



15.905 Technology Strategy

Systems, architecture, and business ecosystems,
value creation and value capture

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23 April 2007



Agenda for today, Wednesday 18 April 2007

~12:45

Systems, architecture,
business ecosystems,
value creation and value
capture

~13:15

Adobe



High-tech businesses are built on systems, which co-evolve with business ecosystems

- “...new products are rarely stand-alone items. Rather, they are components of broader systems or architectures”¹
- “...co-evolution [is] a process in which interdependent species evolve in an endless reciprocal cycle, in which ‘changes in species A set the stage for natural selection of changes in species B’- and vice versa”²
- “The organization of firms and industries and the architecture of products are interrelated.”¹
- “Indeed, harnessing the full potential of the technology necessarily involves cooperation amongst industry participants, many of whom might also be competitors.”¹

David Teece, “Capturing Value from knowledge Assets”, California Management Review, Spring 1998, pages 55-79

James Moore, “Predators and Prey”, Harvard Business Review, May-June 1993, pages



High-tech businesses are built on systems, which involves *business ecosystems*

- Products part of larger and more complex systems
- Performers
- Media companies
- *Personal computing*
- *Browsers, ISPs*
- Apple
- *Cases, headphones, docks, cars*
- Software vendors
- Component vendors
- Products are comprised of multiple (sub-)systems



The wireless sensor networking business ecosystem in about 2003

Image removed due to copyright restrictions.



(Business) Ecosystem

noun

1. a a system formed by the interaction of a community of organisms with their environment¹
2. “[a system in which] companies co-evolve capabilities around a new innovation, they work cooperatively and competitively to support new products, satisfy customer needs, and eventually incorporate the next round of innovations”²
3. “[a] loose network...of suppliers, distributors, ...makers of related products or services, technology providers [that] affect, and are affected by, the creation and delivery of a company’s own offerings”³

1: Random House Unabridged Dictionary, © Random House Inc. 2006

2: James Moore, “Predators and Prey”, Harvard Business Review, May-June 1993, pages

3: Marco Iansiti and Roy Levien, “Strategy as Ecology”, Harvard Business Review, March 2004, pages

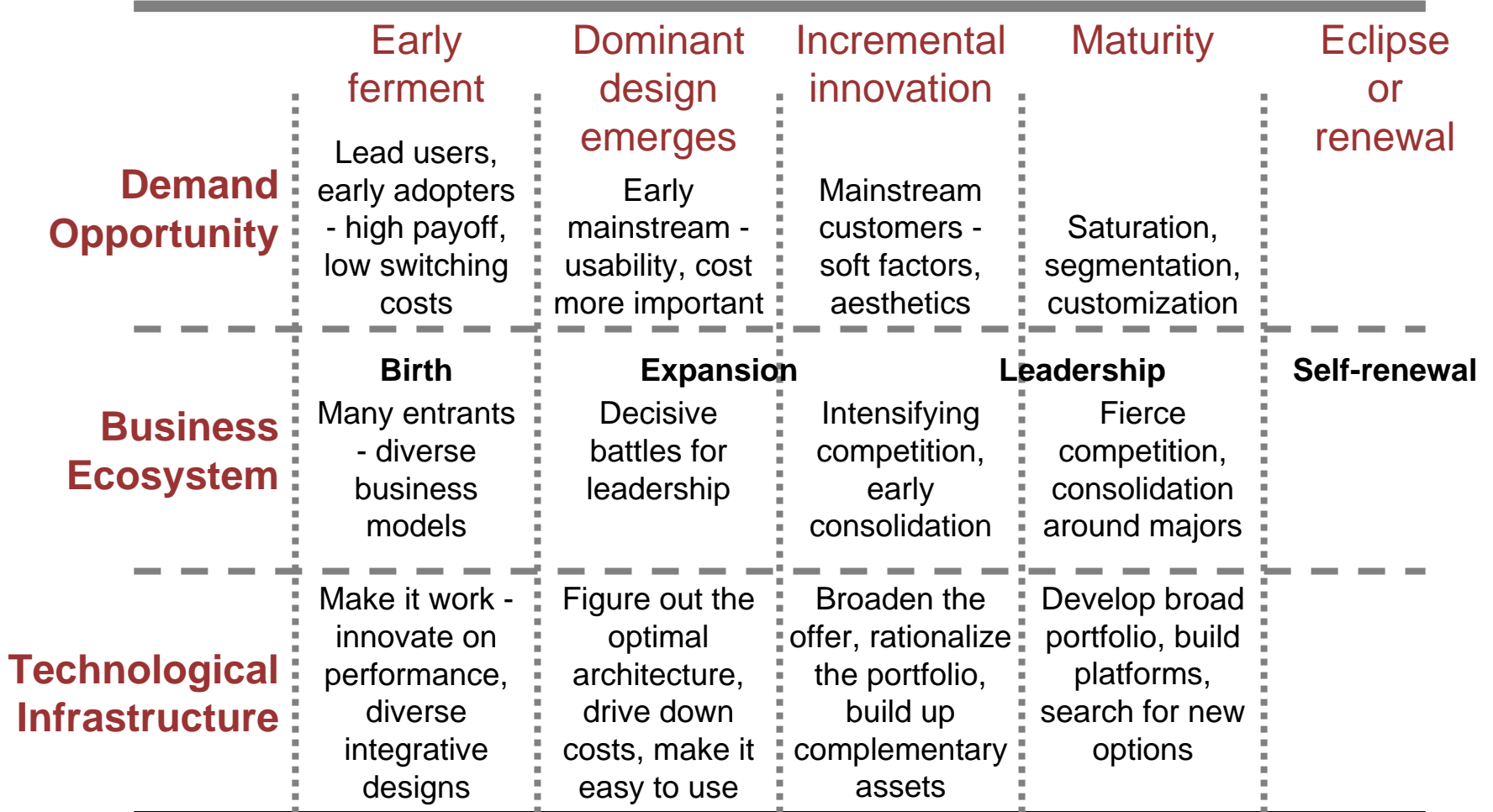


Industries vs business ecosystems, business ecosystems vs biological ecosystems

Industry	Business ecosystem	Biological ecosystems
<ul style="list-style-type: none">• Stable structure and boundaries<ul style="list-style-type: none">– SIC codes– mature• Same customers• Same suppliers• Similar scope of activities• Same business models• Horizontal competition amongst like competitors	<ul style="list-style-type: none">• Innovation• Dynamic and evolving• Unclear and fuzzy boundaries• Very different scope of activities• High degrees of specialization• Participants depend on one another for their effectiveness and survival	<ul style="list-style-type: none">• <i>Stable inputs(?)</i>• Dynamic and evolving• Unclear and fuzzy boundaries• Very different scope of activities• High degrees of specialization• Participants depend on one another for their effectiveness and survival

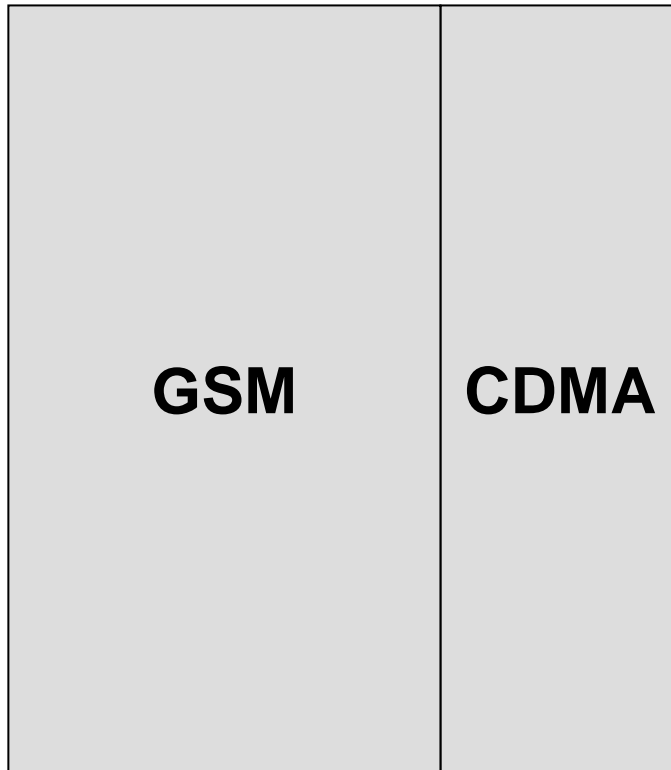


Ecosystems go through stages, co-evolving with technological innovation and demand opportunities





Performance depends on competition both between ecosystems and within ecosystems





Ecosystem maps: Architectural; Business; and Chronological

	<u>Content</u>	<u>Application</u>
Architectural map A	<p>How things work, roles</p> <p>Contributions of individual participants or business elements</p> <p>“You are here and there are your neighbors”</p>	<p>Basic education about the STRUCTURE of the business, roles and niches, and who its competitors and complementors are</p>
Business map B	<p>Participants with relative share, at a point in time</p> <p>Optionally, adjacent ecosystems too</p> <p>“Who’s doing well”</p>	<p>Illustrate relative SCALE or strength of a business, its competitors and complementors</p> <p>Can demonstrate ecosystem invasion</p>
Chrono-logical map C	<p>Detailed ecosystem changes (or events) over time</p> <p>Activity compared with competitors</p> <p>Evolution trajectory</p> <p>“What’s going on”</p>	<p>Show historical or potential DYNAMICS in the ecosystem</p> <p>Benchmark against competitors; show strategic intent</p> <p>Help plan for strategic goals</p>

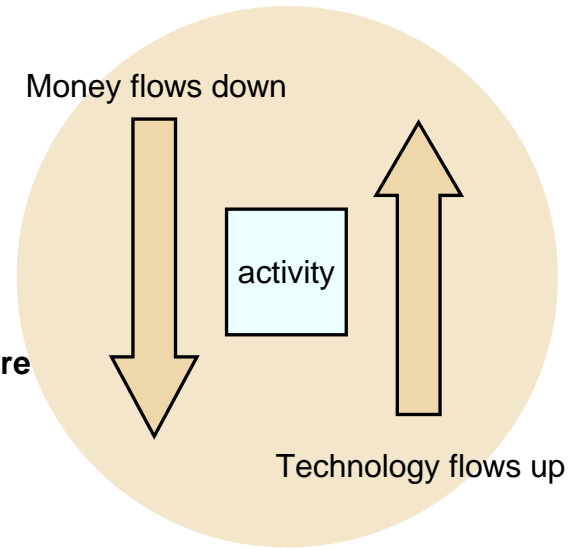
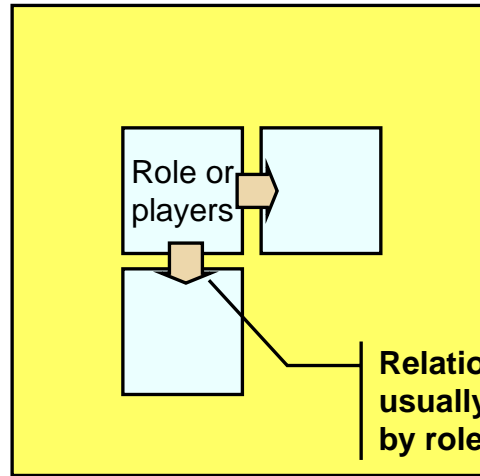


A: players or roles on a plane with dimensions that illustrate contributions, locations and relationships

A

Architectural map

Logical hierarchy
or Scope
or Adjacent ecosystems



We nearly always use hierarchy on vertical axis

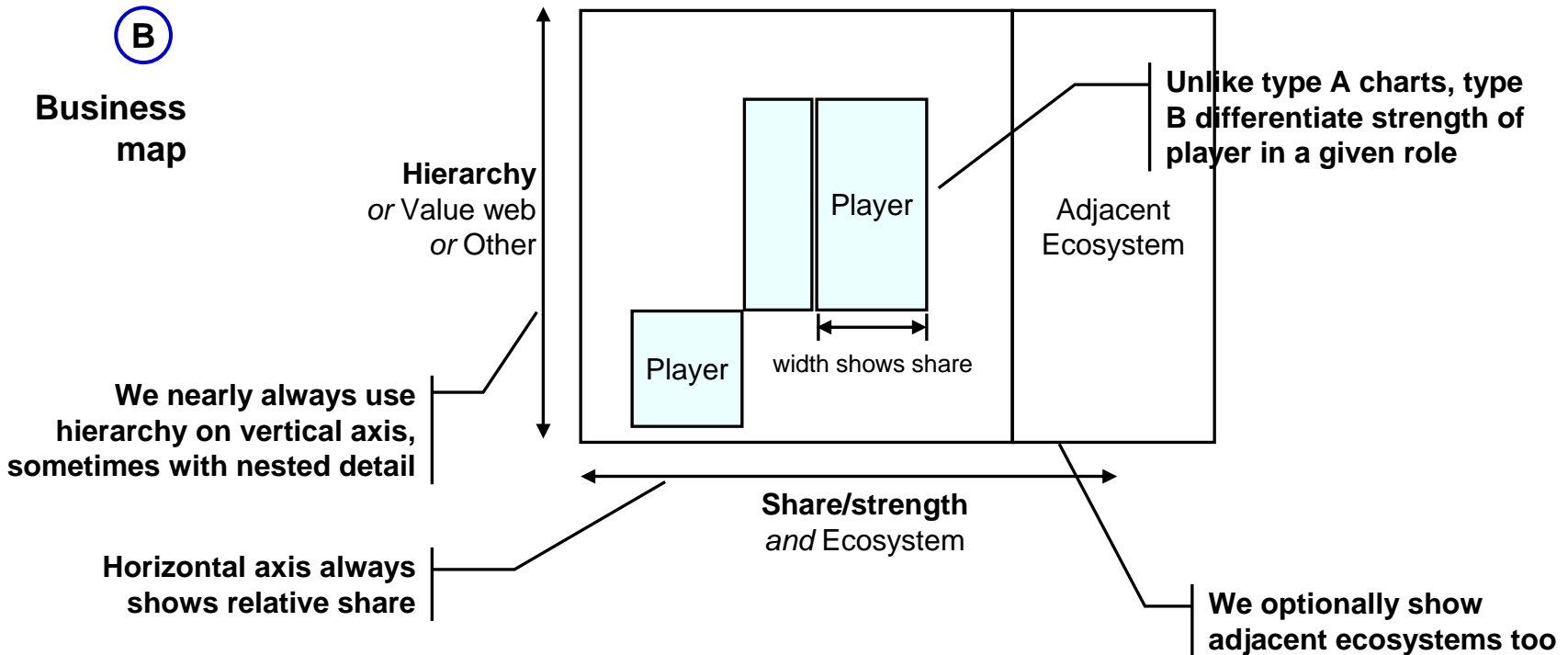
Horizontal axis – physical topology, showing what is next to what, is most common

Physical topology
or “Wiring diagram”
or Geography
or Value chain

This model sometimes helps the choice of dimension and direction for axes



B: relative strength of players on horizontal axis, value capture on the vertical axis

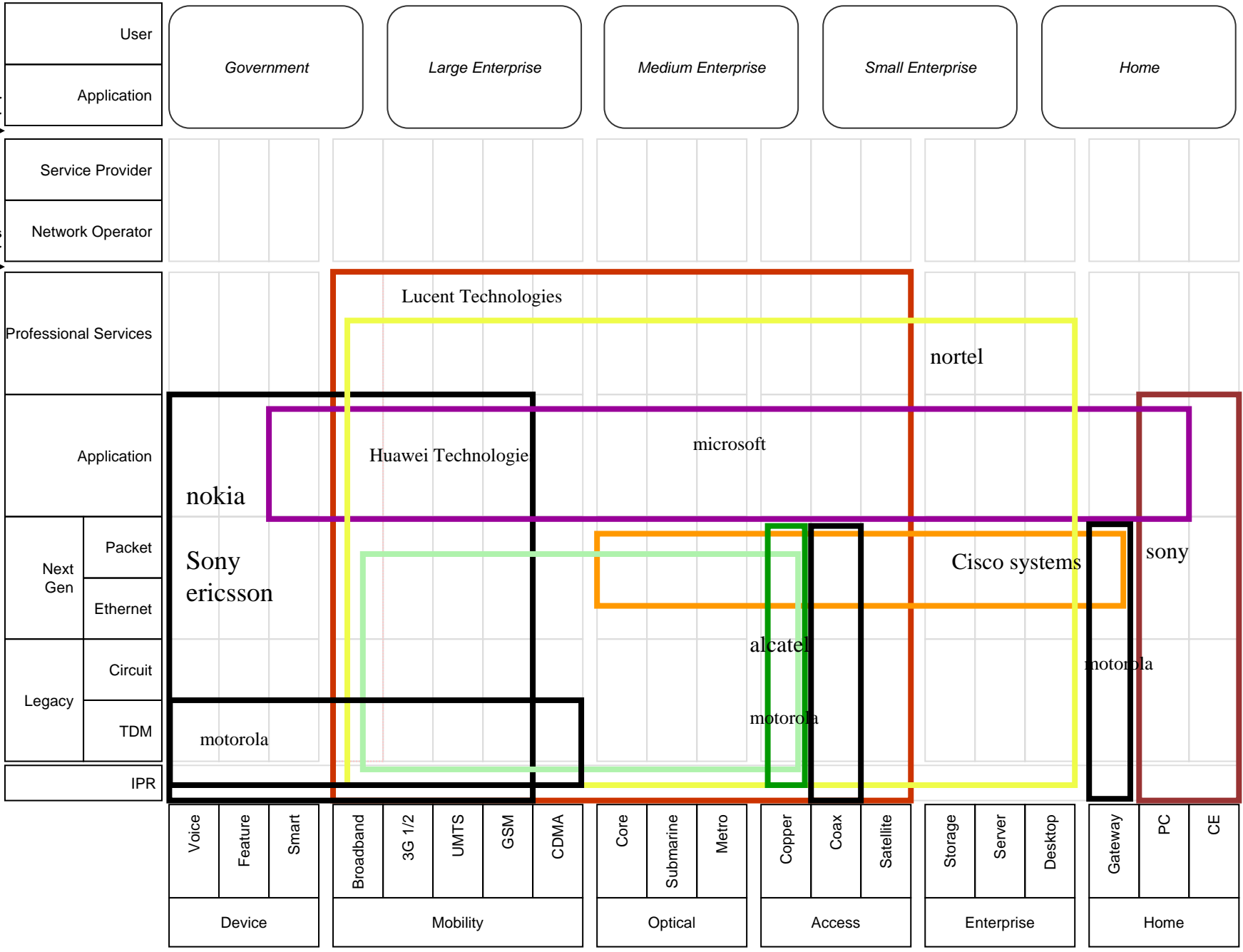


i



Customer Offer

Lu's Offer





Mobile in 2001

Mobile reaching full penetration mass marketing; beginning to give way to niche approaches

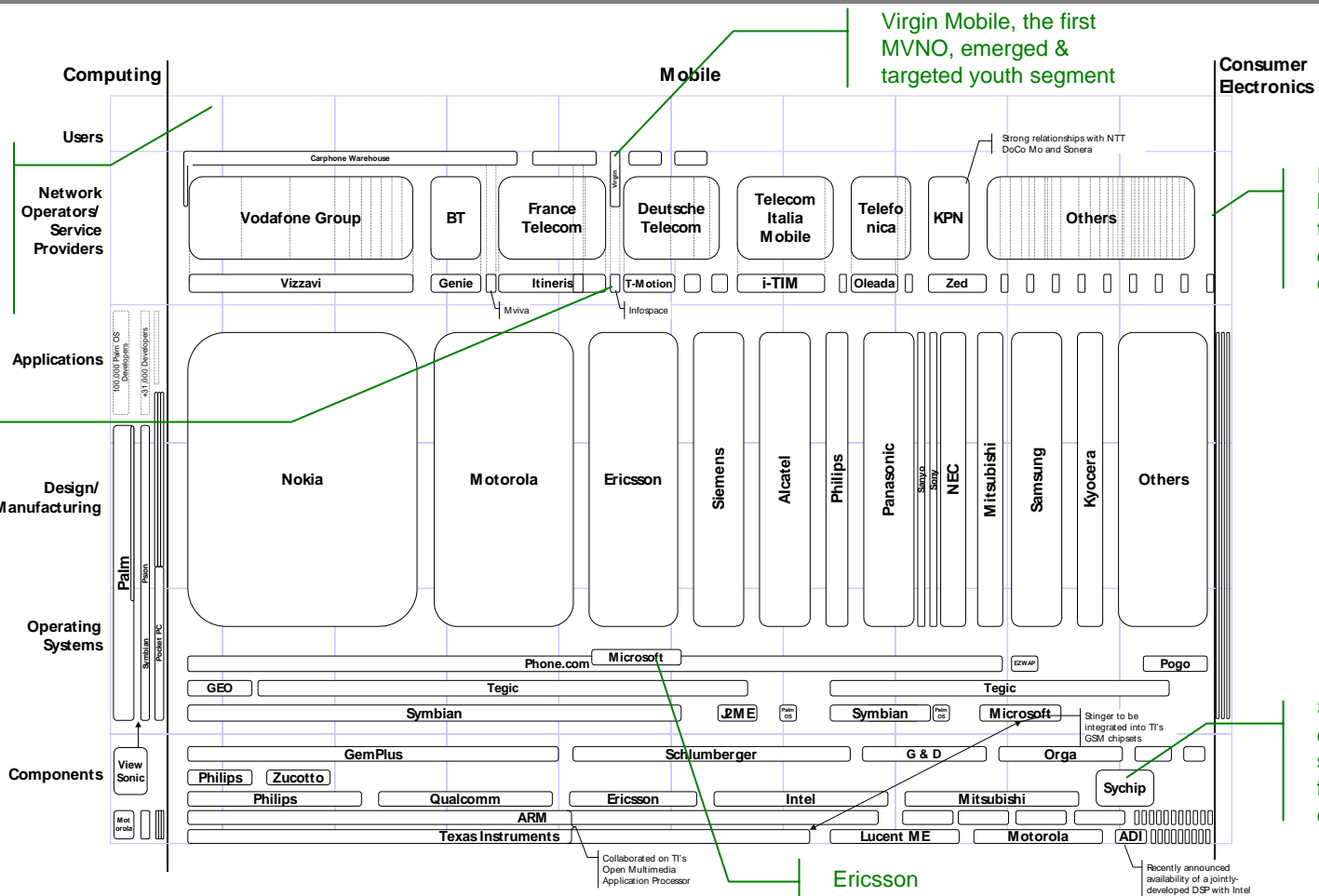
Infospace, a 3rd party wireless portal, is working with Virgin

Virgin Mobile, the first MVNO, emerged & targeted youth segment

Relatively little incursion to date from consumer electronics

Sychip has consolidated significant function in a chipset

Ericsson working with Microsoft on microbrowsers





By 2002, transition underway

Early adopters begin to purchase 3G apps & services

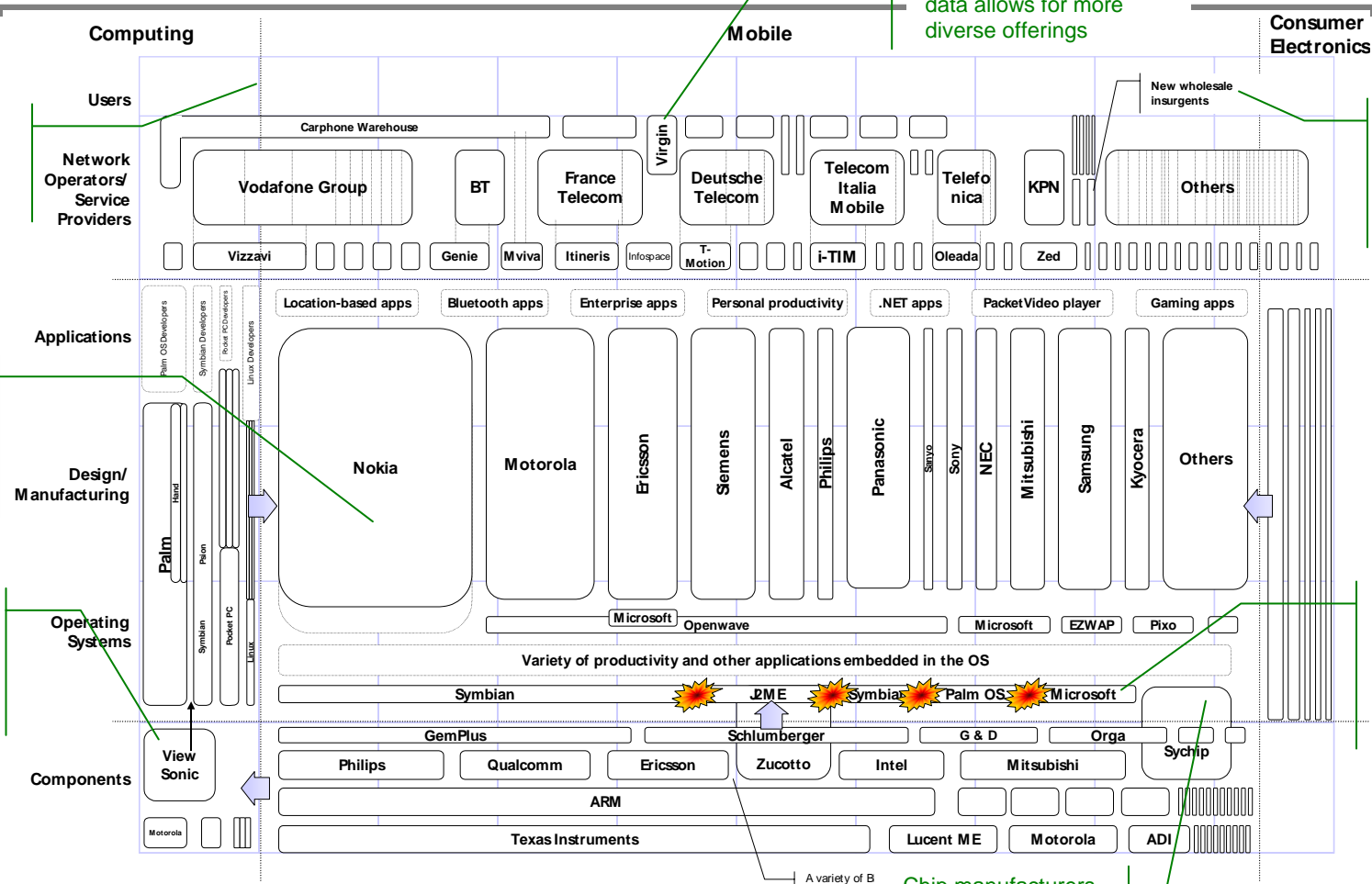
Nokia still dominant; loses some share but holds on stronger to vertical integration
New, flexible vendors begin to develop custom solutions for NOs/SPs

MVNOs become more significant as mobile data allows for more diverse offerings

New wholesale 3G carriers emerge and bolster the MVNO/SSP market

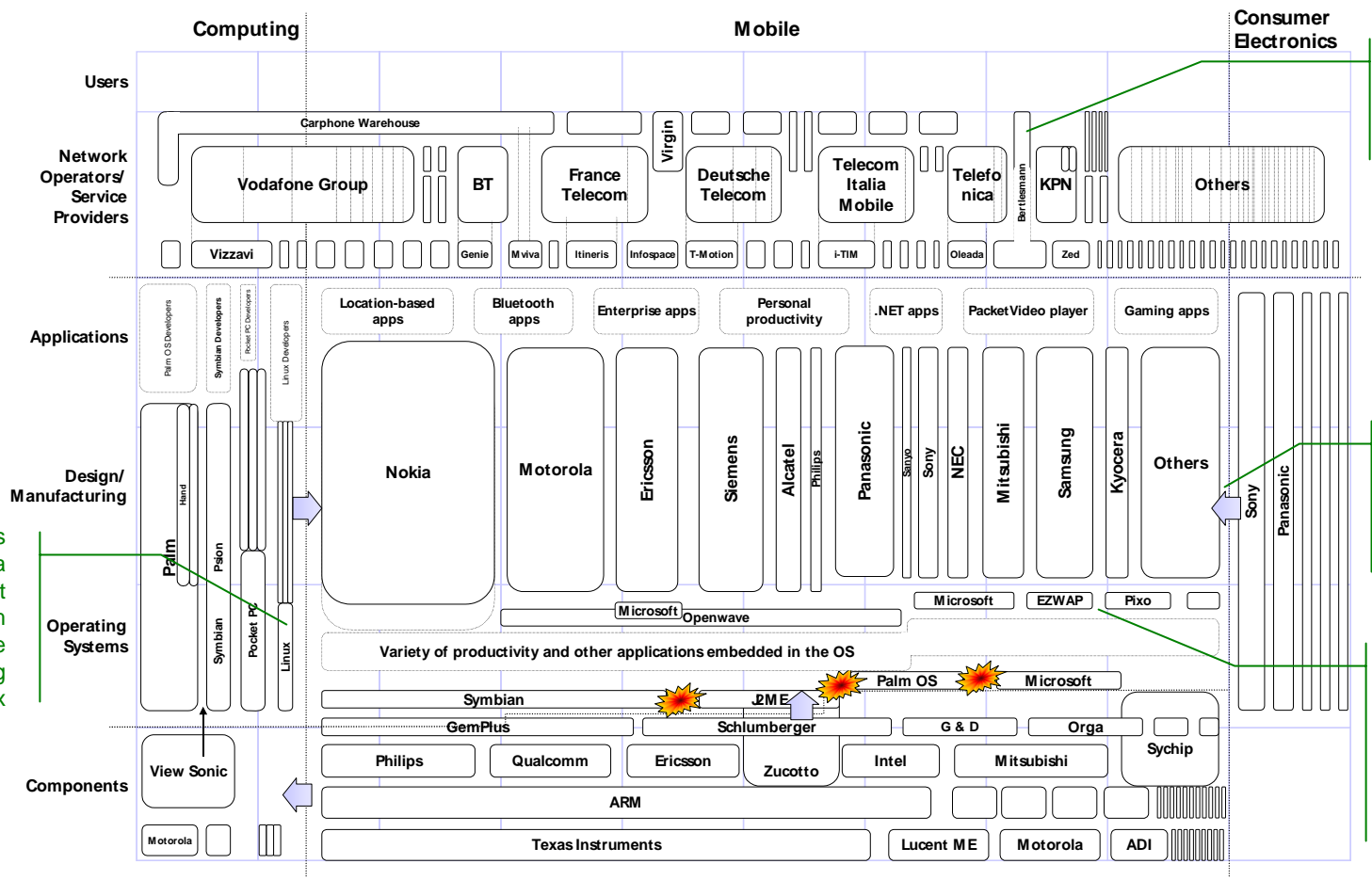
By 2002, the OS battle has intensified as mobile data devices become more important

Chip manufacturers continue to embed greater functionality in silicon





By 2004 - major contests

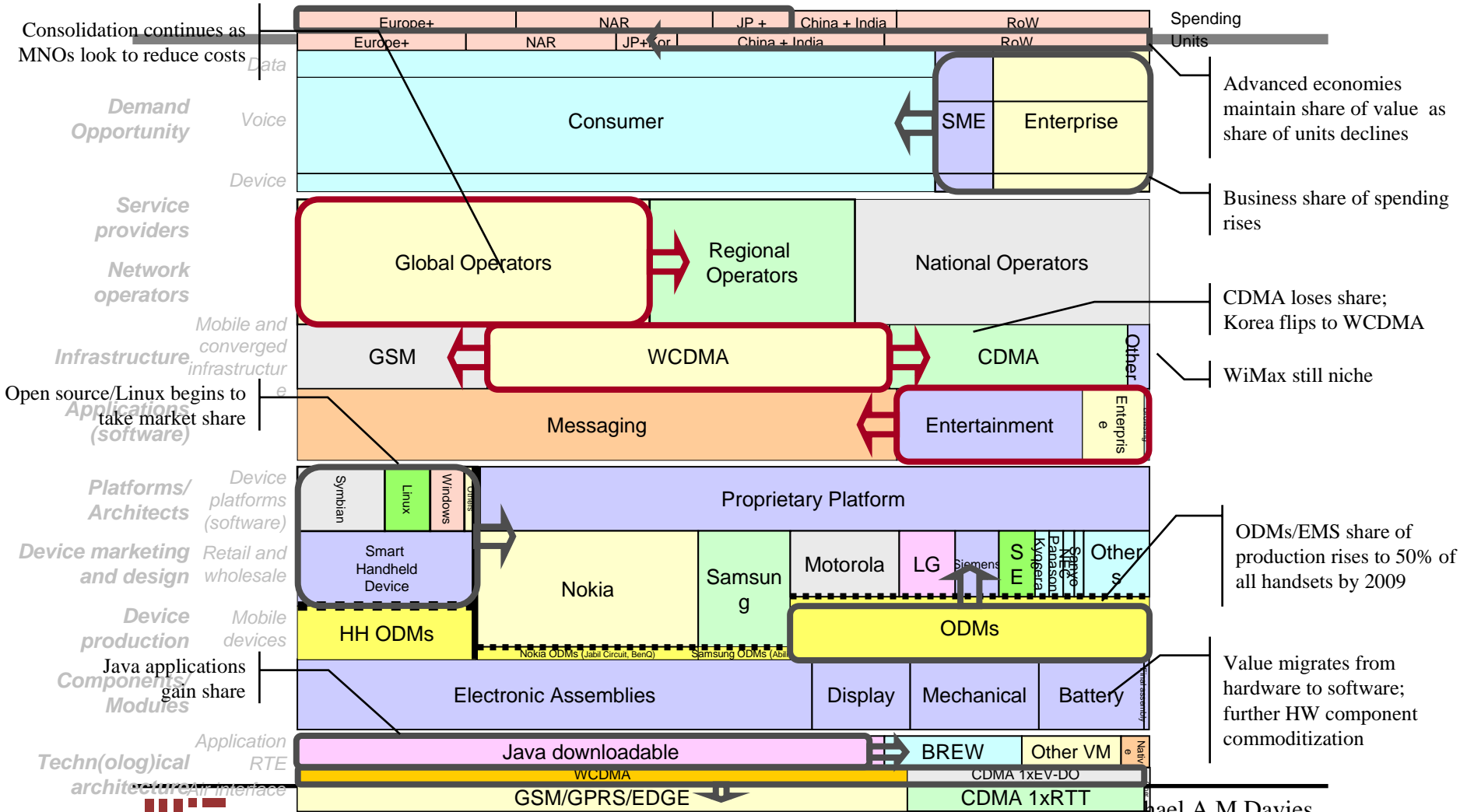


Major content providers enter as MVNOs

By 2004, consumer electronics players will significant incursions into mobile

As component vendors add functionality to chipsets, terminal vendors surrender value to them

By 2004, it is likely that a robust ecosystem will be forming around Linux



Consolidation continues as MNOs look to reduce costs

Demand Opportunity

Service providers

Network operators

Open source/Linux begins to take market share

Applications (software)

Platforms/Architects

Device marketing and design

Device production

Java applications gain share

Technological architecture

Advanced economies maintain share of value as share of units declines

Business share of spending rises

CDMA loses share; Korea flips to WCDMA

WiMax still niche

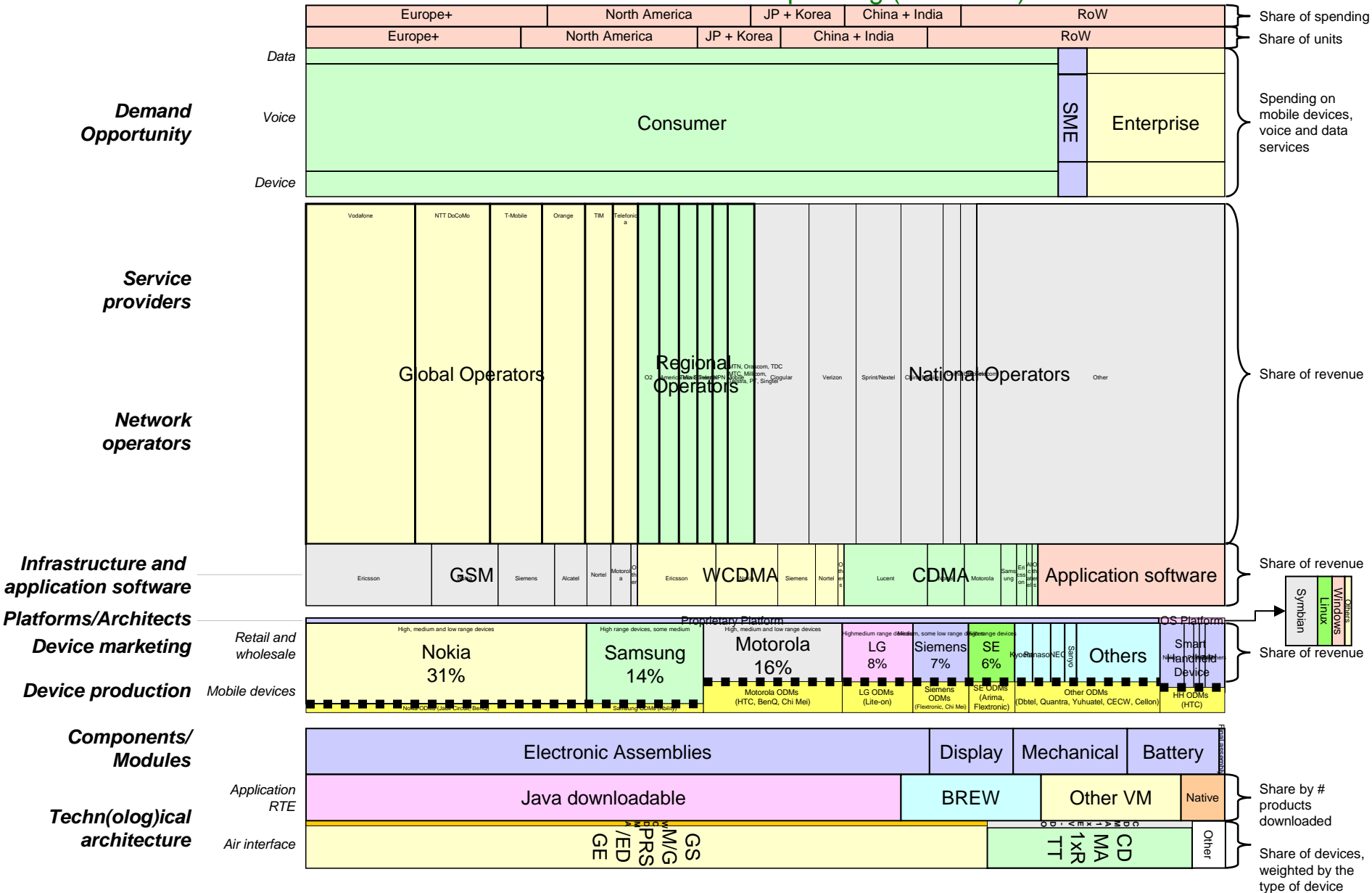
ODMs/EMS share of production rises to 50% of all handsets by 2009

Value migrates from hardware to software; further HW component commoditization



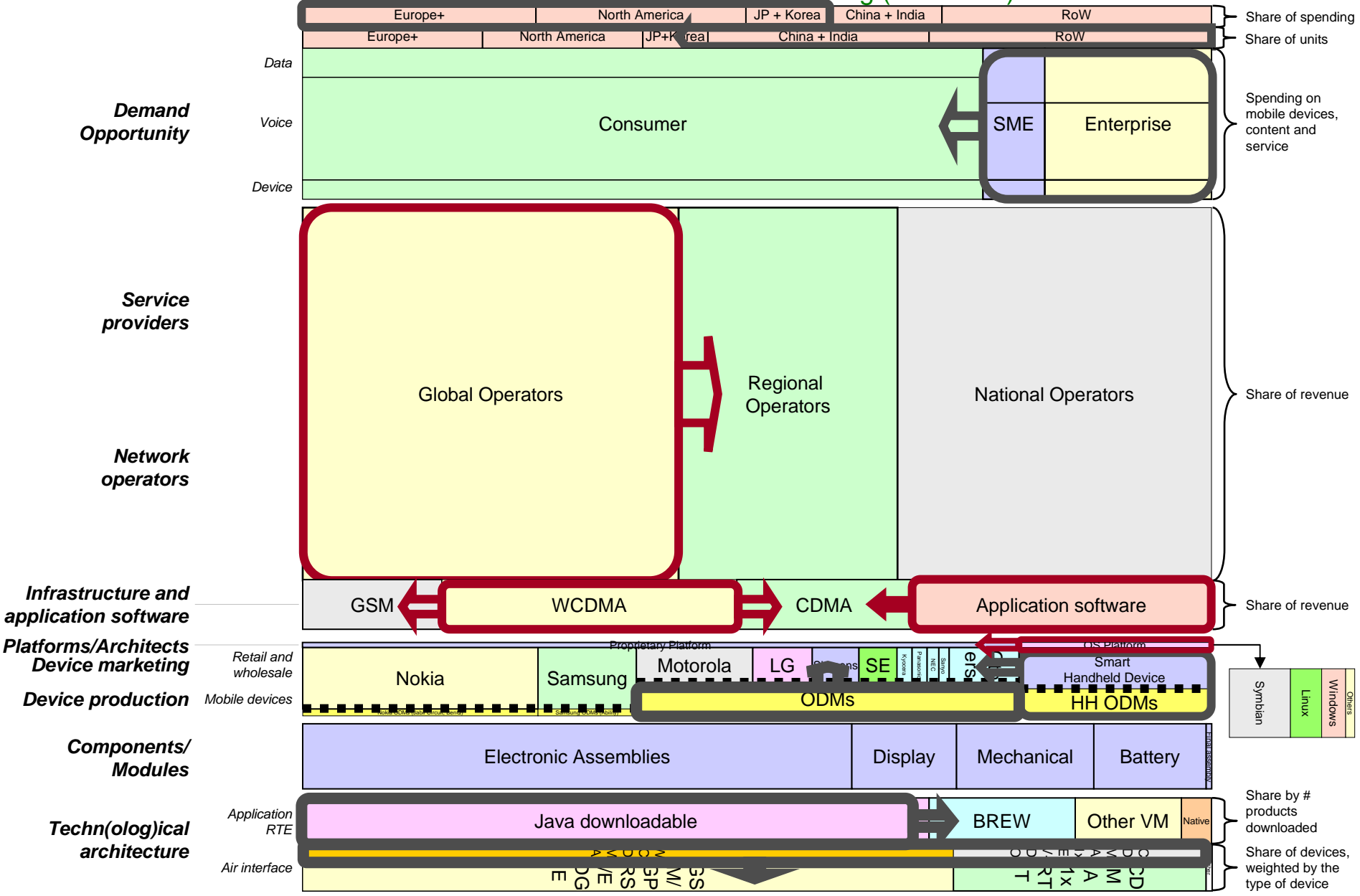
Mobile Business Ecosystem

Business scale – share of 2005 spending (estimated)



Mobile Business Ecosystem

Business scale – share of 2010 spending (estimated)





So, business ecosystems involve related choices about niche and strategy

- Leader or keystone/dominator role or niche versus secondary or follower role or niche (so-called niche)
 - leaders shape architecture - how components, and hence companies, fit together
 - leaders invest in platforms to improve overall system performance or economics of others
 - secondary or followers occupy niches defined by leaders or keystones
- As a leader, key trade-off between creation and capture
 - how much to share, to grow overall ecosystem
 - how much to do oneself - scope of activities
 - bigger pie, smaller slice vs smaller pie, bigger slice



(Business) Niche

noun

1. a situation or activity specially suited to a person's interests, abilities, or nature¹
2. the position or function of an organism in a community of plants and animals²
3. the status of an organism within its environment and community (affecting its survival as a species)³

1: American Heritage® Dictionary, © 2000 Houghton Mifflin

2: Random House Unabridged Dictionary, © Random House Inc. 2006

3: WordNet®, © 2005 Princeton University



Technology businesses, in ecosystems, must *capture value*, just as much as *create value*

Challenge

- Need complements, and hence complementors, to construct a complete offer
- Most players have broad range of possible activities
- In high-tech, many activities draw on similar underlying skills
- Innovation is typically rapid, eroding leadership

Capture

- Complementary assets
 - **unique** manufacturing capacity
 - brand
 - channels
- Knowledge assets
 - patents, copyright
 - trade secrets
 - tacit knowledge



The *resource-based view* explains how a company's *resources* drive its performance

- “Companies are very different collections of physical and **intangible** assets and capabilities. No two companies are alike because no two companies have had the same set of experiences, acquired the same assets and **skills**, or built the same organizational cultures.”
- Substitutability
 - not trumped by something different
- Superiority
 - **distinctive competence**
 - better than competitors from customers’ perspective
- Inimitability
 - hard to copy
- Durability
 - does not depreciate quickly
- Appropriability
 - bound to the business
- **Dynamic capabilities**

David Collis and Cynthia Montgomery, “Competing on Resources”, Harvard Business Review, July-August 1995, pages 118-128





OK, so where does *inimitability* come from?

- Physical uniqueness
 - real estate location, mineral rights
 - **unique** manufacturing assets(?)
 - *location, location, location*
- Path dependency
 - because of what has happened in their accumulation
 - must be built up over *time*
 - **brand name**
- Causal ambiguity
 - cannot disentangle what it is or how to re-create it
 - **organizational capabilities**



For technology businesses, *knowledge assets* (intellectual property) are critical to value capture

- Patents
 - disclosed information about **novel** and **useful** invention
 - legal monopoly for a fixed period of time
- Copyright
 - exclusive rights to the **execution** of a design, such as an innovation
- Trade secrets
 - protect covered secrets in perpetuity
 - **misappropriation is theft**
- Trademarks
 - right to use a distinctive sign to identify offer
- Tacit knowledge
 - can be basis for **distinctive competence**
 - difficult to articulate in a way that is meaningful and complete
 - slow and costly to transmit
 - ambiguous, needs face-to-face communication, prone to errors of interpretation
 - often contextually dependent
 - may be causally ambiguous: *“so complex that the firm itself, let alone its competitors, does not understand them”*



Summary

- Systems and business ecosystems
 - architecture
- Co-evolution
- Co-opetition: cooperation and competition
 - vertical competition
 - diverse players
- Value creation
 - cooperation
- Value capture
 - complementary assets
 - knowledge assets
 - distinctive competence
 - tacit knowledge