



How Corporations Navigate Through Technological Change

*Exploring the Impact of Innovation on
Industry Structure, Corporate Strategy and
Management Practices*

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Agenda of today

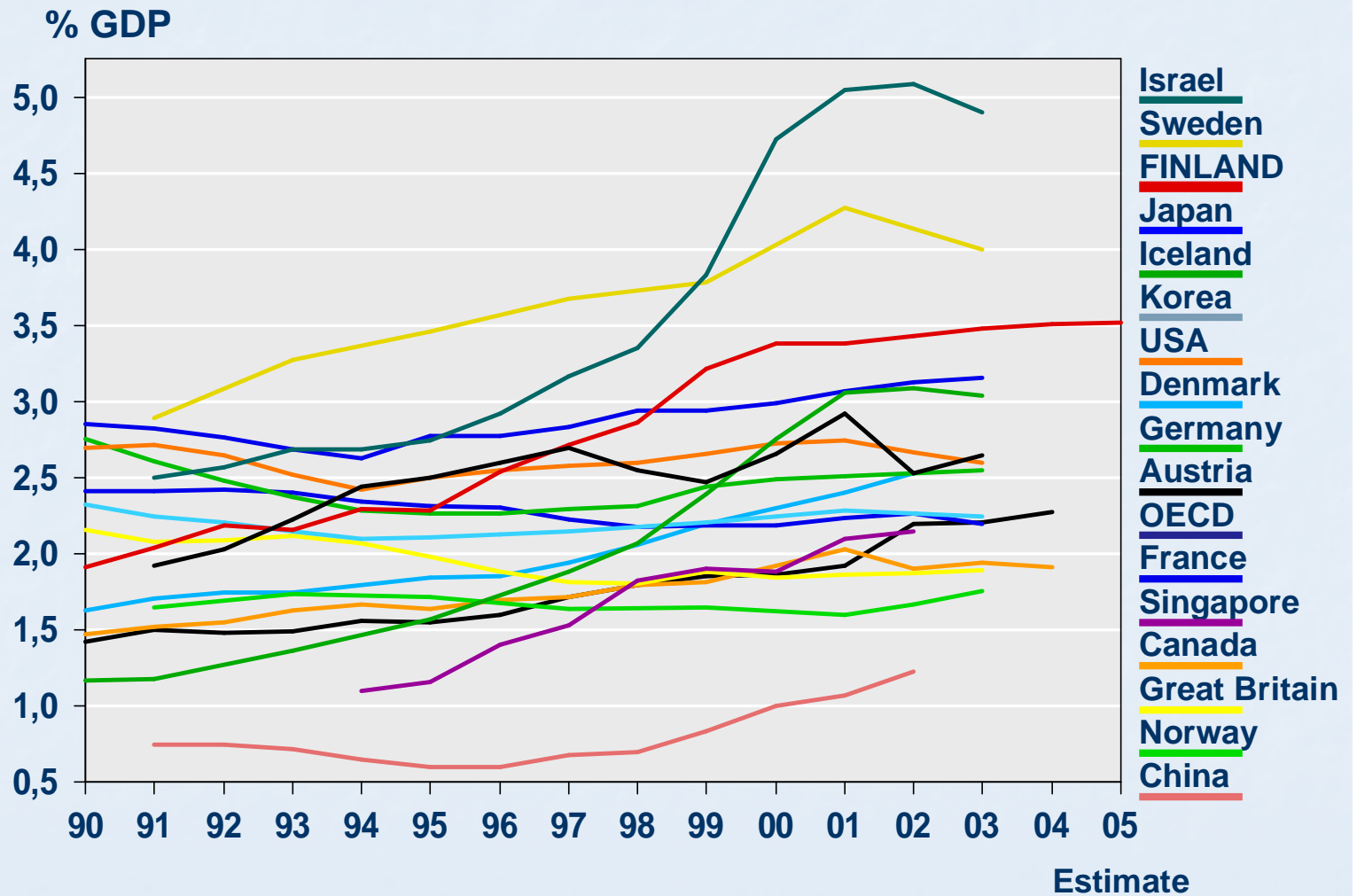


- n Definitions and types of innovations
- n Outside-in perspective: How technological change affects industry structure and firm strategies?
- n Inside-out perspective: How to better promote creativity and innovation in established firms?
 - n Problems faced by corporate venture managers (managers of innovative new ventures)
 - n Ways of promoting innovativeness
 - n Formal organization structures
 - n captured in the organization chart
 - n Informal organization structures
 - n corporate culture: values, norms, practices...

Why innovation management?

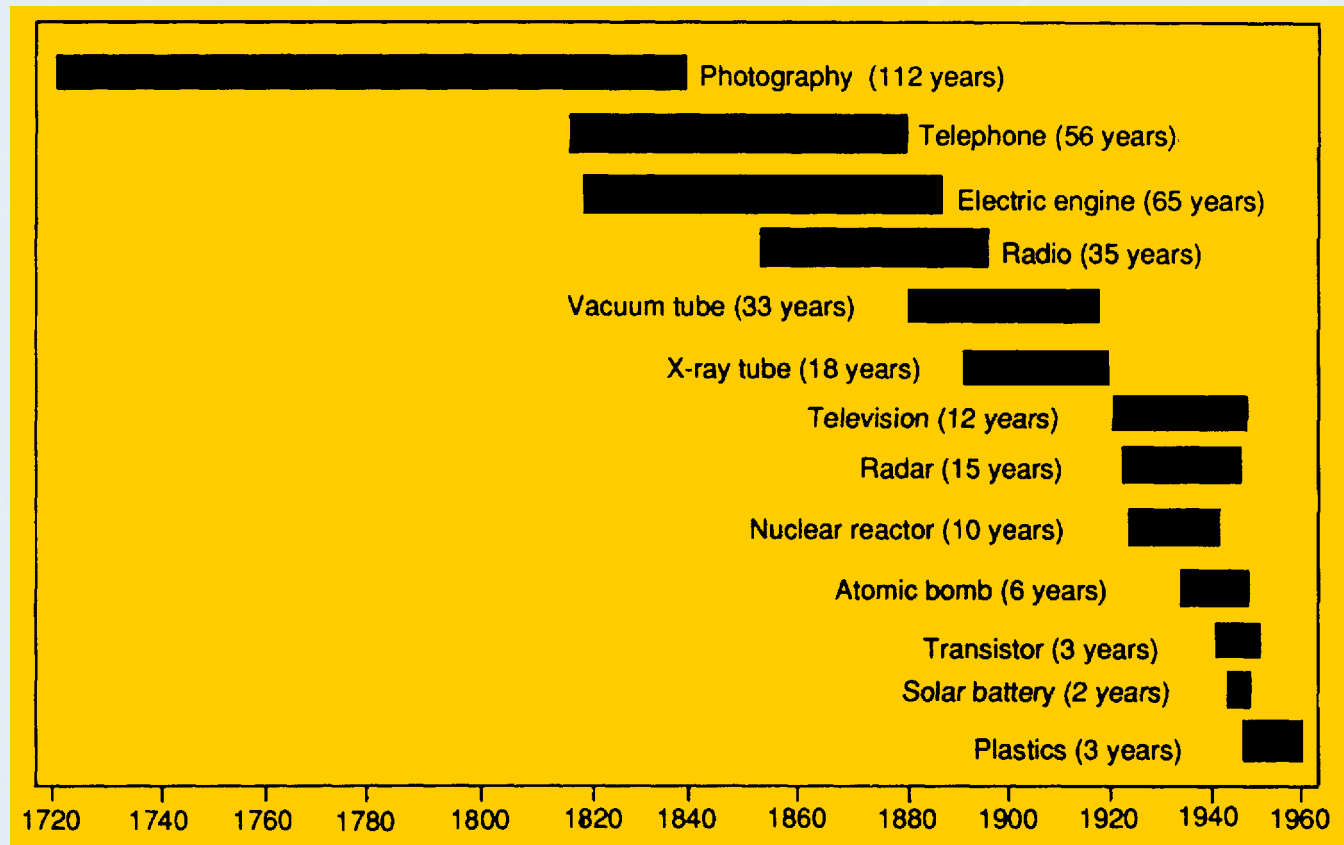
- n Technology and innovation are seen as a stimuli to economic growth and important source of competitive advantage for individual firms.
 - n Industrial research and development expenditures have been steadily increasing during the past decades
 - n 3-15% of sales is invested in research and development in technology intensive sectors (in some sectors even more)
 - n technology-intensive industries account for a lion's share of sales growth

R&D Investments in Selected OECD Countries



Sources: OECD, Main Science and Technology Indicators and Statistics Finland

Speed of innovation



Innovation dilemma

- n A seven country PricewaterhouseCoopers survey of 399 global executives finds that innovation easily surpasses globalization, industry convergence and even e-business as their top strategic challenge.
- n An Arthur D. Little survey of 669 global executives finds that “fewer than one in four believe they have fully mastered the art of deriving business value from innovation.”



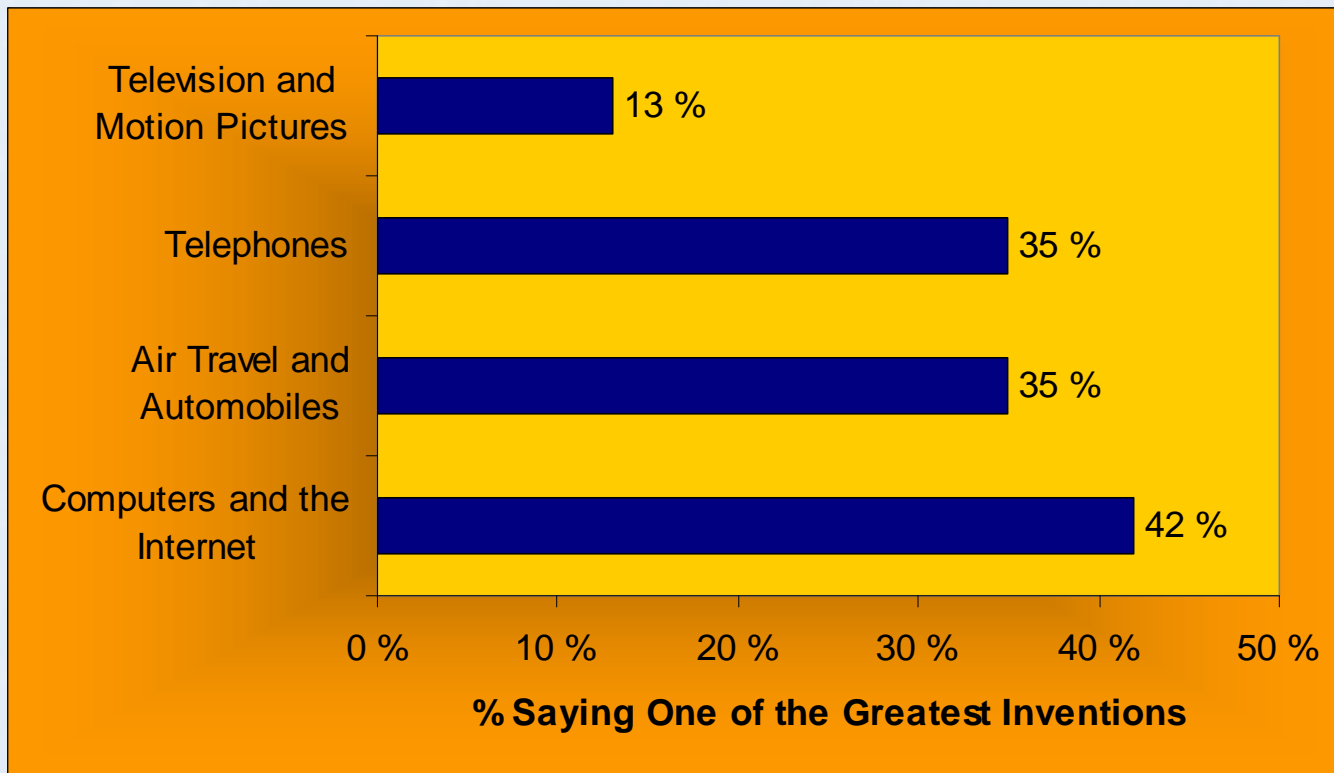
Past evidence of the difficulty of innovating

- n This “telephone” has too many shortcomings to be seriously considered as a means of communication. The device is inherently of no value to us.”
Western Union internal memo, 1876.
- n “The wireless music box has no imaginable commercial value. Who would pay for a message sent to nobody in particular?” David Sarnoff’s associates in reponse to his urgings for investment in the radio in the 1920s.
- n “I think there is a world market for maybe five computers.” Thomas Watson, Chairman IBM, 1943.
- n “There is no reason why anyone would want a computer in their home.” Ken Olson, president, chairman and founder of Digital Equipment Corporation, 1977.
- n “The concept is interesting and well-formed, but in order to earn better than a “C”, the idea must be feasible.” A Yale university management professor in response to Fred Smith’s paper proposing reliable overnight delivery service. (Smith went on to found Federal Express.)

Definition of innovation

- n A new combination of existing elements resulting in a new good, the introduction of a new method of production, the conquest of a new source of supply of raw materials or half-manufactured goods... “
(Schumpeter, 1934)
- n Innovation is an iterative process initiated by the perception of a new market/or new service opportunity for a technology-based invention which leads to the development, production and marketing tasks striving for the commercial success of this invention (OECD, 1994)

Greatest innovations of the last century?



Source: Survey of Nobel Laureates

A Typology of Innovations I

Type of innovation	Example
Product Innovation	New or improved product
Process Innovation	New or improved production process
Organizational Innovation	New organizational arrangement: a new venture division, a new internal communication system
Management Innovation	New managerial practice: TQM, BPR (business process re-engineering)
Marketing Innovation	New marketing practices: New financing arrangement, new sales approach
Service Innovation	New service concepts: online financial services
Business Model Innovation	New ways of creating value and earning revenue (Virgin Group, Apple)

Innovation revisited

- n Macro perspective:
 - n New to the world, new to the industry, new to the market
- n Micro perspective
 - n New to the firm, new to the consumer
- n Marketing discontinuity
 - n New market places or new marketing skills
- n Technological discontinuity:
 - n A paradigm shift in the state of science or technology embedded in a product, new R&D resources or new production processes for the firm

A typology for identifying technological innovations II

- n Radical innovation: marketing and technological discontinuities on both macro and micro levels (12.5%)
- n Incremental innovation: technological OR market discontinuity only on a microlevel (37.5%)
- n Really new innovation: combinations between these two extremes (50%)
- n Garcia, R., & Calantone, R., 2002, A critical look at technological innovation typology and innovativeness terminology: a literature review, *Journal of Product Innovation Management* 19: 110-132.

The Glenavlon



By 1870, sailing ships had lost 50% of their business to ships powered by steam



The France II



The Thomas W. Lawson



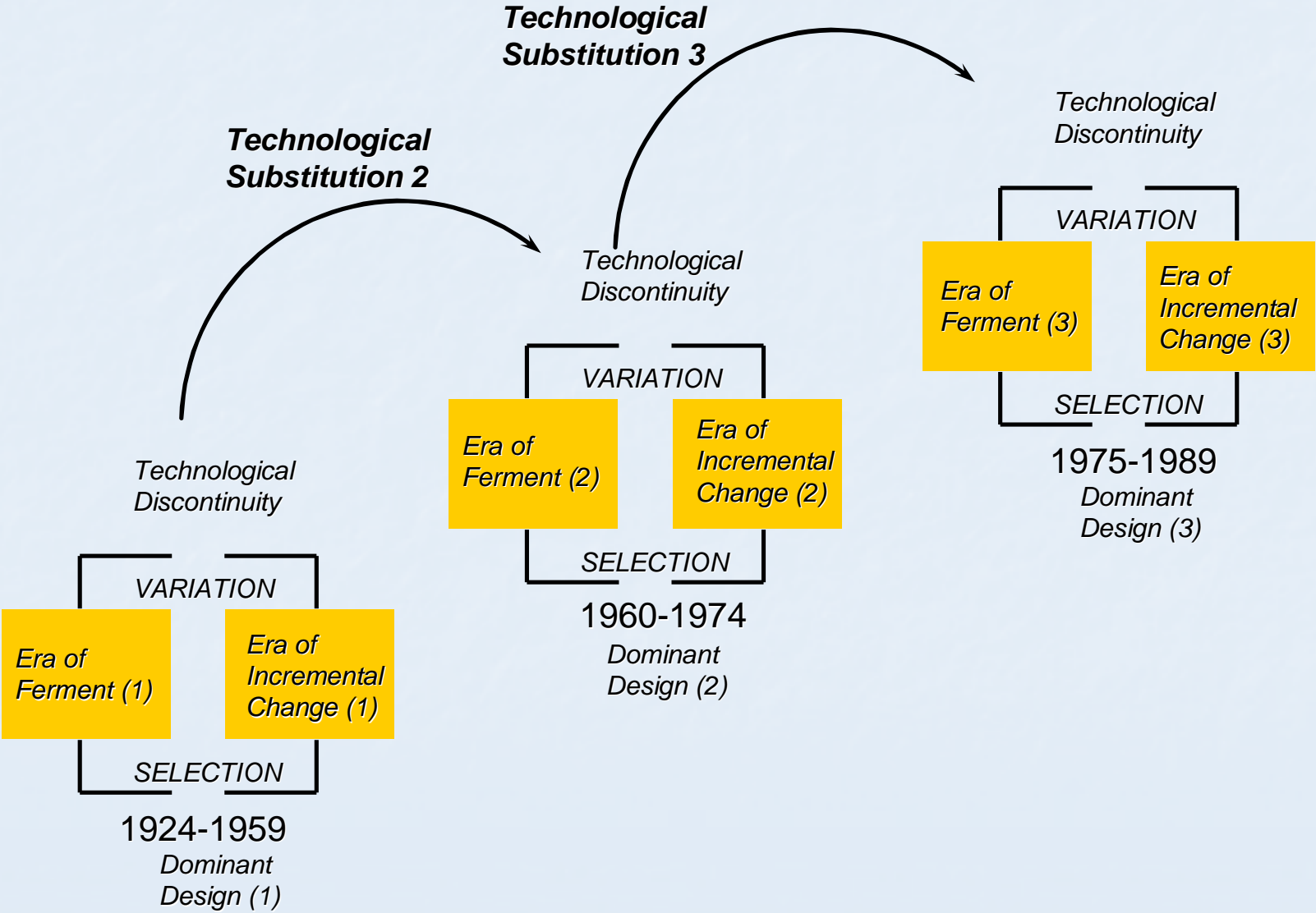
Ran into Rocks in 1907

Case: The evolution of the Finnish electronics industry

- n What regularities do you see in the evolution of the Finnish electronics industry during the years 1960-1989?
- n In which ways was the evolution of the industry and the development of technology interrelated?



Technology cycles over time



Era of ferment

- n alternative, competing technological standards, alternative technological guideposts
- n market consists of early adapters and lead users
- n emphasis on product differentiation and technical performance
- n price not an issue
- n competing, often new, technology-based firms
- n creation of positive externalities often crucial
- n chaotic, non-linear stage

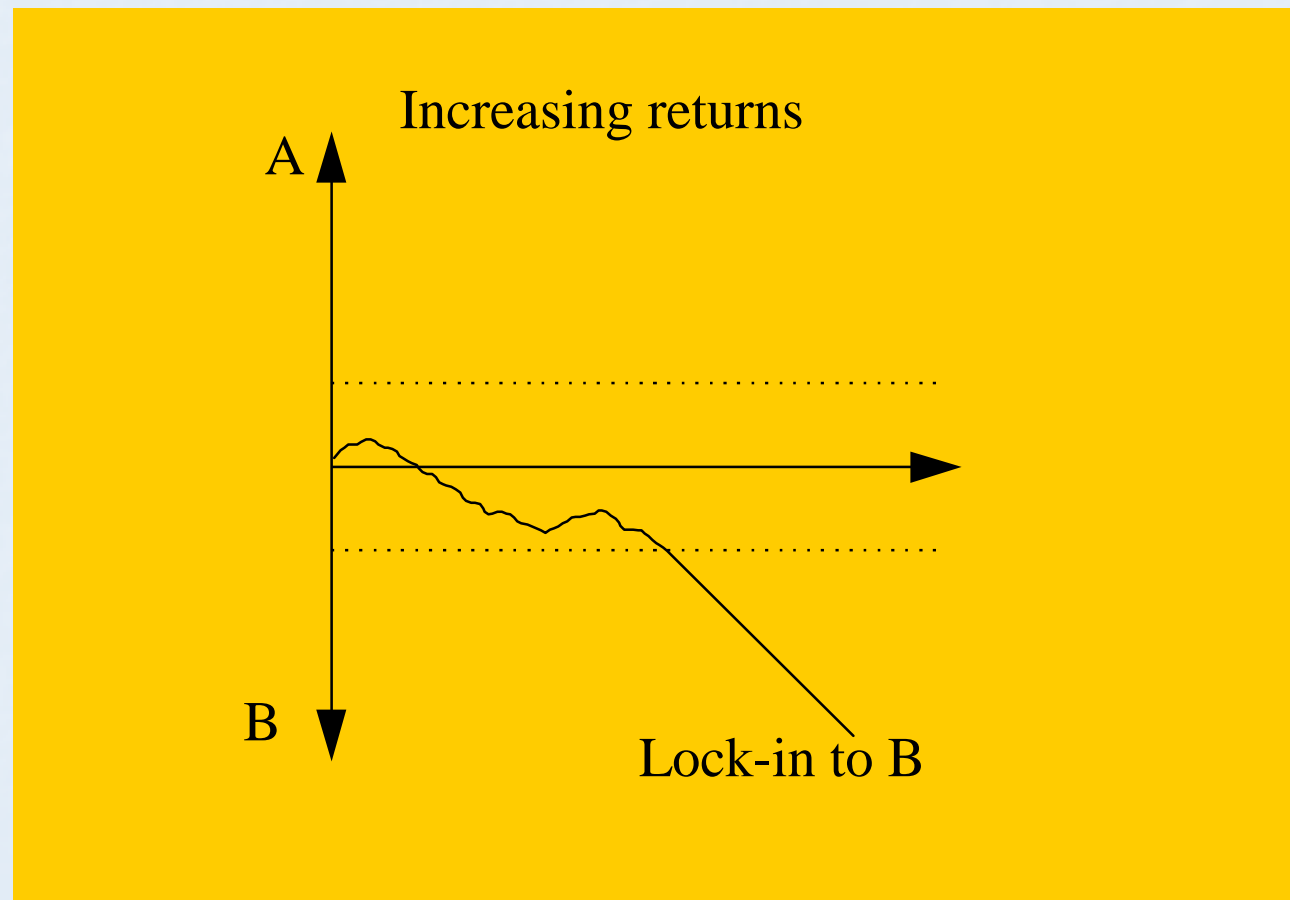
Emergence of dominant design

- n shake-out of alternative technologies as the dominant design emerges
- n rapid accumulation of positive externalities
- n enables the transition to (path dependent!) growth stage
- n often small factors can be decisive

How does a dominant design emerge?

- n technological superiority
- n collateral assets
 - n including also investment in design-specific skills (QWERTY-example)
- n industry regulation and government intervention
- n strategic manoeuvring at the firm level
 - n Betamax (Sony) vs. VHS (Matsushita/JVC)
- n communication between producers and users
- n network externalities

Positive network externalities



Technological complexity and dominant designs

Technological complexity	Basis of design dominance	Influence of social, political and organizational dynamics
Non-assembled products	Technical superiority; easily measured dimensions of merit	Minimal
Simple assembled products		
Closed assembled systems	Competition among alternative designs with diverse dimensions of merit	High
Open systems	Competition among alternative component and interface designs with diverse dimensions of merit	Pervasive

Competitive dynamics: standardization battles

	Dominant Designs	
	Product	Process
Competence Destroying	Veteran	Veteran
Competence Enhancing	Veteran	Veteran

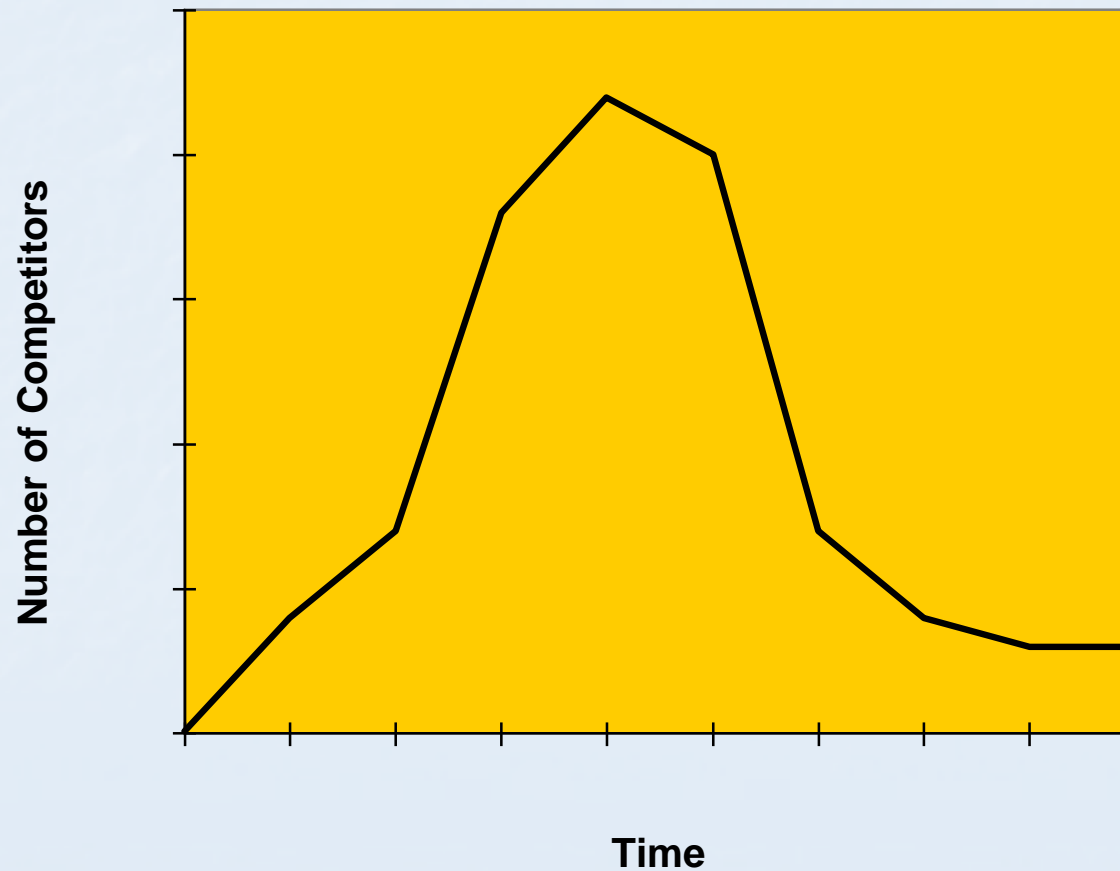
Era of incremental change

- n the emergence of dominant design enables growth in terms of the volumes sold
- n highly defined and standardized products
- n reconsolidation, shake-out of small players
- n competition increasingly based on price
- n economies of scale become important
- n late adapters, mass market
- n division between broad cost competitors and specialized niche players

Summary: The Dynamics Over the Technology Cycle

Product	From high variety, to dominant design, to incremental innovation on standardized products
Process	Manufacturing progress from heavy reliance on skilled labor and general-purpose equipment to specialized equipment tended by low skilled labor
Organization	From entrepreneurial organic firm to hierarchical mechanistic firms with defined tasks and procedures and few rewards for radical innovation
Market	From fragmented and unstable with diverse products and rapid feedback to commodity-like with largely undifferentiated products
Competition	From many small firms with unique products to an oligopoly of firms with similar products

Dominant design and the number of competing firms



Criticism

- n non-applicable for simple, non-assembled systems
- n applicable for mass market products only
- n cultural factors ignored
- n determinism



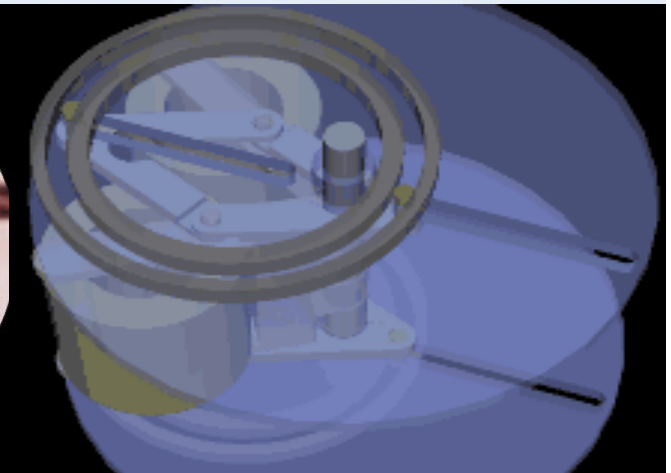
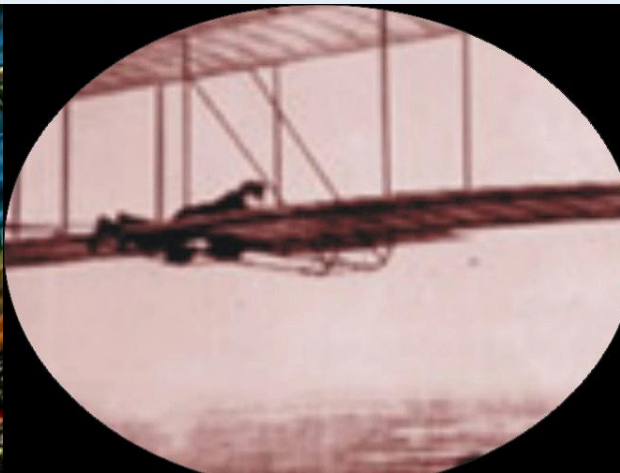
Managerial implications of technology life cycle framework

- n Expect discontinuities!
- n The dynamics of the era of ferment
 - n Too many entrants
 - n Chasing future profits
- n Establishing a dominant design requires massive investment -- but may be necessary to ensure survival!!
 - n Flexibility is the issue here
- n The dynamics of the era of incremental change
 - Concentrated industry structure
 - Possibility of “price wars”
 - Need to anticipate technological discontinuities
 - Need to build ambidextrous organizations

For more information, please see

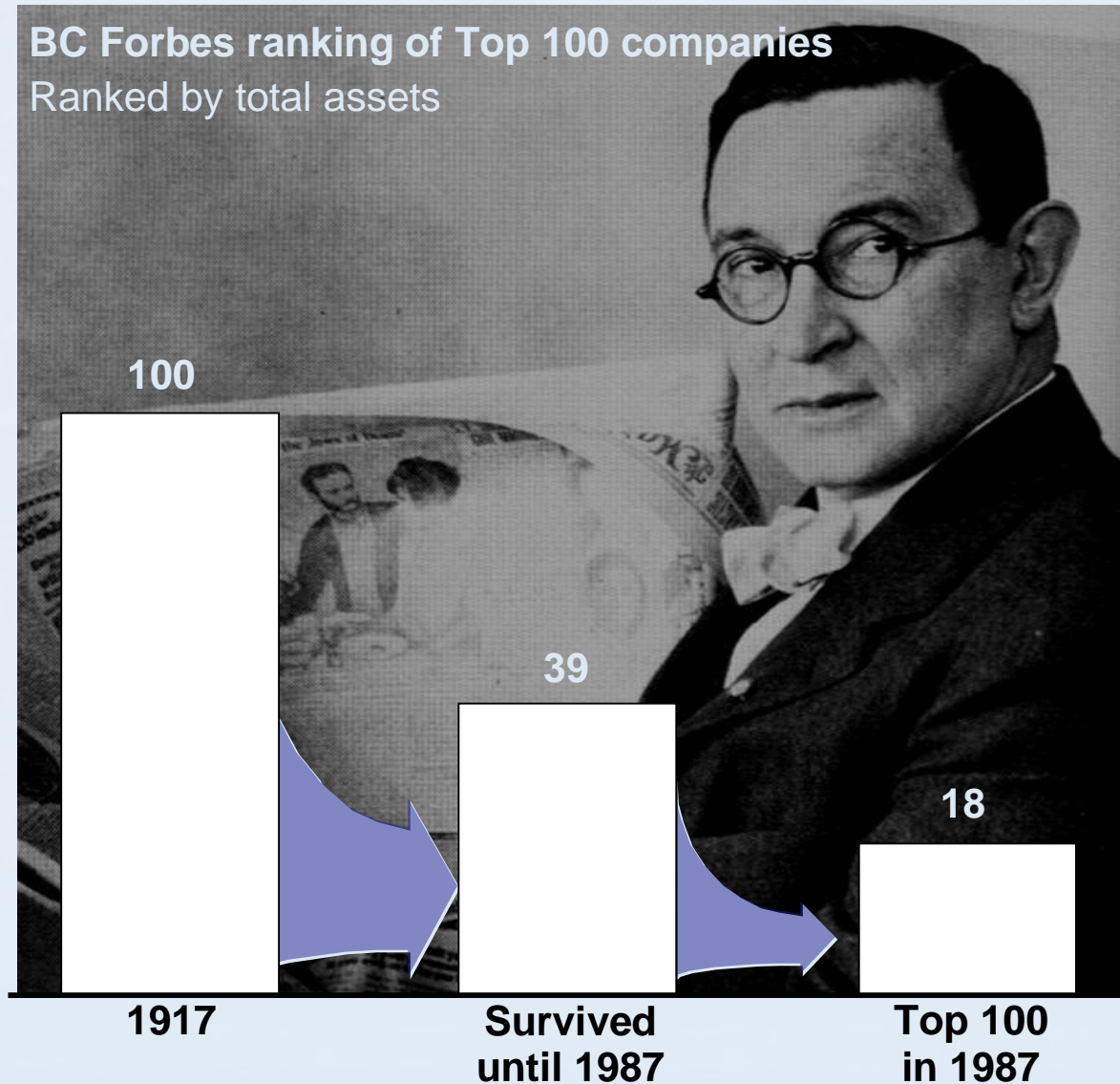
- n Garcia, R., & Calantone, R., 2002, A critical look at technological innovation typology and innovativeness terminology: a literature review, *Journal of Product Innovation Management* 19: 110-132.
- n Utterback, J. 1994. *Mastering the Dynamics of Innovation*. Harvard Business School Press.

Organizing for innovation: Promoting creativity and innovation in large corporations

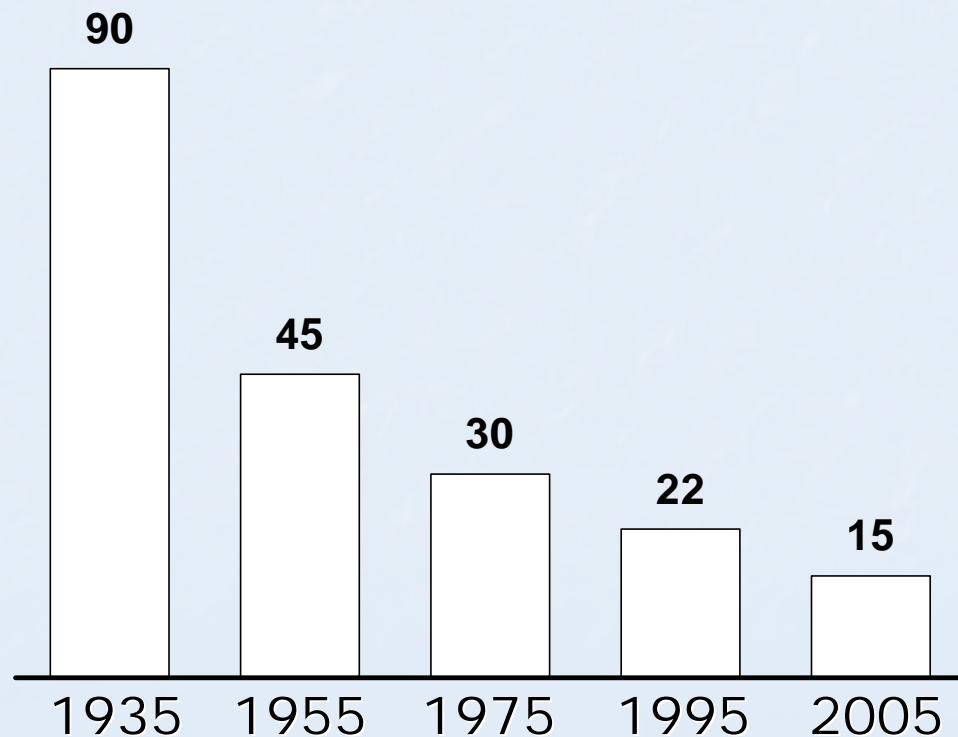


Survival of Established Corporations

BC Forbes ranking of Top 100 companies
Ranked by total assets



Implied lifetime in S&P 500 based on company exits

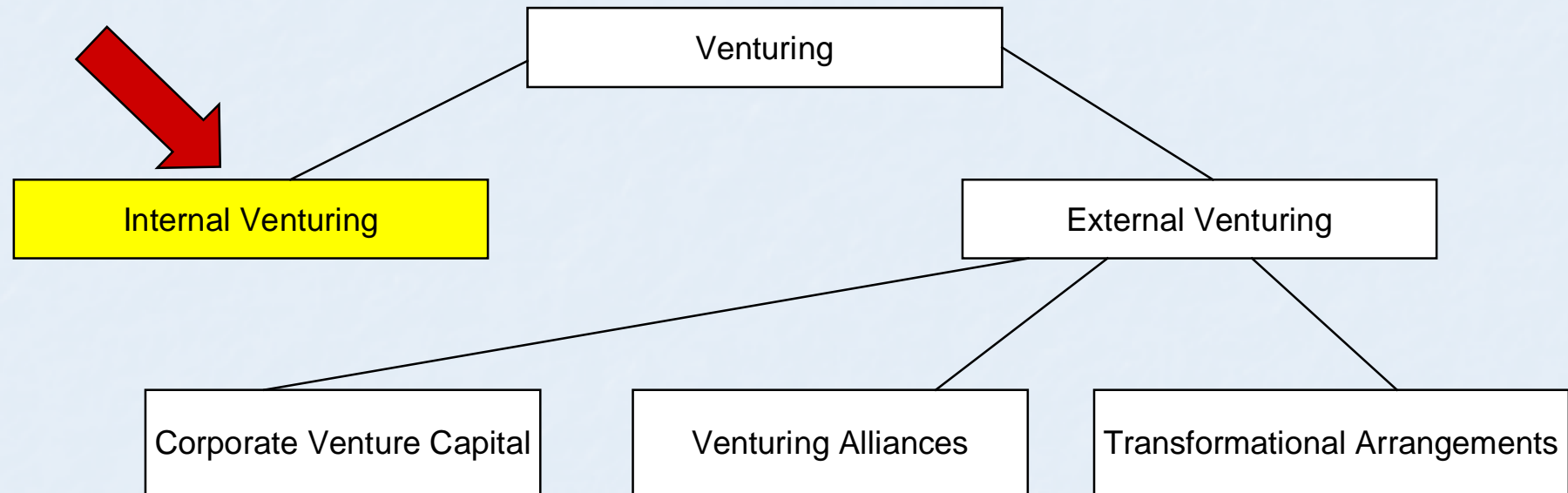


- Half of all companies in S&P 500 today are likely to be gone by 2020
- Pace of change is accelerating

Creativity and Corporate Venturing

- n Creativity: creation of novel ideas
- n Internal Corporate Venturing
 - n involves an activity that is new to the organization
 - n is initiated or conducted internally
 - n involves significantly higher risk of failure and greater uncertainty than the base business

Typology of corporate venturing (innovation)



Source: Keil (2002)

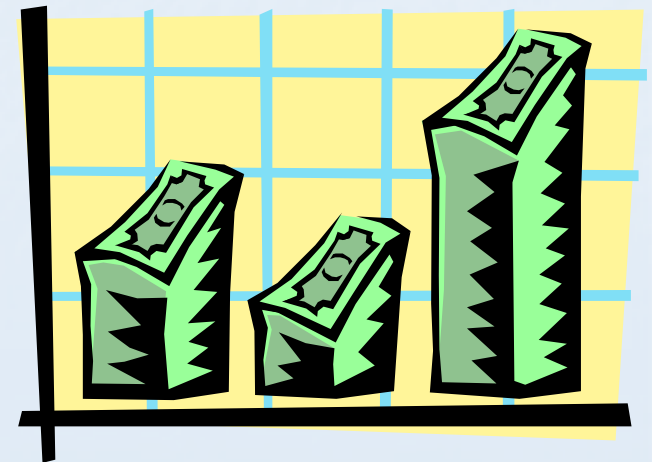
Question of Size in Innovation



- n Small firms are better innovators (Scherer 1965; Mansfield et alii 1971; Cooper 1964; Acs and Audretsch, 1988; Rothwell and Zegveld, 1982)
- n Small independent firms are able to bring products to the market faster than large corporations (Roberts & Berry, 1985)
- n Large firms are better innovators (Schumpeter, 1942; Damanpour, 1992)
- n There is no difference in the innovative capability of large and small firms (Arvanitis, 1997)
- n It all depends
 - n Small firms dominate the early stages of the innovation process while large firms are strong in process innovation (Freeman 1974; Williamson 1975; Roberts and Berry 1985)
 - n Competence enhancing innovations favor large firms whereas competence destroying innovations favor small firms (Henderson and Clark, 1990)

Internal Corporate Venturing: Track Record

- n 50% success rate
- n Some examples
 - n Xerox Palo Alto Research Center (PARC)
 - n Kodak
 - n 6/14 shut down
 - n 3/14 sold out
 - n 1/14 operates independently
 - n 4/14 merged into the company





Obstacles in Corporate Venturing

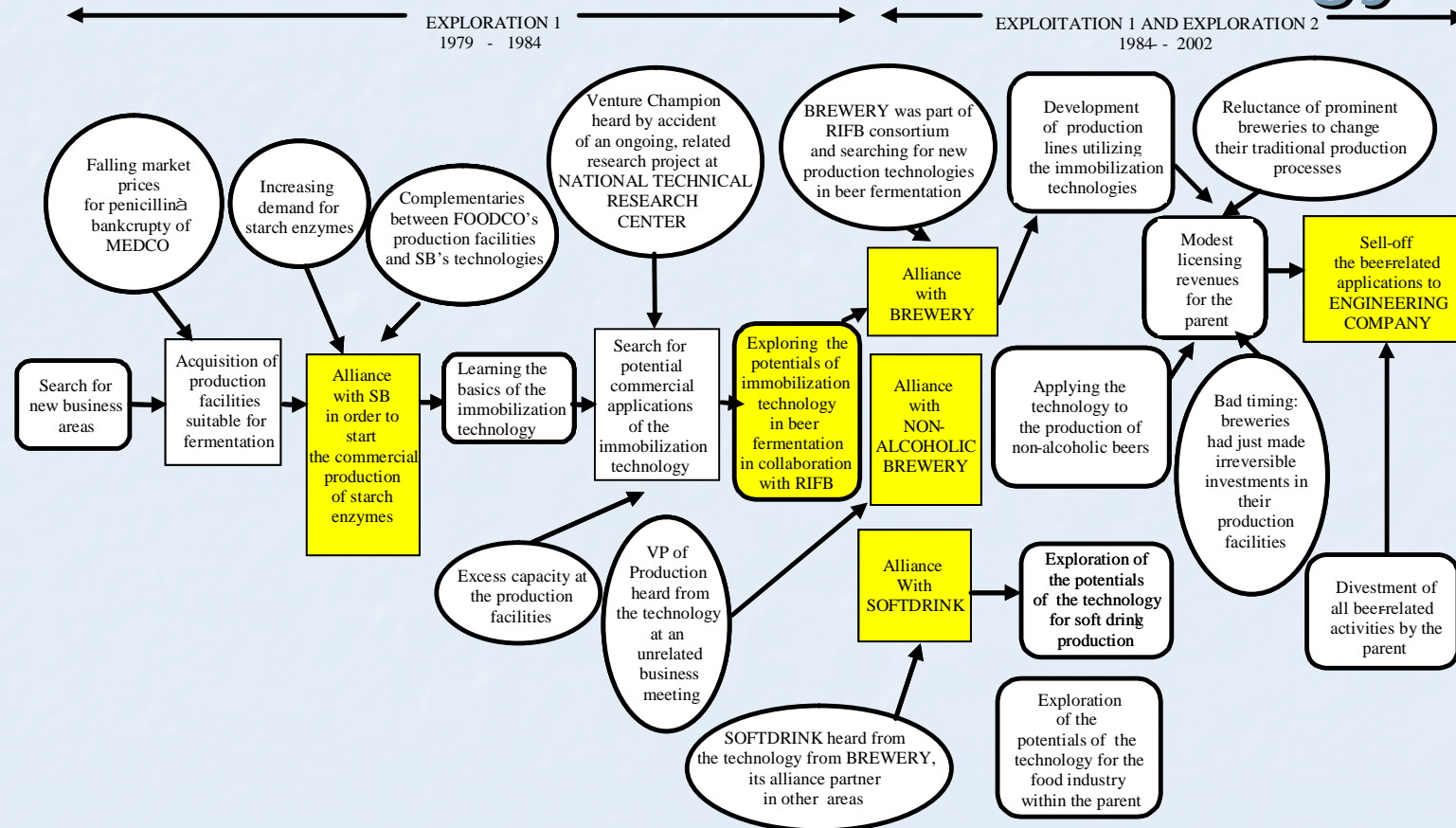
- n Clash of operating logics, mentalities (rationality vs. non-rationality (if not irrationality?))
- n Multiple, confusing objectives - vulnerability
- n Boom-bust cycle of investments in innovation
- n Hurdles too high, scope too narrow
- n Controls too tight, lack of a system of rewards and incentives à staffing difficulties
- n Undervaluing and underinvesting in the human side of innovation
- n Lack of legitimacy - Delaying access to time-critical resources
- n Biased resource allocation mechanisms
- n Resistance and Inertia
 - n Mental rigidities
 - n Economic rigidities
 - n Social rigidities
 - n Systemic rigidities



Clash of operational logics: To be efficient or innovative?

To be efficient	To be innovative
You stick to your knitting.	You think outside of the box.
You exploit what you know.	You explore what you don't know.
You meet current customer needs.	You anticipate future customer needs.
You plan.	You let things emerge.
You demand accountability.	You allow freedom and flexibility.
You impose process and structure.	You avoid process and encourage unstructured interaction.

History of a venture developing the immobilization technology





Would you tell me, please, which way I ought to go from here?" Said Alice to the Cheshire Cat.

- n "That depends a great deal on where you want to get to" said the Cat.
- n "I don't much care where ---" said Alice.
- n "Then it doesn't matter which way you go." Said the Cat.

Lessons from a study focusing on ventures developing new to the world technologies (1/2)

- n Intentionality, Rationality, and Strategy
 - n Our case corporations rarely had a well-defined goal for their technology-based ventures
 - n Those case corporations that did have a clear-cut goal, typically could not achieve this goal (or the goal lost its importance once achieved)
- n Advancement in technology development
 - n triggered by social contacts, coincidental encounters, chance events and luck

Serendipity and Intuition: Experiences of Corporate Venture Managers

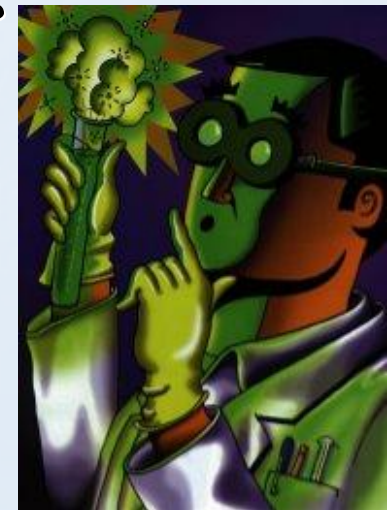
- n *“Many of these things just happened. It seems to me that there was no systematic management of technology in this organization, at least you couldn’t see it at the lower levels”.*
- n *“In search of potential applications for this technology, we engaged in a thorough and systematic analysis of existing literature and existing customer base. However, all the applications that actually worked and were implemented were found by chance. Companies often aim at modeling processes and using well-structured management methods. However, our experience shows that intuition can often lead to exactly the same results.”*

Lessons from a study focusing on ventures developing new to the world technologies (2/2)

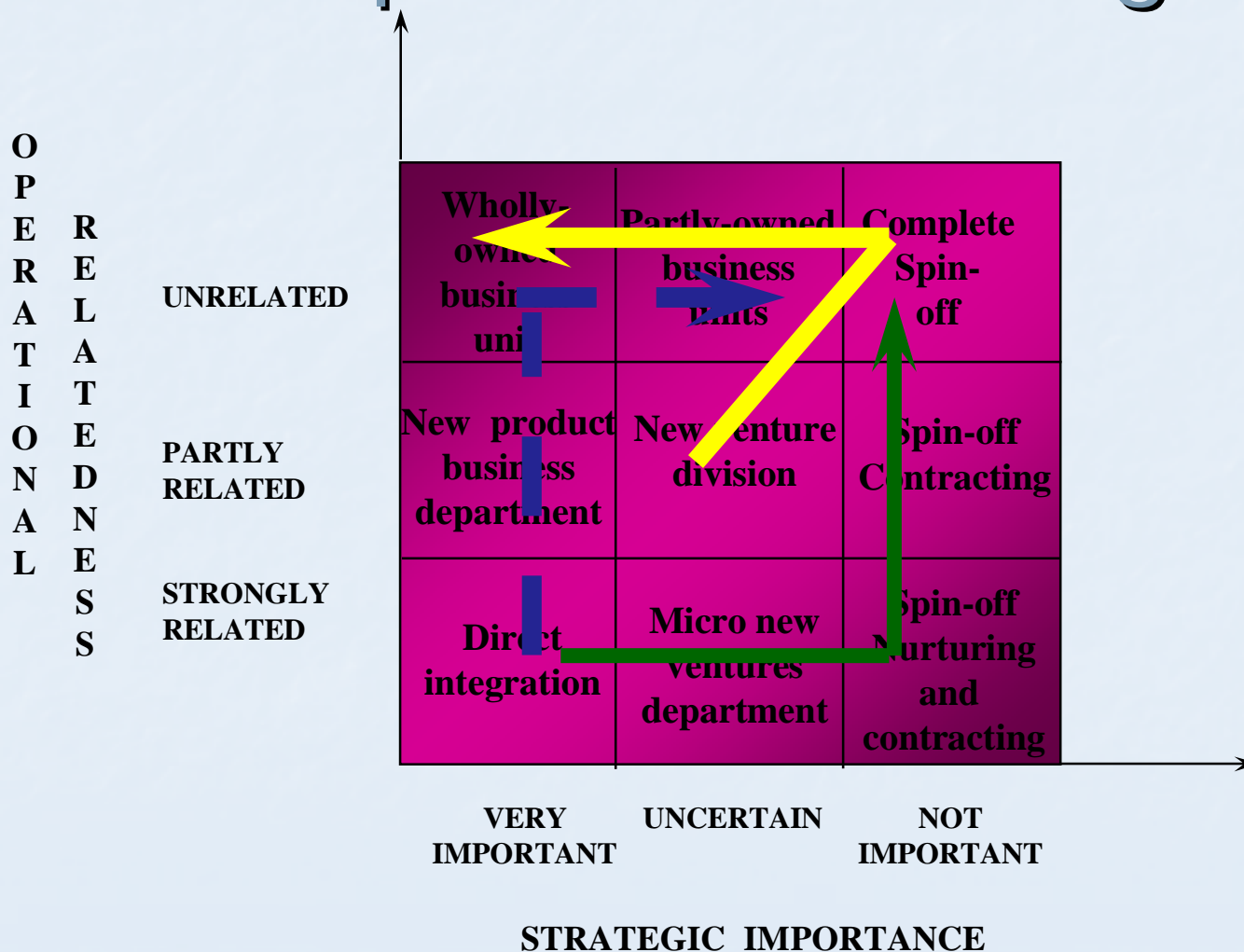
- n Benefits to parent firms
 - n Besides revenues accruing from divestments, parent firms seem to benefit very little from technology development
 - n Paradoxically, firms other than the parent were better able to unleash the potential of these ventures
- n Benefits to society
 - n all technology-based ventures became an important basis for the creation of numerous product applications and new firms

Obstacles in Corporate Venturing

- n Clash of operating logics, mentalities (rationality vs. non-rationality (if not irrationality?))
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Design alternatives for corporate venturing

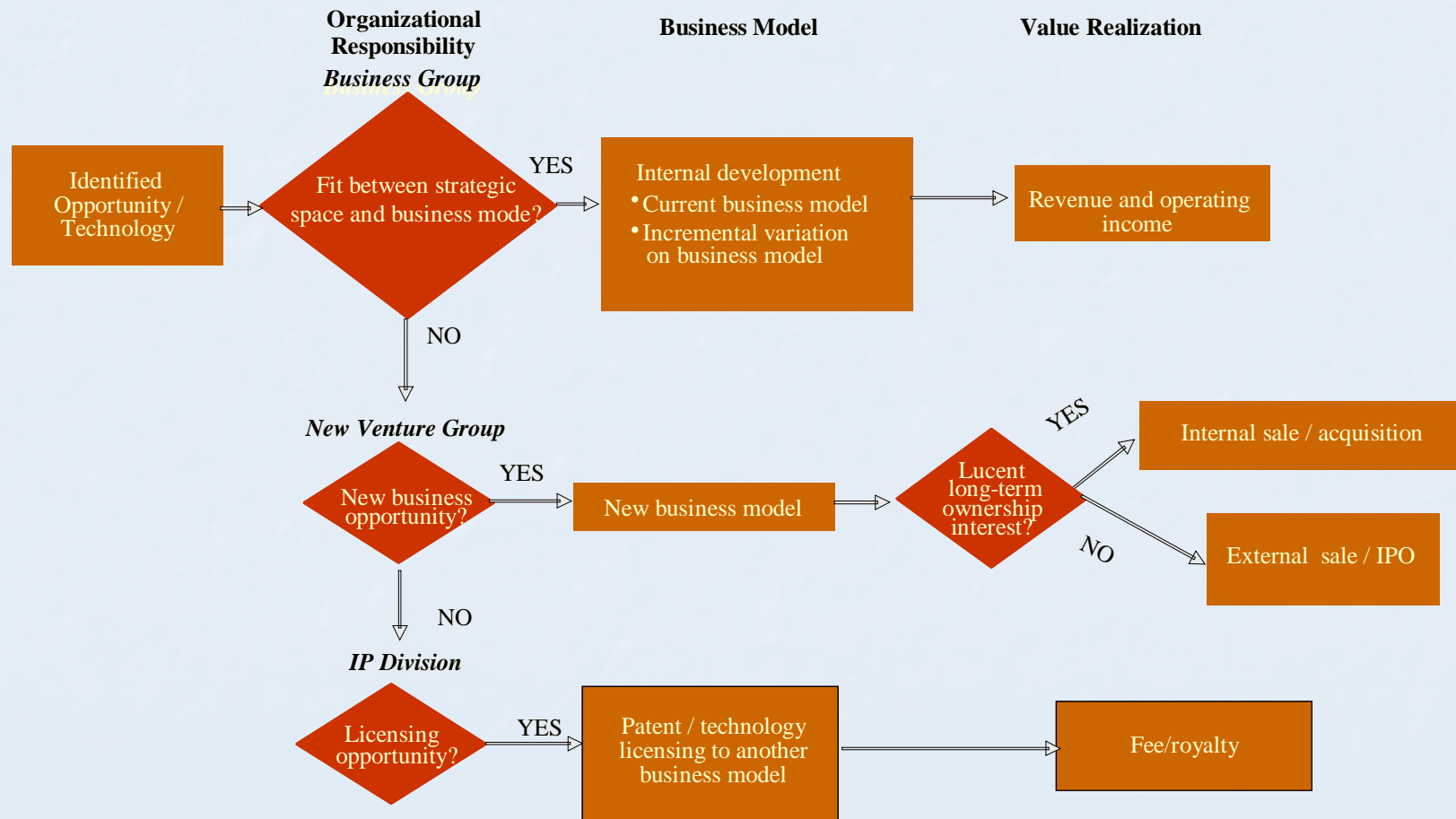


Walking Forest Machine: An Example of a Spin-off and a Spin-In



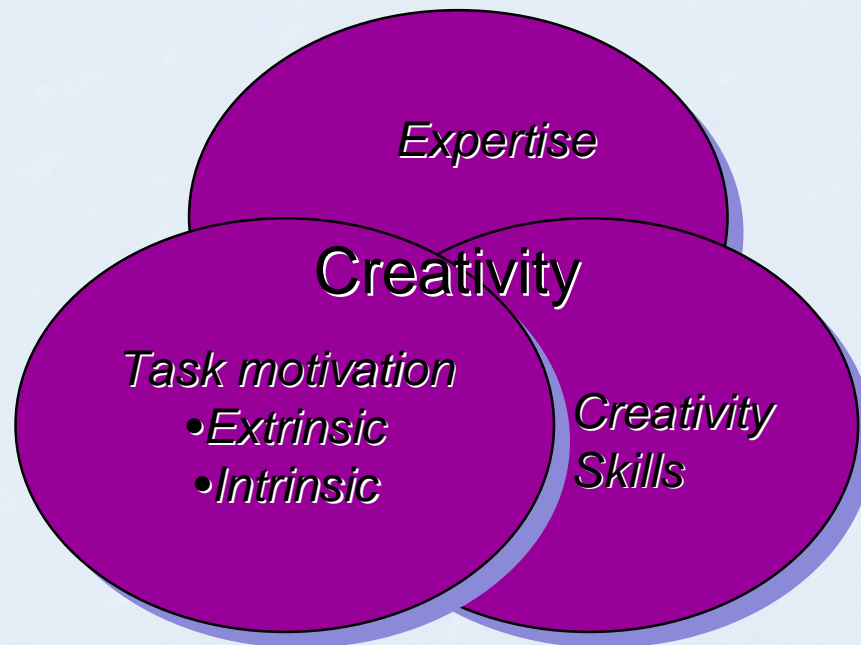
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Lucent's approach to the management of innovative ideas



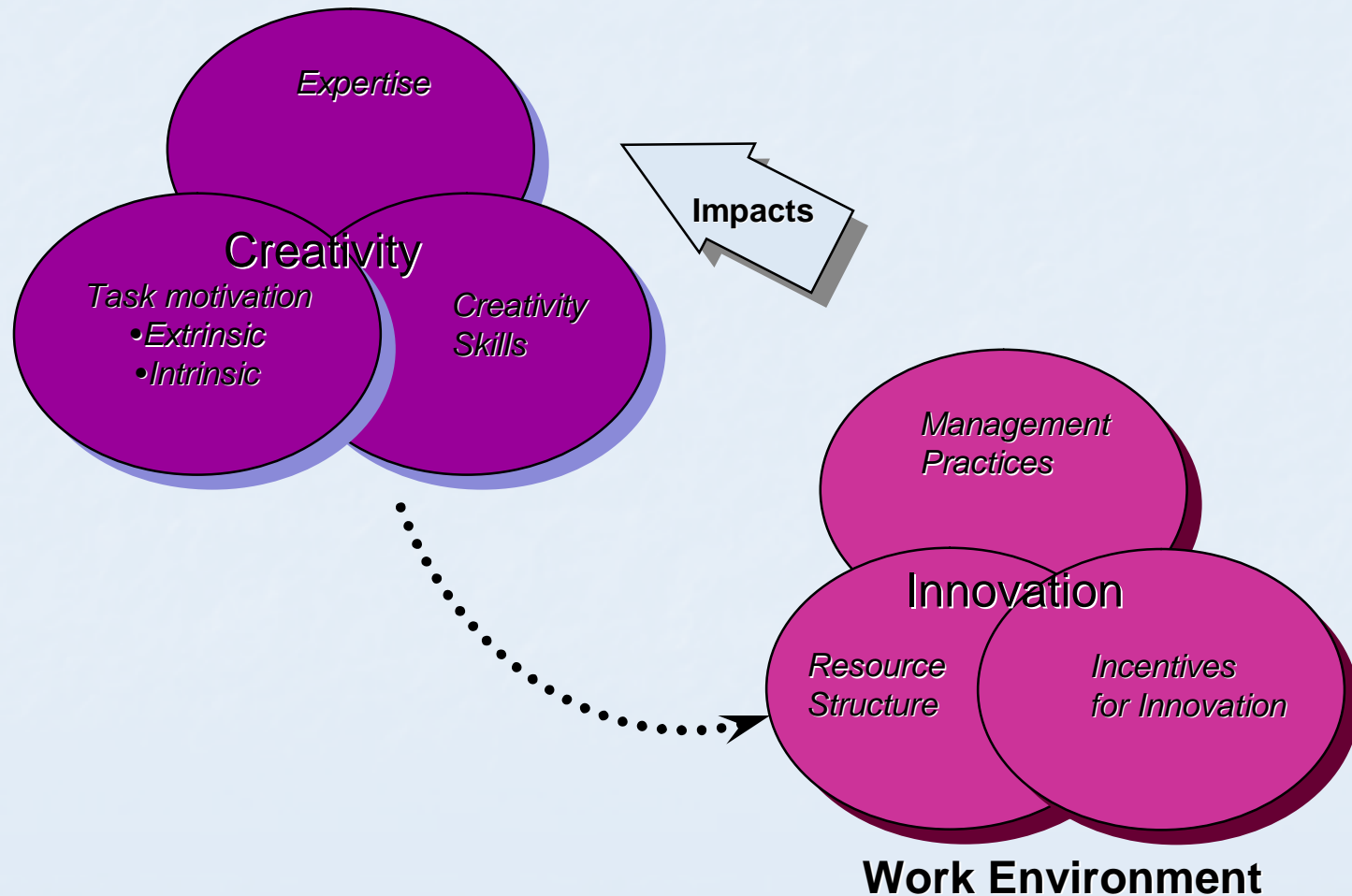
The components of creativity

Individual / Team Creativity



Relationship between individual and team creativity and innovation

Individual / Team Creativity



Think of yourself as a corporate manager who wants to promote the creativity of his organization...

- n How would you increase organizational motivation to innovate?
- n What kind of management practices would you use?
- n What kind of resources should you have available to boost innovativeness and creativity ?

Factors promoting innovation

Work Environment

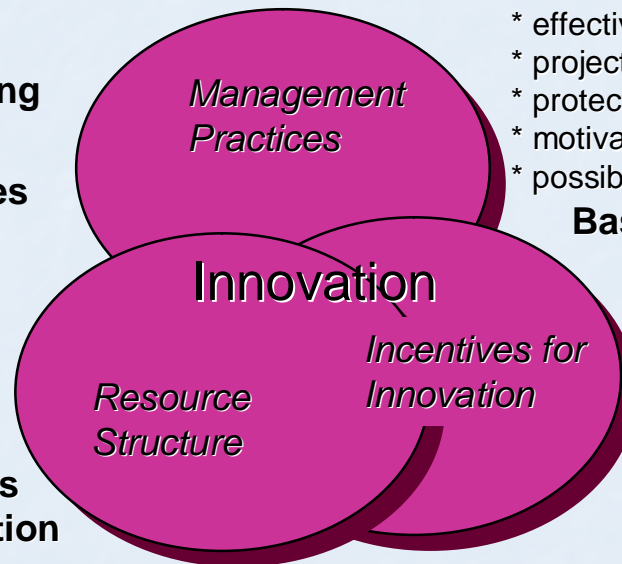
A sense of positive challenge

**"Incremental" Decisions
and Commitment**

Freedom

**Explicit Reporting
Relationships
Clear Hierarchies**

**Sufficient time
Expertise
Funds
Material resources
Relevant information
Training
Versatility of skills
Access to external networks**



Good project supervision

- * clearly set objectives
- * feedback
- * effective teams
- * project champion
- * protection from internal politics
- * motivating tasks
- * possibility for the part time pursuit of own interests

Basic orientation toward innovation

- * value placed on creativity
- * a sense of pride of one's achievements
- * orientation toward risk-taking
- * dynamism versus a sense of security
- * a sense of fun in the workplace

Support for Innovation

- * mechanisms for developing ideas
- * open and active communication of ideas
- * rewards and recognition
- * fair evaluation
- * co-location

Some Counter-Culture Tactics for Nurturing Innovation

- n Hire slow learners of the organizational code
- n Hire people that make you uncomfortable, even those you dislike
- n Hire people you don't probably need
- n Encourage people to ignore and defy superiors and peers
- n Reward success and failure. Punish inaction.
- n Forget the past, especially your company's successes

Source: Sutton, 2000. *Weird Ideas That Work: 11 ½ Practices for Promoting, Managing and Sustaining Innovation*

Managing the Unmanageable

Finding the Delicate Balance

- n Structure vs. chaos
- n Individual vs. group
- n Rewarding vs. bribing
- n Feedback vs. criticism
- n Homogeneity vs. heterogeneity
- n Short term vs. long term
- n Risk vs. security

Suggested Readings on Promoting Innovativeness and Creativity

- n Tidd, J. & Saurins, S. 1999. Learn or leverage: Strategic diversification and Organizational learning through corporate ventures, *Creativity and Innovation Management*, 8(2): 122-129.
- n Amabile, T.M. 1997. Motivating Creativity in Organizations. *California Management Review*, 40(1): 39-58.
- n Andriopoulos, C. 2001. Determinants of Organizational Creativity: A Literature Review. *Management Decision*, 39(10): 834-840.
- n Martins, E.C., & Terblanche, F. 2003. Building Organisational Culture that Stimulates Creativity and Innovation. *European Journal of Innovation Management*, 6(1): 64-74.

THANK YOU FOR YOUR
ATTENTION!

Any Questions?