

Innovation and Technology Commercialisation

Week 4: Learning from Markets and Alliances & Managing Internal Processes

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Learning from Markets

- ❑ How do the characteristics of an innovation shape the approach to marketing and market development?
- ❑ How do the characteristics of potential users influence the development and adoption of innovations?
- ❑ What factors shape the diffusion of new innovations?

Technological & Market Maturity

Novelty of technology	High	Technological: New solutions to existing problems	Complex: Technology and markets co-evolve
	Low	Differentiated: products compete on quality and features	Architectural: novel combinations of existing technologies
		Low	High

Novelty of markets

Technological & Market Maturity

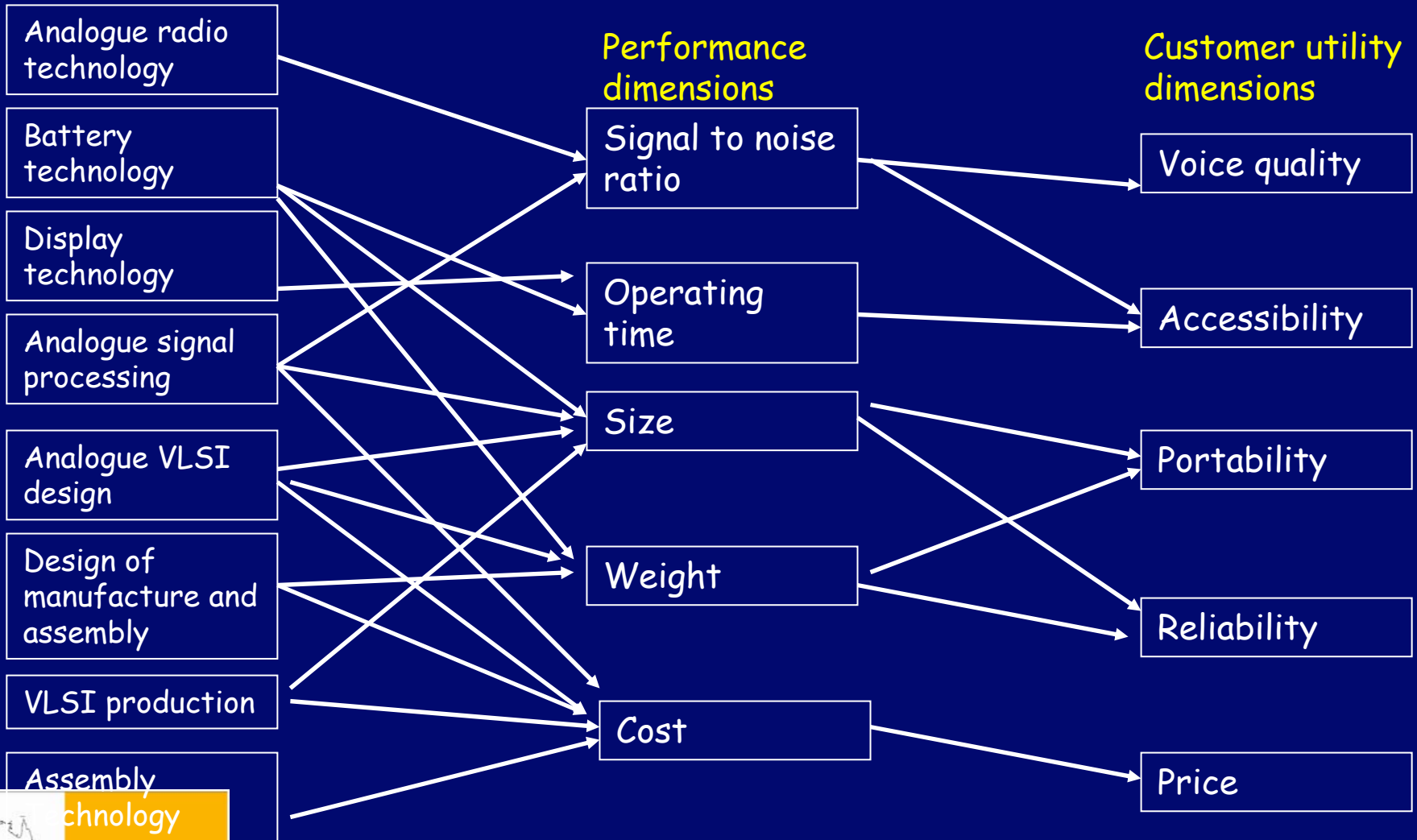
High	Technological: New solutions to existing problems	Complex: Technology and markets co-evolve
Novelty of technology	Differentiated: products compete on quality and features	Architectural: novel combinations of existing technologies
Low	Low	High
	Novelty of markets	

Incremental Innovation Requires

- Structured roles and responsibilities
- Centralized procedures
- Highly efficient
- Highly engineered work processes
- Strong manufacturing and sales capabilities
- More homogenous, older, experienced work force
- All in all a more traditional environment

Customer Utility, Product Performance and Technologies

Technologies



Technological & Market Maturity

Novelty of technology	High	Technological: New solutions to existing problems	Complex: Technology and markets co-evolve
	Low	Differentiated: products compete on quality and features	Architectural: novel combinations of existing technologies •Segmentation •Product extensions
		Low	High
		Novelty of markets	

Architectural Innovations

- Takes existing technologies and applies them in new, innovative ways
- Needs both efficiencies and entrepreneurial capabilities
- Takes parts of both the Incremental and Discontinuous environments

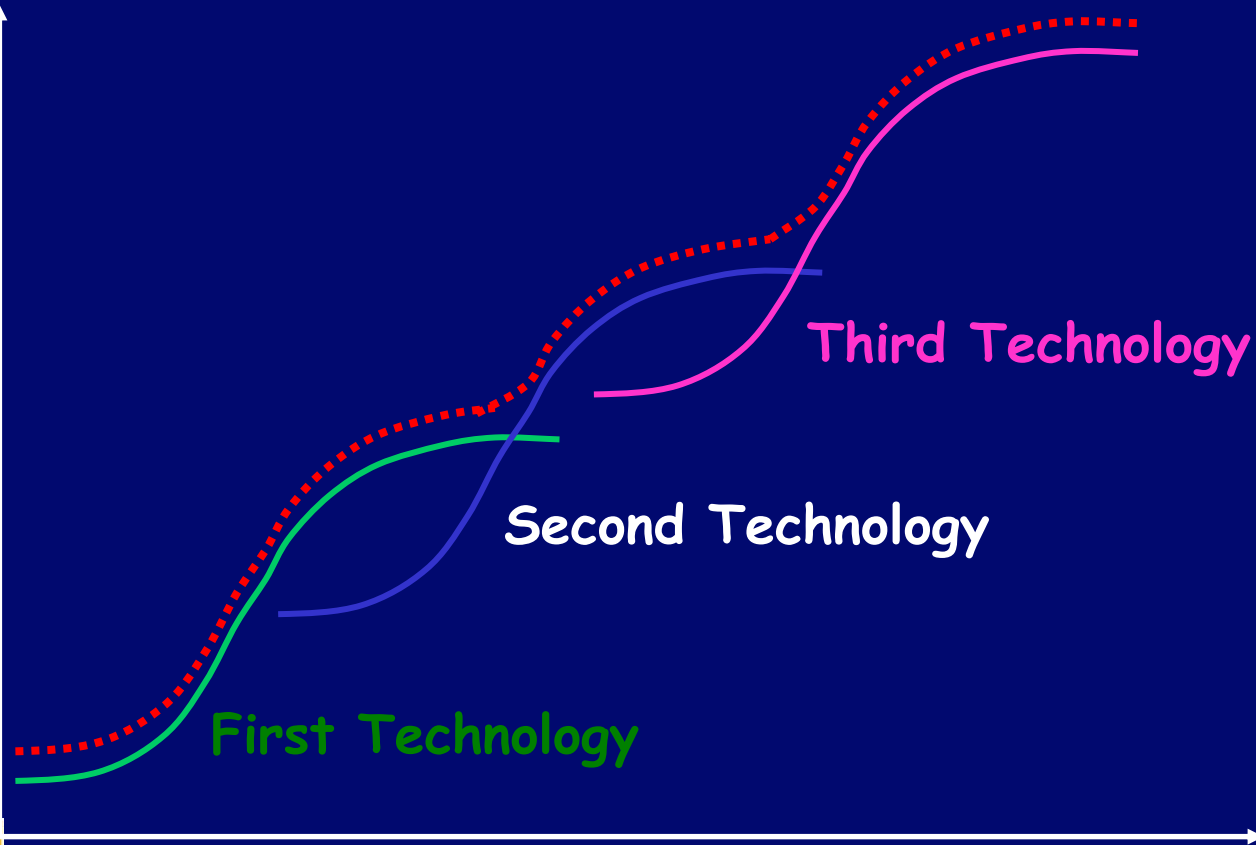
Technological & Market Maturity

<p>High</p> <p>Novelty of technology</p>	<p>Technological: New solutions to existing problems</p> <ul style="list-style-type: none">• May have many specific applications• Often part of a technological system	<p>Complex: Technology and markets co-evolve</p>
<p>Low</p>	<p>Differentiated: products compete on quality and features</p>	<p>Architectural: novel combinations of existing technologies</p>
	<p>Low</p>	<p>High</p>

Novelty of markets

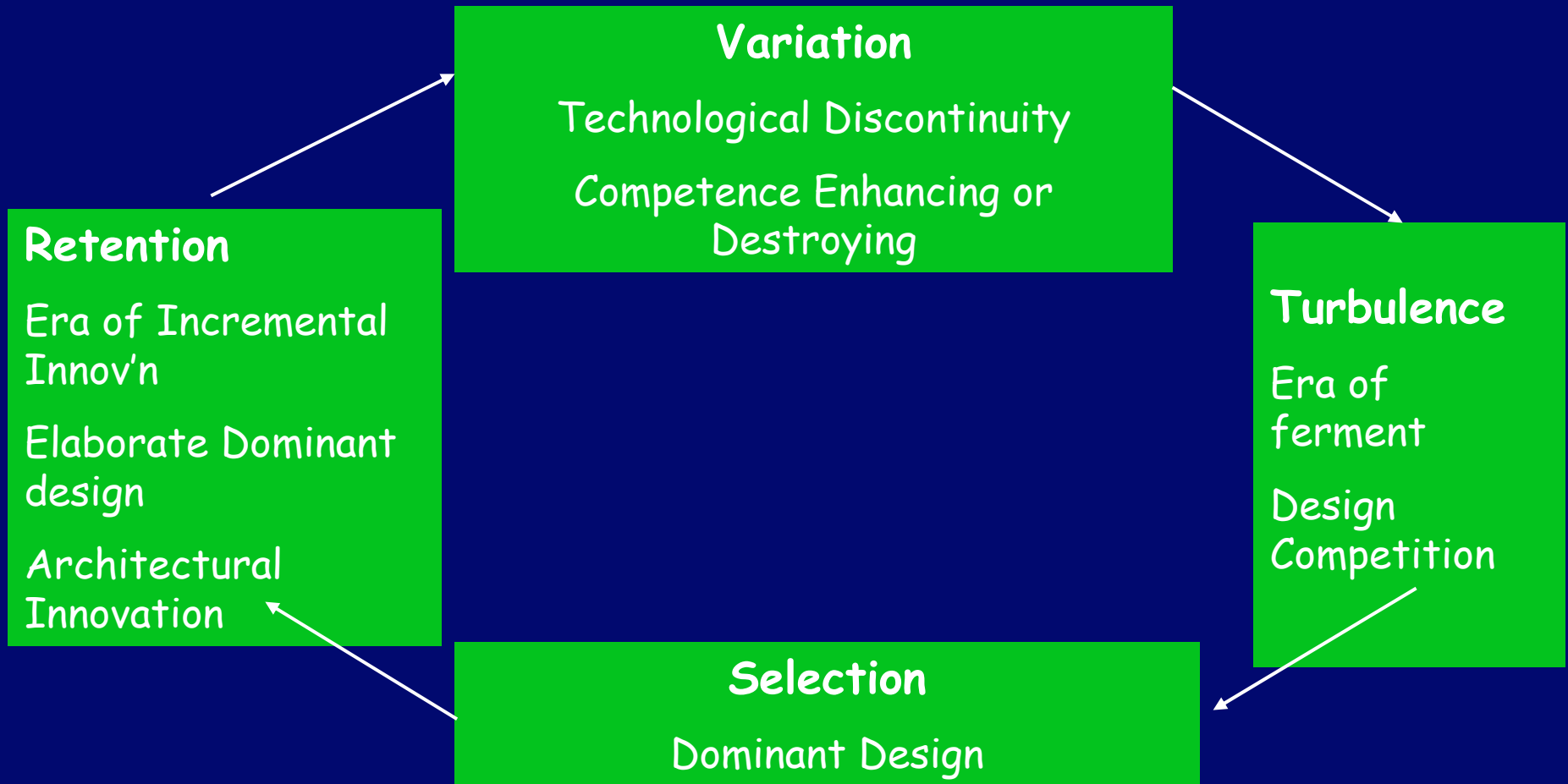
Conventional Technology S-Curve

Product
Performance



Time or Emerging Effort
Innovation & Technology Commercialisation

A Typical Technology Cycle

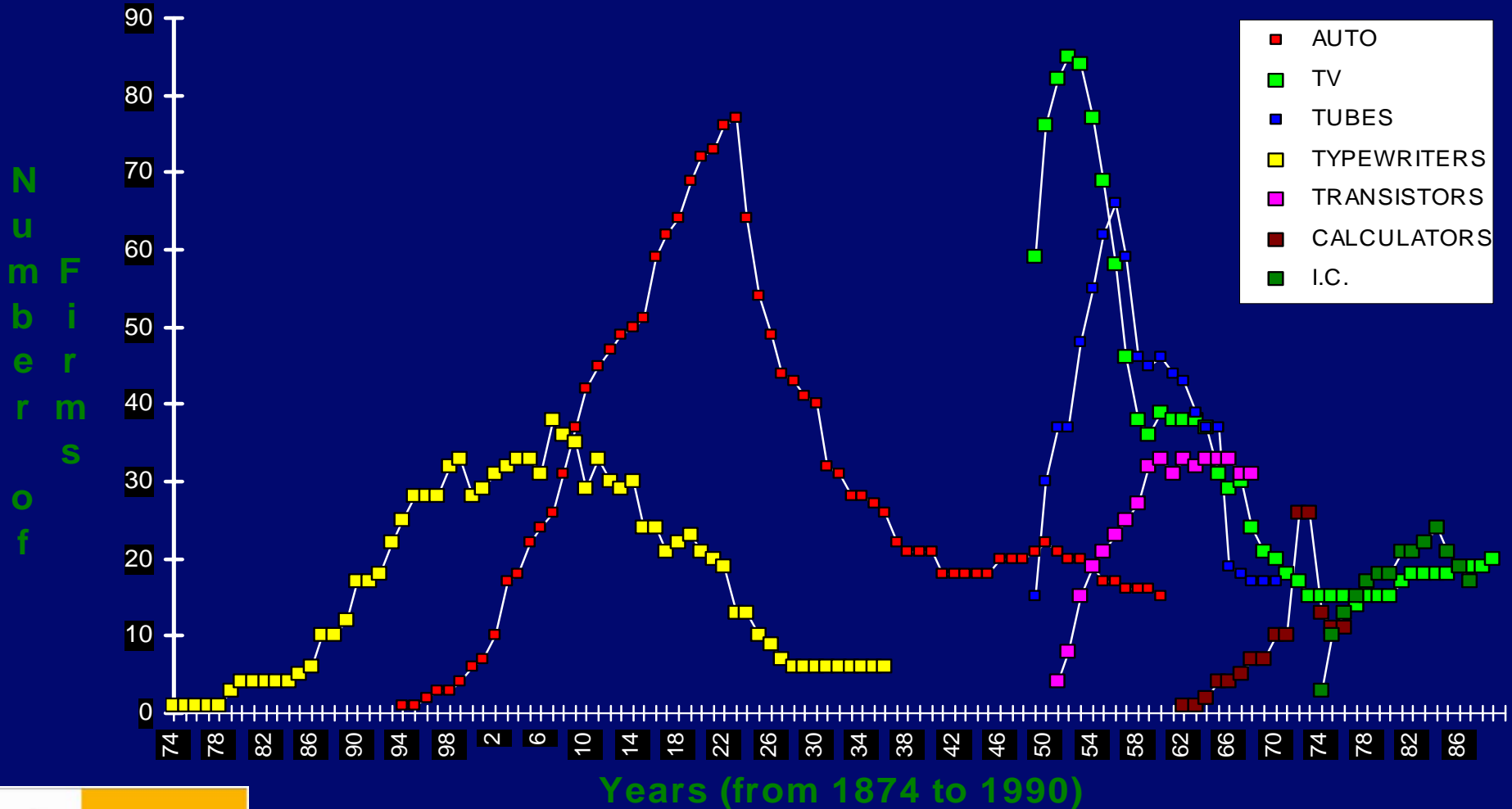


Dominant Design

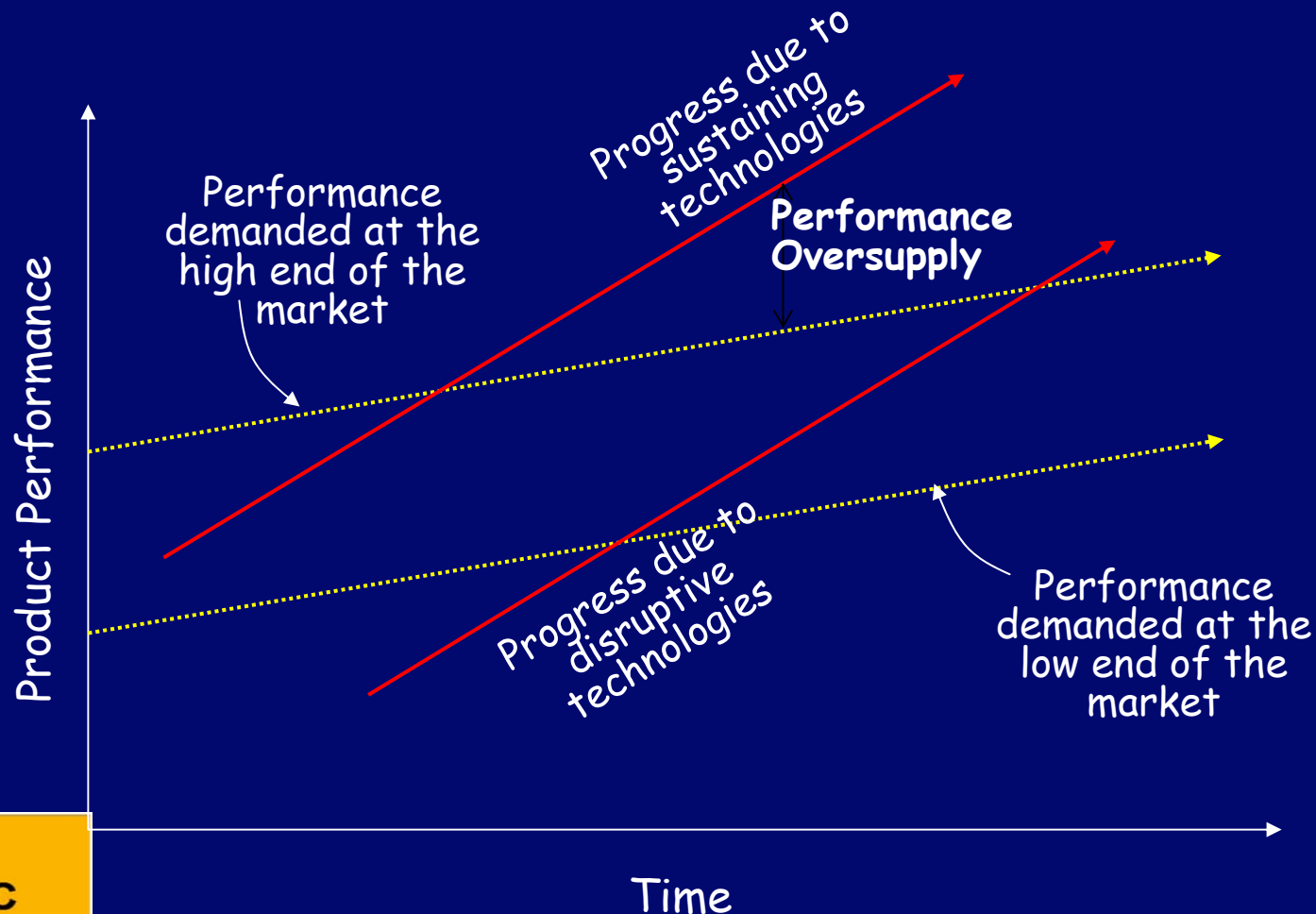
A Dominant Design Functions to:

- help integrate the industry as a system with a specific solution embodied in an accepted **product design**.
- concentrate efforts of participants in industry onto refining that solution and bringing down **cost of production**
- Firms' specialist roles are co-ordinated around leading designs

Dominant designs: Industry dynamics



The Impact of Sustaining and Disruptive Technological Change



Sustaining vs. Disruptive Technologies

- **Sustaining technologies:** they improve the performance of established products, along the dimensions of performance that mainstream customers in major market have historically valued.
- **Disruptive technologies:** innovations that result in lower product performance, at least in the near-term. Generally, they underperform established products in mainstream markets.
- Products based on disruptive technologies are typically *cheaper, simpler, smaller*, and more *convenient* to use.

Disruptive Technologies

- Disruptive products are simpler and cheaper; they generally promise lower margins, not greater profits.
- Disruptive technologies typically are first commercialized in emerging or insignificant markets.
- Leading firm's most profitable customers generally don't want, and initially can't use, products based on disruptive technologies.

Sustaining Technologies

- Silver halide photographic film
- Wireline telephony
- Notebook computers
- Full-service stock brokerage
- Bricks & mortar retailing
- Electric utility companies
- Graduate school of management
- Offset printing
- Manned fighter and bomber aircraft
- General hospitals

Disruptive Technologies

- Digital photography
- Mobile telephony
- Hand-held digital appliances
- On-line stock brokerage
- On-line retaining
- Distributed power generation
- Corporate universities and in-house management training
- Digital printing
- Unmanned aircraft
- Outpatient clinics and in-home patient care

Technological & Market Maturity

<p>High</p> <p>Novelty of technology</p>	<p>Technological: New solutions to existing problems</p>	<p>Complex: Technology and markets co-evolve</p> <ul style="list-style-type: none">• Often close interaction with users• Need to understand user needs (eg support) and segments• Adoption decision may be complex and political.
<p>Low</p>	<p>Differentiated: products compete on quality and features</p>	<p>Architectural: novel combinations of existing technologies</p>
	<p>Low</p>	<p>Novelty of markets</p> <p>High</p>

Complex Products

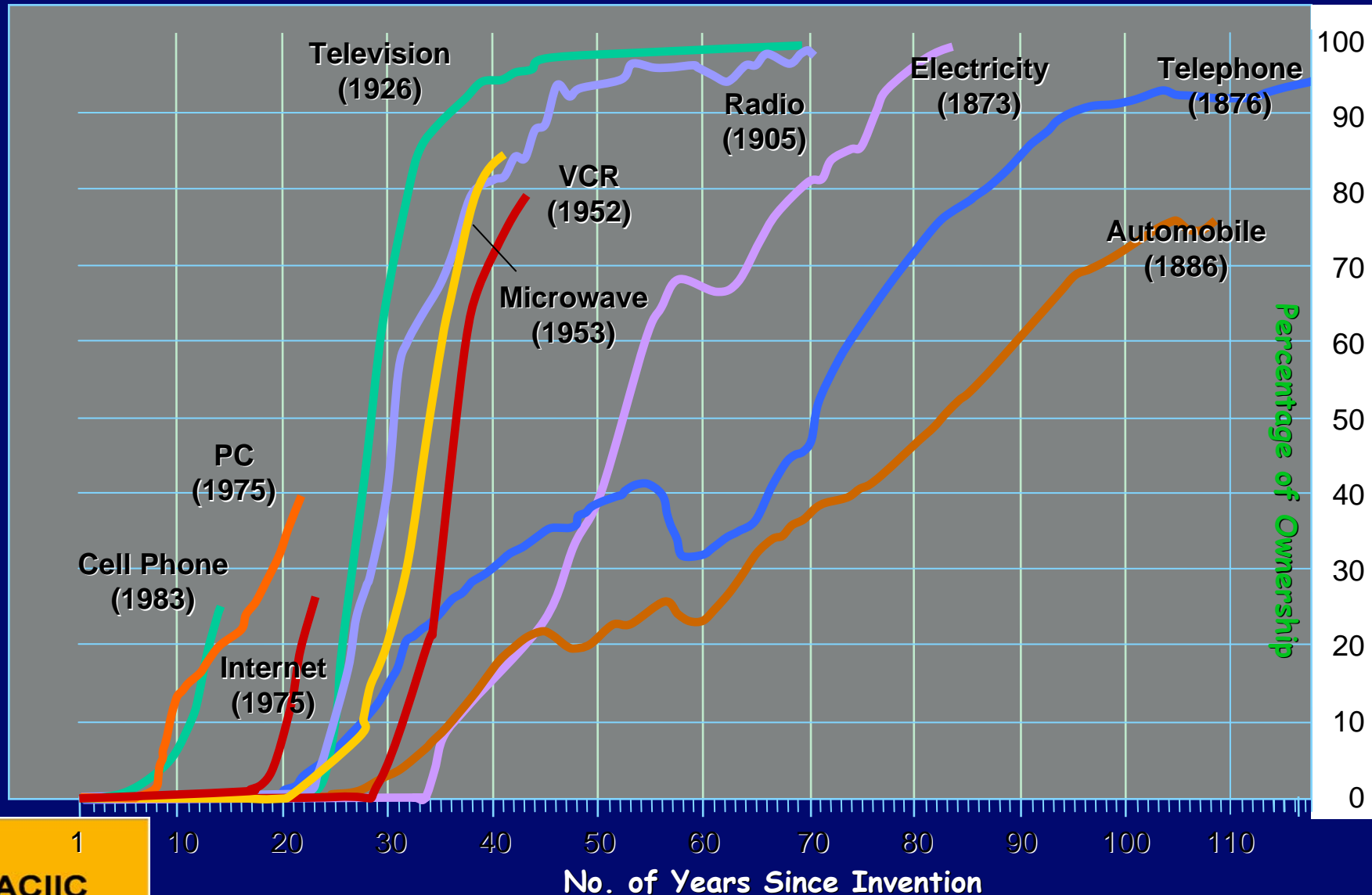
Complex products: aeroplane, hospital

- Large number of interacting components and subsystems
- Usually close interaction and some co-design with users
- Long design and build process
- Servicification!
- Innovation contracts

Innovation Characteristics that may affect diffusion

- Relative advantage
- Compatibility
- Complexity
- Trialability
- Observability

Technology Rate of Adoption (1/2)



Technology Rate of Adoption

- Most new technologies typically require many years to become a new standard.
- As shown in the previous graph, the number of years it took for the following technologies to reach 25% of U.S. households are as follows:

Automobile = 56 years

Electricity = 45 years

Telephone = 36 years

Microwave = 31 years

Television = 26 years

Internet = 23 years

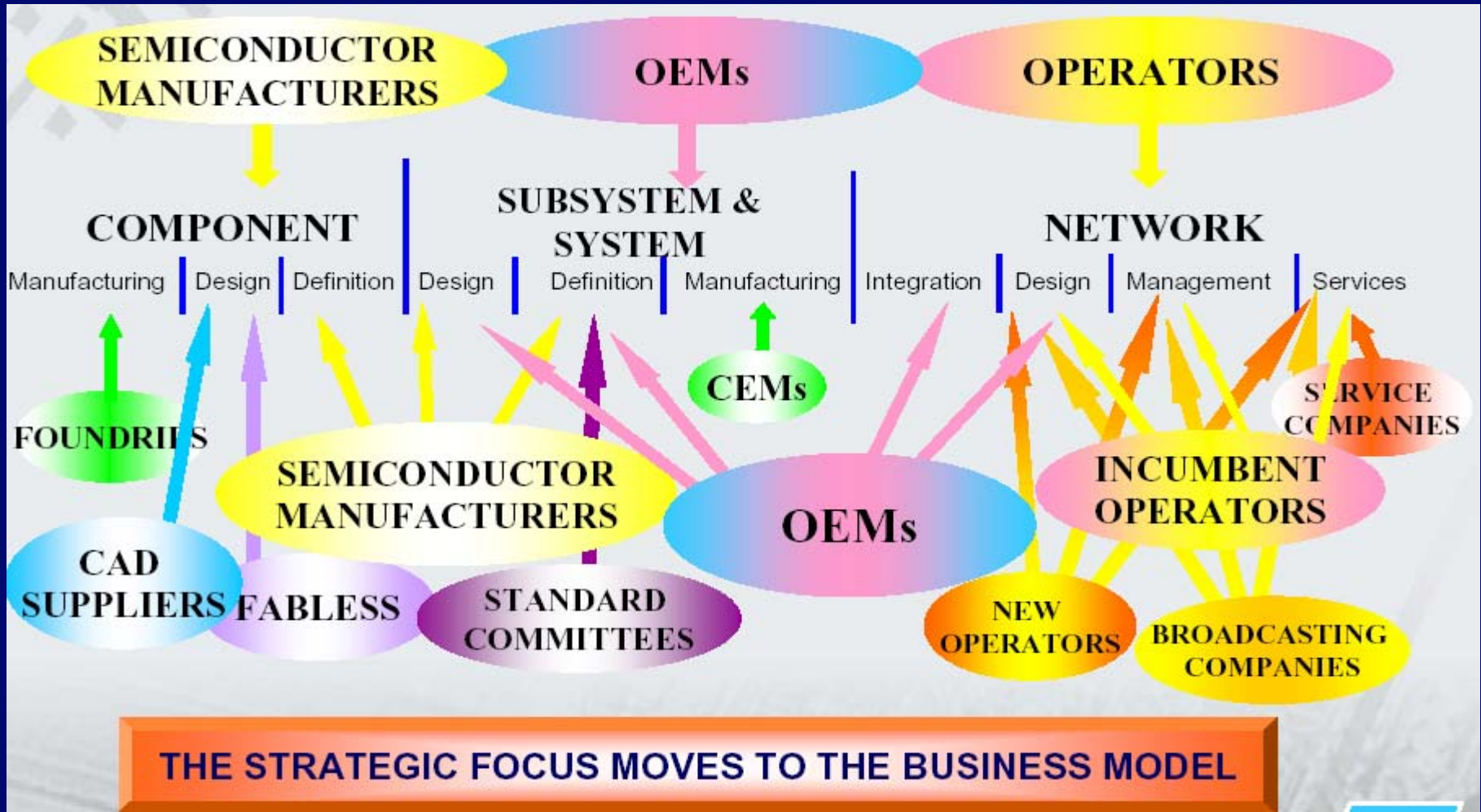
Cell phone = 14 years

Learning through Collaboration

Collaboration

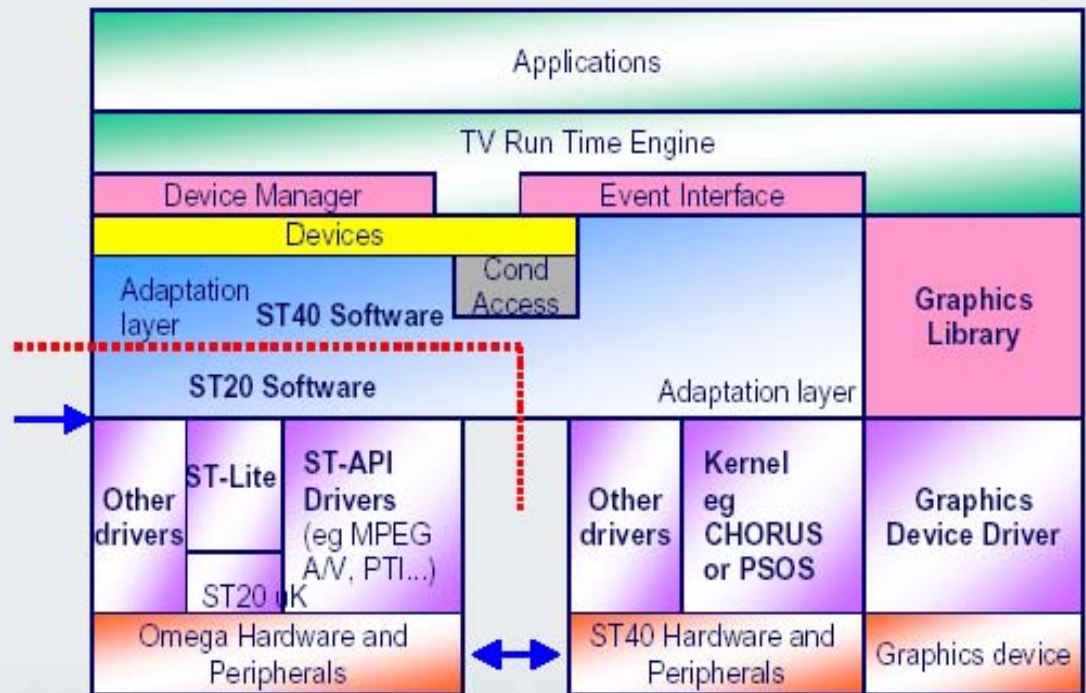
- Why do firms collaborate?
- What types of Collaboration are appropriate for different objectives and situations
- What factors affect the success of collaboration
- How can firms use alliances to strengthen their competitive position and their competencies?

Challenge 1: Value Chain Complexity



2nd challenge: Business Models for a Semiconductor company

- System house?
- System integrator?
- Solution provider?
- Subsystem provider?
- Technological leader?
- IP provider?
- Foundry?



3rd challenge: breadth of the knowledge base

A few things to do...

GSM, XML, DAVIC, DVB, MPEG2, MPEG4, MPEG7, TINA-C, QTP, ATM, WAN, LAN, SONET, SDH, IPVG, COFDM, QAM, QPSK, VLIW, RISC, CISC, GPRS, EDGE, UMTS, CDMA, WBCDMA, ADSL, VDSL, G-LITE, REMPEG, SLIMPEG, SPKI, PKI, SDMI, DVD, MP3, AC-3, BLUETOOTH, USB, ETHERNET, DSS, JPEG, 1394, DOS, WINDOWS, EPoC, OS/2, CD-ROM, BBNT, HOMERF, 802.11, HYPERLAN II, SIRLAN, CRYPTO, ZERO-IF, PRML, AGENTS, LINUX, VXWORKS, TURBOCODES, CORBA, DCOM, JAVASCRIPT, JINI, CSSI, UNIX, SCSI, POSICS, OST, OPENIP, WINCE, CMIP, KERBEROS, WBEM, CA-TV, ITTI, FDMA, DECT, SDR, HSCCSD, SIM, STK, WAP, WAN, PALMOS, GEOS, MAGICLAP, ORBITOR, IS-95, POTS, SS7, T1, CCBS, VPN, GUI, UICC, USIM, DIRECT-X, MMX, MHI, MeXe, 3GPP, APIs, SPS, DWDH, CCBI, QoS, PROXY, VCSEL, UWB, SWANET, MSP, MSC, PCS, MIMOWL, MCFD, ADFED, OPENGL, FDTD, FFT, PDC, HTTP, CTI, DSP, CPU, EPLD, IFFT, TCM...

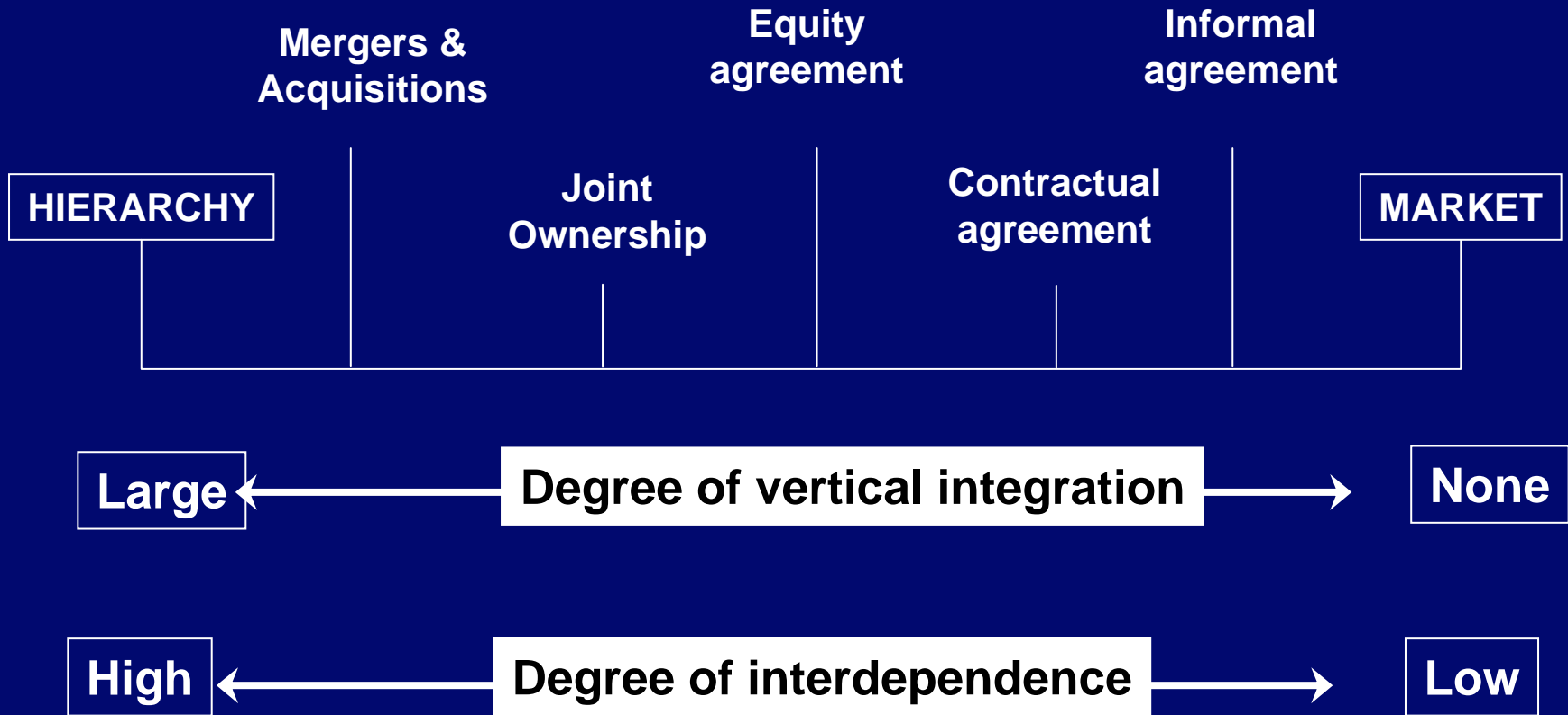
To name a few

Advanced System Technology

Innovation and alliances

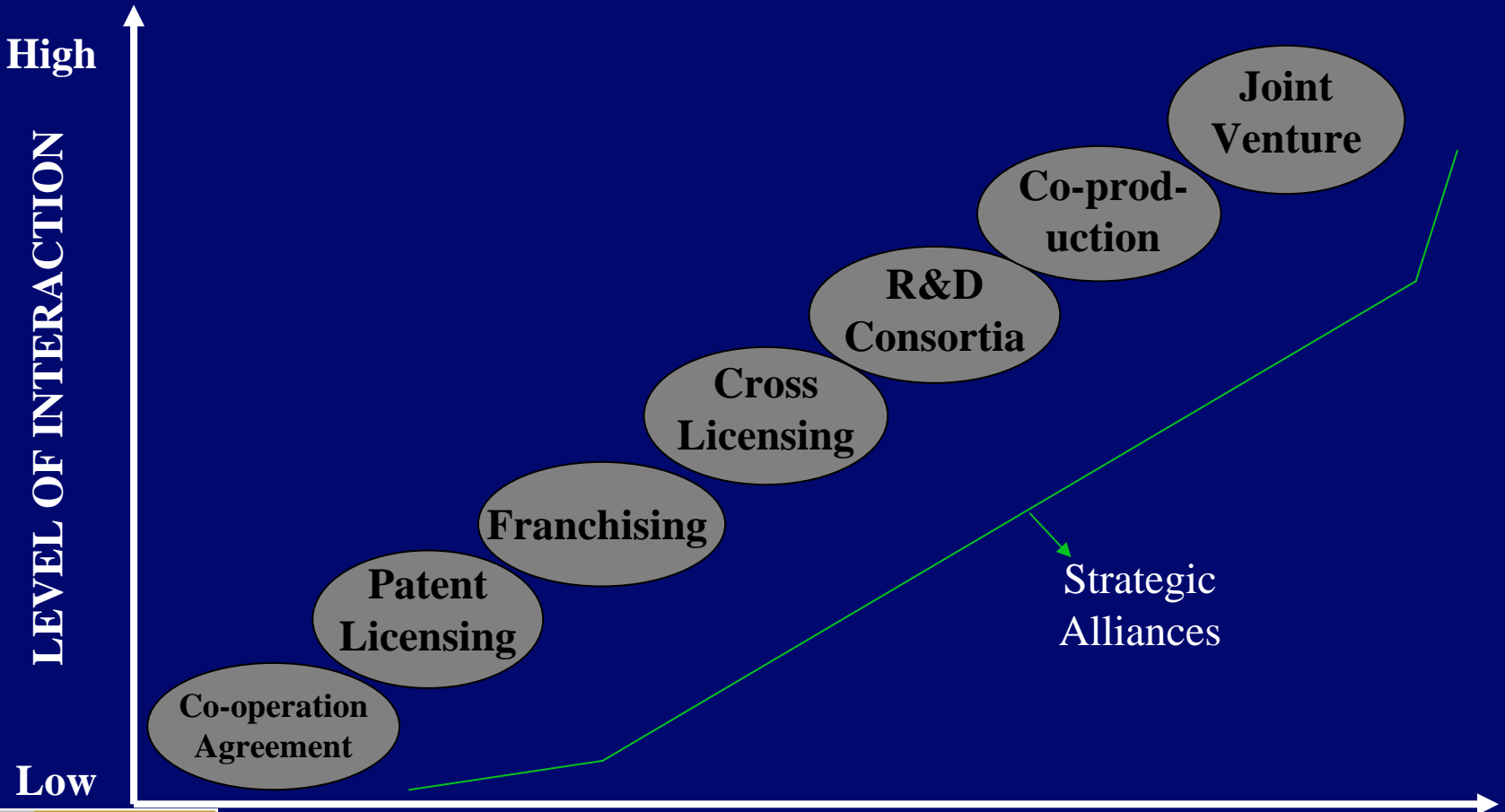
- Alliances can provide:
- **Faster and cheaper** way to develop new products and processes
- Route to reach critical mass of resources for large projects
- Means to merge knowledge and skills to support innovation
- Way to 'hedge bets' on new technologies

What we mean by alliances and partnerships?



(Adapted from Lorange & Roos, 1992 and CTM)

Range of Strategic Alliances



Samsung's Technology Relationships with US & European Firms

Hewlett Packard

Sole distribution of HP products
 Licenses for: software
 design
 assembly
 test &
 programming technology
 SEC-HP Co - minority JV
 Joint development and production
 agreement for RISC microchips
 and workstations - OEM and own sales

Control Data

Cross licensing in computer
 manufacturing & technology

+ General Instruments

Advanced Risc Machines -UK

USA Video

Madrigal

Qualcomm

Dancall-Denmark

Hales Design Group

Rambus

Weitek

Micron Technology



USA Video ISD

TI

Licenses for: DRAM

Micron Technology

Licenses for: DRAMs
 Cooperation on memory
 devices

(Both ended with IPR disputes,
 but still trying to work together)

INTEL

License for:
 ASIC technology

Corning Glass

Samsung-Corning JV
 Links to AFL & MPI

AT&T

Joint development of
 network & pen-based PCs
 (AT&T - marketing
 SEC- development & production)

ITT

Licensing for:
 digital switching exchange
 semiconductors
 optic fibre technology

Bell Telephone Manufacturing

License for:
 electronic switching
 cooperative agreement
 to exchange & produce
 technology

Motorola

Design chips and develop systems
 and applications software

IBM

Samsung Data System -JV
 Cross licensing for:
 semiconductor design &
 production technology
 Joint development & selling desktop PCs

Philips

License for:
 video disk player
 magnetron technology

Samsung's Technology Relationships with Japanese Firms

TOSHIBA

Licences for :

- fax machines
- airconditioners
- cellular modular phones
- word processors
- washing machines
- Hi Fi, VCRs

Joint development projects in:

- Computerized typesetting
- LCD drive ICS, ASICs,
- Flash memories

FUJITSU

Cross licensing in LCDs

SHIBASOKU

DNS

TOWA

TOREY

ACMC



SANYO

Licences for:

- microwave oven technology
- automatic sales machines

MATSUSHITA

Licenses for:

- magnetron production technology
- VCRs
- Joint development of broadcasting VCRs

MITSUBISHI

Joint standardization of DRAM

NEC

Joint production of DRAMs

SHARP

Licences for :

- semiconductor technology
- SRAM, ROM, DRAM

SONY

Licenses for;

- VCRs
- broadcasting cameras

IKEGAMI

Licenses for :

- broadcasting colour monitors

OKI

Technology transfer and technical assistance for synchronous DRAMs

Partnership process

Needs analysis

- Why is this necessary?

Identification

- How to find?

Selection

- How to choose?

Negotiation

- What type of agreement,
- how much resource, what if ?

Formation

- When, how, who?

Management

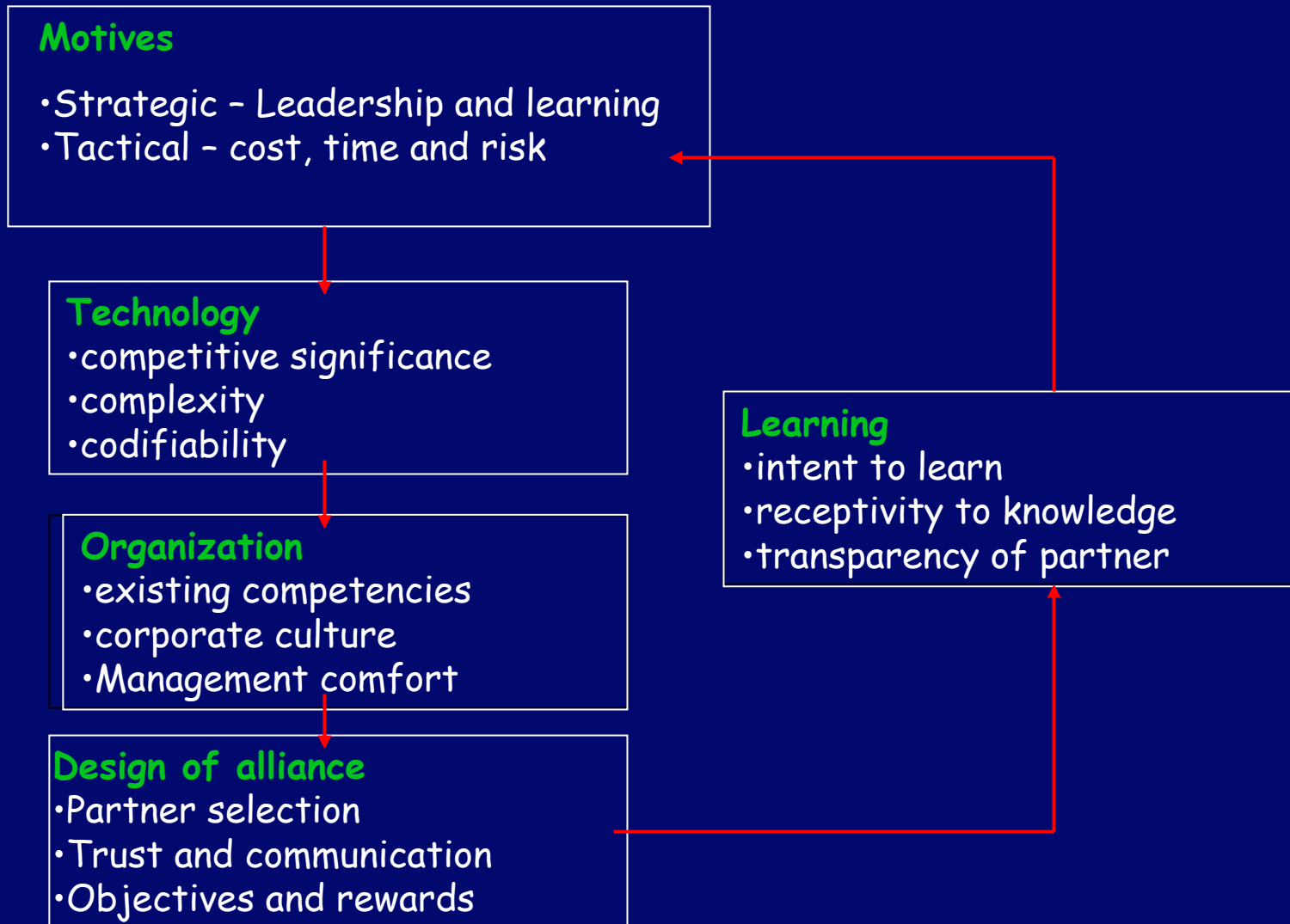
- Monitoring, performance, milestones, corrective actions.

Evolution

- On-going strategic fit, alternatives

Open Innovation??

A Model for Collaboration



Learning from Collaboration

Technological Learning

Effective introduction of new technological knowledge

Organizational Learning

Introduction of new routines, systems and managerial practices

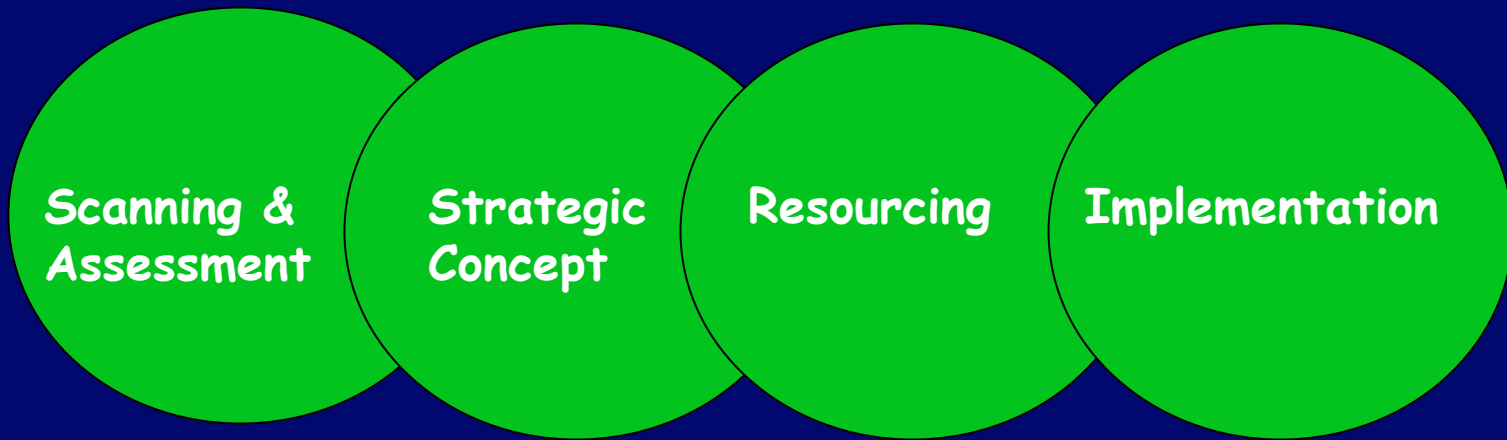
Strategic Learning

Amended strategic mindset of managers



Managing Innovation Processes

Stages in the Innovation Process



Routines

Corporate Routines

Managing Innovation Processes

- What are the key innovative capabilities?
- Where can new technology be acquired from?
- How can a firm learn about new technologies?
- Is there an ideal innovation strategy?

Innovative Capabilities

- *Forecasting & Assessing*
- *Searching & Selecting*
- *Acquiring & Protecting*
- *Implementing*
- *Aligning*
 - technology plans to technology audits
 - technology & business strategy
- *Integrating*
 - different functions & divisions
 - external & internal inputs
- *Combining*
 - imaginative & entrepreneurial combination of resources to create competitive advantages

Acquiring, Commercialising & Protecting

Technology Acquisition

- R&D
- Licensing
- Purchase

Governance of Commercialisation

- Arms Length/Market
- Integration
- Collaboration

Innovation & Technology Commercialisation



Methods of Acquiring Technology

How do firms acquire knowledge ie learn?

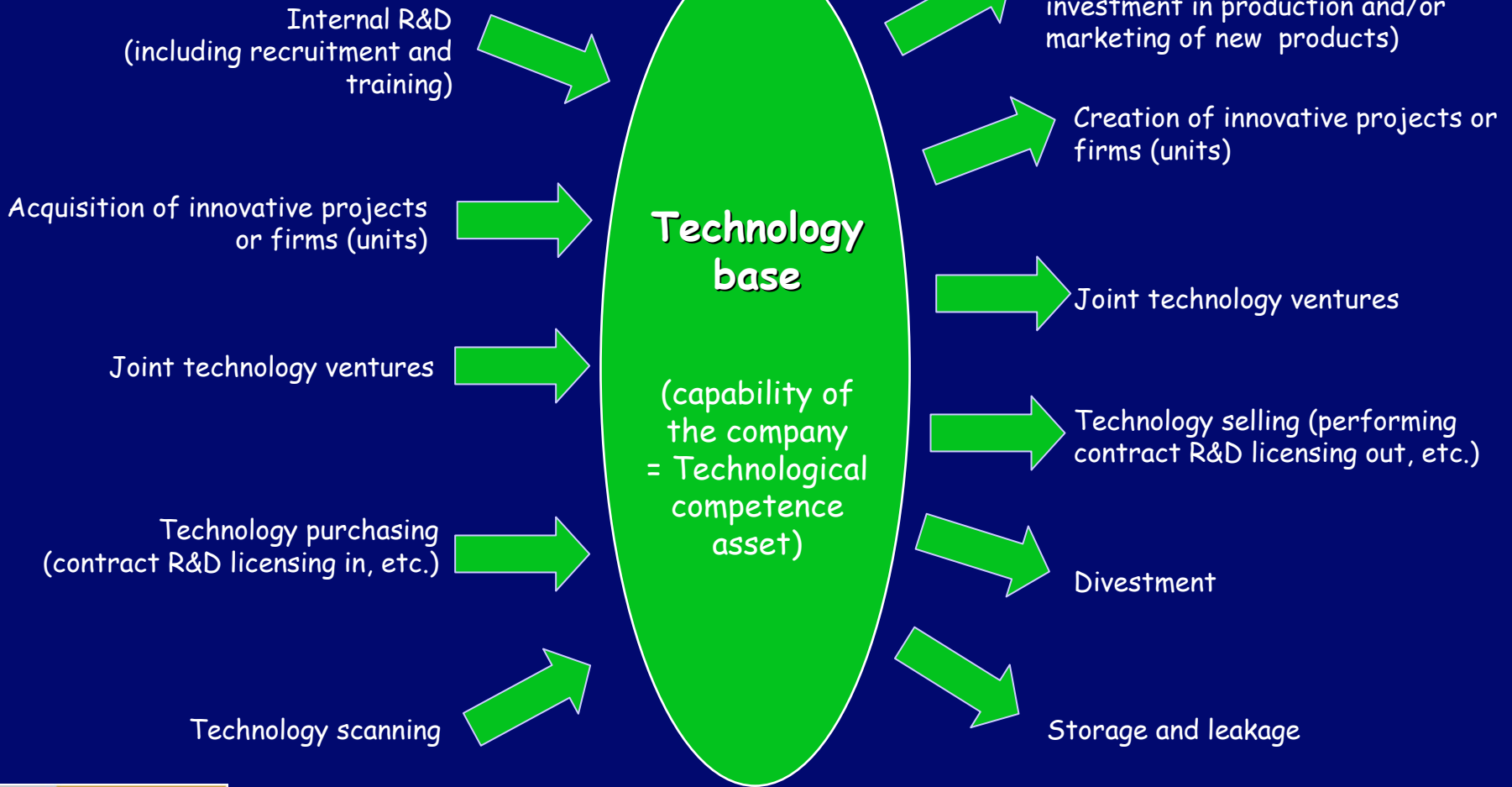
Methods of Learning About Technology

- Learning through links with science base
- Learning through collaboration and joint ventures
- Learning through subcontracting
- Learning by doing and using
- Learning through training and recruitment
- Learning through reverse engineering
- Learning through DFI
- Learning through competitor evaluation
- Learning through licensing
- Learning through distribution and marketing
- Learning by failing
- Learning through M&A
- Learning through consultancy exercises

Degree of organizational integration ↑

Technology acquisition (sourcing strategies)

Technology exploitation (commercialisation strategies)



Strategic Positions

Transform

Strategic objective

New Businesses
New & Disruptive
technology

Development via corporate
funding

New Ventures
New & Disruptive
technology

- New spin-outs
- Joint ventures

Exploit

Sustainable Core Businesses
Core Technology

Strong technology &
efficient product
development

Growing Valuations
Holding portfolio

- Passive holding of spin
outs
- Licensing in Non
competitive fields

Internal

External

Channel

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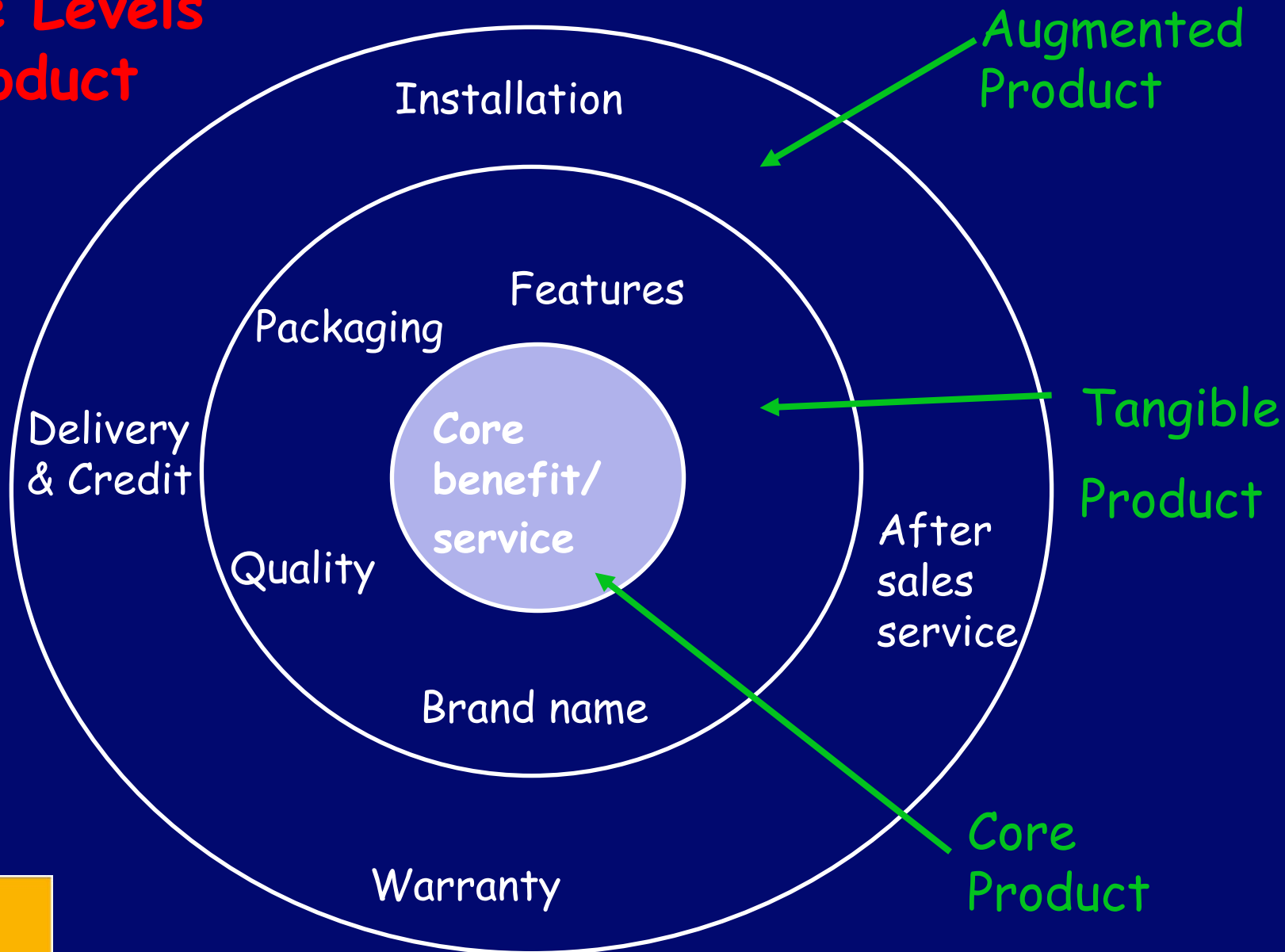
New PRODUCT Development

Pure Product

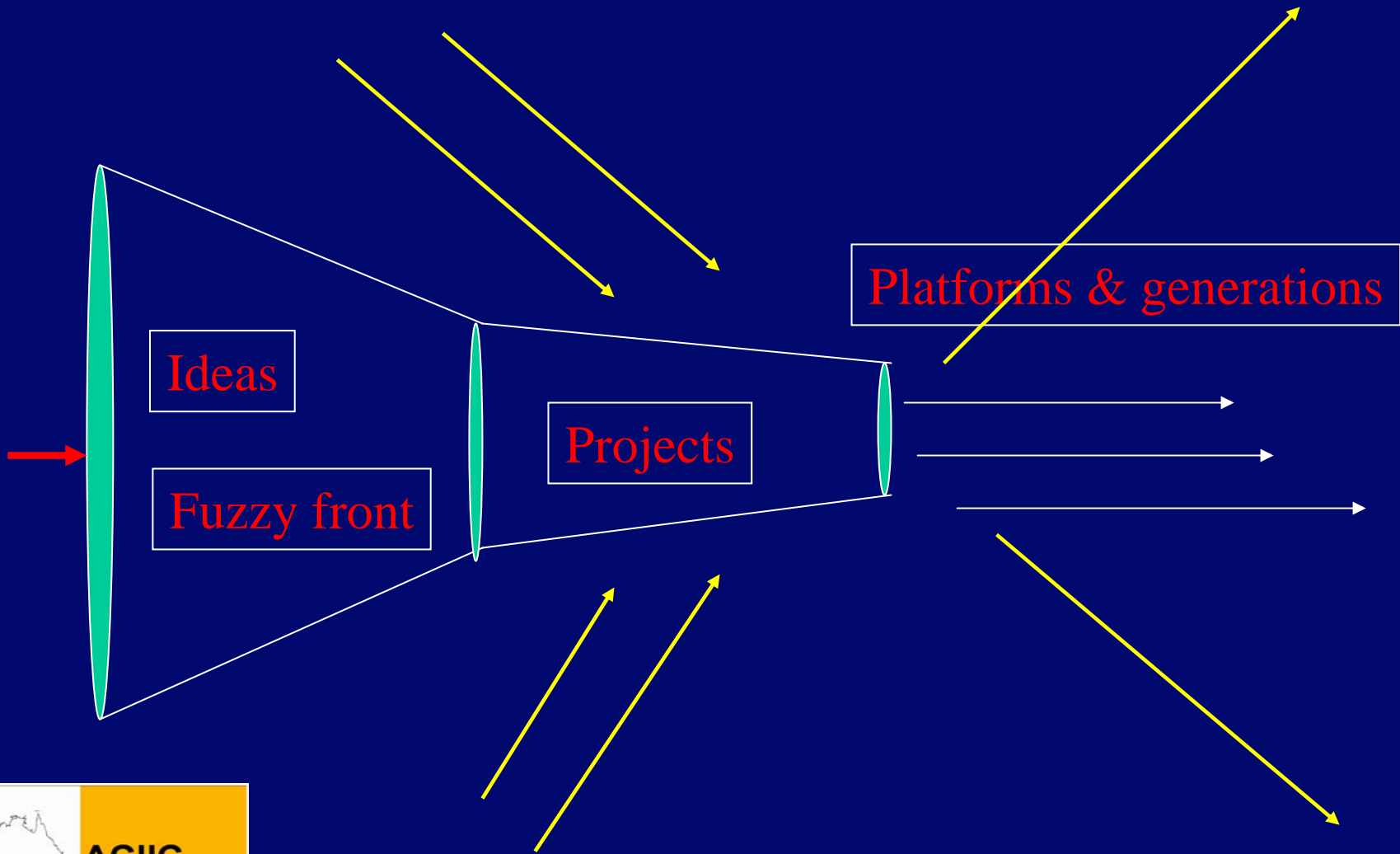
Bundle

Pure Service

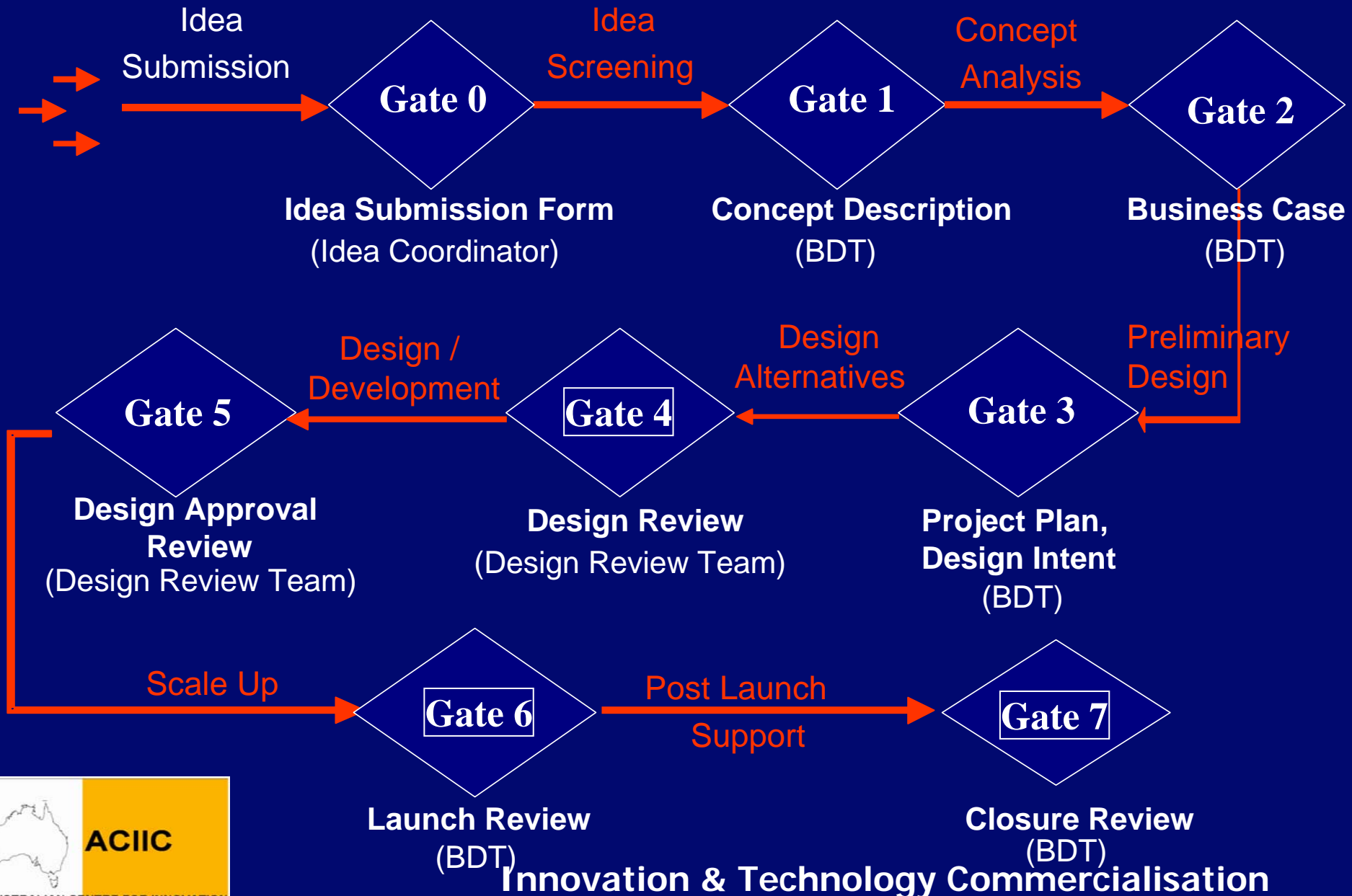
Three Levels of Product



The funnel concept



NPD Process Structure: Phases & Gates



Balancing

Radical innovation

- Change
- Diversity
- Sustainability
- Dependence on internal assets
- Leadership

Incremental Innovation

- Stability
- Focus
- Profit maximising
- Dependence on external assets
- Responsiveness