

Strategic
Computing and Communications
Technology

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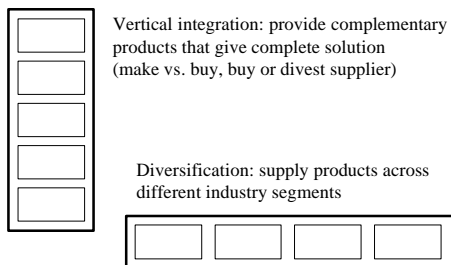
Diversification and convergence

by
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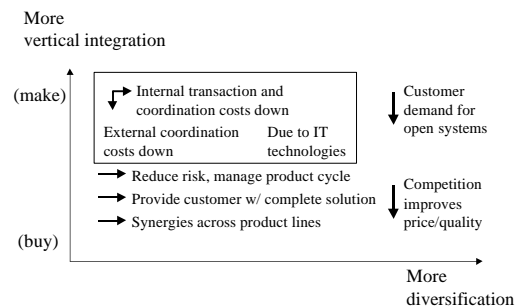
Summary

- Trends
 - More diversification and vertical disintegration (within limits)
 - Convergence
- Convergence of computing and communications

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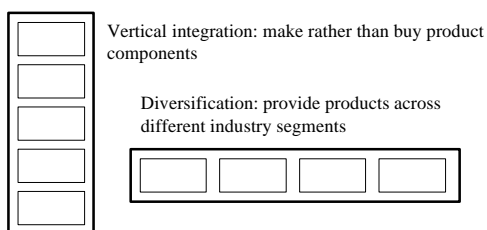


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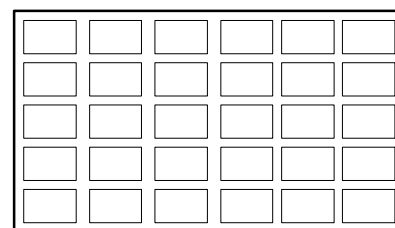
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Vertical integration vs. diversification



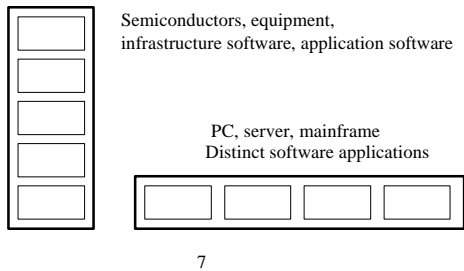
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Both can co-exist in large firms

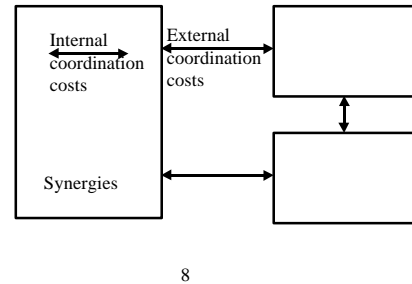


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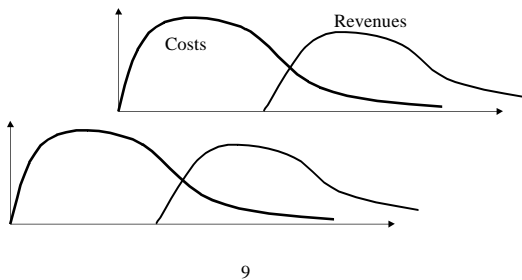
Example: computer industry



Boundaries of the firm



Consistency



Diversification by acquisition

- Where time to market is important (as it usually is) acquisition is rapid path to diversification
 - Nortel buys Bay networks
 - CISCO and Microsoft
 - AOL buys Netscape
 - Lucent buys Ascend
 - AT&T buys TCI
- Buying product, customers, expertise, people

Question

- What are some recent examples of diversification (specialization) in the:
 - Computer industry
 - Telecommunications industry
- Vertical disintegration (integration)

What is convergence?

- It is *not* diversification
- It is when two industries' products formerly were not, but have become (from the customer's perspective) either complementary (dependent) or competitive (overlapping)

Examples of convergence

- Complementary:
 - Computing and telecommunications
 - Entertainment and storage
 - Publication and networking
- Competitive:
 - Consumer electronics and telecommunications+computing
 - Telephony and cable television
 - Internet and telephony
 - Information appliance and PC

This is oversimplified: often industries are both competitive and complementary

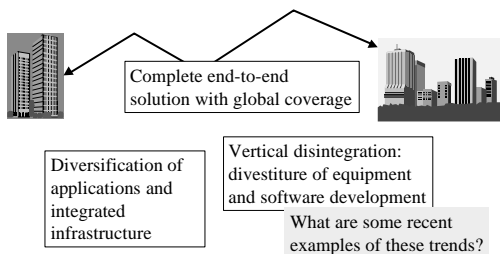
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The past

Telecommunications	Networked computing
<ul style="list-style-type: none"> • National monopolistic providers • Stovepipe networks • Premium on end-to-end connectivity and interoperability <ul style="list-style-type: none"> – Standardization • Service providers 	<ul style="list-style-type: none"> • Highly competitive firms • Stovepipe solutions to both platforms and applications • Customer owned and operated

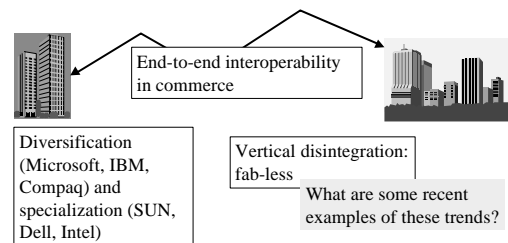
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Telecommunications trends



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Computing trends



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Infrastructure trends

- Expansion of functionality
 - Middleware, caching, proxies, etc.
 - In part to achieve end-to-end interoperability and integration across applications and platforms
- Integration across applications
 - Multimedia PC's
 - Integrated networks
- Integration across platforms
 - Portable and mobile software
 - Backbone and wireless
 - Telephone and Internet

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The future

Telecommunications	Networked computing
<ul style="list-style-type: none"> • Global competitive providers with diversified applications • Integrated layer networks • Less emphasis on standardization? Probably not, due to network effects • Less regulation? Maybe not 	<ul style="list-style-type: none"> • More standardization for global commerce applications • Expansion of the infrastructure • Software portability and mobility • More regulation

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Some distinct capabilities

- Equipment
 - Hardware + embedded software
 - e.g. computers, switches
- Infrastructure software
 - e.g. OS, middleware, intelligent network
- Operational (enterprise) and commerce software
- Operations and customer service

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Some key competencies

Service providers	Equipment suppliers
<ul style="list-style-type: none"> • Real estate • Customer service operations <ul style="list-style-type: none"> – Operational support software • Dealing with regulatory bodies 	<ul style="list-style-type: none"> • Chip and hardware design • Standalone, high performance software • Differentiation from competitors • Standardization • Time to market

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Some abandoned attempts

- Combining computing and communications equipment
 - IBM and Rolm
 - AT&T/Lucent and NCR
- Combining equipment and operations
 - IBM sells global networking business to AT&T
 - Prodigy spun off
 - AT&T divests Lucent and NCR
- Combining operational software and service
 - RBOC's spin off Bellcore

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Lessons?

- At least four distinct capabilities
- Vertical integration creates a conflict when you want to be a supplier to your competitors

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Recent examples

- Computing help jump-starting communications
 - Intel helps start Covad
- Standardization for global interoperability in computing
 - CORBA, W3C, XML, etc
- Operational software separate from equipment
 - Inktomi
 - Bellcore's intelligent network
- Telephone and networking equipment
 - Lucent buys Ascend, Nortel buys Bay Networks

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Some distinct capabilities (again)

- Equipment
 - Hardware + embedded software
 - e.g. computers, switches
- Infrastructure software
 - e.g. OS, middleware, intelligent network
- Operational (enterprise) and commerce software
- Operations and customer service

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Trend: integrated layers

- Applications: operational, enterprise, commerce software
- Infrastructure software: OS, middleware, caching, proxy, signal processing, etc.
- Communications service provision
- Equipment: computers, switches, etc.

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Spanning layers

- Platform (processor/OS) becomes commodity when hidden by middleware layers
- Physical layer networking (Ethernet, ATM) becomes commodity when hidden by IP layer

(Caution: in both cases performance still matters)

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Question

- Can you draw parallels between:
 - Impact of Internet on telecommunications industry
 - Impact of PC on computer industry

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Impact of convergence on telecommunications

- Integrated networks
 - Multimedia, data
 - Broadband access
 - Wireless access
- Unbundling of infrastructure from applications
- Stranded investments
 - Switching (telephone, CATV)

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Impact of convergence on computing

- Emphasis on portability and interoperability across platforms and networks:
 - Standardization
 - Middleware (CORBA, Java, etc.)
 - Integrated solutions by diversification (Microsoft) or consortia/collaboration
- Greater societal impact
 - e.g. privacy, universal access, interconnection, etc
 - Increased policy and regulation

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Summary

- Computer industry looks much more like telecommunications (standardization, regulation)
- Telecommunications looks much more like computing (competition, unbundling, layering)
- Will convergence companies emerge?
 - Integrated network operations and provisioning
 - Information appliances

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