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	Low Novelty of markets	High Novelty of markets
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

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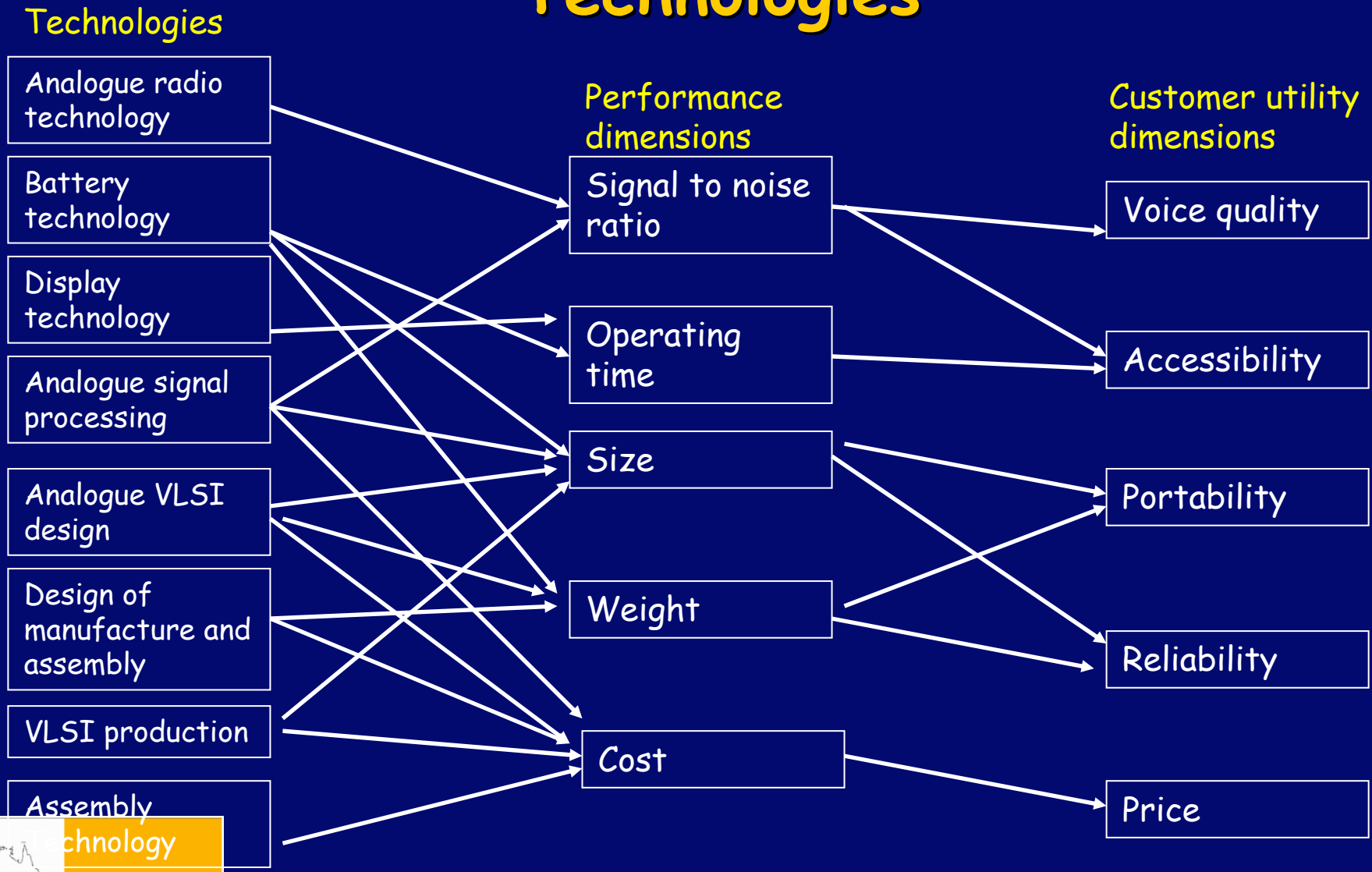
Incremental Innovation Requires

- 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



Oskarsson & Sjoberg, 1994

Technological & Market Maturity

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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

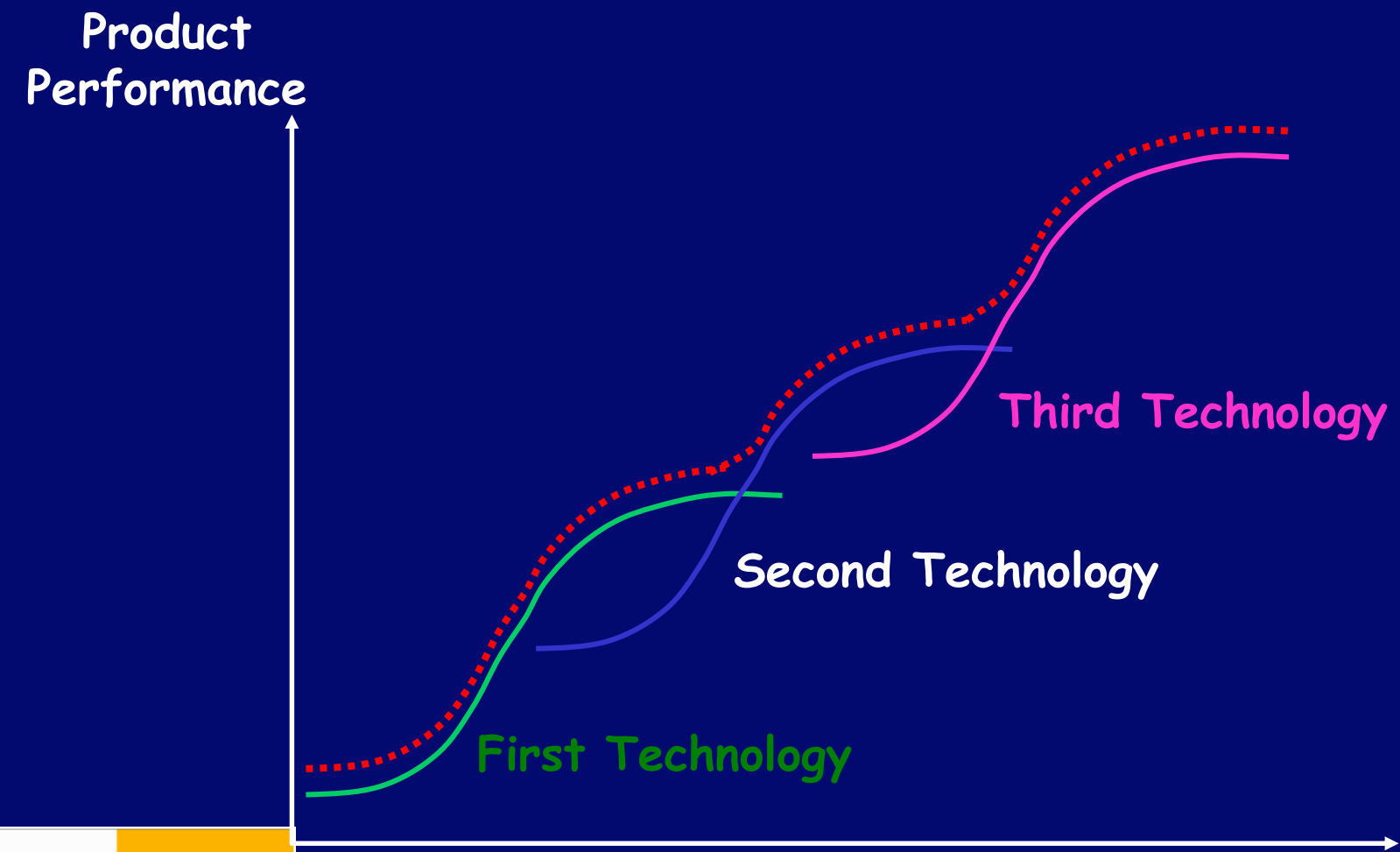
Architectural Innovations

- 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

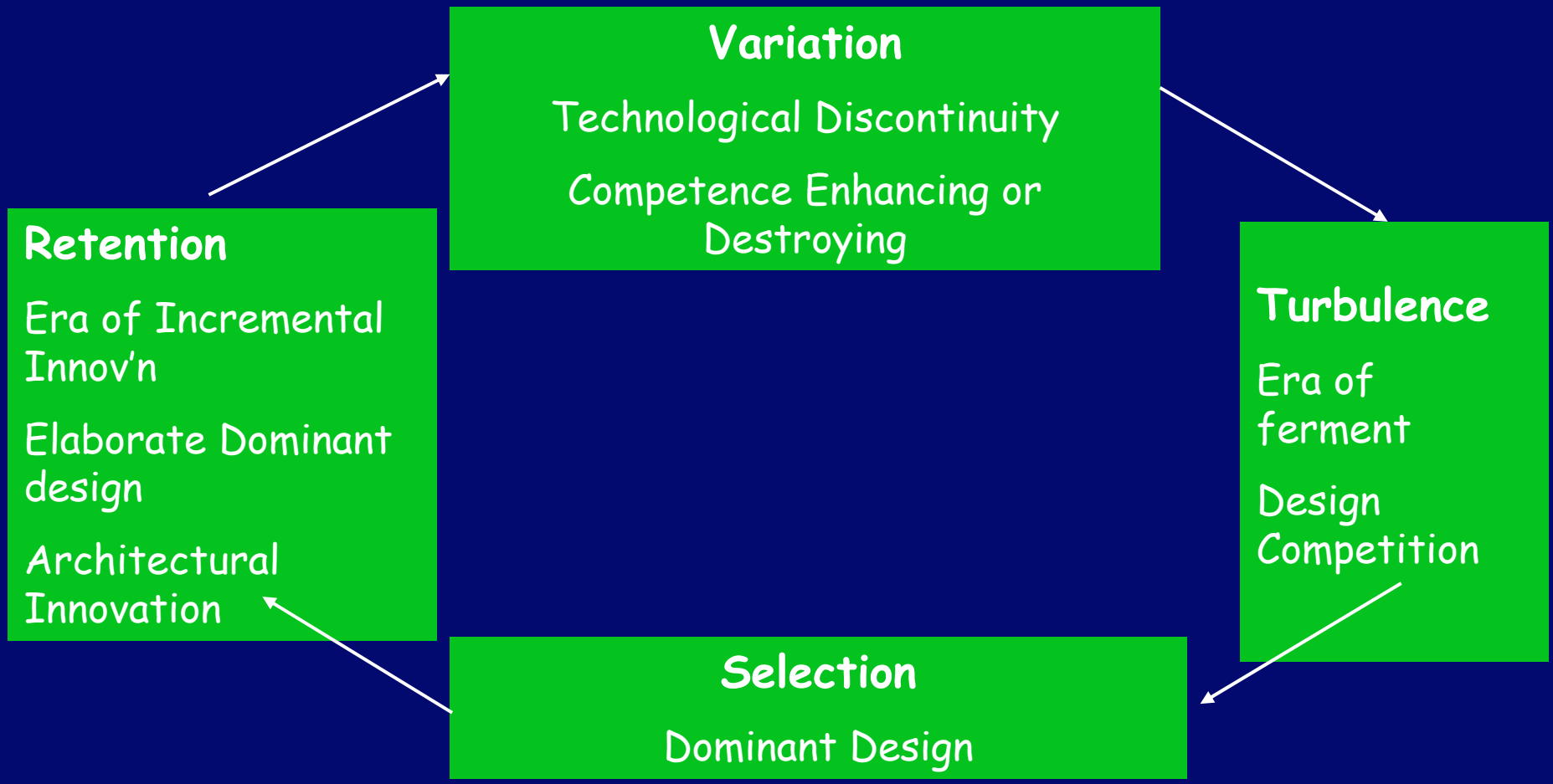
Technological & Market Maturity

Novelty of technology \ Novelty of markets	Low	High
High	**Technological:** New solutions to existing problems ·May have many specific applications ·Often part of a technological system	Complex: Technology and markets co-evolve
Low	Differentiated: products compete on quality and features	Architectural: novel combinations of existing technologies

Conventional Technology S-Curve



A Typical Technology Cycle

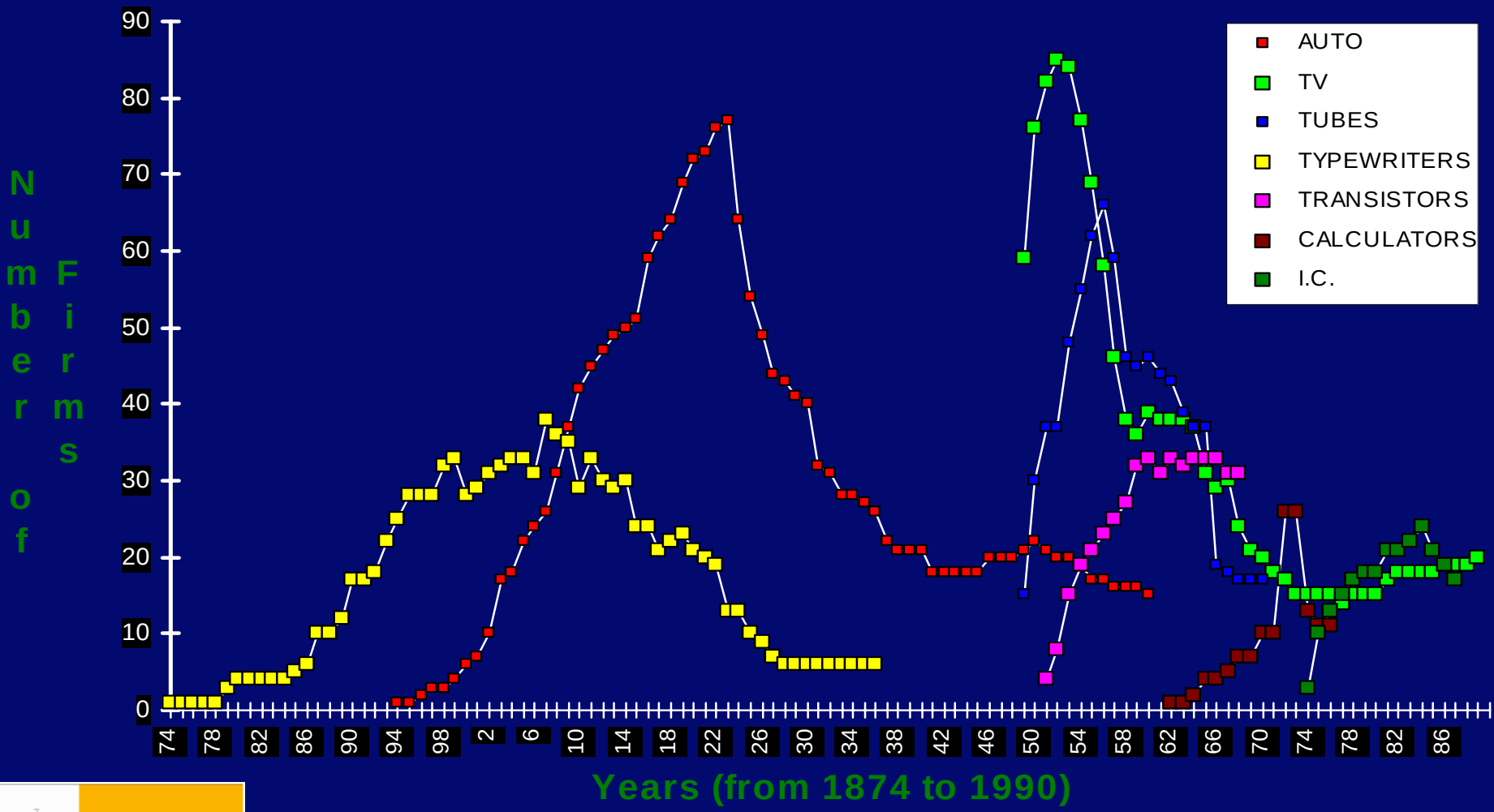


Dominant Design

A Dominant Design Functions to:

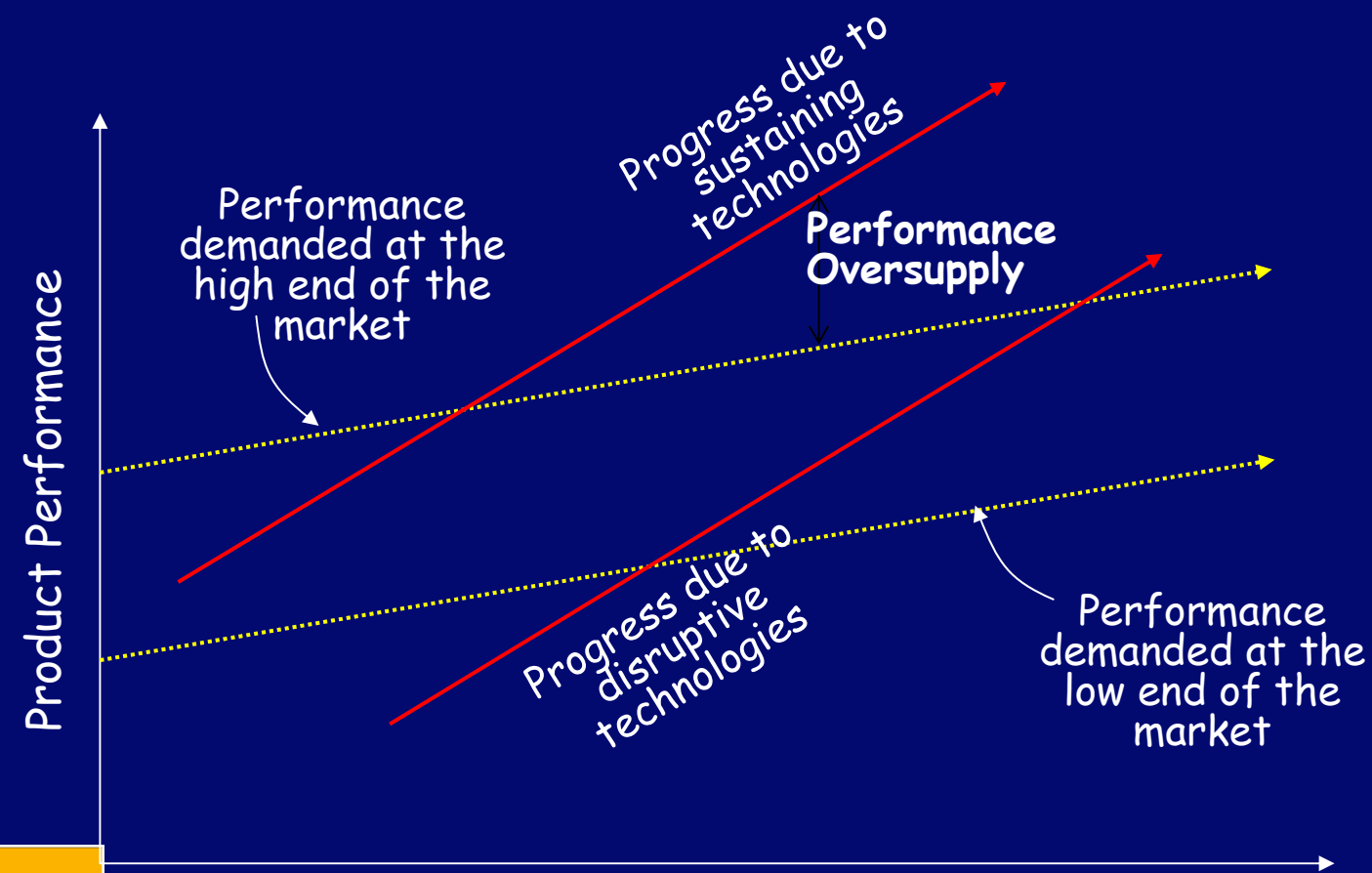
- help integrate the industry as a system with a specific solution embodied in an accepted **product design**.
- concentrate efforts of participants in industry onto refining that solution and bringing down **cost of production**
- Firms' specialist roles are co-ordinated around leading designs

Dominant designs:Industry dynamics



Derived from Debackere

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

Novelty of technology	Low Novelty of markets	High Novelty of markets
High	**Technological:** New solutions to existing problems	**Complex:** Technology and markets co-evolve • Often close interaction with users • Need to understand user needs (eg support) and segments • Adoption decision may be complex and political.
Low	Differentiated: products compete on quality and features	Architectural: novel combinations of existing technologies

Complex Products

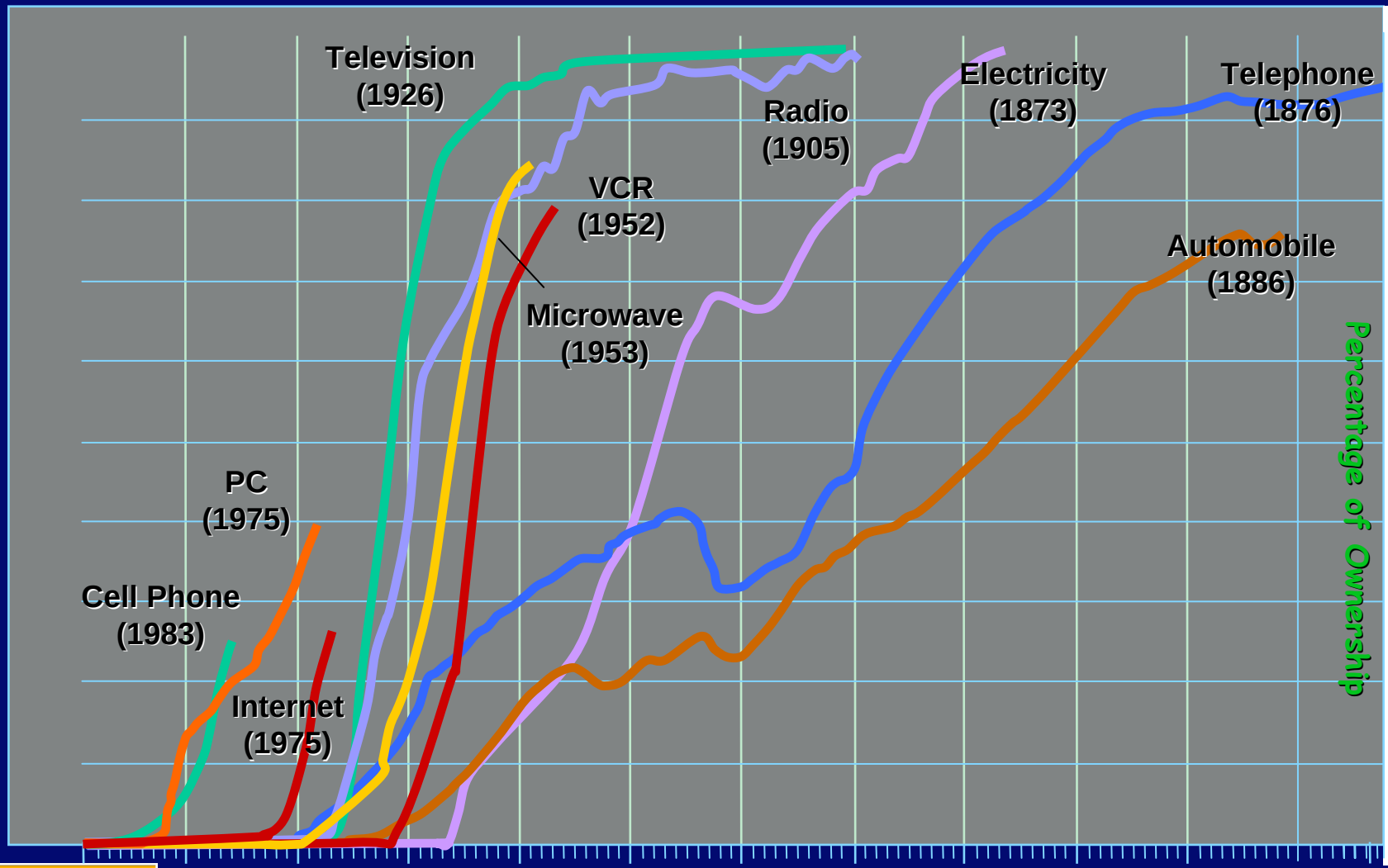
Complex products: aeroplane, hospital

- 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)



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Source: Rob Chaplain, Microsoft

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

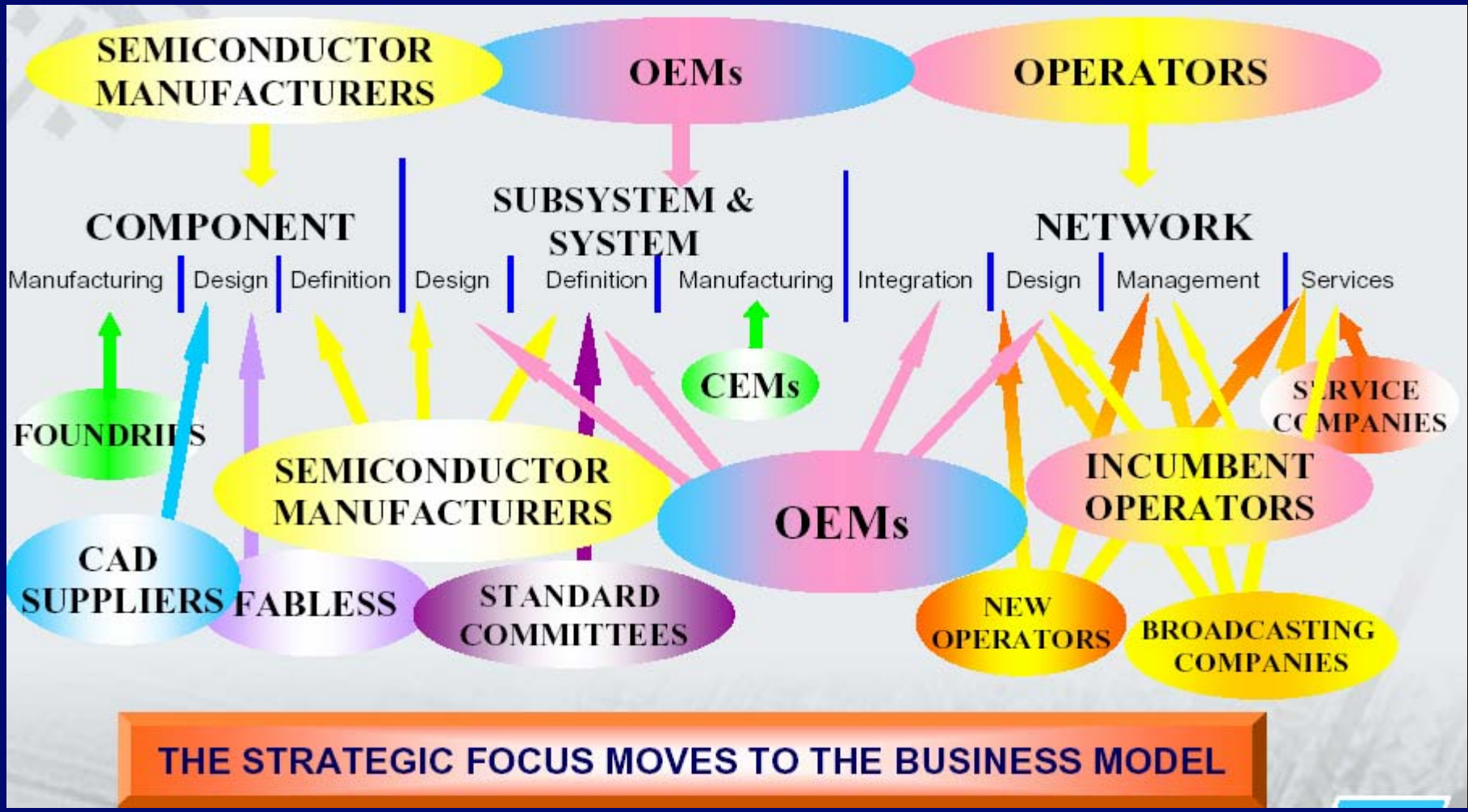
Cell phone = 14 years

Learning through Collaboration

Collaboration

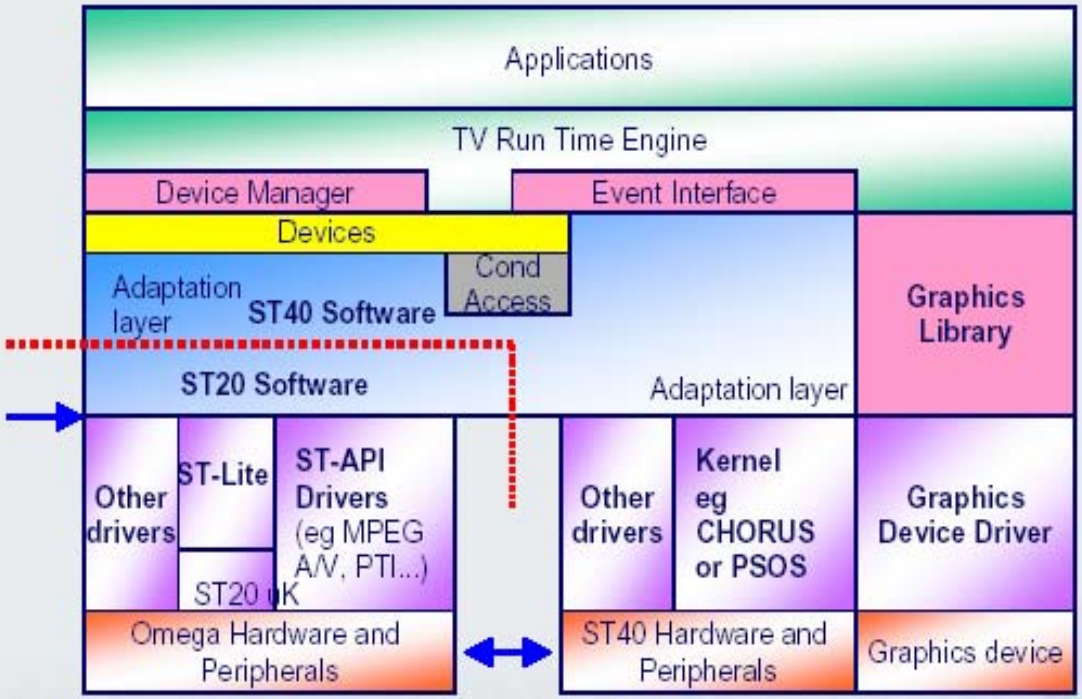
- Why do firms collaborate?
- What types of Collaboration are appropriate for different objectives and situations
- What factors affect the success of collaboration
- How can firms use alliances to strengthen their competitive position and their competencies?

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...

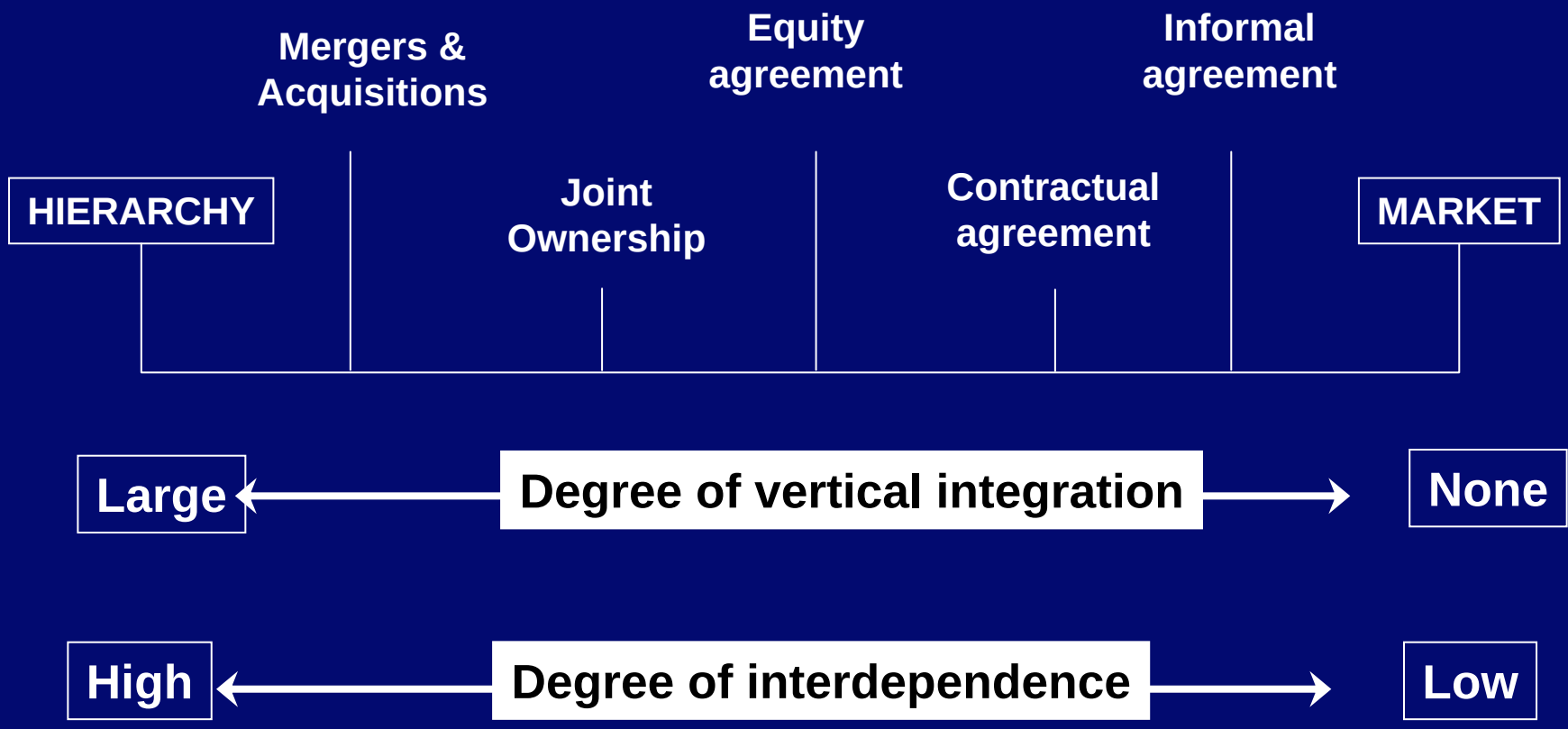
GSM, XML, DAVIC, DVB, MPEG2, MPEG4, MPEG7, TINA-C, QTP, ATM, WAN, LAN, SONET, SDH, IPVG, COFDM, QAM, QPSK, VLIW, RISC, CISC, GPRS, EDGE, UMTS, CDMA, WBCDMA, ADSL, VDSL, G-LITE, REMPEG, SLIMPEG, SPKI, PKI, SDMI, DVD, MP3, AC-3, BLUETOOTH, USB, ETHERNET, DSS, JPEG, 1394, DOS, WINDOWS, EPoC, OS/2, CD-ROM, 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

Innovation and alliances

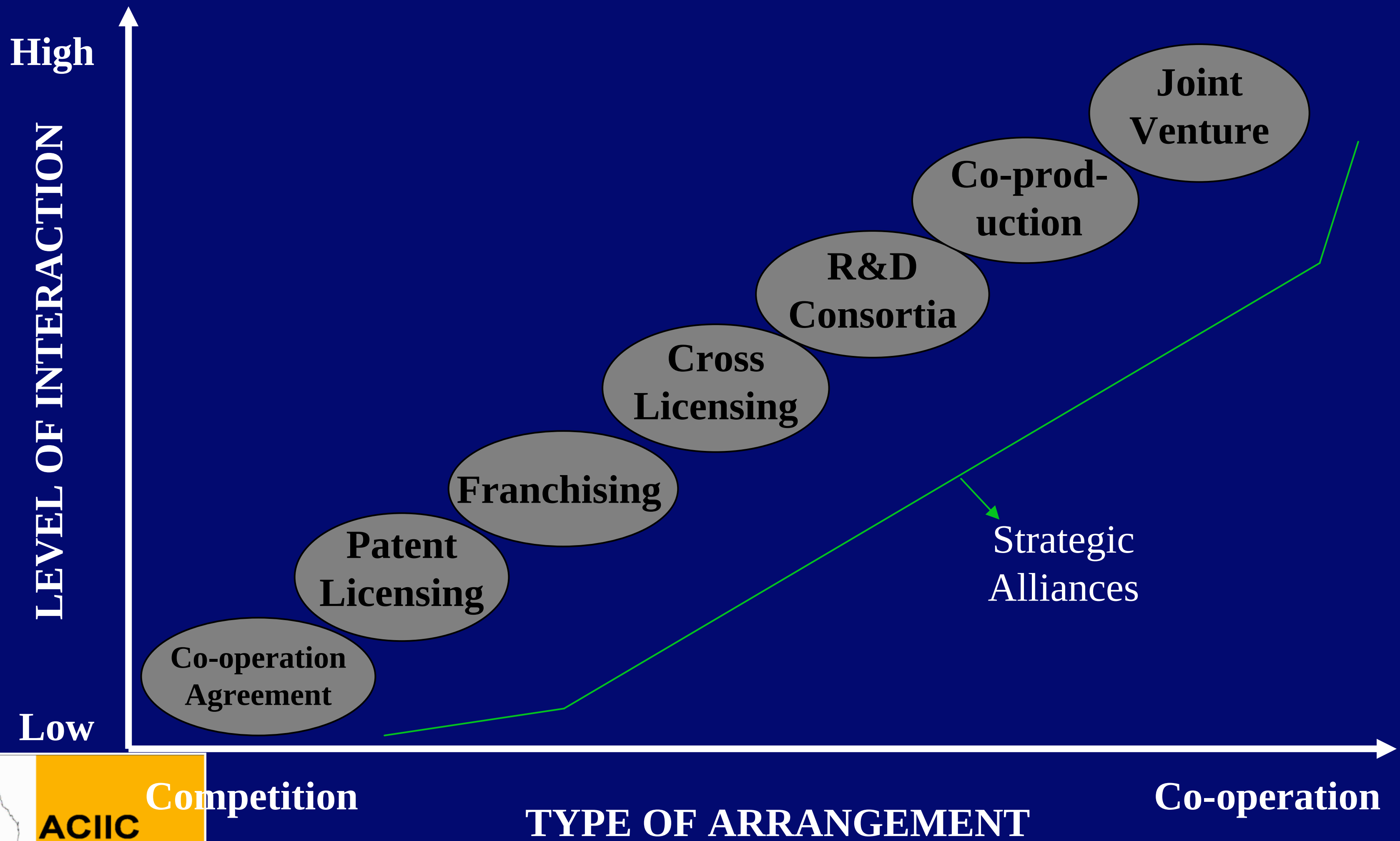
- Alliances can provide:
- **Faster and cheaper** way to develop new products and processes
- Route to **reach critical mass** of resources for large projects
- Means to **merge knowledge and skills** to support innovation
- Way to '**hedge bets**' on new technologies

What we mean by alliances and partnerships?



(Adapted from Lorange & Roos, 1992 and CTM)

Range of Strategic Alliances



Source: Beamish, Morrison, Rosenzweig and Inkpen, 2000, p. 114.

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

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**

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

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

Philips

License for:
video disk player
magnetron technology

USA Video
ISD

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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
TORAY
ASIC

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

Motives

- Strategic – Leadership and learning
- Tactical – cost, time and risk

Technology

- competitive significance
- complexity
- codifiability

Organization

- existing competencies
- corporate culture
- Management comfort

Design of alliance

- Partner selection
- Trust and communication
- Objectives and rewards

Learning

- intent to learn
- receptivity to knowledge
- transparency of partner

Learning from Collaboration

Technological Learning

Effective introduction of new technological knowledge

Organizational Learning

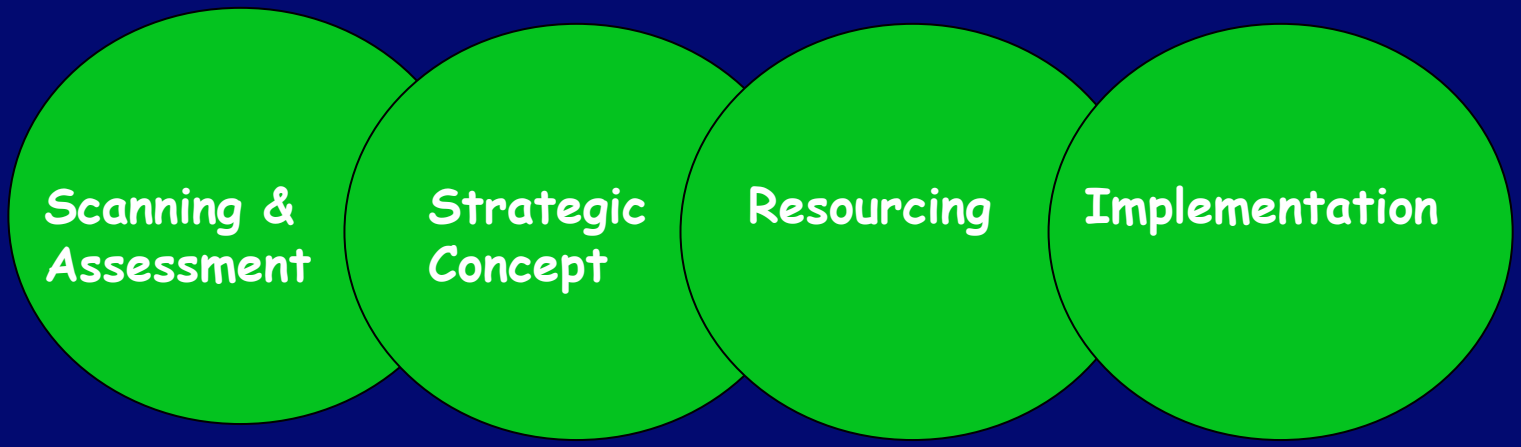
Introduction of new routines, systems and managerial practices

Strategic Learning

Amended strategic mindset of managers

Managing Innovation Processes

Stages in the Innovation Process



Routines

Corporate Routines

From Tidd, Bessant and Pavitt

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
- *Learning*

Acquiring, Commercialising & Protecting

Technology Acquisition

- R&D
- Licensing
- Purchase

Governance of Commercialisation

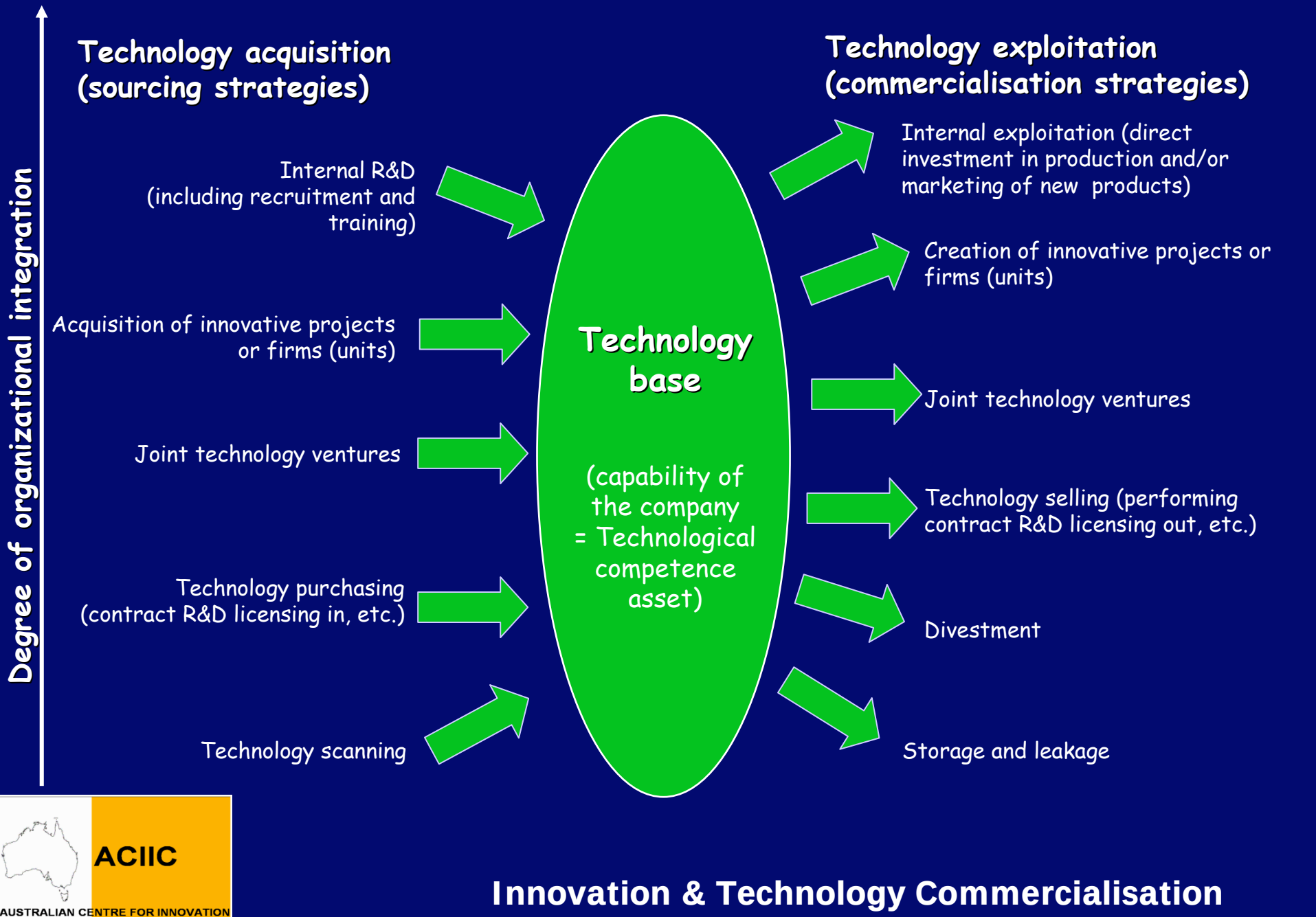
- Arms Length/Market
- Integration
- Collaboration

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**



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Strategic Positions

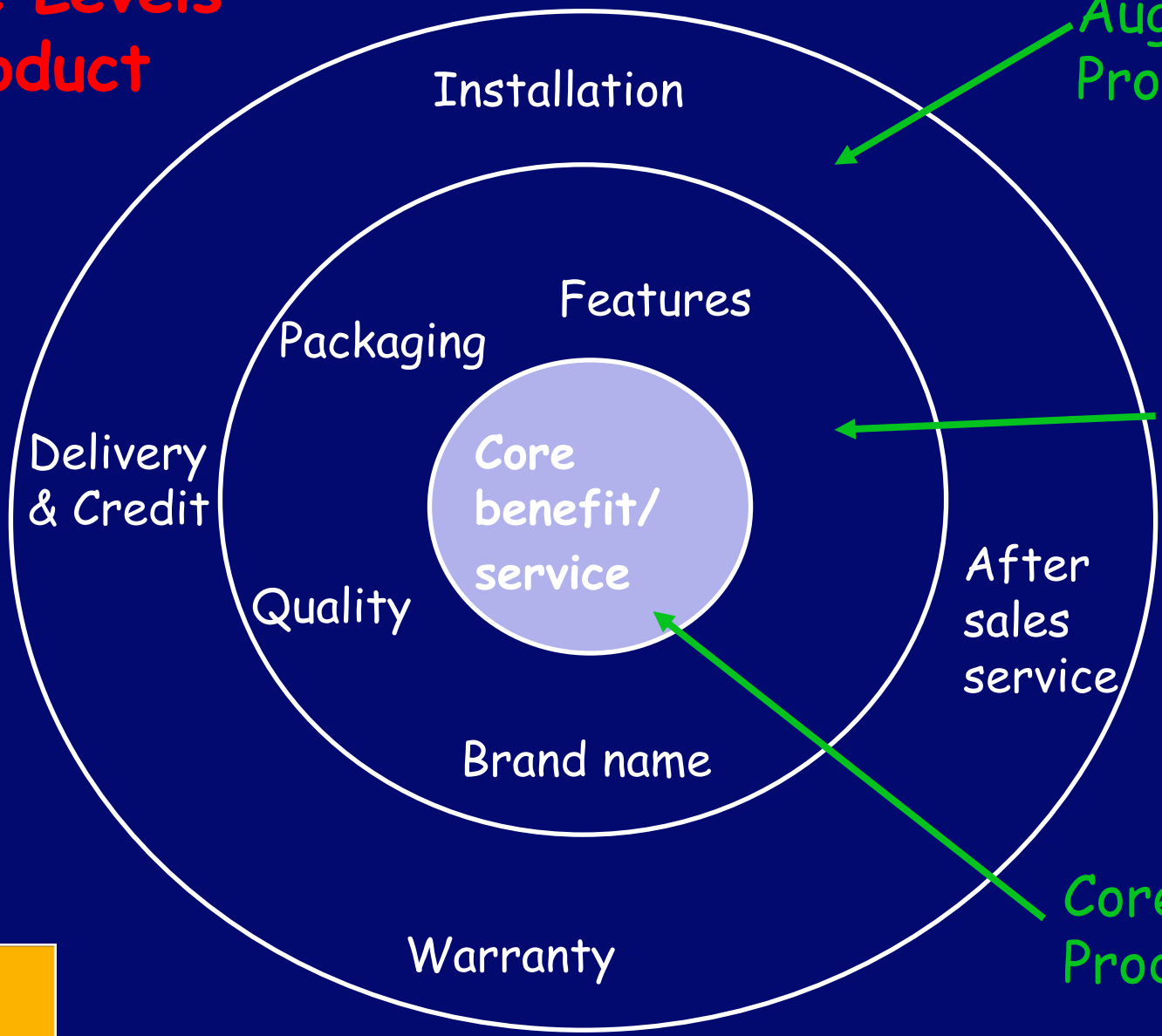
Strategic objective	Internal	External
Transform	New Businesses New & Disruptive technology Development via corporate funding	New Ventures New & Disruptive technology •New spin-outs •Joint ventures
Exploit	Sustainable Core Businesses Core Technology Strong technology & efficient product development	Growing Valuations Holding portfolio •Passive holding of spin outs •Licensing in Non competitive fields

Channel

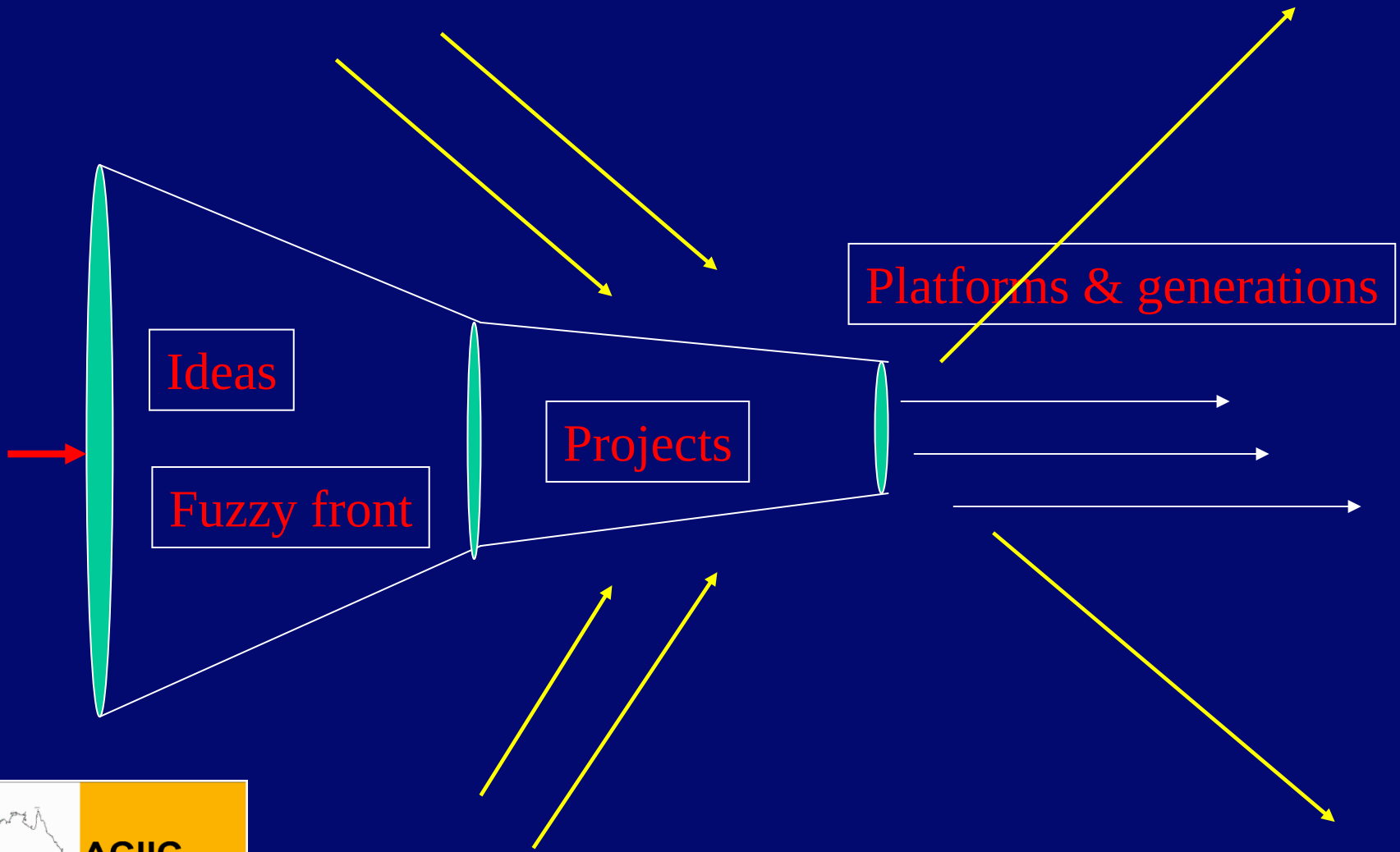
New PRODUCT Development

Pure Product ..... Bundle ..... Pure Service

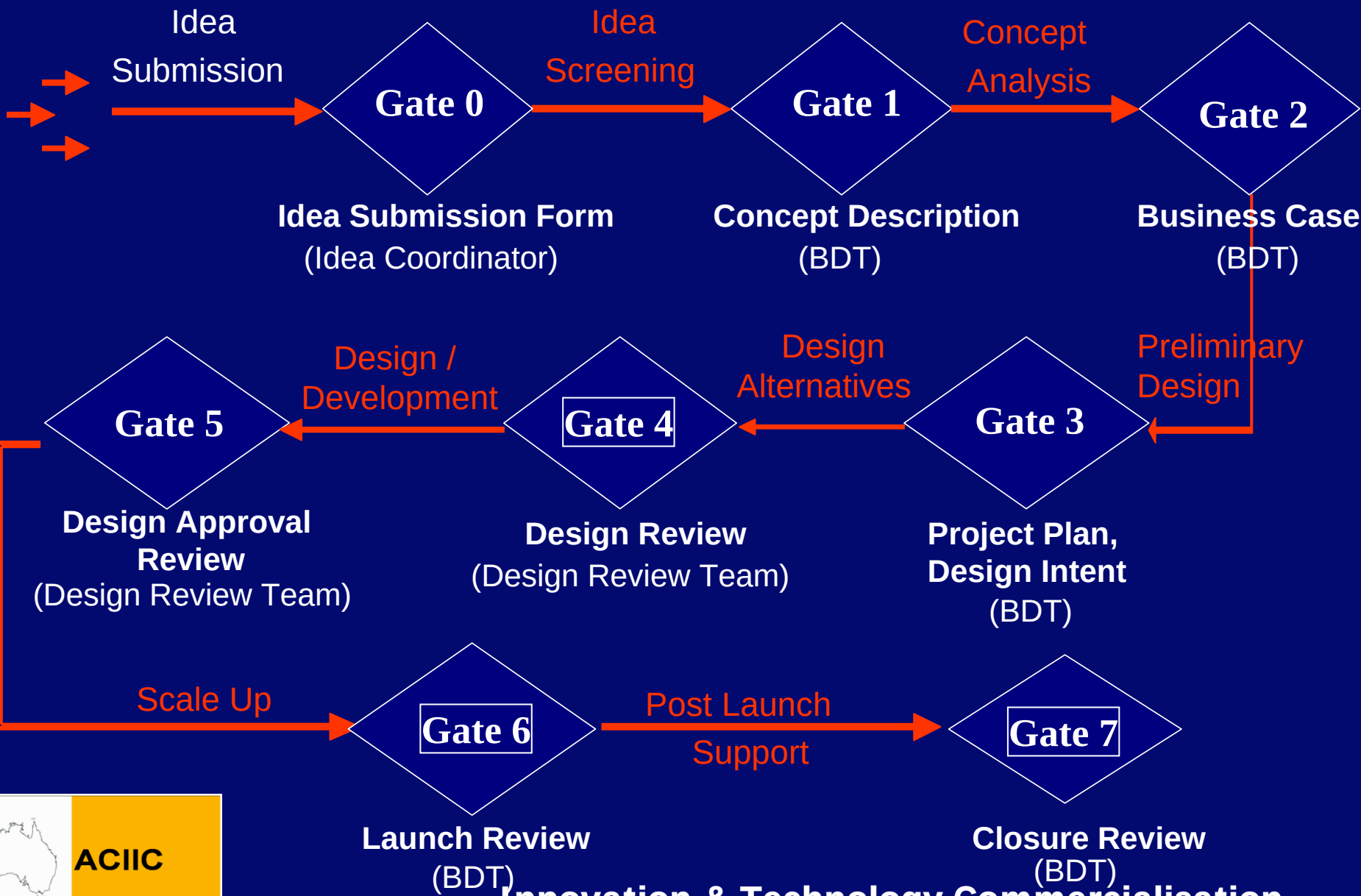
Three Levels of Product



The funnel concept



NPD Process Structure: Phases & Gates



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Balancing

Radical innovation

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

Incremental Innovation

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