MOT132A

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Overview

- Many industries experience strong pressure to select a single (or few) dominant design(s).
- There are multiple dimensions shaping which technology rises to the position of the dominant design.
- Patforms and ecosystems

- Industrial economics / network economics (Katz and Shapiro, 1985; Farrell and Saloner, 1985; Arthur, 1994)

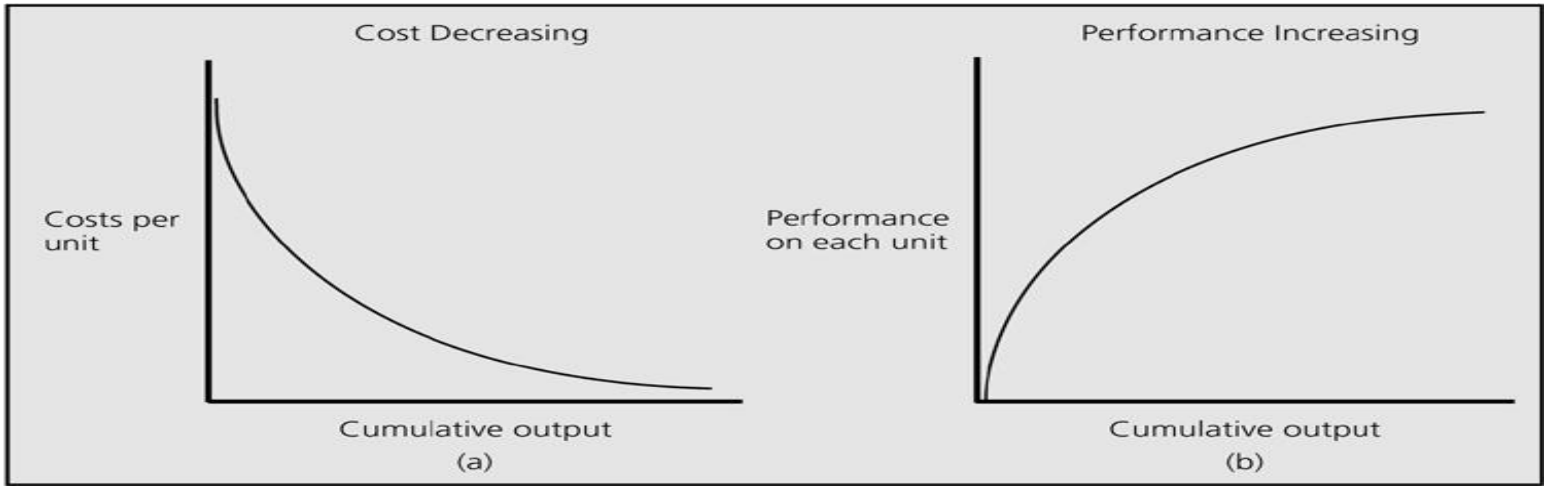
Why dominant designs are selected

- **Increasing returns to adoption**
  - Learning effects
  - Network externalities
- Government regulation
- Path dependencies
- Committee based standardization

Why dominant designs are selected

- **Increasing returns to adoption**
  - Learning effects

FIGURE 4.1
Standard Learning-Curve Forms



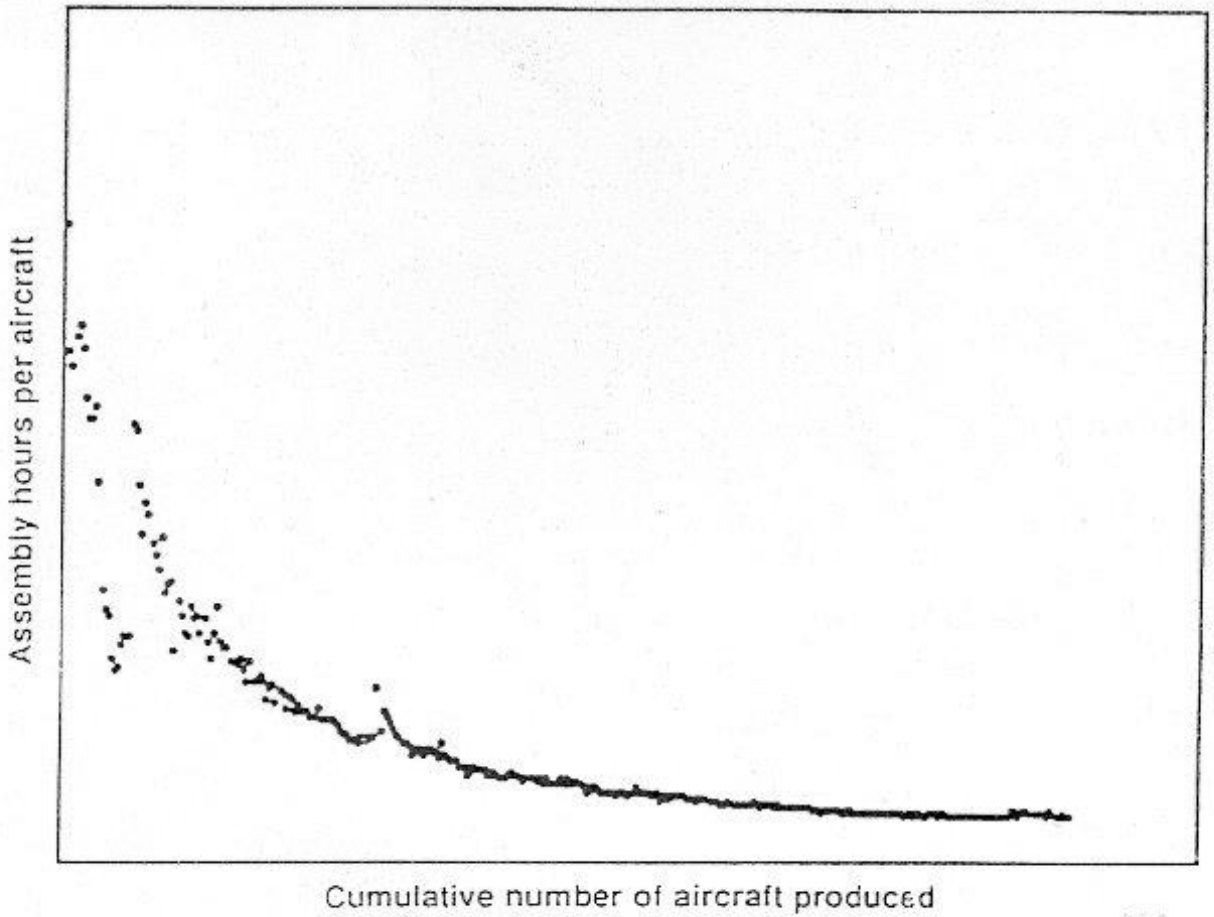


Figure 10.3 Learning curve—assembly hours per aircraft and cumulative number produced. (*Source:* Argote and Epple, 1990. Reprinted by permission of the author and publisher from *Science*, Vol. 247, pp. 920–924. Copyright 1990 by the AAAS.)

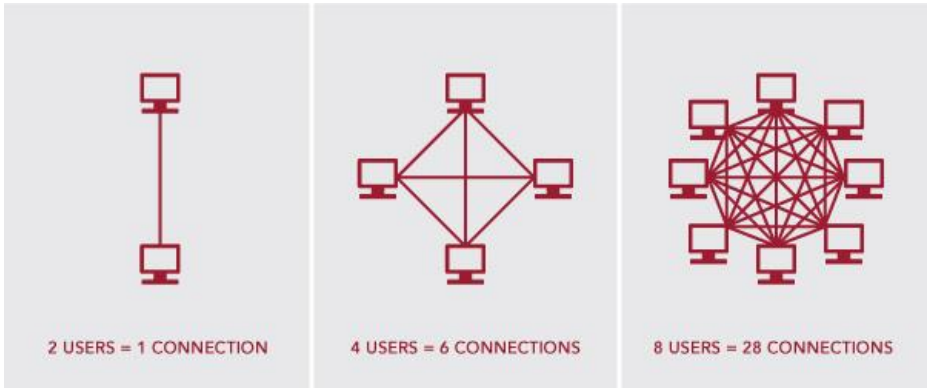
Why dominant designs are selected

- **Prior Learning and Absorptive Capacity**
  - A firm's prior experience influences its ability to recognize and utilize new information.
    - Use of a particular technology builds knowledge base about that technology.
    - The knowledge base helps firms use and improve the technology

Why Dominant Designs Are Selected

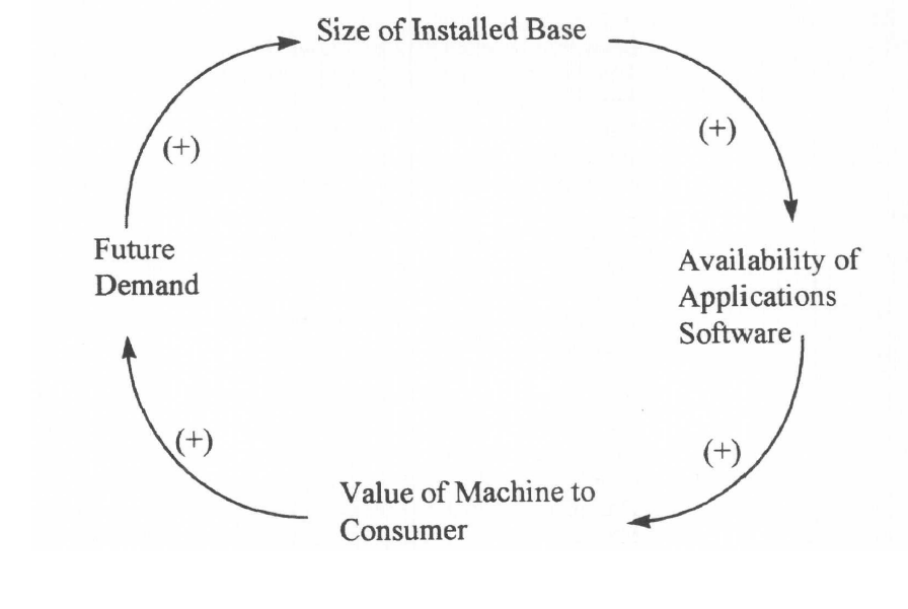
- **Increasing returns to adoption**
  - Network externalities
    - Network externalities are common in industries that are physically networked
    - Network externalities also arise when compatibility is important

$$n\,(n-1)\,/\,2$$



Why dominant designs are selected

- Hill (1997) proposes that the amount of complementary goods and installed base is interrelated



Why Dominant Designs Are Selected

- **The Result: Winner-Take-All Markets**
  - Natural monopolies
    - Firms supporting winning technologies earn huge rewards; others may be locked out.

Why Dominant Designs Are Selected

- What are some examples of industries that demonstrate increasing returns to adoption?

Why dominant designs are selected

- Increasing returns to adoption
- **Government regulation**
- Path dependencies
- Committee based standardization

Why Dominant Designs Are Selected

- **Government Regulation**
  - Sometimes the consumer welfare benefits of having a single dominant design prompts government organizations to intervene, imposing a standard.

USB type-c

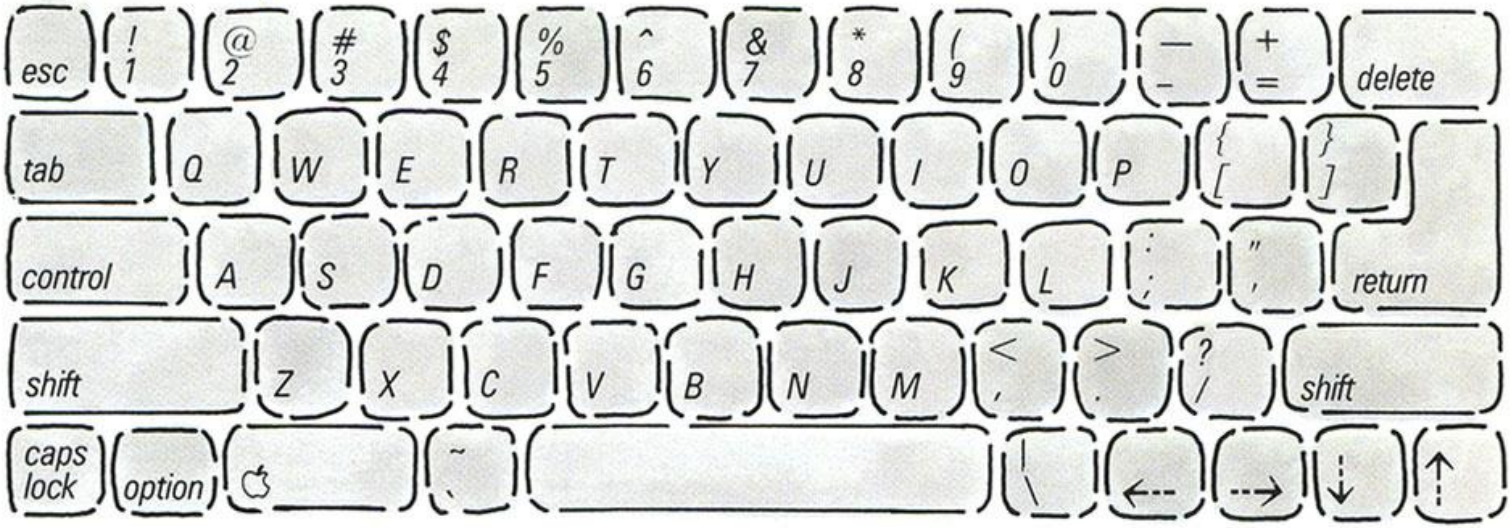
Why dominant designs are selected

- Increasing returns to adoption
- Government regulation
- **Path dependencies**
- Committee based standardization

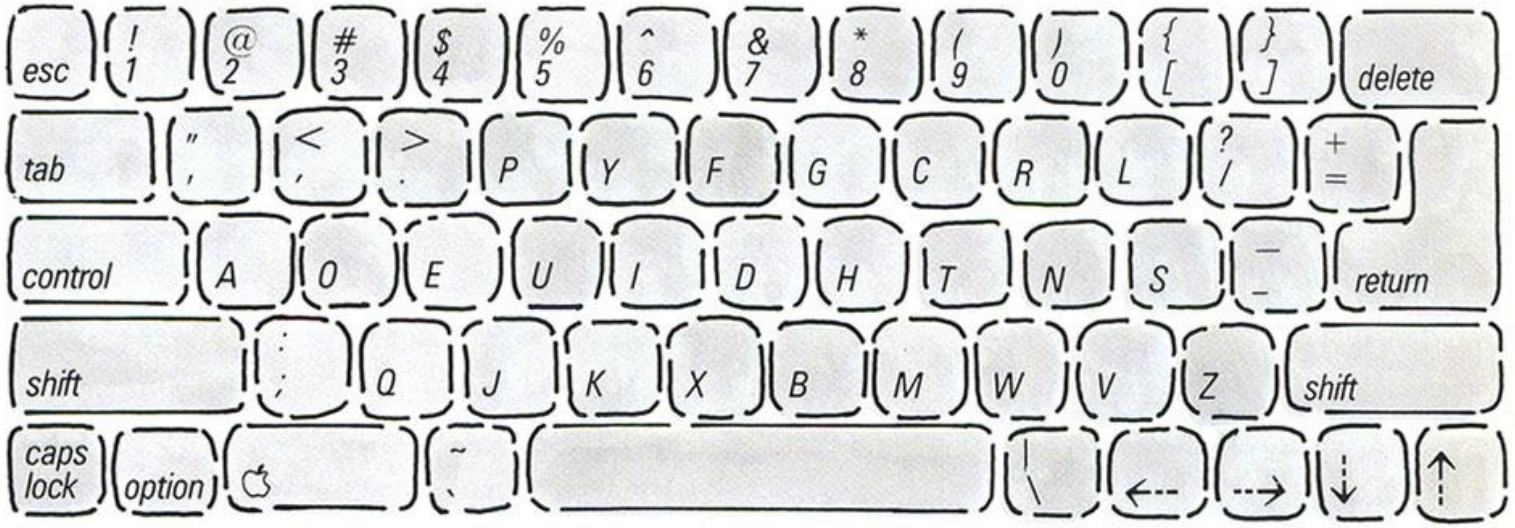
Why Dominant Designs Are Selected

- Increasing returns indicate that technology trajectories are characterized by *path dependency*:
  - End results depend greatly on the events that took place leading up to the outcome.

Standard Keyboard



Dvorak Keyboard



Source: Apple IIc Plus Owner's Guide,
Copyright 1988, Apple Inc.

Why Dominant Designs Are Selected

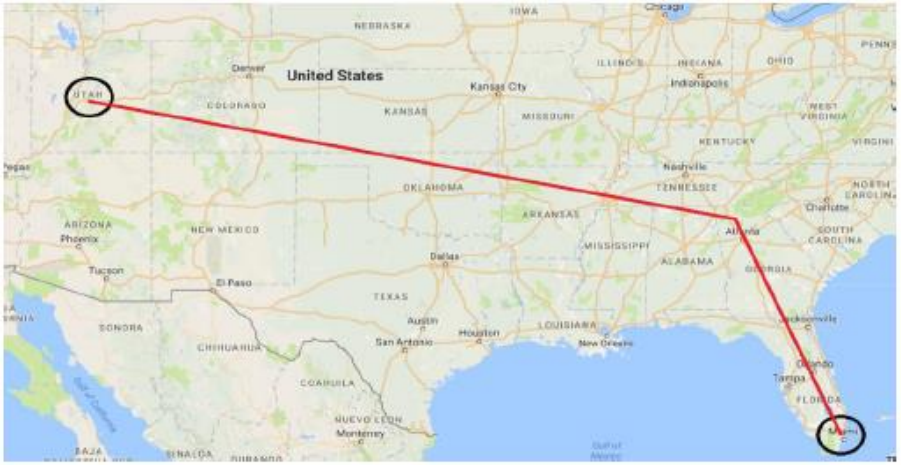
QWERTY vs DVORAK (David, 1985)

- QWERTY introduced at end of 19th century
- DVORAK introduced in 1950s

- QWERTY was insuperior to DVORAK

- QWERTY became dominant due to:
  - Timing of entry
  - Marketing
  - Switching costs (learning): costs required to switch from one technology to another.
  - Complementary goods (typewriters and PC keyboards)

Why Dominant Designs Are Selected



Why dominant designs are selected

- Increasing returns to adoption
- Government regulation
- Path dependencies
- **Committee based standardization**

The story of WiFi: historical overview

Federal
Communications
Commission

1985

The story of WiFi: historical overview

NATIONAL CASH REGISTER CO.

1985

The story of WiFi: historical overview

1985-1989

The story of WiFi: historical overview

IEEE

802.11

1990-1997

The story of WiFi: setbacks

- Voting rules were misused to gain support for a proposal
- Actors had conflicting goals
- Battles occurred between technological proposals

- … a recipe for failure?

1990-1997

Incentives for cooperative behaviour during decision making

- Perspective of future and enduring gain
- A sense of urgency and the incentive to compromize

- So: during negotiating a standard there are more things at stake then only trying to reach the technologically best standard

- What are the advantages and disadvantages of developing a standard through a committee-based standardization process?

Multiple dimensions of value

Multiple Dimensions of Value

- **A Technology's Stand-alone Value**
  - Includes such factors as:
    - The functions the technology enables customers to perform
    - Its aesthetic qualities
    - Its ease of use, etc.

Multiple Dimensions of Value

	Purchase	Delivery	Use	Supplements	Maintenance	Disposal
Customer productivity	Price of Insight 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 combus-tion 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 electircal 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	Insight might be more difficult to resell or have lower resell value
Fun and image			Connotes image of environmental responsibility			
Environmental friendliness	Buyer feels they are helping support the development of more environ-mentally friendly cars		Emits lower levels of pollutants	Requires less use of fossil fuels		

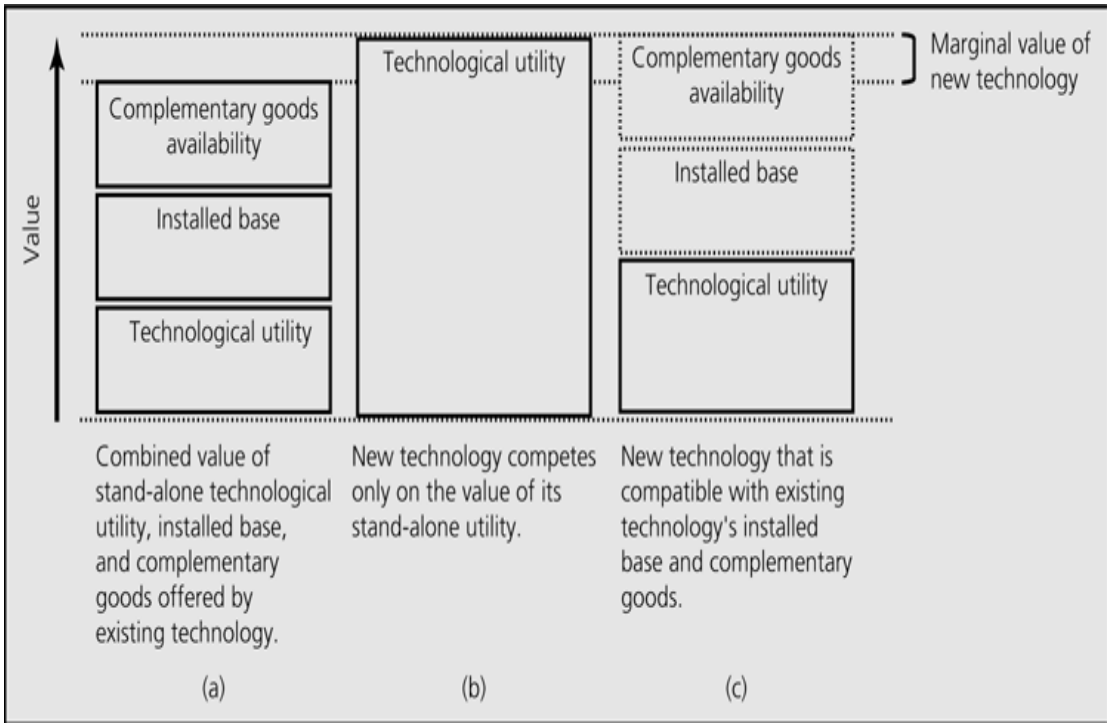
Kim and Mauborgne developed a “Buyer Utility Map” that is useful for identifying elements of a technology’s stand-alone value

Multiple Dimensions of Value

- **Network Externality Value**
  - Includes the value created by:
    - The size of the technology's installed base
    - The availability of complementary goods
  - A new technology that has significantly more standalone functionality than the incumbent technology may offer less overall value because it has a smaller installed base or poor availability of complementary goods.

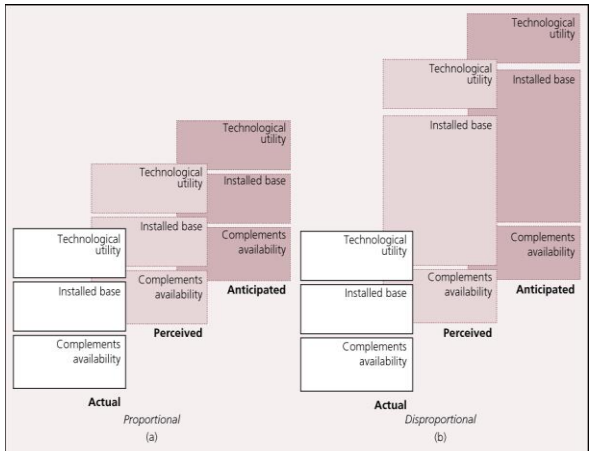
Multiple Dimensions of Value

- To successfully overthrow an existing dominant technology, new technology often must either offer:
  - Dramatic technological improvement
  - Compatibility with existing installed base and complements



Multiple Dimensions of Value

- Subjective information (perceptions and expectations) can matter as much as objective information (actual numbers)
- Value attributed to each dimension may be disproportional



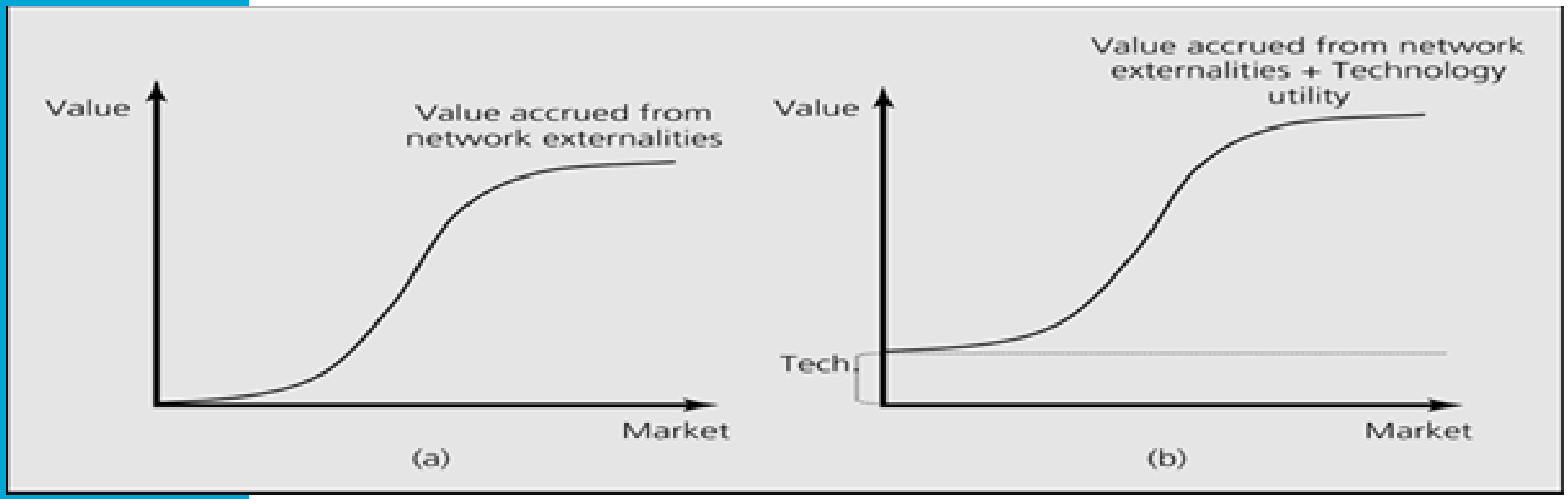
Multiple Dimensions of Value

Discussion question: How can perceived and anticipated installed base be influenced?

Multiple Dimensions of Value

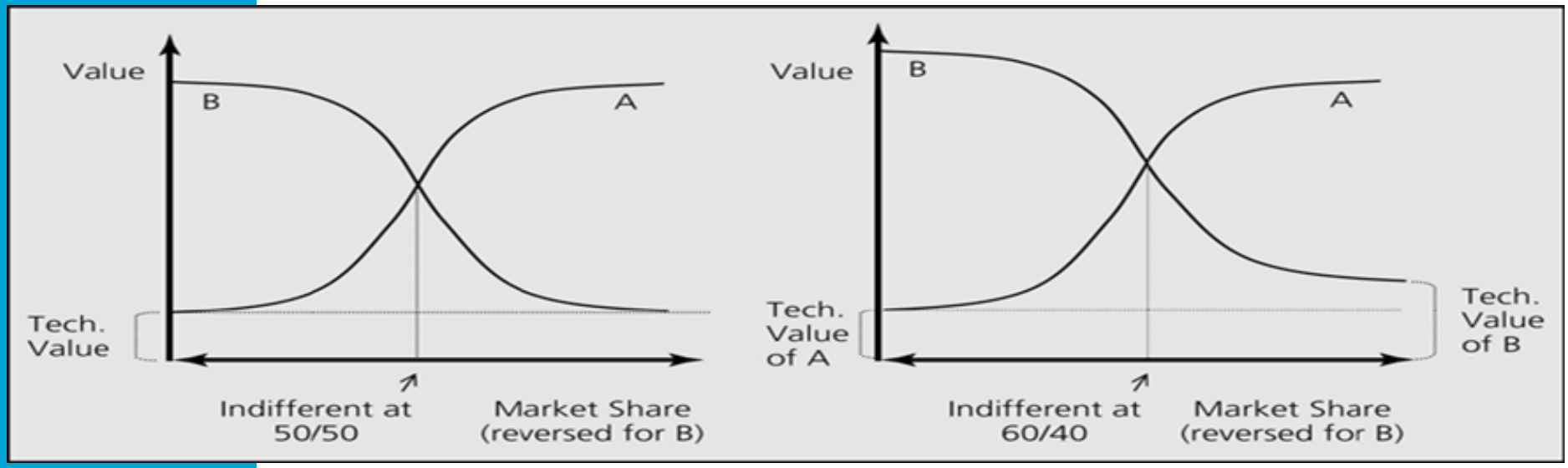
Competing for Design Dominance in Markets with Network Externalities

- We can graph the value a technology offers in both standalone value and network externality value:



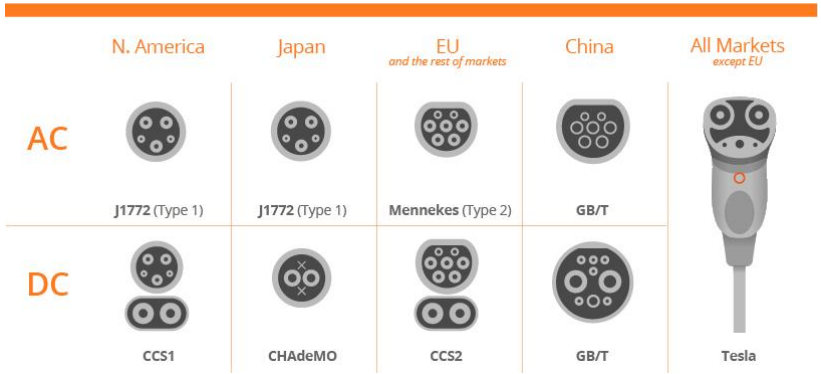
Multiple Dimensions of Value

– We can compare the graphs of two competing technologies, and identify cumulative market share levels (*installed base*) that determine which technology yields more value.



Discussion

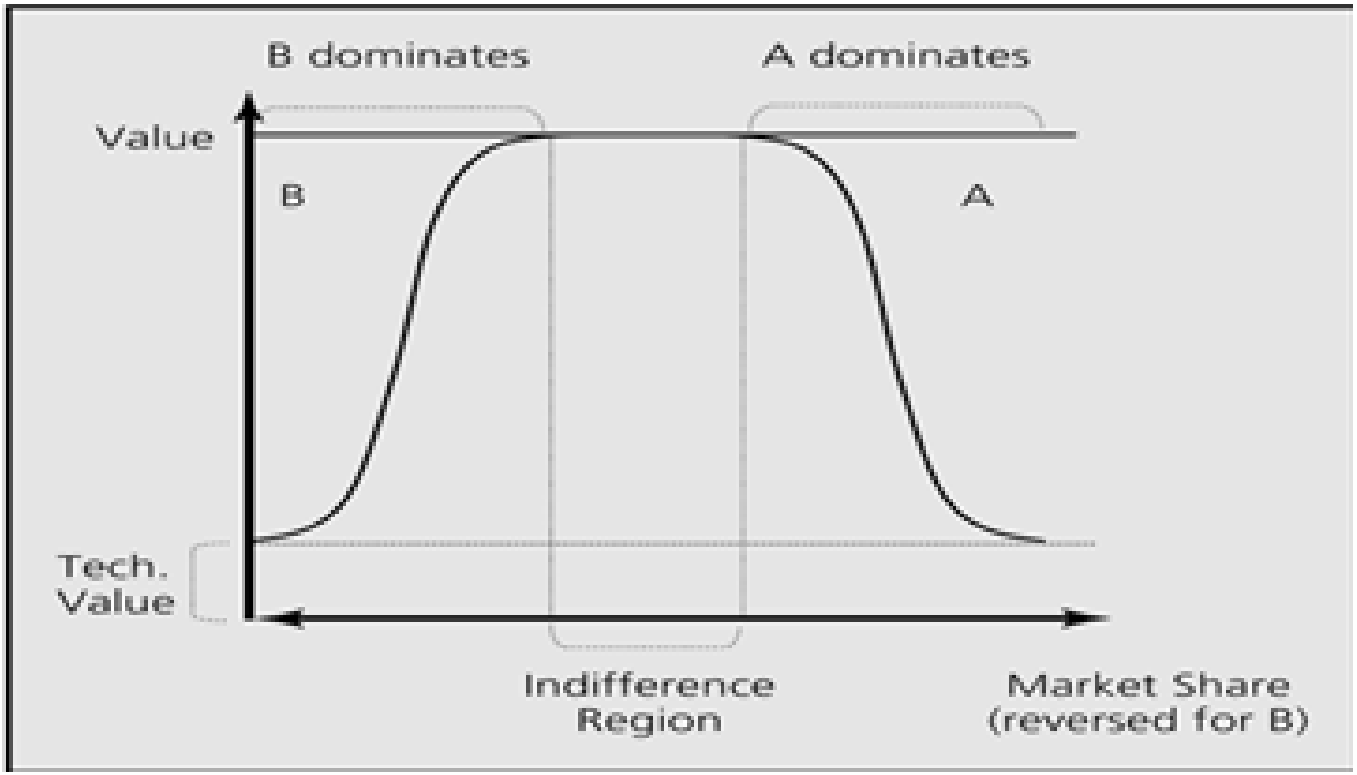
What determines whether an industry is likely to have one or a few standards, dominant designs or platforms?



[1] H.J. De Vries, J.P.M. De Ruijter, N. Argam, Dominant design or multiple designs: the flash memory card case, Technology Analysis & Strategic Management, 23 (2011) 249-262.

Multiple Dimensions of Value

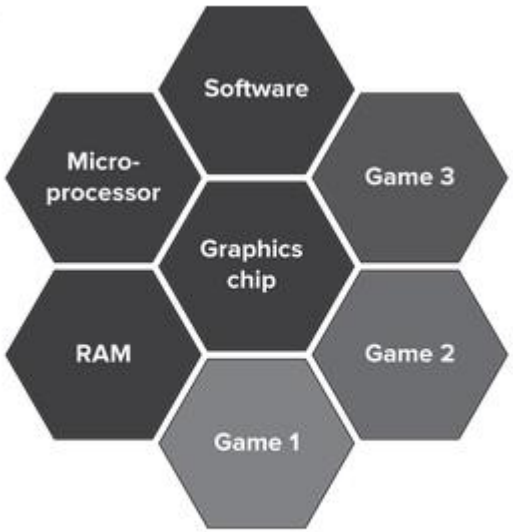
– When customer requirements for network externality value are satiated at lower levels of market share, more than one dominant design may thrive.



Modularity and platform competition

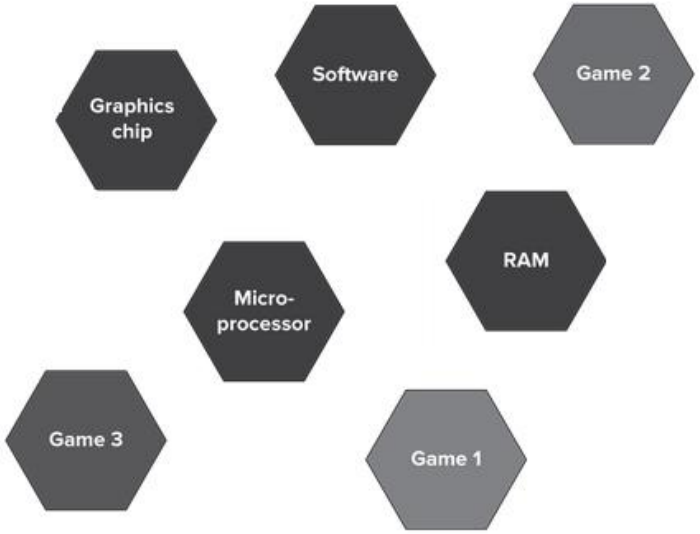
Modularity and platform competition

Integrated product bundle vs pure modularity



iMAC

Platform:
(e.g. playstation)

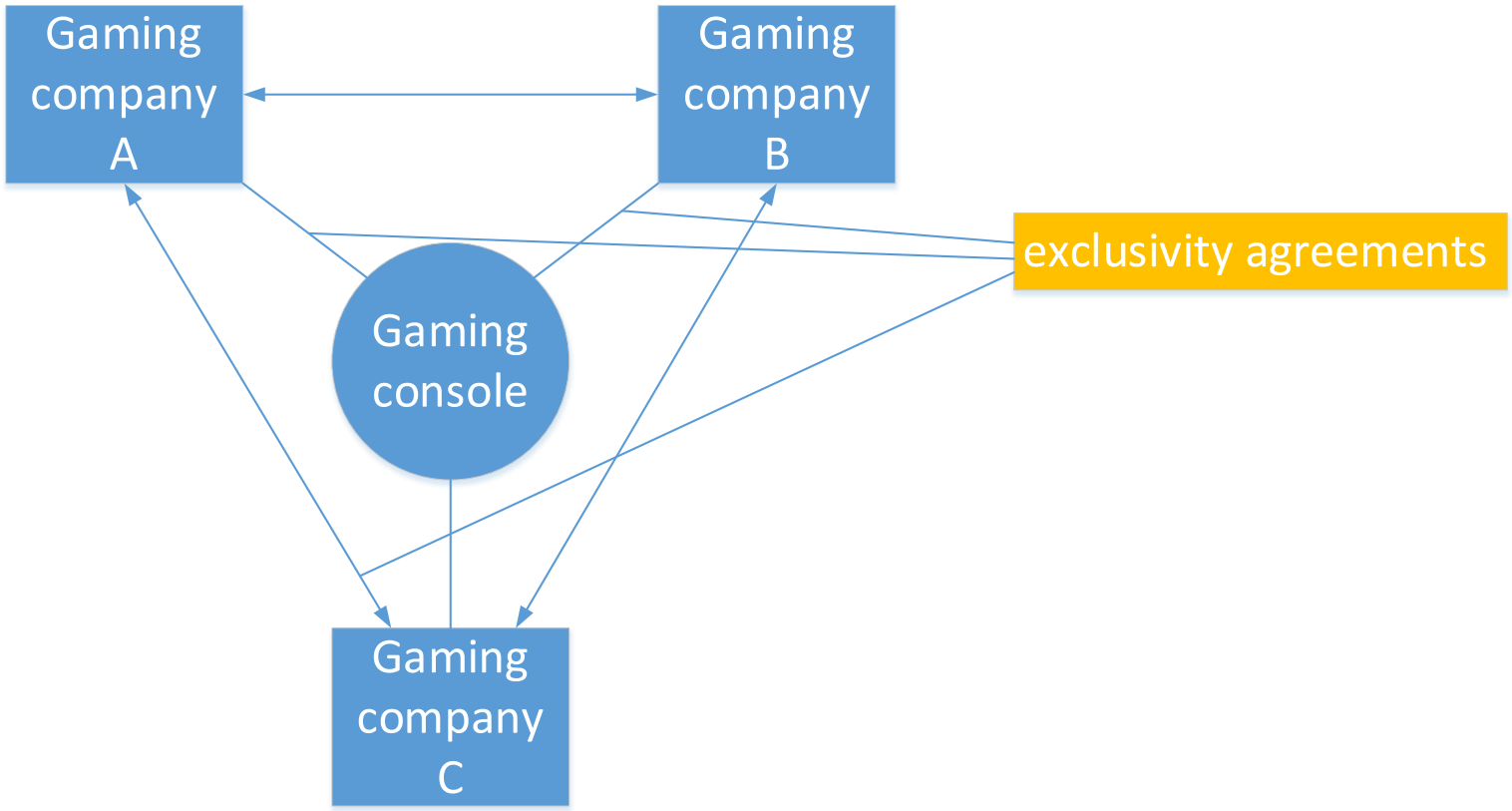


PC

Modularity is valuable when there are

a) diverse technological options that can be recombined
b) customers have heterogeneous preferences.

Platform ecosystem



The success of all members of the ecosystem depends in part upon the success of other members.

Platform ecosystem

Standards are facilitators of ecosystems; they can be used to motivate complementors.

Key characteristics of an ecosystem:

- Multilateral, non-generic complementarities that can be **unique** or **supermodular**
- Relations between actors are standardized and set for each role in the ecosystem, making it difficult to switch to another platform once invested in.
- The ecosystem is not hierarchically controlled

More information, see: Jacobides, M. G., et al. (2018). "Towards a theory of ecosystems." Strategic Management Journal 39(8): 2255–2276

Platform ecosystem

Platform ecosystems are characterized by:

- Generativity
- Tension between stability and evolvability: The platform core should be stable enough so that it is a viable product but the core should also be able to cope with changes that occur in its environment.

Three aspects are related to this tension:

(1) standards and variety
(2) control and autonomy
(3) individual vs collective

More information, see: Wareham, J., et al. (2014). "Technology Ecosystem Governance." Organization science 25(4): 1195-1215.

Questions?