
- They may be from anywhere in the firm, not just marketing

Customers can be involved in the new product development process as information source or as co-developers by doing **beta-testing**.

In **Agile development processes** the product is divided into many smaller features which are rapidly developed into **minimum viable products** and presented to the customer for feedback, enabling rapid incremental adaption.

Lead users are those who face the same needs of the general marketplace but are likely to experience them for months or years earlier and stand to benefit disproportionally from solutions in those needs.

This also goes for involving suppliers, either as actual team members or as alliance partners, to increase efficiency.

Firms can also open up innovation by directing an **innovation challenge** to third parties. **Crowdsourcing** challenges typically go through a 4 step process:

1. **Need translation**, industry jargon is reduced to a minimum, bringing the challenge down to basic science. This **request for proposal** or **need statement** is usually a short 1-2 page document
2. **Connecting** the challenge must be broadcasted to a network
3. **Evaluation/selection**
4. **Acquisition** usually involving a monetary compensation

The most prominent tools used to improve the deployment process include:

- **Stage-gate processes** to prevent projects to be supported too long, **go/kill decision points** can be implemented. The stage-gate process provides a blueprint for moving projects through different stages of development. At each stage, a cross-functional team does parallel activities. Preceding each stage is a go/kill gate. Each gate has 3 components **deliverables, criteria** and **outputs**. As each stage costs more than its preceding one, this breaks it up into incremental commitments.
- **Quality function deployment (house of quality)** is a comprehensive process to improve communication and coordination. The house of quality matrix has a series of steps:
    - Identify customer requirements
    - Customer requirements are weighted from a customers perspective
    - Engineering attributes that drive performance are identified
    - The correlations between engineer attributes are added
    - The body of the matrix is filled with the strengths of relationships
    - The customer importance and relationship to its engineering attribute are multiplied
    - Competition is evaluated
    - Relative importance rating are established for competing products
    - A design is created

  A great strength is that this provides a common language framework
- **Design for manufacturing** to bring design into the process as early as possible. In the figure a set of commonly used design rules along with their expected impact on performance is listed

Design Rule	Impact on Performance
Minimize the number of parts	Simplifies assembly; reduces direct labor; reduces material handling and inventory costs; boosts product quality
Minimize the number of part numbers (use common parts across product family)	Reduces material handling and inventory costs; improves economies of scale (increases volume through commonalty)
Eliminate adjustments	Reduces assembly errors (increases quality); allows for automation; increases capacity and throughput
Eliminate fasteners	Simplifies assembly (increases quality); reduces direct labor costs; reduces squeaks and rattles; improves durability; allows for automation
Eliminate jigs and fixtures	Reduces line changeover costs; lowers required investment

- **Failure modes and Effects analysis** is a method by which firms identify potential failure modes, classify them on **risk = severity** x **likelihood of occurrence** x **inability of controls to detect it** and put a plan in place to prevent them.

- **Computer aided design/computer aided engineering/computer aided manufacturing** are the use of computers to build and test product design. CAD enables the creation of a 3D model, CAE makes it possible to virtually test characteristics, CAM is the implementation of machine controlled processes in manufacturing, more flexible and faster than traditional manufacturing. An example of CAM is **three-dimensional printing** (additive manufacturing)

Measures of the success of the new product development process can help management to:

- Identify which projects met their goals and why
- Benchmark the organizations performance compared to that of competitors or to own prior performance
- Improve resource allocation and employee compensation
- Refine future innovation strategies

Multiple measures are important because any measure used singly may not give a fair representation of the effectiveness of a firm's development process/overall innovation performance.

To use methods to gauge effectiveness and efficiency, it is important to first define a finite period in which the measure is to be applied in order to get an accurate view of the company's current performance.

Firms also use a variety of measures to assess overall performance such as:

- Return on innovation
- Percentage of projects that achieve their sales goals
- Percentage of revenues generated by products developed in the past 5 years
- Ratio of successful projects of total portfolio

Chapter 2 – a helicopter view of entrepreneurship

Entrepreneur is one who undertakes an enterprise, one who owns and manages a business; a person who takes the risk of profit or loss. Entrepreneurship is the act of being an entrepreneur: it goes beyond start-up and management as it can be equally applied to those working in larger organizations.

Entrepreneurship is a management style that involves pursuing opportunity without regard to the resources currently controlled. Howard Stevenson's definition includes:

- Pursuit of opportunity
- Rapid commitment and change
- Multi-stage decision making
- Using other people's resources
- Managing through networks and relationships
- Compensating for value created

Entrepreneurship along with the development of innovative scientific ideas is a major mechanism for ensuring both wealth creation and distribution. Over time 3 theories emerged:

1. **Classical capitalist economic theory**. By Adam Smith
2. **Neoclassical theory**. The 'invisible hand' guides the market. Perfect markets are defined by:
    a. Having many buyers and sellers, no single one has price influence
    b. Prices are set by the operation of the market: sales
    c. Products and services must all be equivalent in content so they differ only in price
    d. All buyers/sellers have complete knowledge of the market
3. **The Austrian school**. Schumpeter argues entrepreneurship was too important to capitalism to be ignored. The process of **creative destruction** destroyed static markets and created dynamic markets with changes in buyer and supplier behavior.

There are different types of entrepreneurs:

- **Nascent entrepreneurs** – thinking about it
- **Novice entrepreneurs** – first time out
- **Serial entrepreneurs** – several businesses in sequences
- **Habitual entrepreneurs** – several business in parallel
- **Entrepreneurial managers** – characteristics of entrepreneurs but work for an employer

Stevenson suggested entrepreneurs have a number of personal traits including:

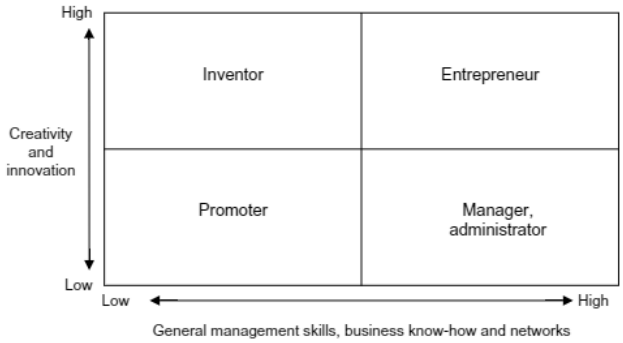
- Tolerance for ambiguity
- Ability to create the illusion of stability
- Risk management
- Attention to detail
- Endurance
- Long-time perspective

He also defined 6 critical dimensions of business practice and their extremes:

Entrepreneur	Key business dimension	Manager
Opportunity driven	Strategic orientation	Resource driven
Quick and short	Commitment to opportunity	Long and slow
Minimal with many stages	Commitment of resources	Complete in a single stage
Use or rent	Concept of control	Own or employ
Networks with little hierarchy	Management structure	Formalised hierarchy
Value-based and team based	Compensation and rewards	Individual and hierarchical

Jeffrey Timmons found that successful entrepreneurs share the following common attitudes:

- Work hard and driven by intense commitment and determined perseverance
- Optimistic outlook
- Strive for integrity
- Burn with the competitive desire to excel and win
- Dissatisfied with the status que and seek opportunities to improve almost any situation
- Use failure as a tool for learning
- Eschew perfection in favor of effectiveness
- Believe that they personally can make a difference



Wiliam Bygrave summarized these important characteristics in the 10 Ds:

- **Dream** – entrepreneurs have a vision and the ability to implement it
- **Decisiveness** – swiftness is key factor in success
- **Doers** – implement asap
- **Determination** – total commitment
- **Dedication** – and work tirelessly
- **Devotion** – love what they do
- **Details** – must be on top
- **Destiny** – want to be in charge of own destiny
- **Dollars** – not prime motivator, but measure of success
- **Distribute** – ownership with key employees

The entrepreneurial process consists of 3 stages:

- **Innovation phase** time when entrepreneurs generate and select ideas for new products/services
- **Implementation phase** a triggering event and the acquisition of capital and other resources
- **Growth phase** the success of the new venture and the need to acquire managerial skills

The forces behind an entrepreneurial process are:

- Driven by opportunity
- Driven by lead entrepreneur and entrepreneurial team
- Resource thrifty and creative
- Depends on the fit and balance among these and
- Is integrated and holistic

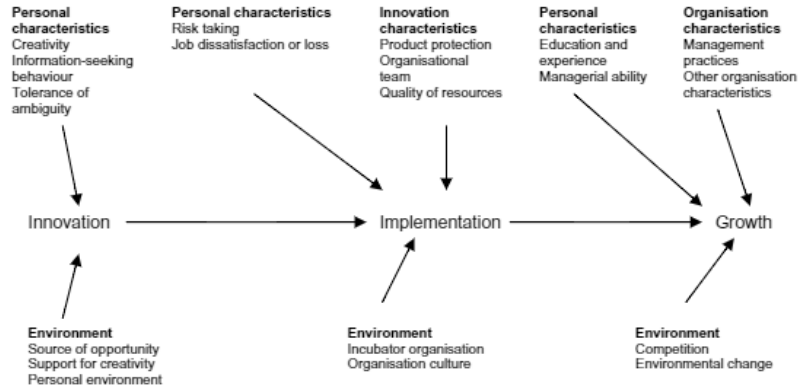


Figure 2.3 The entrepreneurial process

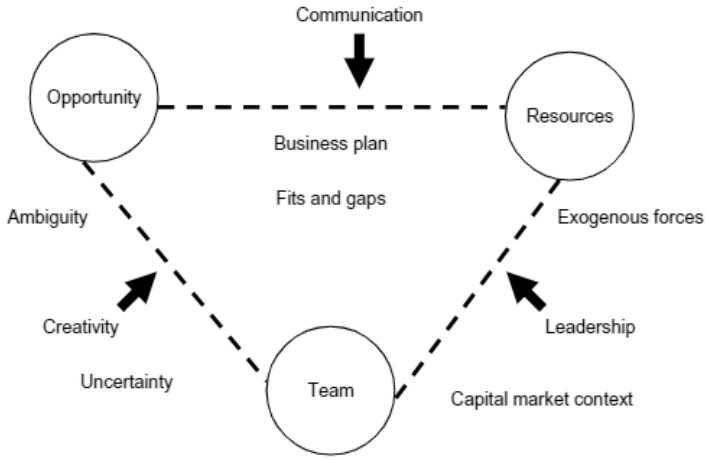


Figure 2.4 Timmons Model of the entrepreneurial process

At the heart of the entrepreneurial process lie opportunities. At the beginning resources need to be minimized and controlled, instead of maximized and owned. The team also is a key element. These 3 main elements are integrated together in the **business plan**.

The distinguishing features of newer entrepreneurial degree programs in universities are:

1. Coverage of core basic area topics from the vantage point of startups
2. Knowledge pertaining to entrepreneurship in particular
3. Skill practice in persuasive communication in writing, oral presentation and one-on-one negotiations

4. More emphasis on creative thinking and synthesis
5. Authentic involvement in real-time ongoing entrepreneurship
6. The creation of program venture plans by students
7. Practice in identification of opportunities stimulated around frontier technologies and path-breaking ideas
8. Exposure to role models of entrepreneurship

There is a growing body of literature which is trying to understand how entrepreneurship works, but so far without success. The conclusion so far is:

> 'There is definitional and conceptual uncertainty and that outputs and outcomes are unmeasured in any consistent way, so we do not yet know if any of it makes sense'.

Although for scholars the field can seem confusing, bearing in mind that society itself needs a great variety of individuals to fill its different needs, perhaps the fact that there is such a variety of offerings is a strength. The weakness may well be that the variety is an accident of incompetence and lack of understanding rather than a deliberate act of well-informed entrepreneurship educators.

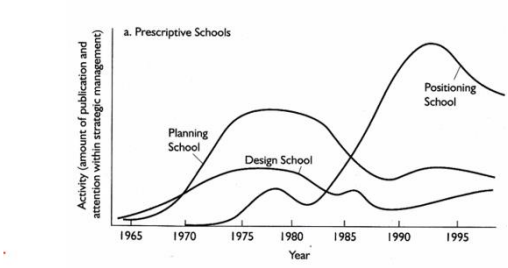
Lecture 11-3

Frederick Taylor is the 'father of **scientific management'**. He was hired to look into how production was done and determined there was 1 best way to do a job. He stated that if you cannot measure, you cannot manage. He split jobs into smaller tasks, create **specialization**. Focus on productivity by the carrot and sticks method. Compensate workers to get their work don > **Taylorism of management**.

Taylorism was a shift from intellectual thinking on the worker's part to just blind, unquestioning following a set of rules.

Innovation got stifled but productivity resulted. This resulted in **Fordism**: mass production. A fast-low cost form of production.

Taylorism helped to produce so effectively that the USA could outdo their enemies in WWII in numbers produced. This led to **post war scientific management** or the **school of deliberate thought**.



You need to focus on people and resources and put them in the right position in your organization, specialization allows you to stay competitive due to low prices. You can keep out competition in that way. This is the way of thinking in the prescriptive schools. It requires:

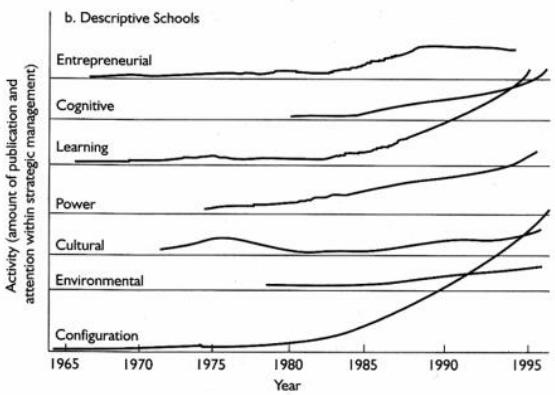
- Rationality
- Predictability
- Data availability

Strategy follows standard rules and regulations. This was following the Taylorism of plan, design and then execute.

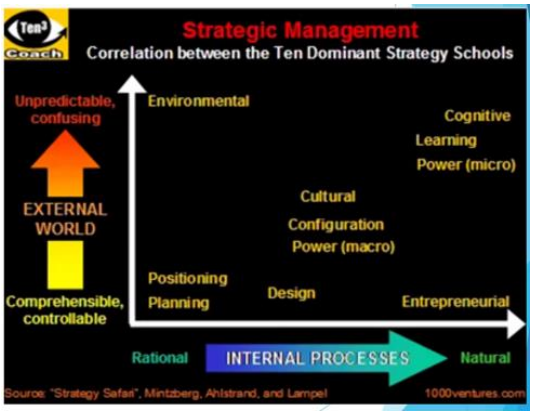
Later in the 70s this became more difficult, mainly because the environment changes. So the **school of emergent thought** arose. Mintzberg proposed to be more flexible, we have to accept we **cannot** always rationalize. Scientific management only works in a stable environment. Emergent requires:

- Flexibility
- Change
- Opportunities

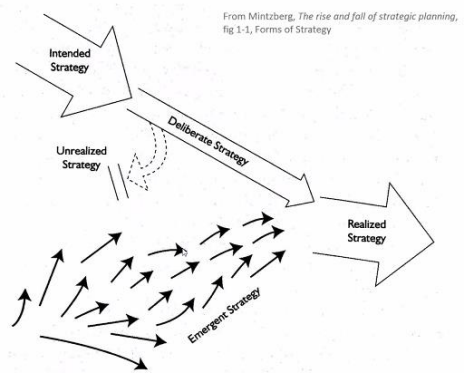
You see Extemporanous composition: learn design and build on the fly. We do not organize before, but as we do it we learn and adapt from the data. Less efficient, but more flexible, more chance to tap into new opportunities and surprises.



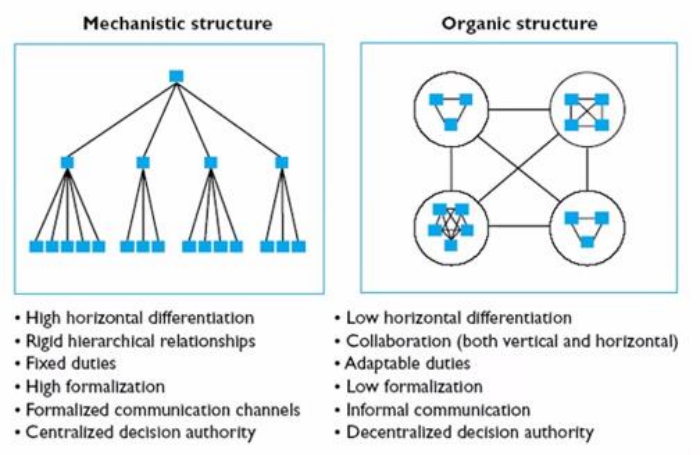
Mintzberg describes different views on how strategic decisions are made. The Ten schools of Thought model is a framework that can be used to categorize the field of strategic management.



Henry Mintzberg said there is an intended strategy and deliberate but not everything works > emergent.



Burns and Stalker studied the relationship between the environment, management and organizational design. How can they see how managers respond and organize their businesses accordingly. They studied upcoming technologies, that first started unable to rationalize. They found some firms could adapt more easily to the changing environment > why? > management



Mechanistic is about the carrot and stick methodology, works very well if everything is clear. Still seen today at e.g. McDonalds. **Organic** better for being flexible, when in need of adapting to the environment. **Decentralization**. Where decisions are made closer to the environment.

Burns and Stalker (1961)

FEATURE	*MECHANISTIC*	*ORGANIC*
Task definition	Rigid & highly specialized	Flexible; less specialized
Coordination & control	Rules & directives imposed from the top	Mutual adjustment. Cultural control
Communication	Mainly vertical	Horizontal & vertical
Commitment & loyalty	To immediate superior	To the organization & its goals & values
Environmental context	Stable with low tech-nological uncertainty	Dynamic, ambiguous, high technological uncertainty

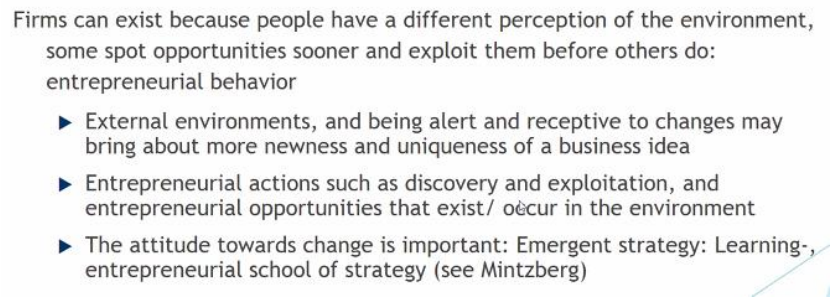
The heart of entrepreneurship. The **strategy paradigm** is focusing on **effective implementation**: analyse – design – execute. Firms can exist because they are heterogenous, they are different because they have different resources, differentials among firms.

This boils down to the **VRIN** conditions: resources that are valuable, rare, in-imitable and non-substitutable. Difficult to patent or imitate. If you can keep them rare, this brings a **sustained competitive advantage**.

The entrepreneurship paradigm has a different approach. It states these resources bring a risk, if they don't fulfil the needs of new customers/opportunities, which is dangerous. Entrepreneurship is not following the resources, it is concerned with opportunities and locus of individual action

Firms can exist because people have a different perception of the environment some sport opportunities sooner and exploit them before others do: entrepreneurial

Eternal environments, and being alert and receptive to changes may bring about more newness and uniqueness of a business idea.



Stevenson and Gumpert asked themselves, how do people respond to change? 2 types:

1. Defensive and try to keep things as they are: keep the status quo
2. Proactive and embrace change or even invoke change

Defensive/ reactive

1. What resources do I control
2. What structure determines our organisations relationship with the market
3. How can I minimize the impact of others
4. On my ability to perform?
5. What opportunity is appropriate

Entrepreneurship is the pursuit of opportunity, regardless of resources controlled.

People try to stick to what they know. Also because for example explaining to shareholders to move to a different market, with uncertainty, is very hard. It is not necessarily because they don't **see** the opportunity, but due to **path dependency**, any money spent on current equipment makes it harder to be flexible enough.

Also when looking at the way incentives in organizations work, we cannot pre factor opportunities in a budget, this takes at least 6 months to pursue an opportunity, but the hierarchical/scientifical management approach makes it first needs to be analyzed. You want to have a formal process.

The other response to change is offensive/proactive. Later extra sentences: how do you gain control. Current entrepreneurs rather work with resources of someone else. If Plan A is not a success, we get rid of the resources we don't need anymore. You **don't want to be path dependent.** Entrepreneurs think in **opportunities** and **collaboration** instead of resources.

Offensive/ proactive

1. Where is the opportunity
2. How do I capitalize on it
3. What resources do I need
4. How do I gain control over them
5. What structure is best

- Strategic focus
  - Administrator
  - Top-down
  - Learn and apply
  - Transaction
  - Resource view
  - Stabililty, continuity
- Entrepreneur focus
  - Promotor
  - Bottom up
  - Learn and unlearn
  - Transformation
  - Knowledge view
  - Change, adapt

Difference between a strategically focused manager and an entrepreneurial focused one.

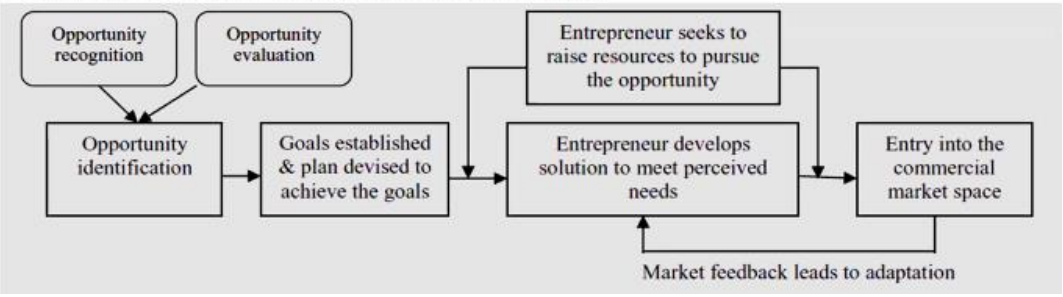
	Promotor		Administrator
Strategic orientation	Driven by perception of opportunity	← →	driven by controlled resources
Episodic use or rent of required resources	Many stages with minimal exposure at each stage	← →	Ownership or employment of required resources
Management structure	Flat, with multiple informal networks	← →	Hierarchy, authority and routinized for productivity
Reward philosophy	Based on value creation	← →	Based on responsibility and seniority
Growth orientation	Rapid growth is top priority; risk accepted to achieve growth	← →	Safe, slow and steady
Entrepreneurial culture	Promoting broad search for opportunities	← →	Opportunity search restricted by resources controlled, failure punished

Entrepreneur VS manager attitude. A competitive landscape requires both effective entrepreneurial and strategic actions. There's:

- Advantage seeking behaviour (strategy)
- Opportunity seeking behavior (entrepreneurship)

How to plan for a business? Entrepreneurship has a **paradox** in itself. We want to pursue the opportunity yet we also want to know what we need to do > **unpredictable**.

Schematic approach to develop a business plan



Creation of new ventures is a causal-planned, goal oriented, return maximizing approach to venture development. It feels natural to see this as a linear approach.

Business planning makes the

- product development cycles faster,
- firm failure rates lower,
- financial returns greater,
- innovation levels higher.

In education, business planning Is rated as the most important skill by entrepreneurship professors which leads to a paradox, as entrepreneurship itself is basically unplannable:

Paradox:

- Entrepreneurship requires considerable thought, preparation and planning, yet it is a basically unplannable event
- For creativity and innovativeness to prosper, rigor and discipline must accompany the process.
- Entrepreneurship requires a bias toward action and a sense of urgency, but also demands patience and perseverance.

Planning for a business: is it more causation or improvising?

Deliberate business planning is design-then-execution or design-precedes-execution framework. It has a linear assumption, which is where we need to be careful as maybe the plan was wrong. Entrepreneurial activity leads to gestation.

Is it improvisation, emergent? Founders plunge into a startup and design firms as they create it, they do not assume linear, rationale or anticipatory action. We just take the situation as it is, and then see what happens.

Bootstrapping is a way of reinvesting own revenues. Not making a plan for an investor, just make some money and then start-over again. Very much in the moment. Bootstrapping is:

- Based on your own financial resources or assets
- Making do and bricolage: more the inventor that is doing something that is needed now. Free publicity is needed as there are no resources, a broker between what we can do and with whom, outsourcing. Creating a lean organization. It is at the extreme of improvising

Saravathy researched causation VS effectuation. **causation** is when effects are given and focus is on selection of a **possible** set of resources, it has very little uncertainty. **Effectuation** is when possible effects can be created given a certain set of resources, it has very high uncertainty. She stated entrepreneurs arent different from anyone else: they simply adopt a different approach to problem solving.

Effectuation is heuristics for making decisions under uncertainty.

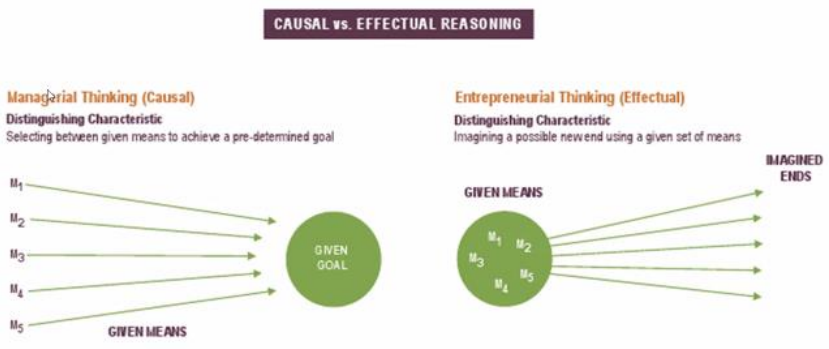
Effectuation: Only some resources and tools are given

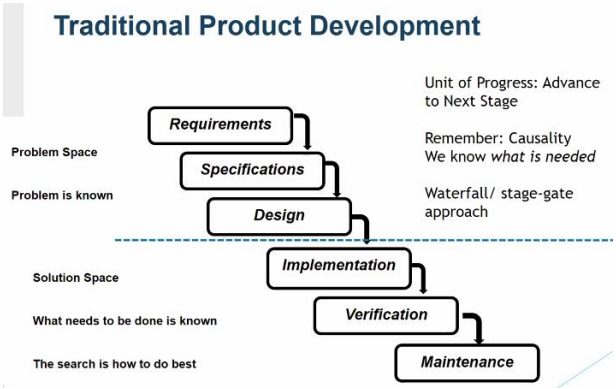
- Outcome is dependent on entrepreneur's traits
- Dynamic and non-linear developments
- Focus on controlling future rather than predicting it
- Focus is on affordable losses
- Emergent markets

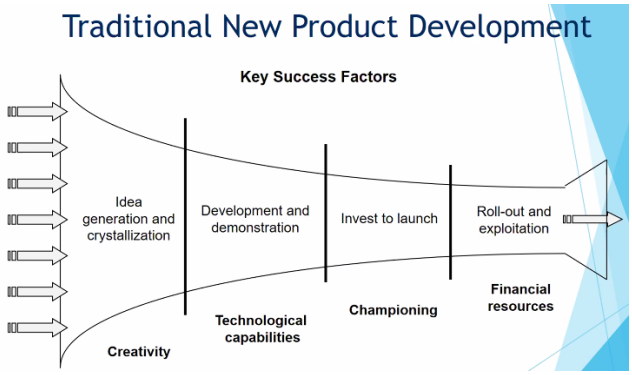
There are some important principles to effectuation:

Effectual decision making logics

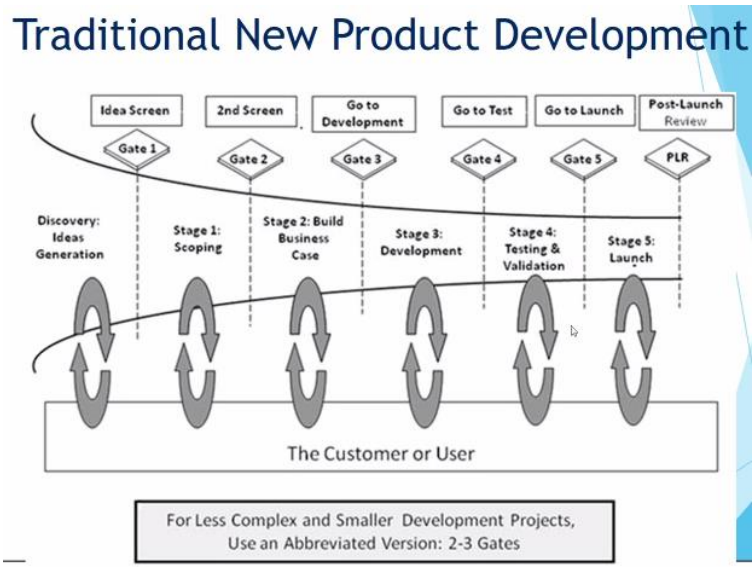
- Bird in hand (start with what you have)
- Lemonade (embrace surprises)
- Affordable Loss (focus on the downside)
- Crazy-quilt (co-creation)
- Pilot in the Plane (embrace uncertainty)





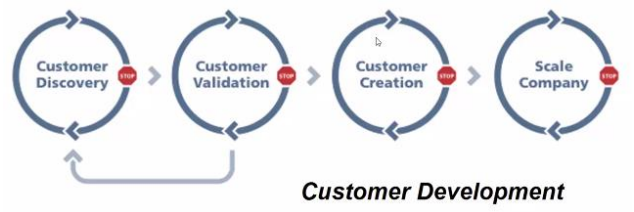


This traditional funnel for innovation stifles creativity, it demotivates. You also lose ownership/responsibility of the people who came up with the innovation. The people who control the innovations could also stop the great ideas if they think to much in the Taylorism approach



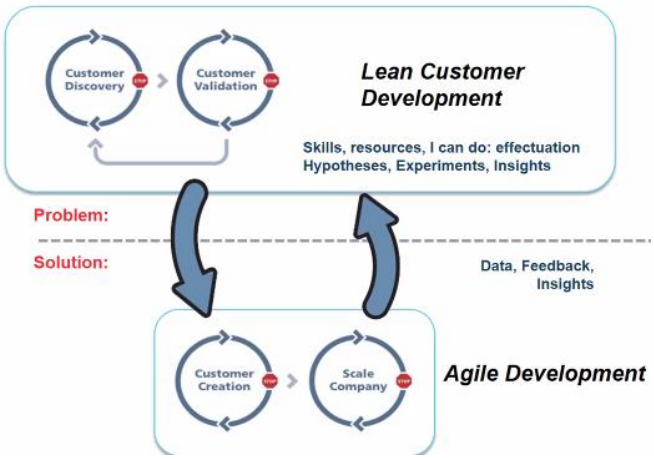
Achieving failure = successfully execution a failed plan.

There are 2 common approaches to iterative processes: lean and agile customer development.



Lean part focusses more on **effectuation**, do quick experiments before we develop our solutions, see if you can understand the user, find if we can develop the right solution. Afterwards speed up the process, create a **MVP** using **agile**.

Know who your customer is via lean, then know how to prioritize, what is the job the product needs to do: effective and in a short time span to gain more feedback.

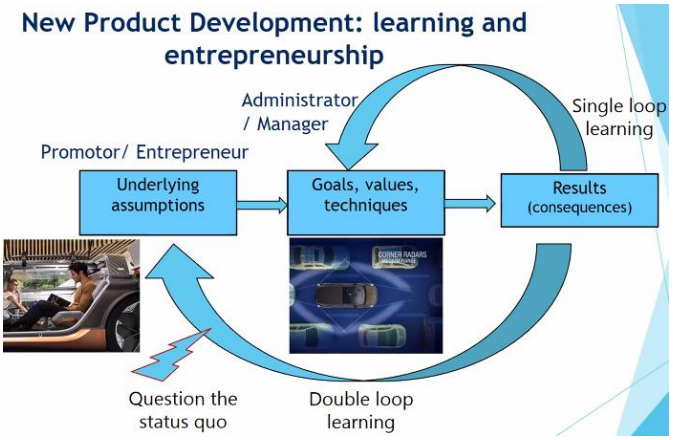


Lean startup methodology

- Evaluate your Strengths (Experience, Expertise, and Social Capital)
- Evaluate Markets that align to your Strengths
- Select a beachhead market to target
- Interview (~30) Decision Makers in the Target Market
- Map Value proposition canvas: Customer Needs (Pain Points and Gain Points)
- Articulate the Problem/ Challenge of the Customer
- Generate Product Lists, your Potential Offerings
- Evaluate products against your Strengths and Market Needs
- Select a product and customer

Agile methodology

- **User Stories** - every work feature component is described from the perspective of the primary user, what the user wants to do, and why they want to do it.
- **Timeboxes** - work is listed as a backlog and performed within a set period of time, or "timebox." Timeboxes enable Agile teams to innovate how to accomplish tasks while avoiding the stress of deadlines.
- **Colocated Teams** - Teams work colocated to ensure everyone can communicate efficiently face-to-face. This also improves team unity and opportunity for inspiration from working near people who are thinking and dealing with similar work challenges.
- **Whole Teams** - the team also works through the whole lifecycle of a work item together, including design, development, and testing. This ensures adequate breakdown of work and the whole team's ownership of getting the work done.



Question what it is that users want with a car: what matters to them, why do they buy the car, find the underlying assumptions. Important for entrepreneurial thinking is WHY, look at it with a blank sheet: tabla rasa.

An **idea IS NOT an opportunity**. Ideas can exist forever, can be free to have, do not need clients to exist and can be the basis of an opportunity. Opportunities on the other hand need work, they need clients, need to solve a problem and need to be worked on. They are temporal, not forever and require a fit.

Opportunities are ideas that can be implemented.

Two fundamental views on entrepreneurship Cheah 1990:

Kirznerian Entrepreneurship: New ventures provide products or services that are very nearly imitations of existing offerings, reproduced with minor variations (Kirzner, 1973).

Schumpeterian Entrepreneurship: New ventures offer products or services that are truly novel and that represent new and different combinations of resources (Schumpeter, 1934).

Opportunities can be small and incremental, single loop learning, but also much more a leap forward, more towards the Schumpeterian approach.

Kirzner entrepreneur as '*agent of adjustment*' - responds to new information and adapts to circumstances dictated by external world

Entrepreneur defined by superior perception of market opportunities - defined as 'entrepreneurial alertness' (Kirzner, 1973)

Skill of the entrepreneur lies in the ability to constantly scan environment for new opportunities, utilising information in new ways to *fill* gaps in the market

According to Kirzner, environment dictates entrepreneurial behaviour

But **Schumpeter** defined entrepreneur as '*agent of change*' - spontaneous, discontinuous change and destroy existing paradigms.

According to Schumpeter, knowledge and attitude dictates entrepreneurial behaviour

- Schumpeter:
  - Reform and revolutionize
  - Creative destruction
  - Reorganizing industry
  - Disturb existing economic equilibrium

- Kirzner
  - Alertness, and perceive opportunities before others do
  - Establish equilibrium
  - Opportunities as combinations of existing knowledge
  - Incrementalism

Opportunity recognition is about:

1. Sensing or perceiving market needs and/or underemployed resources. **Identifying information symmetry**
2. Recognizing a fit between needs and resources. **Closing the information asymmetry**
3. Creating a fit through a business concept > **exploiting the opportunity**

Entrepreneurship as the process of learning

Investigates the process of recognizing needs, identifying opportunities and designing organizations and business models, to create value through technology and capture that value

Someone who exercises business judgement in the face of uncertainty

Goes beyond being self-employed; independent business person but also to 'dependent' employees of organisations.

What is entrepreneurial behaviour?

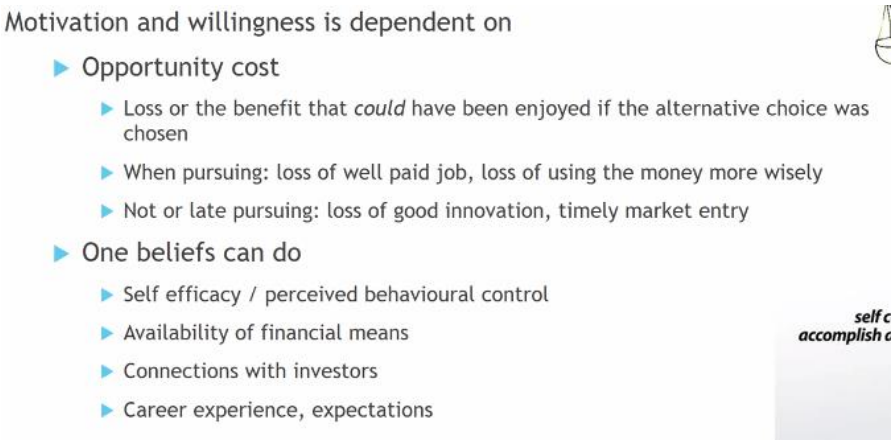
- Innovation
- Proactive
- Bearing risk

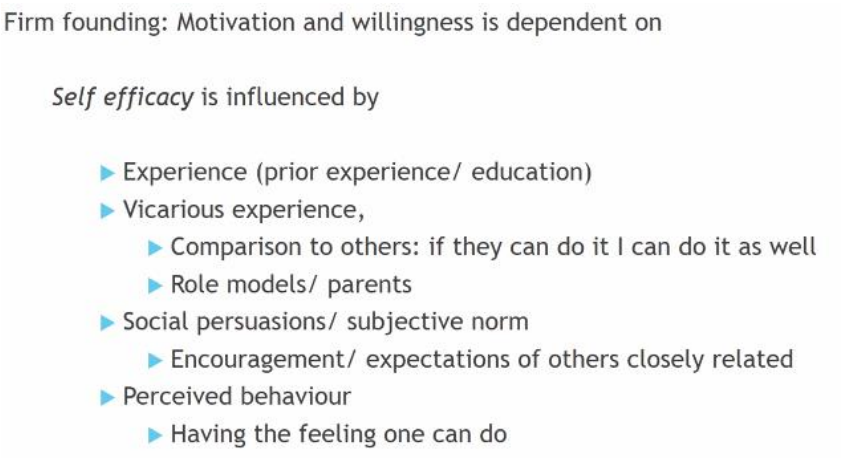
The development process to come from idea to opportunity

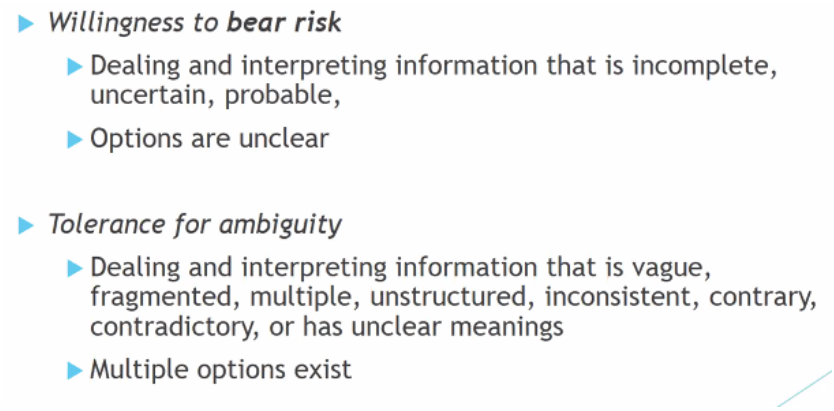
- Identify opportunities
- Opportunity discovery and evaluation
- Opportunity exploitation

- Factors affecting the process
  - Entrepreneurial (Personality) traits
  - Social networks
  - Prior knowledge
  - ➔ Information asymmetry

Startups are in search of a viable business opportunity and the success of that search is highly dependent on learning and entrepreneurial activity. Startup is a temporary organization that is in search of repeatable and scalable business model.







Week 6

Chapter 12 – Managing new product development teams

Bigger teams is not always better, larger teams can create more administrative costs and communication problems and it can be harder to foster a shared sense of identity. Further as team size increases **social loafing**, when an individual in a team does not exert the expected amount of effort and relies instead on the work of others, increases.

Cross-functional teams include members drawn from more than one functional area. A greater variety of specialists provides a broader knowledge base and increases cross-fertilization of ideas.

Brainstorming groups produce fewer ideas and of less novelty than the sum of ideas created by individuals working alone. There are 3 main reasons for this:

- **Fear of judgement**
- **Production blocking** when people take turns they might forget ideas before its their turn and listening to others redirects someone's train of thought
- **Feasibility trumps originality** teams are not just bad at idea generation but also at idea selection

Research on serial breakthrough innovators shows that many spent significant time alone investing heavily in self education, which underlines Google's 20 percent own time schedule.

Diversity however, may also bring coordination and communication costs as individuals tend to interact more with people similar to themselves which is known is **homophily**.

Heterogenous teams should possess more information than homogenous ones and can increase creativity and variance in decision making. However, to realize this heterogenous teams may require long-term contact and incentives to foster communication and cooperation.

Teams engaged in 3 types of boundary-spanning activities:

- **Ambassador activities** directed at representing the team to others and protecting them from interference
- **Task coordination activities** emphasized coordinating and negotiating the team's activities with other groups
- **Scouting activities** directed at scanning for ideas and information that might enhance its knowledge base

Teams can be classified in 4 types:

- **Functional teams** members remain in their functional departments and report to their regular functional manager. However, they meet periodically to discuss the project. The teams are usually temporary and less than 10% of time is spent in teams. It has little opportunity for cross-functional coordination
- **Lightweight teams** members remain in their functional departments, and supervisors retain authority. Like functional teams, these are temporary, members spend 25% of team in teams. However, here they do have a project manager. Small improvement over functional teams. Appropriate for derivative projects where high level of coordination is not required
- **Heavyweight teams** members are removed from their functional departments so that they can be **collocated** with the project manager, who is senior. Core group often dedicated full time, time has strong cross-functional coordination and communication, but still often

temporary. Significant improve of communication and coordination over functional teams, appropriate for platform projects

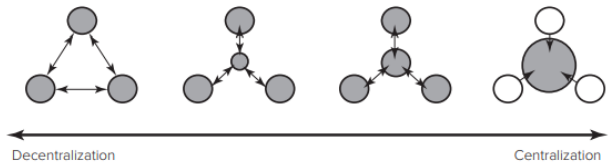
- **Autonomous teams** members are removed from their functional department and dedicated fulltime and often permanently to the development team. Team members collocated with manager, who is very senior and has full control over resources. They often do not conform to the operating procedures of the rest of the organization. Appropriate for breakthrough and major platform projects. Downsides are underutilization of resources and hard to come back into the firm later

Characteristics	Functional Team	Lightweight Team	Heavyweight Team	Autonomous Team
Project manager	None	Junior or middle manager	Senior manager	Senior manager
Power of project manager	NA	Low	High	Very high
Time spent on team activities	Up to 10%	Up to 25%	100%	100%
Location of team members	Functions	Functions	Collocated with project manager	Collocated with project manager
Length of commitment to team	Temporary	Temporary	Long-term but ultimately temporary	Permanent
Evaluation of team members	Functional heads	Functional heads	Project manager and functional heads	Project manager
Potential for conflict between team and functions	Low	Low	Moderate	High
Degree of cross-functional integration	Low	Moderate	High	High
Degree of fit with existing organizational practices	High	High	Moderate	Moderate-low
Appropriate for:	Some derivative projects	Derivative projects	Platform projects/ breakthrough projects	Platform projects/ breakthrough projects

Effective team leaders are often much more directly related to the team's success than senior management or project champions, because they interact more frequently.

Many organizations have heavyweight and autonomous teams develop a contract book and **project charter**: it has the project's mission and measurable goals and might include a vision statement, who is on the team, time spent, budget and KPIs. The **contract book** defines in detail the basic plans to achieve the goal laid out in the project charter and estimates the resources required, time schedule and results achieved. Most importantly gives sense of ownership.

Virtual teams are at distance from each other but still intensively collaborate through technology. There are 4 patterns in teams of technological multinationals: decentralized self-coordination, system integrator as coordinator, core team as system archictect and centralized venture team.



Decentralized Self-Coordination

All R&D conducted by decentralized divisions that coordinate loosely with each other.

System Integrator as Coordinator

Most R&D activity conducted by decentralized divisions, but each coordinates with central integrator.

Core Team as System Architect

Core team takes lead role in R&D activities while also coordinating the R&D activities of the decentralized divisions.

Centralized Venture Team

R&D resources transferred to centralized venture team, which then conducts all R&D activities.

Lecture week 6

Objectives

1. Opportunity and planning for business: causation/effectuation
2. Heart of entrepreneurship: strategic/entrepreneurial attitude
3. Exploration VS exploitation/ambidextrous organization
4. Entrepreneurial NPD teams
5. Social networks
6. Open VS closed innovation

M-form of an organization a multidivisional unit, structures of hierarchies. Try looking more at organizations as organic organizations. People interacting with other people, see if they can explain how organizations are structured. It is all about people and how they interact, help people in how they connect and work together. How can organizations sustain focusing on the now or on the future.

Recap: entrepreneurial thinking has a **paradox**: entrepreneurship requires considerable thought, preparation and planning, yet it is basically an unplannable event. For creativity and innovativeness to prosper, rigor and discipline must accompany the process. Entrepreneurship requires a bias toward action and a sense of urgency, but also demands patience and perseverance.

The message you want to convey by putting things into a business plan is making sure everyone is working towards the same goal. But also a plan of activity as in lean/agile, you want to set goals, achieve something, get feedback learn from it. Commitment to do something even if it might be a failure, just continue learn from it. Make it transparent. Ownership, liability, responsibility are also important. If you do well, you want to get a reward.

The business plan isn't there because you want to execute it necessarily, but so you can structure it. It doesn't matter if its not the right plan, just benefit from the learnings.

Recap: **causation** when effects are given and focus is on selection of **possible** set of resources. **Effectuation** is when possible effects can be created given a certain set of resources.

Constant feedback, human centered design is important, customer doesn't know what they need either. Find the resources to make it happen. We know what we can do, lets see what we can learn, what are our options, is it feasible, this is the extreme of effectuation.

The **entrepreneur** looks much more at the **opportunities**, what are the resources they need, only later they look at how to earn money from something/control the situation.

Strategic looks at a the resources first and only pursues opportunities with the given resources. This is inherent with the size, startups don't have this path dependency, no existing resources/people. Large organizations have inertia. Its not that they cannot see, it is that they cannot act accordingly to pursue the opportunity.

The task environment/competitive landscape requires both effective entrepreneurial and strategic actions. You need both advantage seeking behavior (strategy) and opportunity seeking behavior (Entrepreneurship)

Company such as tesla has much more space to experiment. An older car company should know better, cannot make mistakes. In the old industries it is seen as a problem, for the newer ones like tesla it seems more solvable, more opportunity seeking behavior.

A firms ability to compete overtime lies in it ability to both **integrate and build upon competencies** while simultaneously **developing fundamentally new capabilities**.

Process management to improve building competencies (exploitation) by developing an interlinked system of organizational routes (repetition).

Too often, process management is efficiency-oriented and **variation decreasing**, it triggers internal biases for certainty and predictable results, and limits exploratory innovation and responsiveness to new customer segments. You punish people to act differently, you don't want that if things are changing.

You need to not only be good at your core activity, that is a race to the bottom. Also focus on new activity. Too much focus on existing products, optimizing the current, is only delaying.

Process management is concerned with

- Mapping process, improving them and adhering to it
- Developing core capabilities, reducing repeatability, tighter intra-organizational linkages, speeding up activities and therefore better satisfies customers and increased revenues and profits
- But not in every context will result in higher profits, race to the bottom
- Core capabilities may become **core rigidities or competency traps** in rapidly changing environments
- It slows down exploratory learning, experimenting and absorbing technological knowledge from external sources. Myopic, denials in these organizations who think they know things better
- Short-term, easy-to-measure efficiency improvements make vague, uncertain, difficult to quantify exploratory activities less attractive

Underlying problem to explore and exploit simultaneous is **bounded rationality**. We do what we know. Helps us to be at ease. As a person going to university its fine, but as an organization it can be problematic. Choosing a different route forces you to pay more attention to the environment, but it requires more attention, more energy. You might get lost, be late, but it gives you new information.

Individuals have limits:

- In formulating the problem
- In solving complex models
- In processing (receiving, storing, retrieving, transforming) information

And therefore tend to innovate close to the known, incremental innovation, **process innovations**.: trying to improve things we know we are good at. We want to think fast instead of slow.

Agents with bounded rationality look for satisfying answers, which means that agents deliberate only long enough to come up with good enough course for actions

- Neighborhood search
- Local search
- Incremental search

Bounded rationality will favor specialization and inhibit experimentation.

Ambidexterous organizations apply mechanisms to **solve the exploitation VS exploration dilemma**

- Alternating between different organizational designs (**rhythmic ambidexterity**, organic and mechanistic structures)
- Creating loosely coupled organizations (**contextual ambidexterity**) sometimes leave it, sometimes organize. Like concurrent units that let go and then come together again. Organized like a bazaar, everybody is competing in concurrent teams. Much more autonomy at each of the departments. At times reconcile. Microsoft organized like this. People have different jobs over time, sometimes experimenting sometimes much more structured tightly coupled activities, for the same person.
- Separating distinct units, skunk works, **structural ambidexterity**. Lets structurally separate. It is too hard to bring this together into 1 person, people like working in the same way. Skunk works is something you want to put outside your organization. Experiment outside of your organization. You want to give them freeway to do something they believe will work. You want the people working not to be interfered by the existing organization.

main problems with rhythmic and contextual approaches where at sometimes its mechanic and sometimes organic:

- People remain the same person, within bounded rationality it is difficult trying to rationalize things and at the same time do different things. People have to adapt, think in a different way. It might be possible, but we have cognitive bias. It leads to demotivation it is hard to make people think in a different way, people are not that flexible. Communication gets very hard.

Ambidexterous organizations

Companies need an organization that can do 2 things at the same time

Exploit existing business/mainstream activities, capitalize on the core competencies. Thus improve existing knowledge, technologies and business models. But also: explore new opportunities by inventing new and disruptive technologies.

	Structural	Contextual
How is it achieved	Organisational separate units	Individuals alter between activities
Locus of decision	Top down	Bottom up
Role of TMT	Define, structure, direct	Facilitate, develop context
Nature of roles	Clearly defined	flexible
Skills required	Specialists	Generalists
	Venture funds	Google's 20% time

Entrepreneurial NPD teams: pessimistic view

Team members that are more diverse have different experiences, different beliefs and their different perspectives cause them to 'see different environment' which can have **negative effects**:

- It introduces social divisions
- Different viewpoints and communication makes communication difficult
- Less willingness to reach consensus

- Limits the smooth flow of activity and quick development

But an optimistic view on this: diversity is **good** because you have different environments, new opportunities.

Opportunistic view:

- Augments to the discussion among team members
- Improves decision quality
- Improves the scope for identifying opportunities
- Creates people that don't just say yes to the boss , question things

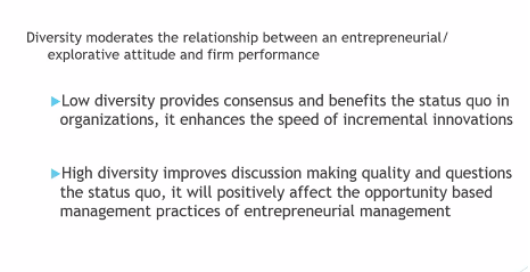
Cognitive conflict: functional, constructive and task-focused disagreement can lead to interactive advantages and is generally considered to improve overall decision quality and understanding and thus a beneficial element of strategy making.

- Considering multiple strategic alternatives from various perspectives
- Improves the quality of final decision and eventually the new product
- Improves the flexibility to adapt to new conditions

Affective conflict is the disliking which negative in all cases, disliking a person

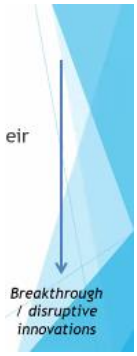
Diversity moderates the relationship between an entrepreneurial/explorative attitude and firm performance

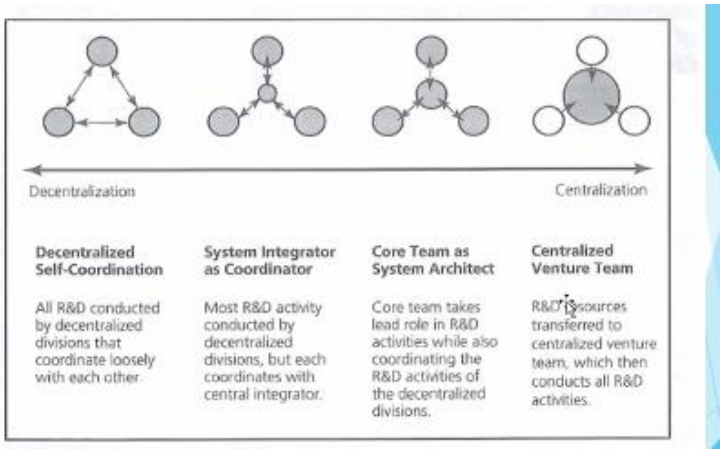
- Low diversity provides consensus and benefits the status quo



Innovation and various NPD teams:

- Functional teams where members remain in their departments spending little time on a common project
- Lightweight team has a project manager managing the members in their respective organizations, who spend little time on the project
- Heavyweight teams spend considerable more time on the project and have a more senior project manager
- Autonomous teams are more at arm's length and operate in a distinct organization

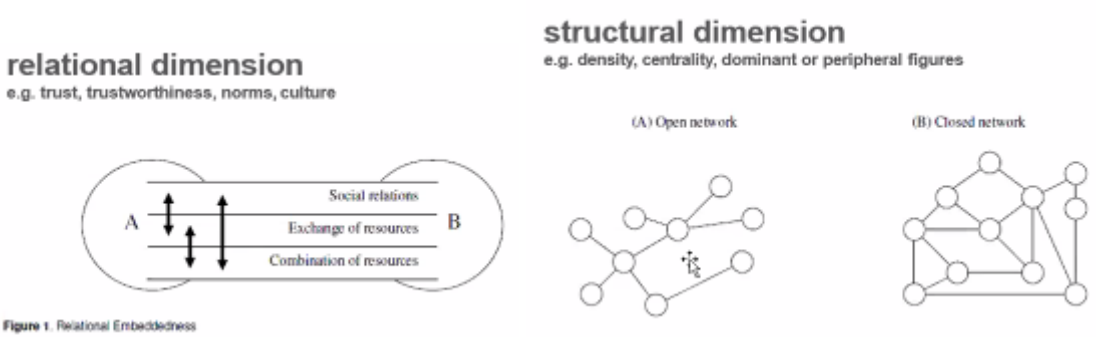




Team composition within and outside the firm: social networks. Structural holes and good ideas > social network analysis. Those people that have good ideas often make connections to others in the organization. Having good friends gives you more knowledge than you can have by yourself.

Social capital: the sum of the actual and potential resources embedded within, available through and derived from the network of relationships possessed by a firm and its members (divisions or employees).

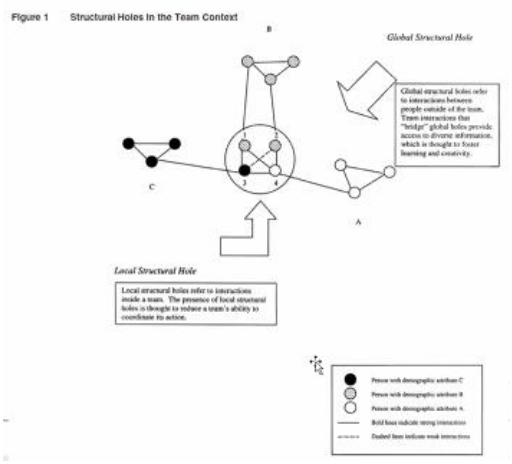
Social network is a description of the social structure between actors, mostly individuals or organizations. It indicates the ways in which they are connected through various social familiarities ranging from casual acquaintance to close familiar bonds. Social construction shape the context in which ideas emerge.



Open network is where not everyone knows everyone as well. In closed network the people you know know each other much more also.

Cognitive dimension is when you have the same understanding, even though you don't know each other. A same way of thinking, shared values, shared vision: a collective mind.

People are connected in certain networks.



Bridging to other networks provides access to knowledge domains more distant from current ones. especially for new ventures to succeed, entrepreneurs must attend to building new ties that link to others and create differential advantages through bridging and building network ties.

These **bridging ties** change the network into more sparsely connected networks with many weak ties that enjoy **brokerage advantages** based on the ability to arbitrage non redundant information exchanges, whereas **bonding ties** reflect the strong and dense network ties that promote trust and cooperation among its members.

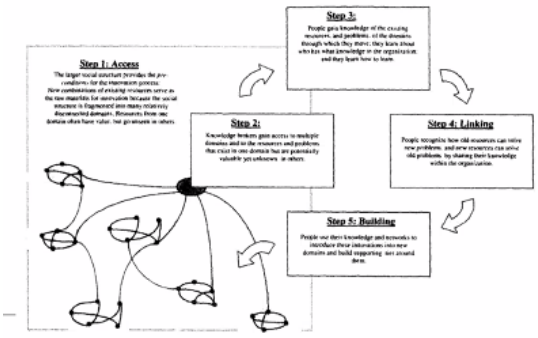
Bonding ties:

- Connecting the people within existing networks
- Same information, same experience, same cognitions, same language
- communication benefit
- fast development
- but little new information, less creativity, we all know the same

Bridging ties

- connecting with people in networks that are disconnected from other ntworks
- information benefits
- time benefits, quickly make connections
- larger scope of referral and scope benefits for better evaluation
- negotiation benefit: what you see in market places, can negotiate a price since the buyer doesn't know at which price you bought it, exploit information]
- open but more weak relationships, relationships can dissolve quickly, takes more time
- to benefit these ties you need to strengthen the team to speed up innovation

Networking and importance of bridging and bonding ties



Networks provide 2 things:

1. They help you identify **opportunities** to be creative
2. They help you **capture value** from an opportunity

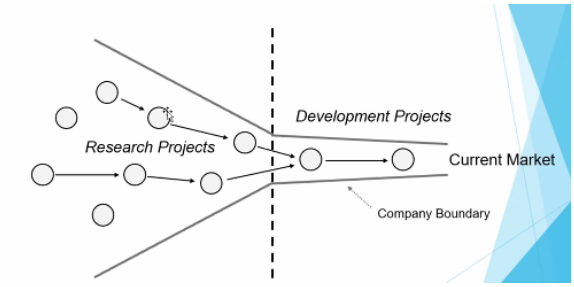
But if we only have bonding/strong ties, it may speed up innovation but we got stuck on an **idea problem** having too many bridging/weak ties provides us with more novel information, a source to be creative, but we have an **action problem**

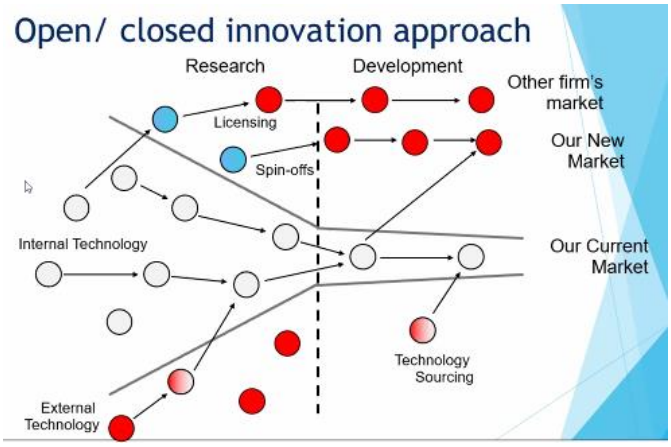
Closed innovation: successful innovation requires control

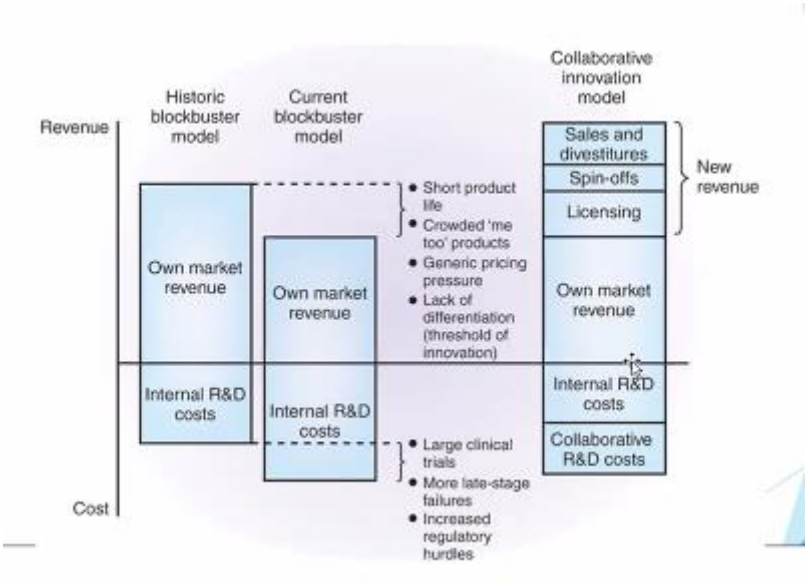
- Attract the best and brightest scientists
- Develop and manufacture yourself
- Market and distribute yourself
- Take profits and reinvest yourself (circle of innovation)
- Control your own IP and protect it from others
- High R&D investments

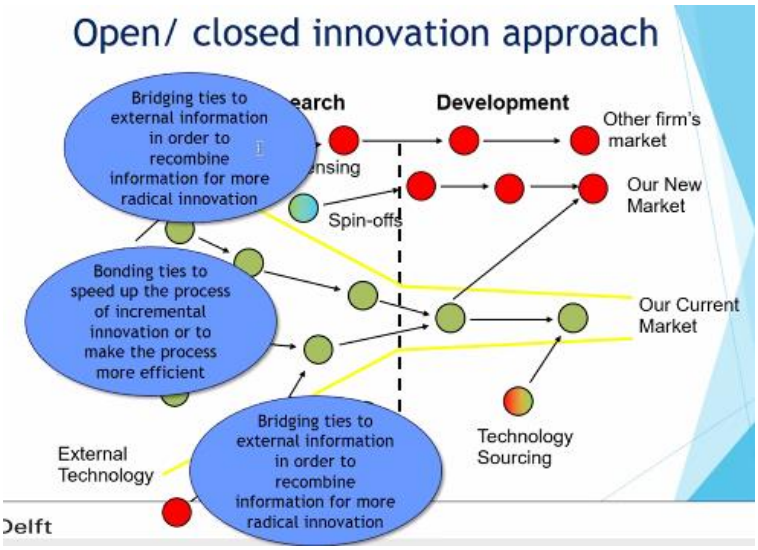
Open innovation: not all the smart people work for us:

- Commercialization of own ideas as well as from other firms
- Bring inhouse ideas outside the current business
- No lock up of IP but use in licensing, joint ventures and corporate ventures
- Porous boundaries of the firm









Innovation ecosystems: Constituents of a science parks: research institutes, venture capital, pool of labor, supportive infrastructures, entrepreneurial spirit, lead users. They lead to spin-offs, start-ups and rapid recycling of knowledge