

Information System Management

The Changing Competitive Environment

*Understanding network economics, information economics
and disruptive technologies*

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Learning Objectives

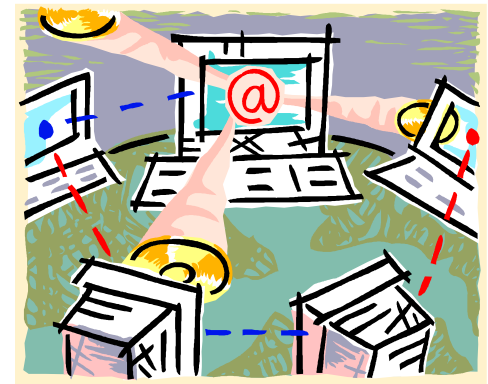
1. Comprehend the basic principles of network economics, including the sources of value in networks, and the definitions of physical and virtual networks. You will also learn to apply these concepts to strategy and managerial decision making.
2. Understand the concepts and vocabulary of network economics, including positive feedback, network externalities, and tippy markets. Be able to recognize when network effects occur and what makes a market tip, as well as what market will not tip toward a dominant player.
3. Comprehend the basic principles of information economics and the role that information plays in the modern competitive environment. Understand the concepts and vocabulary of information economics, including the ability to define classic information goods and information-intensive goods.
4. Be able to explain how the advent of pervasive networks has enabled information to break the constraints imposed by traditional information carriers. You will also be able to explain what the richness/reach trade-off is and its implications for modern organizations.
5. Be able to distinguish between disruptive and sustaining technologies. Be able to identify each kind and draw implications for decision making in organizations faced with the emergence of disruptive technologies.

Introduction

- Understanding how to appropriately deploy the information technology now that the Internet is a cornerstone of business infrastructure requires a basic appreciation of what the Internet is and how it works
- General / functional managers requires an understanding of the
 - economic characteristics of networks and of information
 - impact on the competitive landscape and the strategy of the firm

Internet

- An infrastructure upon which many services are delivered
- The worldwide, publicly accessible system of interconnected computer networks that transmit data by packet switching using the standard Internet Protocol
- The Net \neq the Web



Characteristics of Internet

- Distributed ownership: Different portions of the Internet are owned by different entities.
- Multiplicity of devices: The Internet consists of millions of smaller digital networks, a collection of digital devices (nodes).
- Open standards: The agreed upon set of rules or conventions governing communication among Internet nodes are freely available to everyone.
- The Internet is rapidly evolving.
 - Network and grid computing
 - Wired and wireless connections of a range of intelligent devices

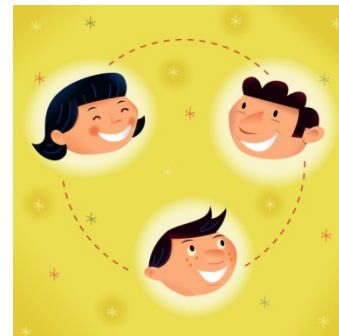
Network Economics

- **Value in scarcity:**
 - The value of a good is a function of its limited availability
- **Value in plentitude:**
 - The value of a network is a function of the number of connected nodes



Types of Networks

- **Physical networks:** the nodes of the network are connected by physical links
 - Telephone network
 - Railroad network
- **Virtual networks:** the connections between network nodes are intangible and invisible, such as people.
 - iTunes network
 - Skype network
 - eBay network

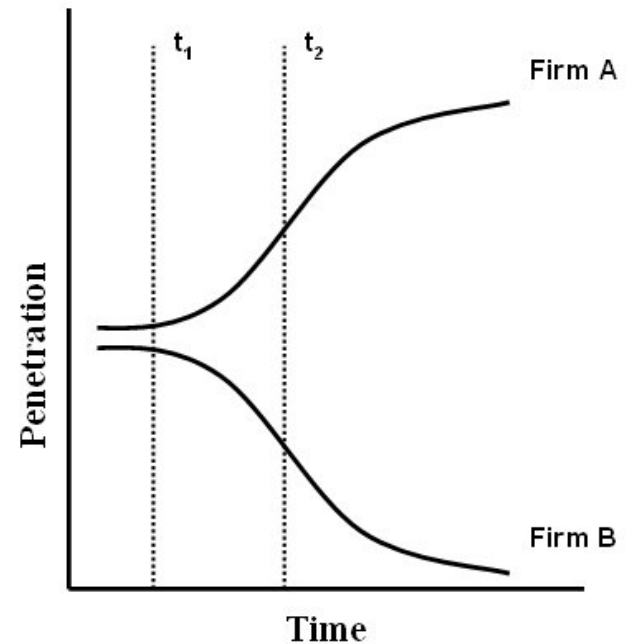


Virtual Networks

- A virtual network is generally sponsored by an organization or technology that enables it, controls access to it, and manages its evolution.
- Value of the virtual network:
 - Shared information
 - Shared expertise
- The value of the network for its members is a function of its size (the number of nodes in the same network).

Positive Feedback

- The self-reinforcing mechanism by which the strong gets stronger and the weaker gets weaker.
- Economies of scale
 - The stronger gets stronger
 - The weaker gets weaker.



Negative Feedback

- The opposite of positive feedback
 - The stronger gets weaker
 - The weaker gets stronger
- Past a certain size, the dominant firm encounters difficulties, such as coordination costs and increasing overhead, that limit further growth.

Network Effects vs.. Network Externalities

- **Network Effects:** Positive feedback dynamics that occur in networks
- **Network Externalities:** When a new node creates value for all the other members of the network by making the network larger, and thus more valuable and the competing networks less valuable
- Examples: Skype

Network Effects

- Positive feedback has no upper limit when it is associated with network effects
- A survival kit for firms at the losing side:
 - Become compatible with the dominant player
 - Find a niche that is different enough from the broader market and big enough to sustain the firm

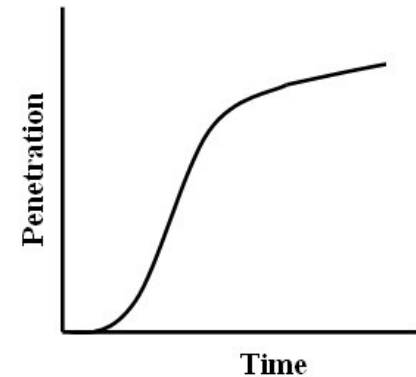


Tipping Point vs.. Tippy Market

- **Tippy Market:** Market that is subject to strong positive feedback, such that the market will “tip” in favor of the firm that is able to reach critical mass and dominate it
- **Tipping Point:** The moment in the evolution of a market where one organization or technology reaches critical mass

Tipping Point vs.. Tippy Market

- Low production and distribution costs yield quick onset of the tipping point
- Not all markets tip
 - Online retailing market?
- Tippy market
 - Characterized by strong network effects
 - Not necessarily “network businesses”



Recognizing Tippy Markets

- The presence and strength of economies of scale:
 - Supply side economies of scale
 - Demand side economies of scale (network effects)
- Variety of customer needs:
 - Demand for variety engenders distinct market niches

		<u>Economies of Scale</u>	
		Low	High
<u>Demand for Variety</u>	Low	Unlikely	High
	High	Low	Depends

Two-Sided Networks

- Networks that have two types of members
 - Users of content and suppliers of content (i.e., Adobe PDF format)
 - Buyers and suppliers of goods (i.e., Online electronic marketplaces)
- The value of the network to one type of member depends on the number of members from the other side that take part in the network

Implications of Network Economics

- Network effects occur in the presence of technology standards, virtual networks and communities of interest
- It is critical to be an innovator in the market of digital products delivered over the Internet
- Customers will pick a network, not a product or a service provider
- Sponsoring a dominant network provides competitive advantage
- The steeper the costs associated with being a member of competing networks, the more valuable it is to be able to control and retain ownership of the network

The Economics of Information

“The information you can derive from e-commerce is as interesting as the commerce itself.”

Andy Cohen, former Senior Vice President of Sales and Marketing at Instill



Data and Information

- Data: Codified raw facts
 - Things that have happened
 - Coded as letters of the alphabet and numbers
 - Increasingly stored digitally
- Information: Data in context
 - Audience-dependent

<u>Ticket number</u>	<u>Record Locator</u>	<u>Departure</u>	<u>Arrival</u>	<u>Flight #</u>	<u>Departure</u>	<u>Arrival</u>	<u>Passenger</u>
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Classic Information Goods

- Products that a customer purchases for the only purpose of gaining access to the information they contain
- Product that can be digitized

United States - Ho'okipa (wave: NWW3 31.3.2011 06 UTC)																		Options						
Forecast		Map	Webcams	Wind reports	Accommodation	Schools/Rentals	Shops	Other...																
GFS 31.03.2011 06 UTC		We 30.	Th 31.	Th 31.	Th 31.	Th 31.	Th 31.	Fr 01.	Fr 01.	Fr 01.	Fr 01.	Fr 01.	Fr 01.	Sa 02.	Sa 02.	Sa 02.	Sa 02.	Sa 02.	Sa 02.	Su 03.	Su 03.	Su 03.	Su 03.	
		20h	05h	08h	11h	14h	17h	20h	05h	08h	11h	14h	17h	20h	05h	08h	11h	14h	17h	20h	05h	08h	11h	14h
Wind speed (knots)		11	12	13	12	14	14	13	13	14	14	13	13	12	11	12	11	12	11	11	9	9	9	10
Wind gusts (knots)		16	17	16	15	16	18	18	17	18	17	15	15	16	15	15	14	13	13	13	12	11	12	11
Wind direction		↖	↖	↖	↖	↖	↖	↖	↖	↖	↖	↖	↖	↖	↖	↖	↖	↖	↖	↖	↖	↖	↖	↖
Wave (m)		2.7	3.3	3.3	3.3	3.3	3.2	3.1	2.9	2.8	2.8	2.7	2.7	2.6	2.5	2.4	2.3	2.3	2.2	2.2	1.9	1.9	1.8	1.8
Wave period (s)		18	16	15	15	15	15	14	13	13	13	13	12	12	12	11	11	11	11	11	10	10	10	9
Wave direction		↘	↘	↘	↘	↘	↘	↘	↘	↘	↘	↘	↘	↘	↘	↘	↘	↘	↘	↘	↘	↘	↘	↘
*Temperature (°C)		23	22	22	23	23	23	22	22	23	24	23	22	22	22	23	24	23	22	22	22	24	24	24
Cloud cover (%) high / mid / low		-	-	9	35	24	34	55	-	-	-	-	10	13	8	-	21	10	-	14	34	30	51	46
*Precip. (mm/3h)		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	-	-	-
Windguru rating		★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★
GFS 31.03.2011 06 UTC		Su 03.	Su 03.	Mo 04.	Mo 04.	Mo 04.	Mo 04.	Mo 04.	Tu 05.	Tu 05.	Tu 05.	Tu 05.	Tu 05.	We 06.	We 06.	We 06.	We 06.	We 06.	We 06.	Th 07.	Th 07.	Th 07.	Th 07.	
		17h	20h	05h	08h	11h	14h	17h	20h	05h	08h	11h	14h	17h	20h	05h	08h	11h	14h	17h	20h	05h	08h	
Wind speed (knots)		6	9	9	10	9	8	9	9	14	16	15	14	14	14	15	14	14	14	14	13	15	16	
Wind gusts (knots)		7	11	12	13	11	9	10	12	19	21	19	17	17	20	19	19	18	16	17	19	20	21	
Wind direction		↖	↖	↖	↖	↖	↖	↖	↖	↖	↖	↖	↖	↖	↖	↖	↖	↖	↖	↖	↖	↖	↖	
Wave (m)		1.8	1.8	1.9	1.9	2	2	2.1	2.1	2.3	2.4	2.5	2.6	2.8	2.9	3.4	3.6	3.6	3.7	3.6	3.5	3.2	3.1	
Wave period (s)		9	8	13	13	13	12	12	12	12	12	12	11	11	11	11	11	11	11	11	11	12	12	
Wave direction		↖	↖	↖	↖	↖	↖	↖	↖	↖	↖	↖	↖	↖	↖	↖	↖	↖	↖	↖	↖	↖	↖	
*Temperature (°C)		23	23	22	22	24	24	23	22	21	22	22	22	22	21	21	22	22	23	22	21	21	21	
Cloud cover (%) high / mid / low		46	61	98	98	99	99	99	99	98	99	99	96	96	97	97	23	27	64	64	56	47	43	
*Precip. (mm/3h)		16	33	7	-	-	-	-	12	20	15	-	-	-	-	13	13	-	-	-	9	-	-	
Windguru rating									★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	

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Economic Characteristics

- Information has high production costs
- Negligible replication costs
- Negligible distribution cost
- Information is not the carrier
- Sunk costs
- No natural capacity limits
- Not consumed by use
- Experience goods

Implications of Information Goods

- Information is customizable
- Information is reusable
- Information is often time-valued
- Information goods can produce significant gross profit margins



Information & Intensive Goods

“every business is an information business.”

Evans, P.B. and Wurster, T.S. (1997)

- Most products and services are information intensive goods
- Information plays a critical role in:
 - Creating the product/service
 - Bringing it to market
- Information may be:
 - At the periphery of the product or service
 - Embedded in the product itself as knowledge

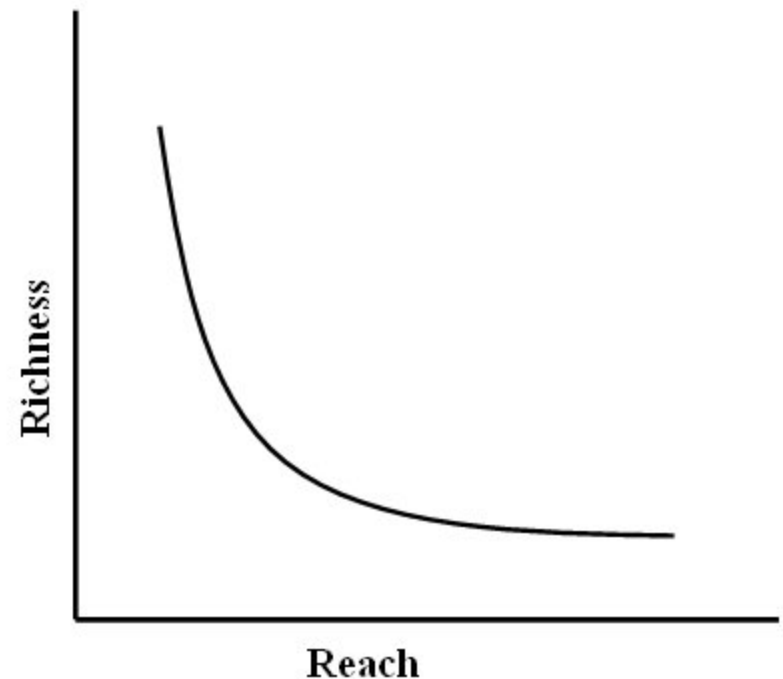
Information in Networks

- Physical carriers of information goods often prevent information goods from behaving like information goods



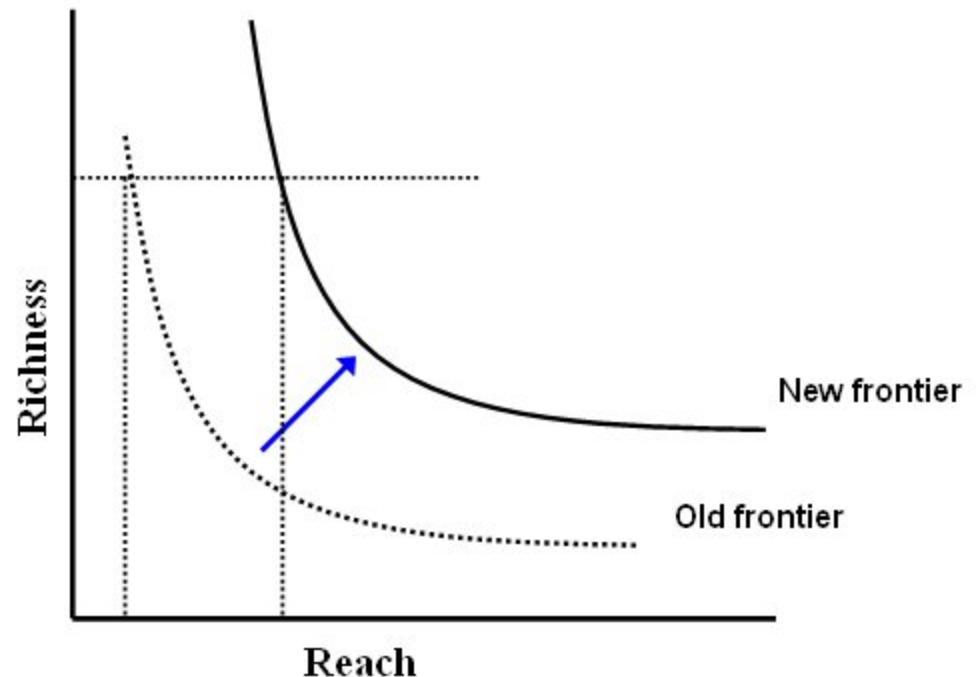
The Richness and Reach Trade-Off

- Richness:
 - The amount of information that can be transmitted
 - The degree to which the information can be tailored to individual needs
 - The level of interactivity of the message
- Reach
 - the number of possible recipients of the message



The Richness and Reach Trade-Off

- The Internet and the technologies that leverage it have mitigated the trade-off between rich information and reach of the message
- However, the trade-off between reach and richness has not been eliminated



Implications

- Traditional business models continue to be questioned particularly for those firms where the current business model is predicated on the need to bundle information with a physical carrier.
- As products that could never be brought together before can now be bundled, it becomes critical to have a direct relationship with the customer, or owning the customer interface, may become critical
- The decreasing value of asymmetric information gives pressure to organization bases its value proposition on the inability of individuals to obtain and use information at low costs

Obstacles

- Old technology leave the scene only when new ones have fully replaced the relevant features.
- New entrants using new technologies face retaliation from incumbents.
- New technologies entail costs:
 - Learning obstacles
 - Switching costs
 - Inertia slows the stopping and dismissal of old routine
- A proliferation of information leads to a scarcity of attention
- Scarcity of attention leads to slow adoption rates for all but the most revolutionary innovations.

Retaliations

- Legal means
 - Music industry vs. digital music
- Legislative means
 - Car dealership networks vs. direct sales by car manufacturers.
- Hybrid offers
 - Retailers (physical stores) vs. retailers (online operations)
- Heightened competition,
 - Traditional telecommunications vs. Voice over IP

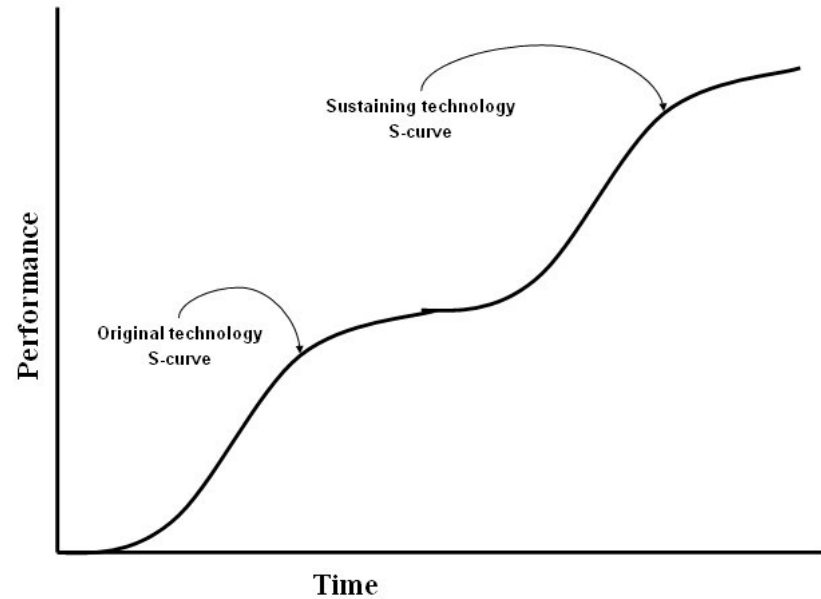
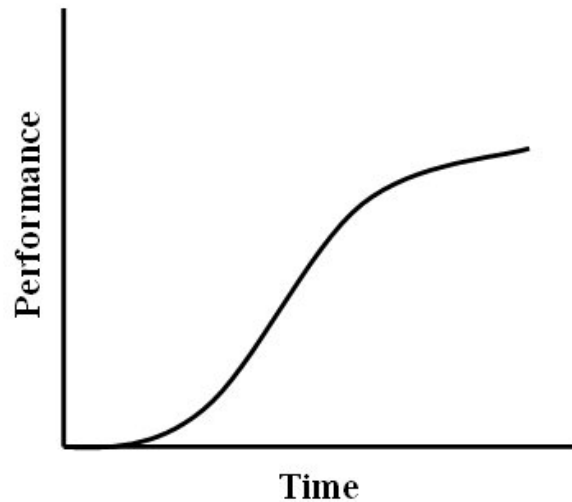
Internet Changes Everything?

- The debate
 - The Internet is the last stage in the ongoing evolution of information technology
 - The Internet a force of social change that goes far beyond technology
- Network economy provides new opportunity to firms that are able to take advantage of the changes
- Adoption of global networks has enabled these boundaries to become increasingly permeable under the guise of outsourcing arrangements and partnerships



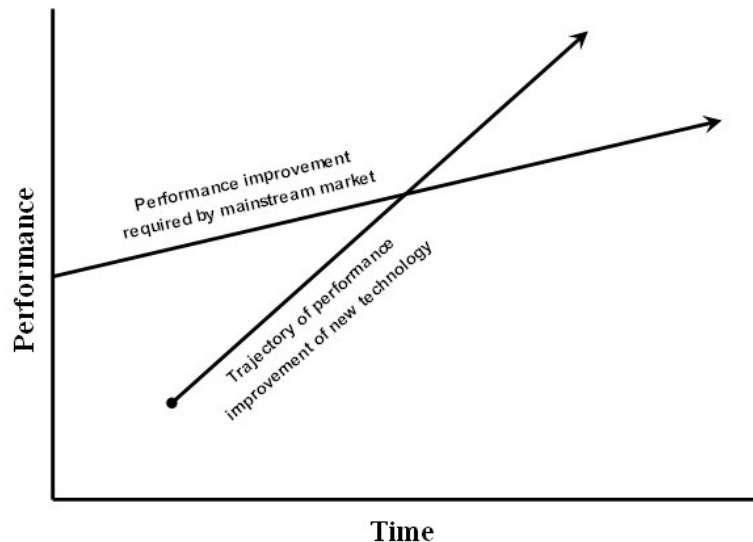
Sustaining Technology

- Technologies that maintain or rejuvenate the current rate of performance improvement of the products and services that use them.
- A good candidate to replace a previous generation because it offers the same set of attributes, but it yields superior performance.



Disruptive Technology

- The technology offers a different set of attributes than the technology the firm currently uses in its products
- The performance improvement rate of the technology is higher than the rate of improvement demanded by the market

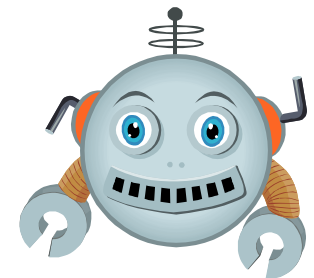


Implications

- Managers should estimate whether the disruptive technology will catch up to market needs on the critical performance dimensions
- The novel set of attributes of the disruptive technology may become a source of positive differentiation and increasingly attractive to potential customers
- Listening attentively to your most aggressive customers will create a bias toward prompt adoption of sustaining technology and a reluctance to buy into disruptive ones

What to Do?

- Keep an eye on the emergence of new technologies
- Identify the customers who will appreciate the attributes of the disruptive technology
- Spin off a new division exclusively focusing on the commercialization of products based on the disruptive technology



The Recap

- Value creation in networks, physical ones such as the telephone network and virtual ones such as eBay's online community of buyers and sellers, is created by plentitude.
- Because the most valuable networks are the largest ones, the act of joining a network by an individual creates value for the other members of the network—a phenomenon termed network effects.
- In industries subject to strong network effects, particularly when the demand for variety is low and networks are mutually exclusive, winner-take-all dynamics ensue and the market is dominated by one organization.
- Information, a prevalent resource in the modern competitive landscape, has unique economic characteristics. In its pure form, information has high production costs, which are sunk, and negligible replication and distribution costs.
- The production of information faces no natural capacity limits, and information is not consumed by use. As a consequence, information is infinitely reusable, highly customizable, and often time valued

The Recap

- When discussing information as an organizational resource, it is important to distinguish the information itself from the carrier of the information.
- New technology continues to push the frontier of the richness/reach trade-off and in the process threatens established business models in information industries and beyond.
- Sustaining technologies are those that maintain or rejuvenate the current rate of performance improvement of the products and services that use them.
- Disruptive technologies are those that offer a different set of attributes than the technology the firm currently uses in its products, and their performance improvement rate is higher than the rate of improvement of market needs.

What We Learned

1. Comprehend the basic principles of network economics, including the sources of value in networks, and the definitions of physical and virtual networks. You will also learn to apply these concepts to strategy and managerial decision making.
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