Standards Battles, Modularity, and Platform competition

Dominant Designs

Dominant design: a single product or process that dominates a product category (about 50% of the market)

Many industries experience strong pressure to select a single (or few) dominant design(s).

Why?

- **Why do industries experience pressure to select a dominant design?**

And moreover

- **Why do some technologies become dominant designs and others do not?**

Why do industries experience pressure to select a dominant design?

- **Market forces** (e.g. increasing returns to adoption, the importance of complementary products, etc.) and
- **government regulatory action** are the two primary sources of pressure to select a dominant design.

Why do some technologies become dominant designs and others do not?

Generally, one design is selected over another because the total value it offers customers (standalone value plus network externality value) is greater than the total value offered by other technologies.

Why do many markets coalesce around a single dominant design rather than supporting a variety of technological options?

There are **many factors** that drive a market to coalesce around a dominant design. These factors often result in a **self-reinforcing process** that continues to increase a technology's dominance even if it is inferior to competing technologies .

→ **Increasing returns to adoption**

A technology becomes more valuable the more it is adopted.

Sources of IR

1. Learning affects: the improvement rate of a technology. **Greater use** of the technology leads to **greater knowledge accumulation.** Greater knowledge accumulation enables the improvement of the technology.

2. Network externalities : result when there are increasing returns to adoption (i.e. a technology becomes more valuable to customers as more and more customers adopt the technology).

3. Complementary product creation often occurs at a faster rate as adoption becomes more widespread.

1. Increasing returns to adoption: Learning Effects

Evidence shows that the more a technology is used the more developed, effective and efficient it becomes.

→ Learning effects have been demonstrated in a **wide variety of industries** including automobiles, ships, semiconductors, pharmaceuticals, and even heart surgery techniques.

1. Increasing returns to adoption: Learning curves

Learning curves represent the cumulative impact of learning on production costs and productivity.

Organizational learning scholars typically model the learning curve as a function of cumulative output.

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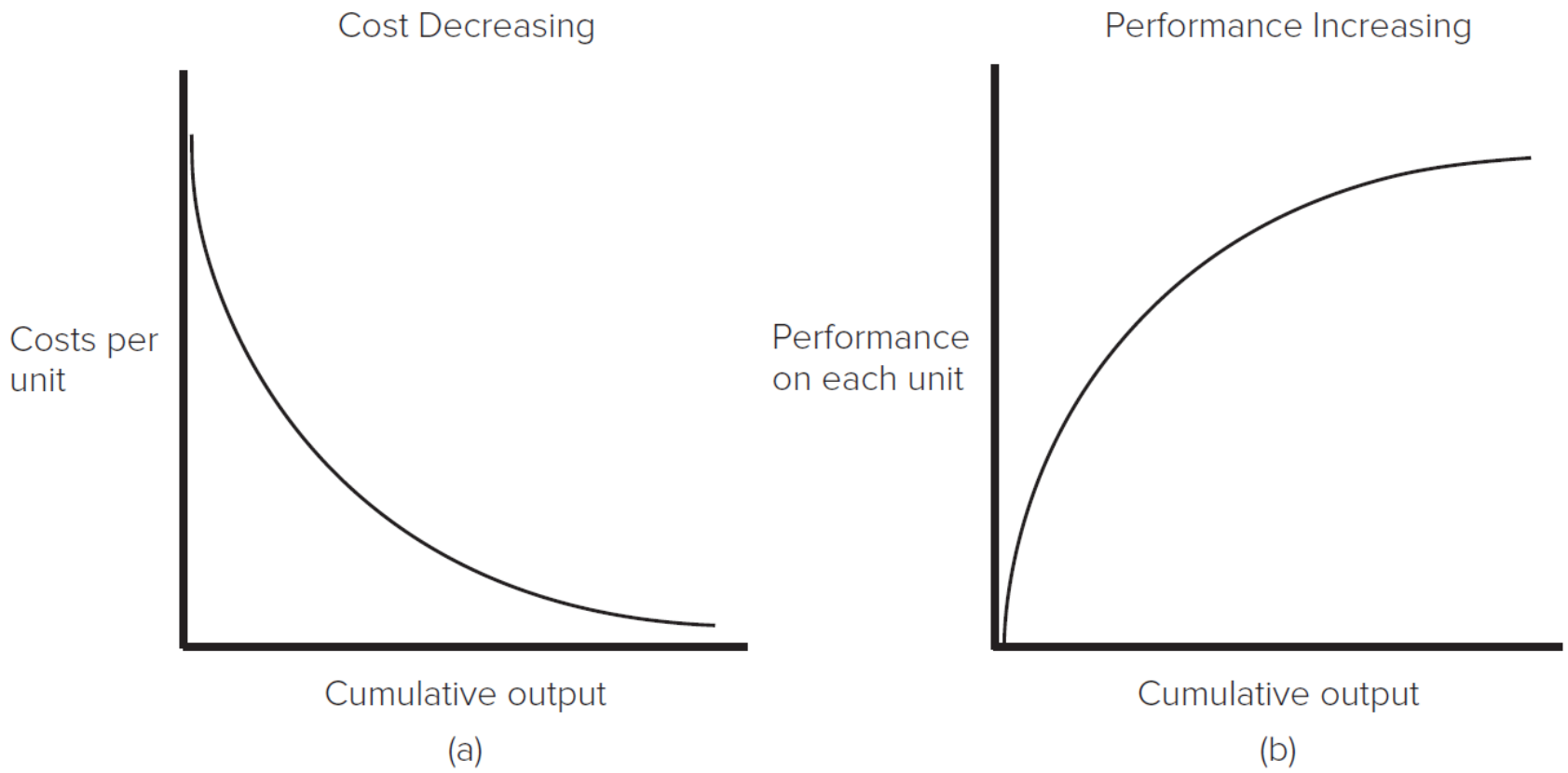
1. Increasing returns to adoption: Learning curves



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Prior Learning and Absorptive Capacity

Firms learn at very different rates.

Firms learn at different rates because their **levels of prior learning** and **absorptive capacity** differ.

Learning rates also differ with the **nature of the task** and firm **strategy**.

→ A firm's investment in prior learning can accelerate its rate of future learning by building the firm's absorptive capacity

Absorptive Capacity

- **Absorptive Capacity:** the ability of an organization to recognize, assimilate and utilize new knowledge

→For example, the development of a new technology requires experimentation.

→Experimentation helps build a knowledge base that allows the individual or firm to identify what alternatives are most likely to be successful in the future.

- *Firms that do not invest in technology development may not develop the absorptive capacity need to recognize or develop a new technology in the future.*

Prior learning

- 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

→Suggests that technologies adopted earlier than others are likely to become better developed, making it difficult for other technologies to catch up.

Absorptive Capacity at industry level

- **Absorptive capacity also has effects at the industry level.**
- As the number of firms learning about a technology increases and/or the number of firms creating complementary technologies increases **the more effective and efficient the original technology will become.**

2. Increasing returns to adoption: Network Externalities

Network Externalities, or positive consumption externalities affect the adoption of a dominant design because a user's benefit from using a good increases as the **installed base** increases (e.g. railroads, telecommunications, communities of practice, computer platforms).

→Installed base: the number of users of a particular good

For example, many people choose a computer that uses the Windows operating system and an Intel microprocessor because the "Wintel" platform has the largest installed base, thus maximizing the number of people with which the user's files will be compatible

3. Increasing returns to adoption: Complementary products

Network externalities arise when **compatibility** (e.g. exchanging computer files) and the availability of **complementary goods** (e.g. movies for a VCR , film for cameras) are important.

→ **Complementary goods: Additional goods and services that enable or enhance the value of another good** (the value of a video game console is related to the availability of goods like video games, different devices etc.)

3. Increasing returns to adoption: Complementary products

For example, as **Windows' installed bas**e increased developers became more likely to expend their efforts on developing products compatible with Windows rather than the MAC. Thus a virtuous cycle (at least from Microsoft's perspective) begins.

→ An increasing installed base attracts complementary goods developers and the availability of complementary goods increases the installed base, and so on.

Self reinforcing cycle of installed base and availability of complementary goods

A technology with a large installed base attracts developers of complementary goods; a technology with a wide range of complementary goods attracts users, increasing the installed base. A self-reinforcing cycle ensues:

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Increasing returns to adoption:

- In markets with network externalities, the benefit from using a good increases with the number of other users of the same good.
- Network externalities are common in industries that are physically networked
  - For example, railroads, telecommunications
- Network externalities also arise when compatibility or complementary goods are important
  - For example, Many people choose to use Windows in order to maximize the number of people their files are compatible with, and the range of software applications they can use.

Example: The Rise of Microsoft

- In 1980, Microsoft didn't even have a personal computer (PC) operating system – the dominant operating system was CP/M (invented by Gary Kindall, marketed by Kindall's company, Digital Research)
- Before 1980 IBM, the world's largest computer producer ,was not interested in developing personal computer. However, after 1980 it changed its opinion and decided to produce personal computers but without producing their own operating system and microprocessor.
- They planned to use Kindall's CP/M (but Kindall did not get back to them)
- IBM then goes to Bill Gates (who was already supplying other software) asking him to provide an operating system for them.
- Gates did not have an operating system at that time but he told them he would have supplied one.
- He bought a clone of CP/M and reworked it for the IBM called "MS DOS."

Example: The Rise of Microsoft

- With DOS the IBM PCs had a rapid success and an even more rapid proliferation (Installed base)
- Microsoft's Windows was later bundled with (and eventually replaced) MS DOS.
- **Had Gary Kildall signed with IBM, or had other companies not been able to clone the IBM PC, the software industry might look very different today!**
- https://www.youtube.com/watch?v=sDIK-C6dGks&list=PLc6EeKrKYKClN48ow3Irj_sO0zQEY-Vwu&index=50

Why Dominant Designs Are Selected

Path dependency often characterizes technology trajectories with increasing returns to adoption. Path dependency means that **small historical events** may have a large effect on the form of the technology adopted as the dominant design. For example,

- **early entrants** and their technology may become so entrenched that subsequent, superior technologies, may be unable to gain a foothold in the market.

- **sponsorship** by a large powerful firm can help a technology gain a controlling share of the market, locking out alternative and potentially superior technologies.

Why Dominant Designs Are Selected

In addition to the market forces that encourage the adoption of a dominant design sometimes **government regulation** plays a role in the selection of a dominant design**.**

Governments are most likely to intervene when there is a societal or consumer welfare benefit **to having compatible technologies. This has often been the case for the** utilities, telecommunications and television industries**.**

Why Dominant Designs Are Selected

For example:

in 1998, the European Union adopted a single wireless telephone standard to avoid the proliferation of incompatible standards and to facilitate exchange both within and across national borders

Why Dominant Designs Are Selected

The most superior products do not necessarily win

- When all of the above forces are at work, the result can be a **natural monopoly** (though some alternatives may survive in niche markets) and **winner-take-all markets**.

The **winning firm** enjoys **high returns** and is well positioned to **affect the development trajectory** of the technology thereby further enhancing its dominant position in the industry.

Losing firms, not only have to **play catch up** after they adopt the dominant design they also **lose the capital, learning and brand equity** invested in their original technology.

Why Dominant Designs Are Selected

The **influence of a dominant design** can be far reaching.

Dominant designs affect knowledge accumulation after their adoption primarily because firms have a tendency to build on their existing knowledge base rather than build new ones.

This means that a dominant design **will influence the technological discontinuity** that will replace it.

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.

A dominant design can have far-reaching influence; it shapes future technological inquiry in the area.

Winner-take-all markets can have very different competitive dynamics than other markets.

- *Technologically superior* products do not always win.
- Such markets require different firm strategies for success than markets with less pressure for a single dominant design.

Are Winner-Take-All Markets Good for Consumers?

This is a complex question, made more complicated by traditional economics emphasis on the advantages of competitive markets.

To answer this question the **benefits accrued by customers** when a larger portion of the market adopts the same technology (**s-curve**) must be **compared with the corresponding monopoly (exponentially increasing) costs** (e.g. higher prices, less product variety, flatter technology improvement trajectory, etc.)

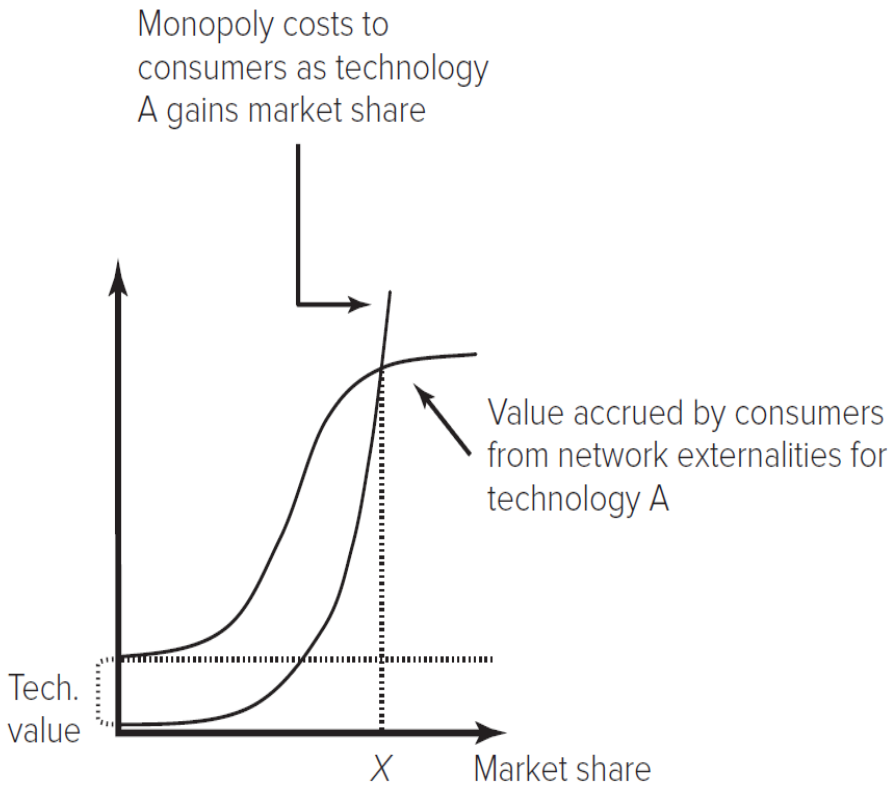
Are Winner-Take-All Markets Good for Consumers?

Economics emphasizes the benefits of competition.

However, network externalities suggest users sometimes get more value when one technology dominates.

Should the government intervene when network externalities create a natural monopoly?

Are Winner-Take-All Markets Good for Consumers?



Curve shapes are different; Network externality benefits likely to grow logistically, while potential monopoly costs likely to grow exponentially.

Where monopoly costs exceed network externality benefits, intervention may be warranted. Optimal market share is at point where lines cross.

Multiple Dimensions of Value

If technological superior products don't always win, what determines which technology and which firm wins?

The company that wins usually is able to effectively **manage the multiple dimensions** that comprise total customer value.

Customers compare the value of two or more competing technologies based on each technologies **stand-alone** and **network externality** value.

Stand-alone Value

Chan Kim and Renee Mauborgne developed the **"Buyer Utility Map"** to help managers determine what aspects of a new technology will be valued by potential customers (e.g. the functions it enables the customer to perform, its aesthetic qualities, its ease of use, etc.).

They recommend considering six **utility levers** and the six stages of a **buyers experience cycle** (purchase, delivery, use, supplements, maintenance, and disposal) in order to fully understand a new technologies standalone value to a customer.

Of course, each benefit has to be considered in light of its cost.

“Buyer Utility Map”

Toyota Prius hybrid-electric example

	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	NA	NA
Simplicity	Buyer may feel less able to assess value of vehicle	NA	Operates like a regular combustion engine vehicle	Refuels like a regular combustion engine vehicle	NA	Hybrids have larger batteries that would have to be recycled and disposed of at end of life

Source: Adapted from *Harvard Business Review.* Exhibit from “Knowing a Winning Business Idea When You See One,” by W. C. Kim and R. Mauborgne, September– October 2000.

"Buyer Utility Map"

	Purchase	Delivery	Use	Supplements	Maintenance	Disposal
Convenience	NA	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	NA
Risk	NA	NA	Buyer might face a higher risk of product failure because it embodies a new technology	NA	Buyer might have difficulty finding replacement parts because of new technology	Prius might be more difficult to resell or have lower resell value

Source: Adapted from *Harvard Business Review.* Exhibit from "Knowing a Winning Business Idea When You See One," by W. C. Kim and R. Mauborgne, September– October 2000.

“Buyer Utility Map”

	Purchase	Delivery	Use	Supplements	Maintenance	Disposal
Fun and image	NA	Connotes image of environmental responsibility	NA	NA	NA	NA
Environmental friendliness	Buyers feel they are helping support the development of more environmentally friendly cars	NA	Emits lower levels of pollutants	Requires less use of fossil fuels	NA	NA

Source: Adapted from *Harvard Business Review.* Exhibit from “Knowing a Winning Business Idea When You See One,” by W. C. Kim and R. Mauborgne, September– October 2000.

Network Externality Value

Network Externality Value is a function of

- The size of the technology's installed base
- The availability of complementary goods

The value of the **Windows** operating system, for example is due to the ability of the system to make it **easy for consumers to use the computer** (**stand-alone value**) plus two sources of **network externality value**: 1) its **large installed base** which translates into a large number of computers with which the user can easily interact, and 2) the availability of **compatible software** developed for Windows as its installed base increased.

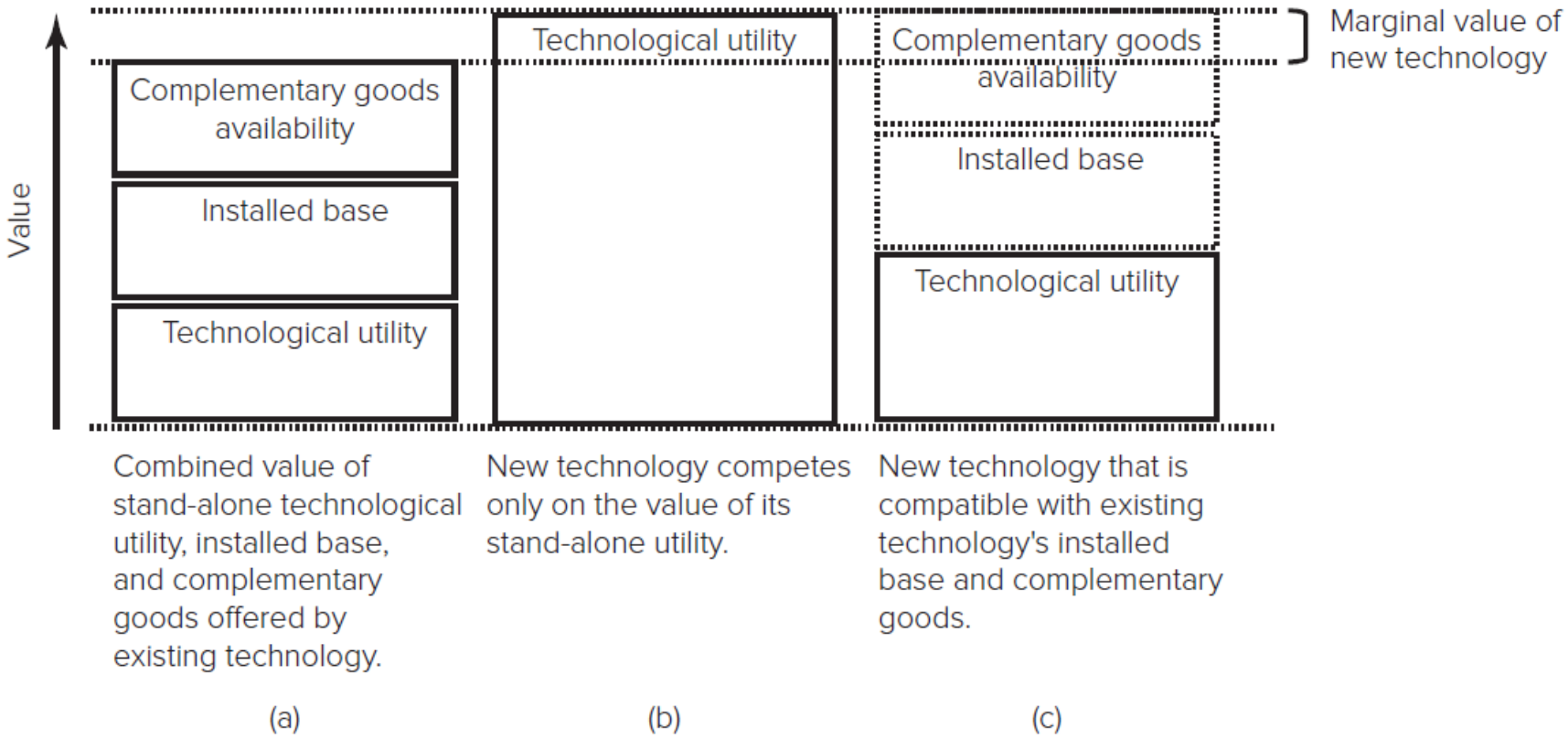
Network Externality Value

- **An incumbent technology may thwart the adoption of a new technologically superior technology** because the **total value** (standalone + network externalities) it offers is higher
- For example, NeXT Computers were extremely advanced technologically, but could not compete with the installed base value and complementary good value of Windows-based personal computers.

Multiple Dimensions of Value

- In industries with network externalities, the value of a technological innovation to users is function not **only of its standalone value**, but also of the value added by the installed base and the existence of the complementary goods.

Multiple Dimensions of Value



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All of the above has been based on the consumer's reliance on **objective information**.

But consumer choice is also affected by **subjective information** (i.e. perceptions of value).

So each value component has a corresponding perceived or anticipated value component that can be considerably different from the actual value.

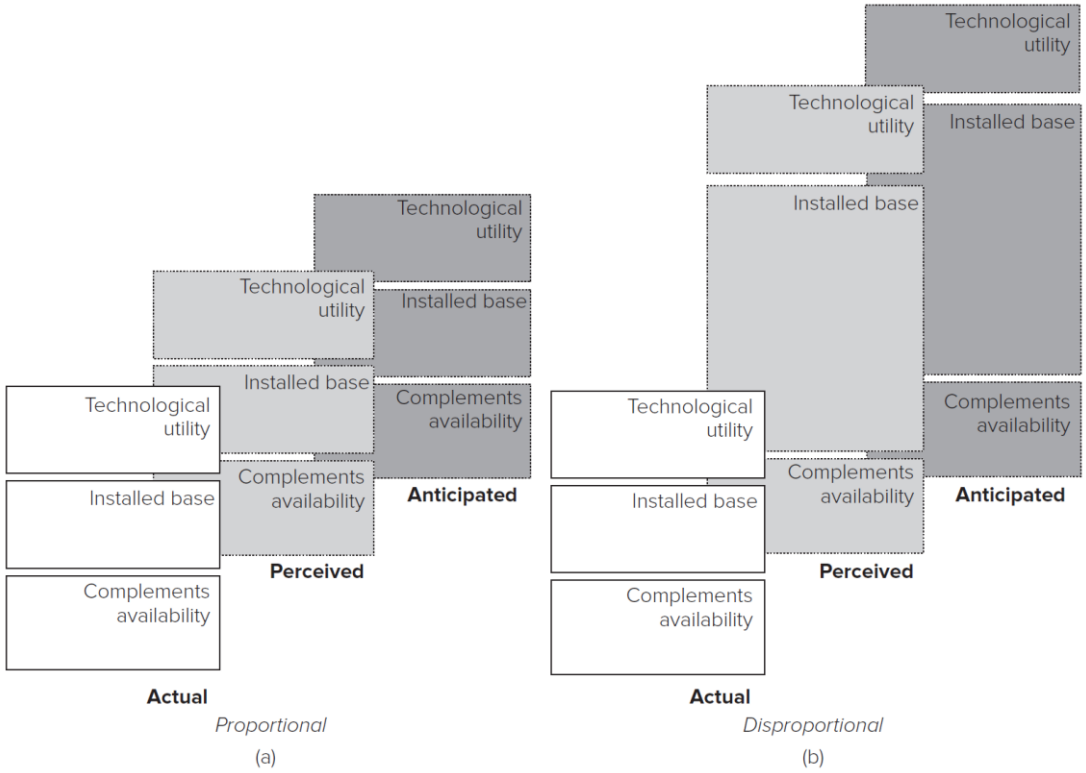
Think for instance of the recent standards battles (e.g.,

Apple iOS versus Google Android)

Multiple Dimensions of Value 7

Subjective information (perceptions and expectations) can matter as much as objective information (actual numbers)

Value attributed to each dimension may be disproportional



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Mindshare

Firms can take advantage of consumer reliance on perceptions by creating a large **'mindshare'** through heavy advertising that makes the installed base appear larger than it actually is and/or make the availability of complementary goods appear greater than they actually are

Example: Sega and Nintendo's battle for dominance in the 16-bit video game console market

“vaporware”

Another tactic firms use to capitalize on consumer reliance on perceptions **is pre-advertising**.

Pre-advertising markets **“vaporware”** (a product that is not yet on the market and may not even exist) in an attempt to persuade customers to wait for the new product instead of buying a competitor’s product that is already available
Example: Apple I-phone

Modularity and Platform Competition

Modularity is when a product can be **separated and recombined**.

Product systems become more modular by expanding the range of compatible components, or by uncoupling components that were previously integrated.

A **platform** is given by a stable core that connects different units for components, complements and final users

Modularity and Platform Competition

In markets where products are complex or complements drive the value of the product system, firms might use modularity to enable different firms to focus on providing different complements or other parts of the ecosystem.

- For example, enabling third-party developers to make applications for the iPhone greatly expanded the range of applications and increased the value of the iPhone ecosystem

Modularity and Platform Competition

In some markets, industry players use modularity to create a **platform ecosystem** where many different firms contribute to the product system.

Ecosystem: a system whose elements have some form of reciprocal dependence.

Platform ecosystem: an ecosystem mediated by a stable core

Platform Ecosystems

In a platform ecosystem, some core part of a product (such as a video game console) mediates the relationship between a wide range of other components or complements (for example, video games, peripherals) and prospective end-users.

- A platform's boundaries can be well-defined with a stable set of members or amorphous and changing.
- The success of all members of the ecosystem depends in part upon the success of other members.
- Members often invest in co-specialization or exclusivity agreements.

Modularity and Platform Competition

Modular systems are those that can be separated and recombined to change their configuration, scale, or functions.

- Standardized interfaces ensure that components are compatible
- In some product systems modularity enables components from different producers to be recombined (for example, smartphones with different apps); in others only components from a single firm are recombined (for example, Ikea shelving systems)

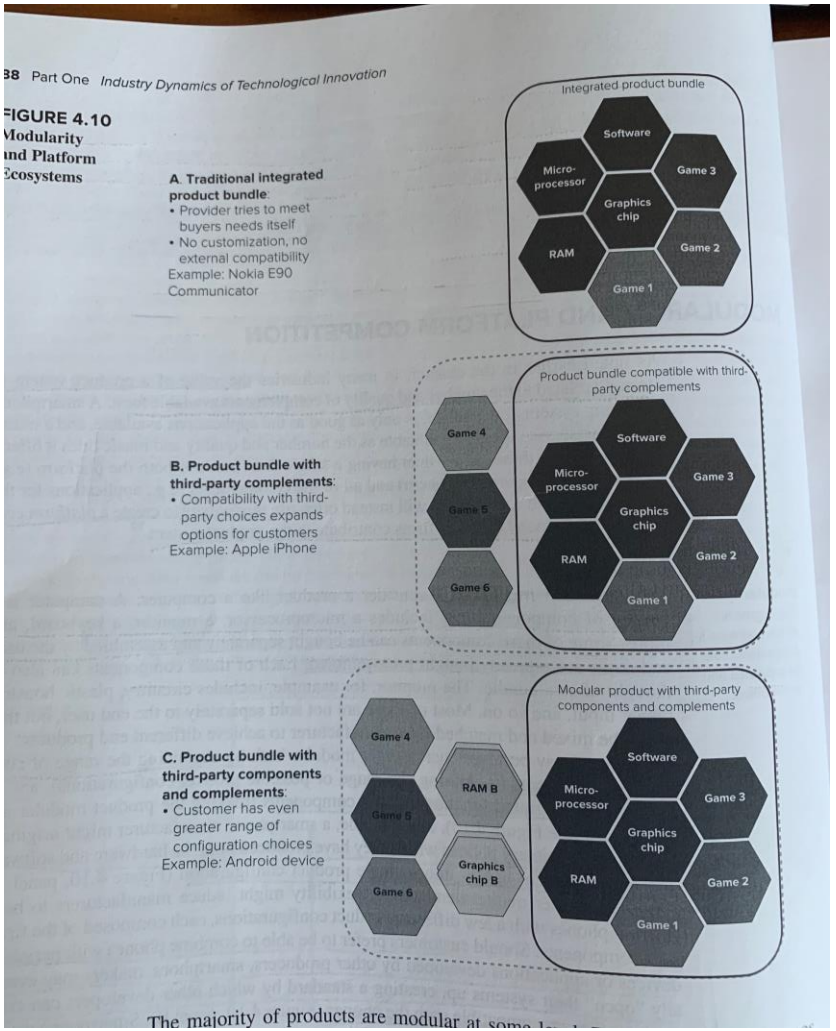
Modularity and Platform Competition

Modularity is more valuable when there are

- **a)** diverse technological options that can be recombined, and
- **b)** customers have heterogeneous preferences.

Modularity and Platform ecosystems

Products may be made increasingly modular by expanding the range of compatible components and by uncoupling integrated functions within components



Platform ecosystems strike a balance between pure modularity and pure integration

Pure Modularity

Combinations take place in the market – no co-specialization

Choice & reconfigurability Competition incentivizes firms to increase quality and decrease price

Quality and compatibility is uncertain (can be hard for customer)

Platforms

Components not owned, but *curated*.

Choice and reconfigurability, but shepherded by platform sponsor

Competition still incentivizes

Producer exerts some control over quality and compatibility

Pure Integration

Combination pre-determined by firm (no reconfiguration)

Captive supply (no competition)

High co-specialization ensures components optimized to work together

Producer controls quality and compatibility

Discussion Questions

1. What are some of the sources of increasing returns to adoption?
2. What are some examples of industries not mentioned in the chapter that demonstrate increasing returns to adoption?
3. What are some of the ways a firm can try to increase the overall value of its technology, and its likelihood of becoming the dominant design?
4. What determines whether an industry is likely to have one or a few dominant designs?
5. Are dominant designs good for consumers? Competitors? Complementors? Suppliers?
6. In what kinds of industries will platform ecosystems be more valuable than pure modularity or integrated hierarchies?