Software Product Development and Business in Europe

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Dr. Jyrki Kontio, Background

- Professor of Software Product Business at Helsinki University of Technology since 2002
  - Actively involved in the software business and empirical research communities
  - Research areas: software business and strategies, risk management, requirements engineering, COTS
- Industry experience:
  - Nokia, 1986 – 2002, research and management positions in software engineering, process and quality management
  - Board memberships:
    - Deputy Chairman of the Board of Directors, Fountain Park Oy
    - Member of the Advisory Board, Distocraft Oy
  - Founder and Principal Partner at R & D-Ware Oy
  - Conducted several technical due diligence reviews at software companies for Nordic Venture Partners, 3i and Trident

Characteristics of Software

- Software is unique
  - ➔Each project is different and contains new business risks
- Software is abstract and complex
  - ➔It is difficult to plan and control development
- Software is young
  - ➔We lack experience
- Software technology evolves
  - ➔Existing experience becomes obsolete quickly
  - ➔Technology discontinuities create new business opportunities
- User expectations increase
  - ➔Continuous push for more and better features
- Competition is international
  - ➔You are competing with the world's best companies
- Manufacturing costs are close to zero
  - ➔Great opportunities for business if you can replicate your idea

What Makes Software Unique from Business Perspective

- Manufacturing costs are close to zero
- Distribution costs are close to zero, marginal distribution cost are zero
- Differentiation can be achieved at a low cost
  - Requires early planning
- Network effects are common
  - People interact with software ("everybody uses MS-Word")
- Lock-in effect can be powerful
  - integration of systems
  - learning curve investment
- Value-based pricing is possible – if you can differentiate your offering
  - There is no need to resort to cost-based pricing

Software Product Industry Survey 2005

Finnish software product business in 2004

Aki Lassila, professor Markku Maula, professor Jyrki Kontio

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Centre of Expertise for Software Product Business

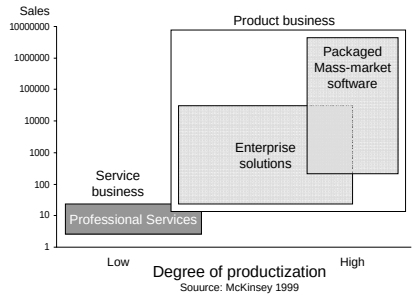
Current state of the software product industry in Finland

- The software product revenue grew 21% reaching 1.19 billion € in 2004
  - International sales increased also by 7% amounting to 405 million € in 2004
- Profitability increased from the previous year's 0.1% to 2.2% in 2004
- Employment increased by 3.3% from previous year to 12 400 software professionals

- Less than half of the companies (46%) have international operations and most of them receive only a small share of their revenues from abroad
- Vast majority of the companies (73%) belong to their founders; VC and foreign ownership is relatively low

The focus of the survey: software product business

- **Software product** is an application that is productized and can be customized to suit the customers' needs by configuration
- **Software product business** is business concerning software products where the customer tailored parts are not an essential part of the whole software
- **Own software product business** is software product business, which is based on company's own, in-house developed and maintained software products
- In Finland the software product industry generates approximately 30 % of the whole software industry's revenues



Souurce: McKinsey 1999

Decisions concerning SW product business are made:

SW development is done:	in Finland	Abroad
in Finland	Included	Included
Abroad	Included	Not included

Background and implementation of the research

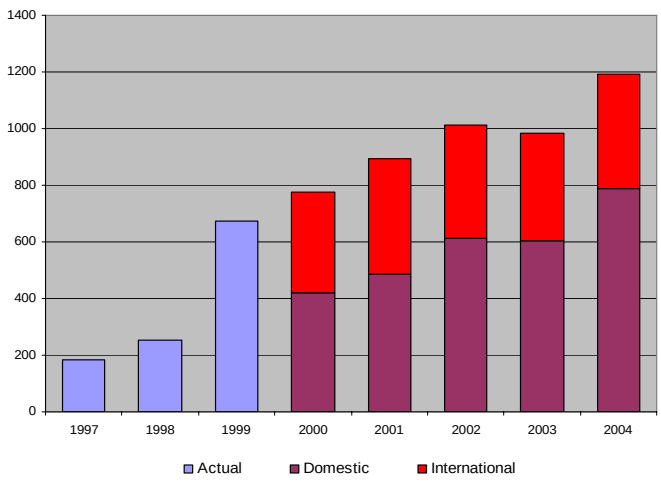
- Conducted since 1997
- Commissioned by the Centre of Expertise Software Product Business in co-ordination with Ministry of Trade and Industry and National Technology Agency
- Conducted during May-June 2005 using a web-questionnaire
- Invitations to participate in the survey were sent to 2 298 companies
  - Sources: company classification of Itella Finland and contact lists of the Centre of Expertise for Software Product Business
  - Software product companies can be found under several industry classification codes (e.g. software design, databases, telecommunication etc.)
  - We received 285 (last year 275) responses, of which 220 (last year 196) did software product business in 2004
- According to the estimates of different industry and research institutions there were approximately 1 100 software product companies in Finland at the end of 2004 (1 100 in 2003)
- We received responses from 220 software product companies i.e. from ca. 20% of the companies in the industry
  - Responding companies generated over 65% of the whole industry's revenues and over 87% of the international revenues

Basic information of the companies who responded to the survey

- Location
  - 86% of the companies are located in the proximity of technology centres and universities
  - 52% of the companies are located in Uusimaa, 70% of the larger companies (SW product business turnover >3 million €)
- Profitability has improved
  - 27% of the companies had profitability over 15% of turnover (24% in 2003)
  - 14% of the responding companies were unprofitable (20% in 2003, 25% in 2002)
- Age of the companies
  - Average age is 12 years (median 11 years) and average age of the software product business is 10 years (median 8 years)
  - The amount of start-up companies has decreased from 2000 to 2003 and then the amount has stabilized
- Size of the companies
  - 31% of the companies generated less than 200 000 € on SW product business in 2004 (34% in 2003, 38% in 2002)
  - Average share of SW product business was 58% of turnover (55% in 2003)
  - Average revenue per employee was 111 000 € (113 k€ in 2003, 107 k€ in 2002)
  - 31% of the companies employed 5 or less people (27% in 2003, 34% in 2002)
- Financing
  - 36% of firms intended to seek external financing in 2005-2006 (41% in 2003, 30% in 2002, 43% in 2001)

Development of the Finnish software product business turnover [1)]

- Software product business revenue increased by 21.0% amounting to 1.19 billion € in 2004
- International business grew by 7.1% amounting to 405 M €
- Growth was evident in small, medium-sized and large companies



[1)] Extrapolated to the industry level

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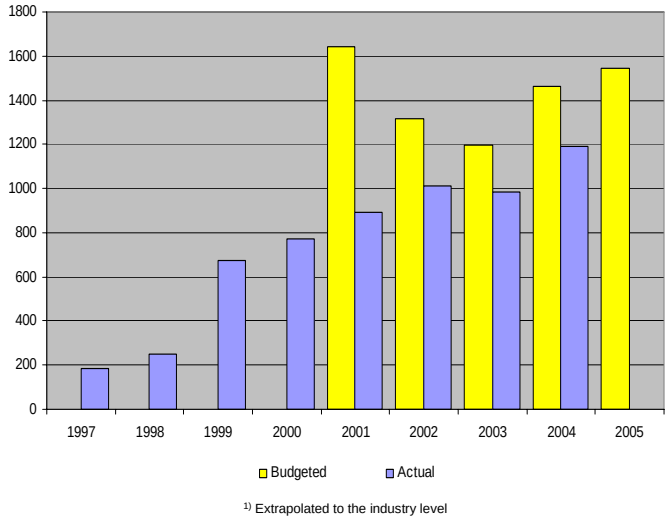
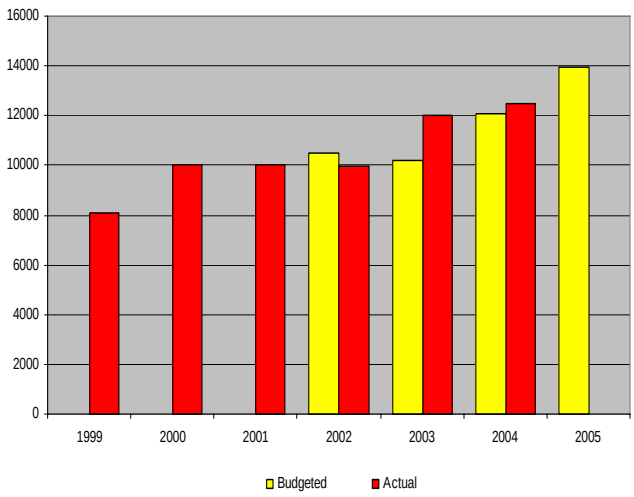


[1)] Extrapolated to the industry level

Software product business personnel [1)]

- Software product business personnel increased 3.3% (20% in 2003)
  - Employs approximately 12 400 software professionals
  - Especially smaller companies (tunrnover from SW product business <3 M €) recruited more personnel
  - Large companies' (turnover >3 M €) number of personnel decresed by 3%
- Companies are planning to recruit more personnel in 2005



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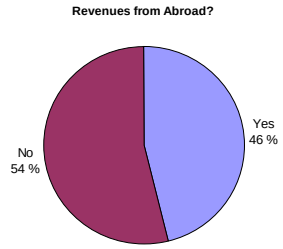
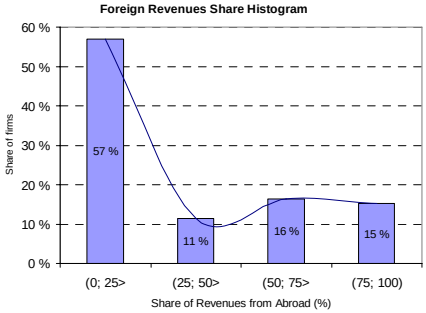
International operations



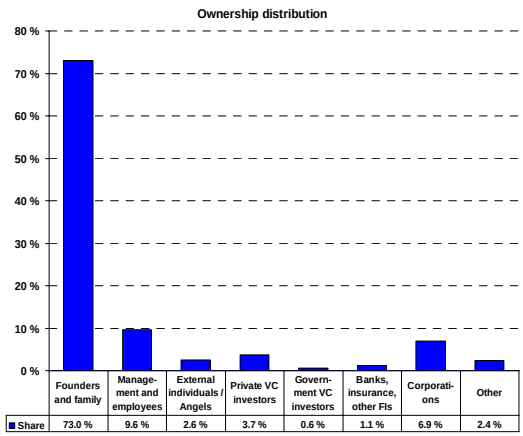


- 46% of companies reported revenues from abroad (50% 2003, 46% 2002, 37% 2001)
- Most of the companies are in the beginning the internationalization process, some are very internationalized
- Average share of revenues from abroad 31% (31% 2003, 39% 2002, 38% 2001)
- Geographic coverage 9.4 countries on average (6.3 in 2003, 8.1 in 2002, 4.6 in 2001)
- The most common exporting countries Sweden, USA and Germany (same as in 2003 and 2002)
- The most common international sale channels were own direct sales and reseller/agent (same as in 2003 and 2002)

Conclusion: The share of internationalized companies has stabilized and is ca. half of the companies, the main challenges still lay in increasing the internationalization rate

Ownership and financing

- 73% of the companies are owned by founders and their family members (70% in 2003)
- Share of VC ownership was 3.7% (7% 2003, 3% 2002)
- Share of foreign ownership was 4.2%
- 36% of firms intended to seek external financing in 2004-2005 (41% in 2003, 30% in 2002, 43% in 2001)
- Significant number of companies (31%) seeking external financing had to change business plans due to problems with availability of financing (25% in 2003, 24% in 2002)
- Young firms still find availability of risk finance as a significant barrier for the emergence of new software product companies (64% of <2 year old firms, 57% in 2003, 71% in 2002)

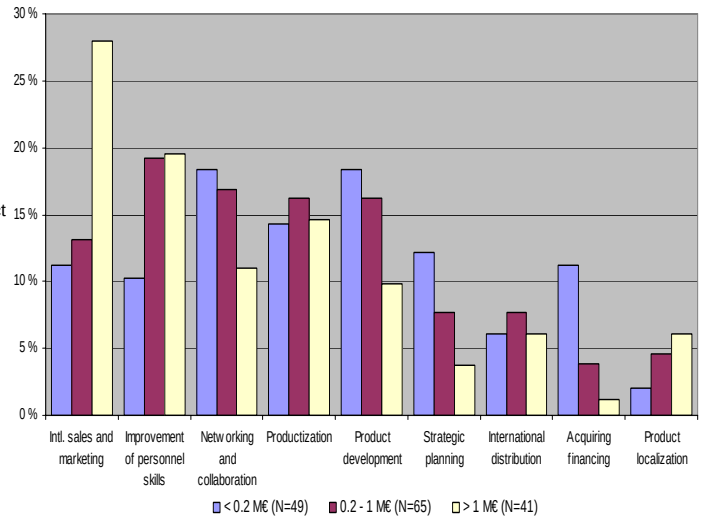


	Founders and family	Manage-ment and employees	External individuals / Angels	Private VC investors	Govern-ment VC investors	Banks, insurance, other FIs	Corporati-ons	Other
Share	73.0 %	9.6 %	2.6 %	3.7 %	0.6 %	1.1 %	6.9 %	2.4 %

Conclusion: no significant changes in growth orientation, use of external finance, and availability of financing

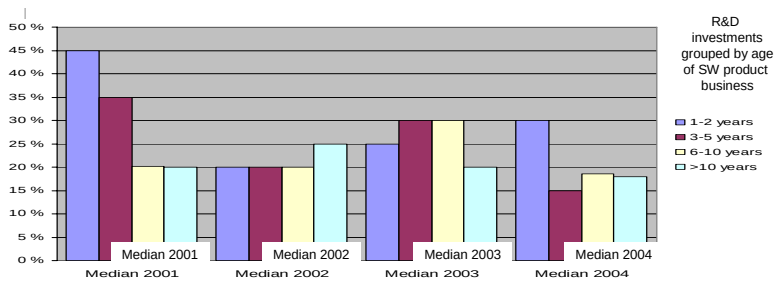
Improvement areas

- The most important improvement areas were product development and networking
  - Focus of small companies was in networking, product development and productization
  - Focus of large companies was in international sales and marketing
- Improvement of personnel skill and knowledge has risen amongst the large companies



Product development

- R&D investments of young firms increased, mature companies' R&D investments fell
  - Companies with age of software product business 1-2 years invested in R&D on average 30% of turnover (25% in 2003)
  - Companies with age of software product business 3-10 years invested in R&D on average 15% of turnover (30% in 2003)
- The most important focus areas of the R&D were development of the degree of productization and development of value-added services
  - The most significant focus area of smaller companies was the degree of productization
  - The significant focus area of larger companies was the development of value-added servicess
- The use of foreign subcontractors is still low
  - 7% of responding companies subcontracted significant amounts of R&D from abroad
- Open source components are used by the companies
  - 15% of the companies use significant number of open source components in their own software products



Summary

- The change for the better has come
  - Revenues of the software product business grew significantly
  - The amount of personnel increased and the growth prospects for this year are good
- The profitability of the software product business improved
- Increasing the internationalization rate is still a significant challenge
- There are big differences in profitability amongst the customer segment clusters

Multidisciplinary Skills Required

	Required software-specific competencies and skills in a software company
Strategic Management	• The platform game • Software-specific strategy options
Organization and management	• "Managing" the software culture • Individual productivity differences • Measurement problem
Entrepreneurship and International Business	• Creating and maintaining the business focus • Managing growth and scalability • Transition from a domestic company to an international player
Technology Management	• IPR management • Technology management • R&D partnership management
Software Engineering	• Business-driven capability development • Subcontracting management
Marketing and Logistics	• Partnership management • Definition and communication of the value proposition

The Main Strategic Decision

- Are you a **software product company** or a **software service company**?
- Software **product** companies
  - have the *potential* for higher profitability, but
  - require higher investments and
  - are more prone to business fluctuations
- Software **service** companies
  - have more stable and continuous business and
  - easier growth path, but
  - higher marginal costs and
  - slower growth potential
- Good companies
  - Have one of them as the main strategy but
  - Have and plan for both elements

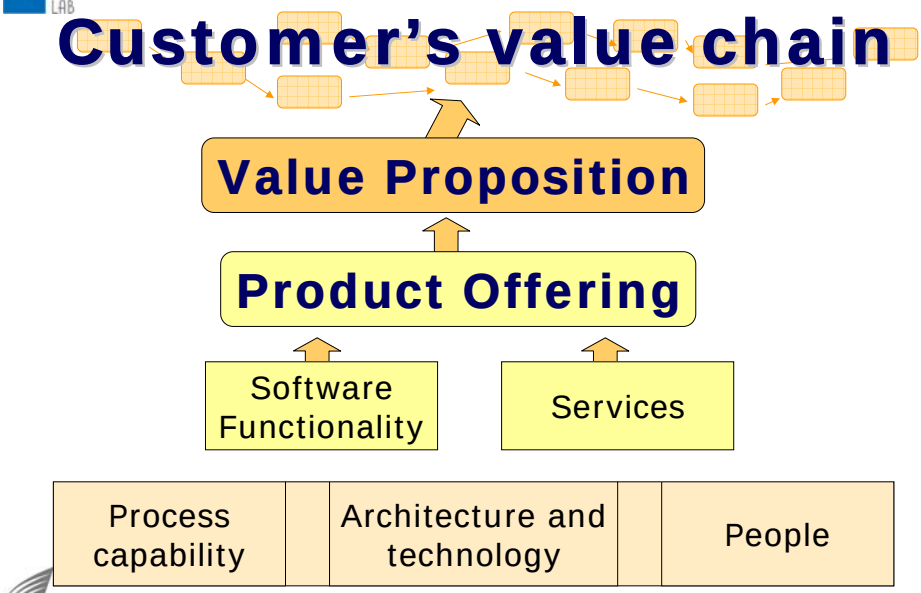
Source: Cusumano, 2004

Profitability by Business Models

Company type	Average revenue (M Euro)	Average revenue (K Euros)/ employee	Median revenue (KEuros)	Median profit (KEuros)
Product licensor (n=35)	3.8	90	300	0
Product integrator (n=41)	4.0	90	680	20
Solution consultant (n=23)	2.3	70	500	0
Product tailor (n=24)	1.2	70	250	1

Hietala et al., 2004

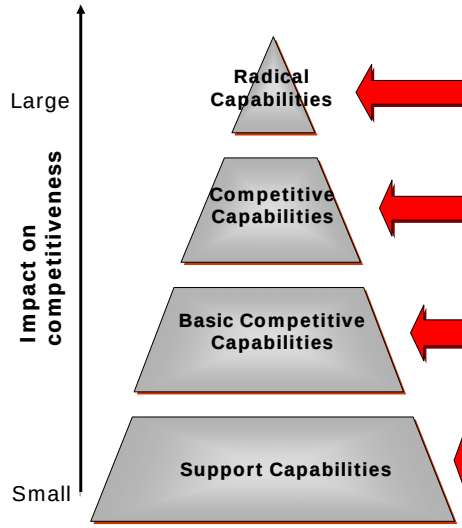
Customer's value chain



Positioning in the Customer Value Chain

- Aim for the highest value points on the customer value chain
- Create and communicate a strong value proposition
  - Express, in customer terms, the benefits of your offering
  - Create a compelling reason to buy (now)
- Protect your position from competition

Capabilities and Competitiveness



Capabilities that create a radical, novel and new competitive advantage. Usually through points of discontinuity.

Capabilities that create a **Competitive Advantage (CA)** for a company

Capabilities that are common to companies in the industry and satisfy the **Basic Competitive Requirements (BCRs)** in the industry. They are necessary but not sufficient prerequisites for being in the business

Capabilities that have an indirect effect on competitiveness.

Source: M. Heikkonen, 2003

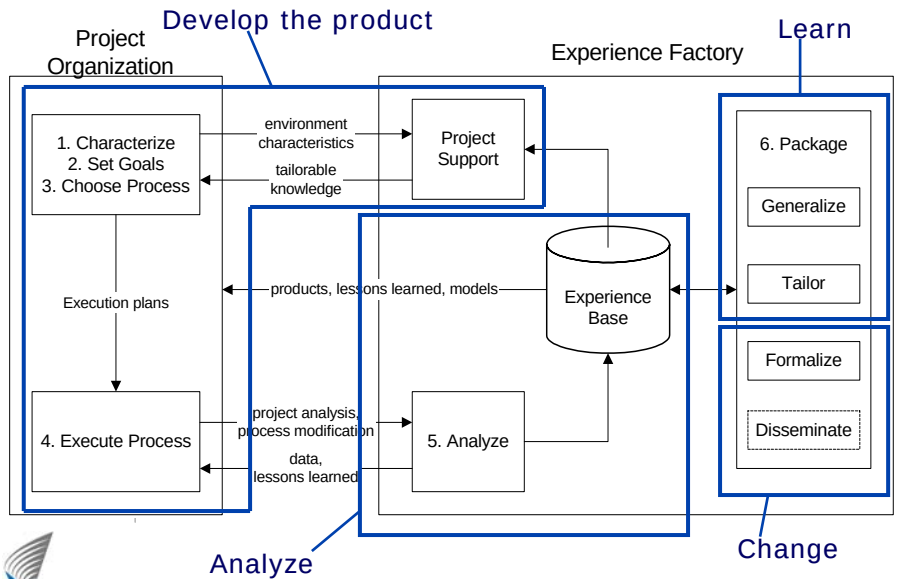
Major Improvement Paradigms

- Reference frameworks and standards
  - CMMI, SPICE (ISO 15504)
  - ISO 9001 / 9000-3
  - Quality awards
- Learning from experience
  - Quality Improvement Paradigm
- Benchmarking
  - Comparing practices with (other) leading companies

Experience Factory and Quality Improvement Paradigm

- Published in 1985 by Basili
- Evolved since mid 1970's at NASA
- Learning through systematic experience capture
- All knowledge is local, general models need to be localized
- Experience Factory Principles
  - Separation of responsibilities between product development and improvement;
  - Systematic capture and accumulation of knowledge;
  - Continuous learning from experience through measurement, data collection, analysis and synthesis; and
  - Systematic reuse of knowledge through packaging and dissemination.

Experience Factory



Experience Factory and Maturity Models

Experience Factory

- All knowledge is local and needs to adapted
- Primarily source of new knowledge: systematic learning through empirical studies
- Organization-specific objectives determine what improvements are most effective

Maturity Models

- There are some best practices that are applicable to all organizations
- Best practices are well documented and can be obtained and transferred to SW organizations
- There is a pre-defined order in which improvements need to be made

➔ Both approaches are needed, Maturity Models for speed and impact, EF for sustainable competitive advantage

Experience-based Learning vs. Maturity Models

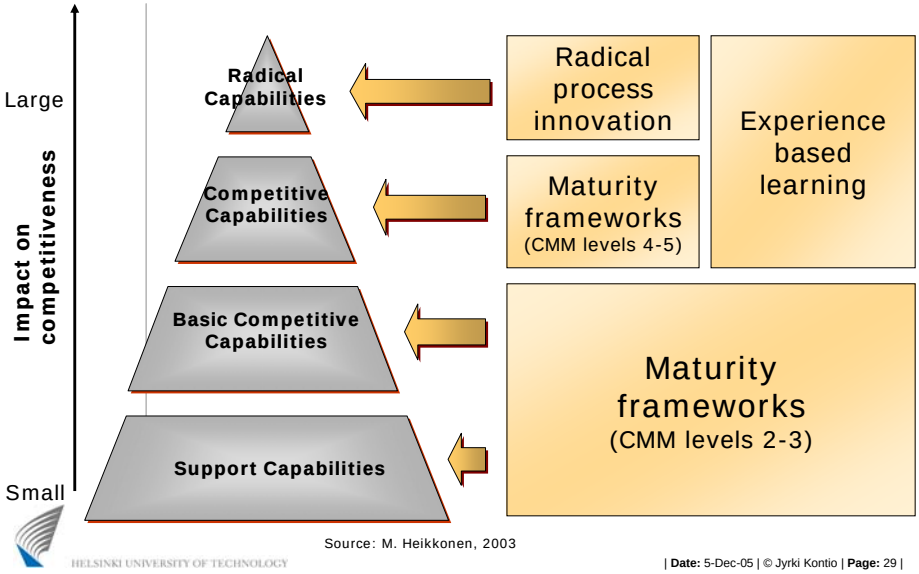
Experience-based learning

Maturity models

- Potential for more sustainable competitive advantage
- Longer impact delays
- Less standard frameworks and models
- Harder to get started, harder to operate

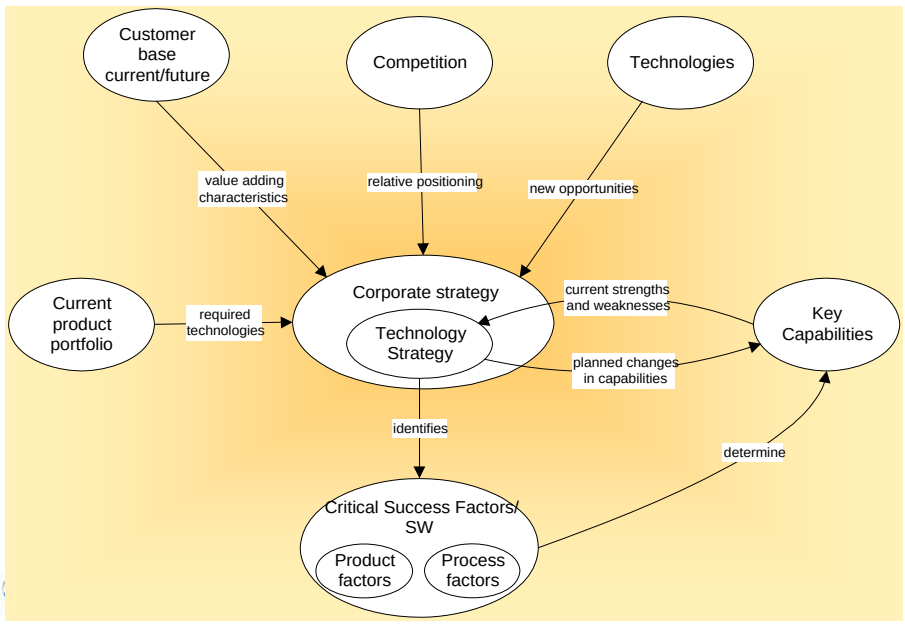
- Fast results
- Easier planning
- Hard to obtain unique competitive advantage

Capabilities and Competitiveness



Source: M. Heikkonen, 2003

Corporate, Technology and Software Strategy



Strategy Leverage Techniques

- The unique characteristics of software can be leveraged in strategic planning and business models
- The most critical leverage techniques:
  - Lock-in effects
  - Customers' positive feedback network effects
  - Differentiation cost vs. opportunity
  - Entry barrier creation
  - Other vertical market business opportunities
  - Partnership opportunities

The New Economy Paradox

The myth:

- "With the unlimited potential and global access of the Internet, it is easier even small even for small companies to become successful overnight"

The reality:

- The Internet has created opportunities for fast growth and international access
- All new ideas are copied quickly
- Capturing the market quickly requires the ability scale up quickly in terms of
  - Ability to serve thousands of customers
  - Product quality
  - …
- Scale-up capability has to be built in in advance

➔The threshold for sustainable success is even higher

Perspectives on the Software Business

- JAPAN: "Software is production"
  - *software factories, zero-defect quality*
- EUROPE: "Software is science"
  - *formal methods, object-oriented design*
  - *Technology-driven*
- The U.S.: "Software is business"
  - *MS-DOS Windows, Netscape Navigator*
  - *Market-driven*

Source: Cusumano, 2004

European Companies

Challenges

- Smaller market
- More fragmented market
- Lack of strong business vision and experience
- Less effective venture capital market

Opportunities

- Strong technology base
- Research and cooperation infrastructure
- More niche markets (and time) to establish a beachhead position
- International and experienced workforce

Must-read Books for Software Business Champions

1. Cusumano, M.A., The Business of Software: What Every Manager, Programmer, and Entrepreneur Must Know to Thrive and Survive in Good Times and Bad, Free Press, 2004.
2. Gawer, A., Cusumano, M.A., Platform Leadership: How Intel, Microsoft, and Cisco Drive Industry Innovation, HBS Press, 2002.
3. Messerschmitt, D.G., Szyperski, C., Software Ecosystem: Understanding an Indispensable Technology and Industry, MIT Press, 2003.
4. Shapiro, C., Varian, H.R., Information Rules: A Strategic Guide to the Network Economy, Harvard Business School Press, 1998.
5. Moore, G.A., Crossing the Chasm, HarperBusiness, 1995.
   (or later books by the same author)

Additional References

Hamel, G., Leading the Revolution, Harvard Business School Press, 2000.

Hietala, J., Jokinen, J.-P., Bauer, L., et al, Finnish Software Product Business: Results from the National Software Industry Survey 2003. (Tekes, 2004), http://www.soberit.hut.fi/oskari/

Nambisan, S., Information Systems as a Reference Discipline for New Product Development, MIS Quarterly, 27(1):1-18, 2003.