



Technology and Innovation Management

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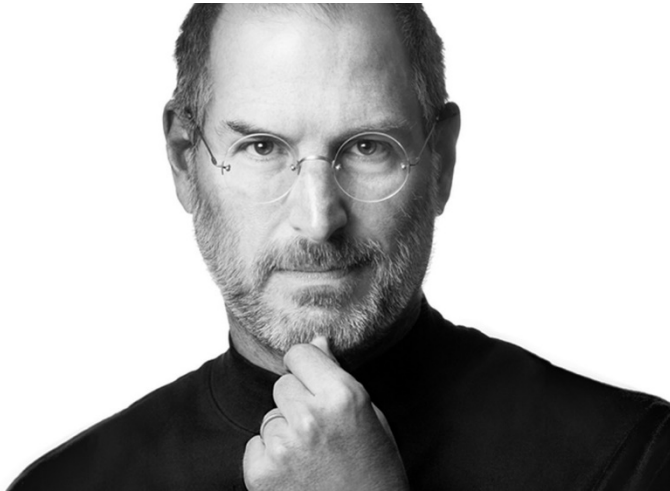


Conclusions to TIM

Technology and Innovation Management

Technology and innovation management is the field of scientific enquiry focused on the analysis of how a socio-technical system of interconnected elements changes over time, whether by emergence or through design, and how such changes can be leveraged to generate value in a sustainable way.

What are we going to talk about?



VS.

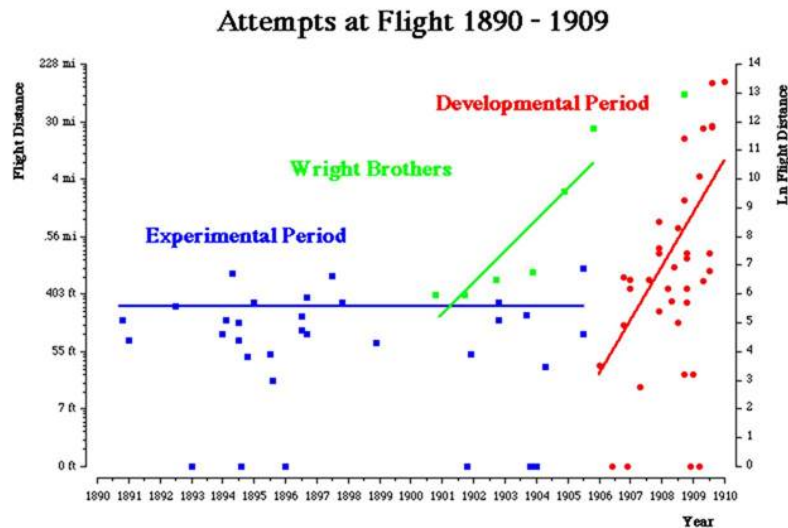


The Woz: Steve Jobs' lack of technical skills drove Apple's success

Steve Wozniak in 2016
(<https://www.cio.com.au/article/598173/woz-steve-jobs-lack-technical-skills-drove-apple-success/>)

**Innovation is a process that builds upon
technical inventions
(it builds on it, yes, but there is more to it)**

What are we going to talk about?



VS.



“A total of 855 conventionally manufactured parts has been reduced to 12 additive parts.”

Source: http://invention.psychology.msstate.edu/tale/Tale_of_Airplane/ (Sept 7 2016)

Source: <https://www.genewsroom.com/press-releases/ge-announces-name-its-advanced-turboprop-ge-catalyst%E2%84%A2-engine-284272> (Aug 2 2018)

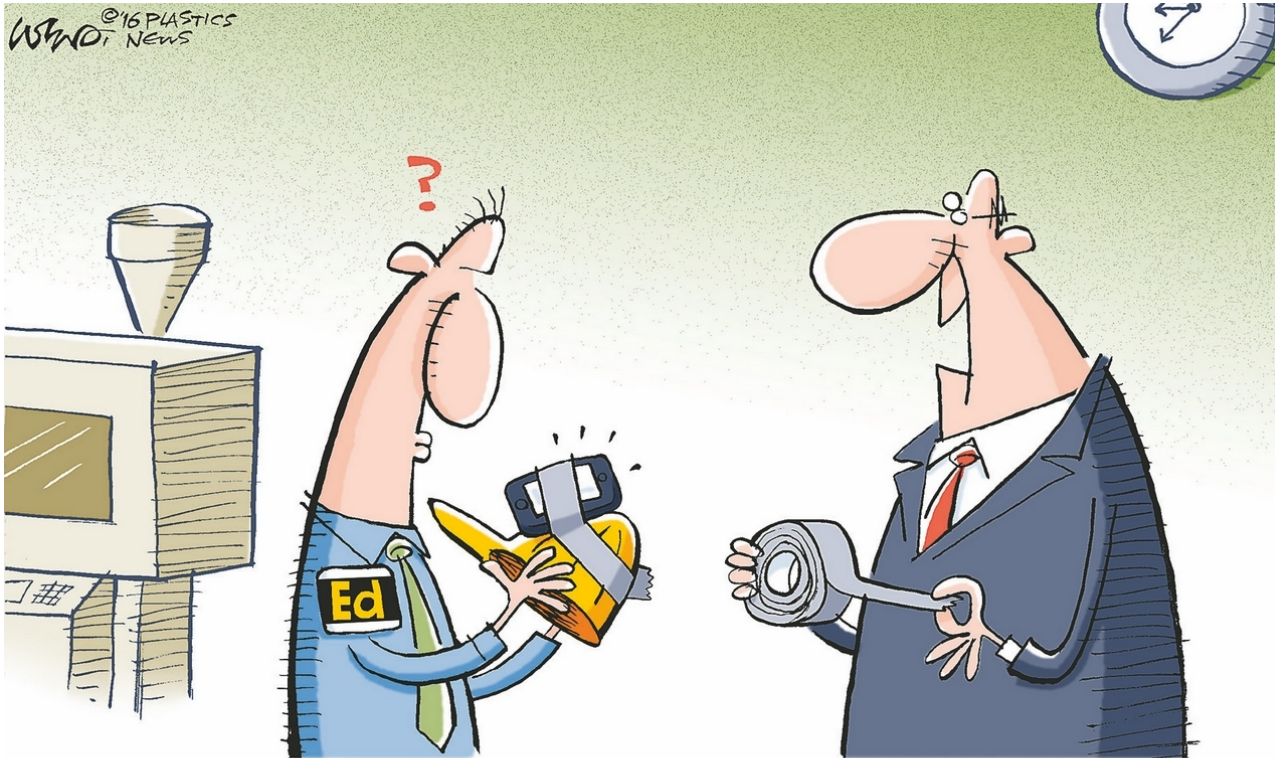
Specialization and ‘simplification’ of work are essential features of the process of innovation

The End of All Corporate Business Models (Medium, 2017)

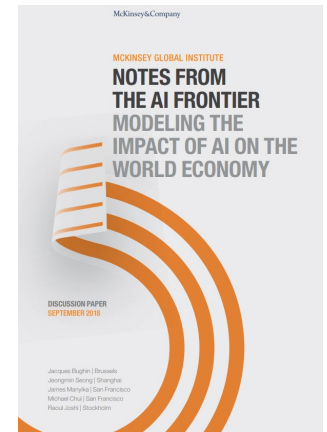
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**Technical and organizational change
reinforce each other
(but might obey different 'laws')**

What are we going to talk about?



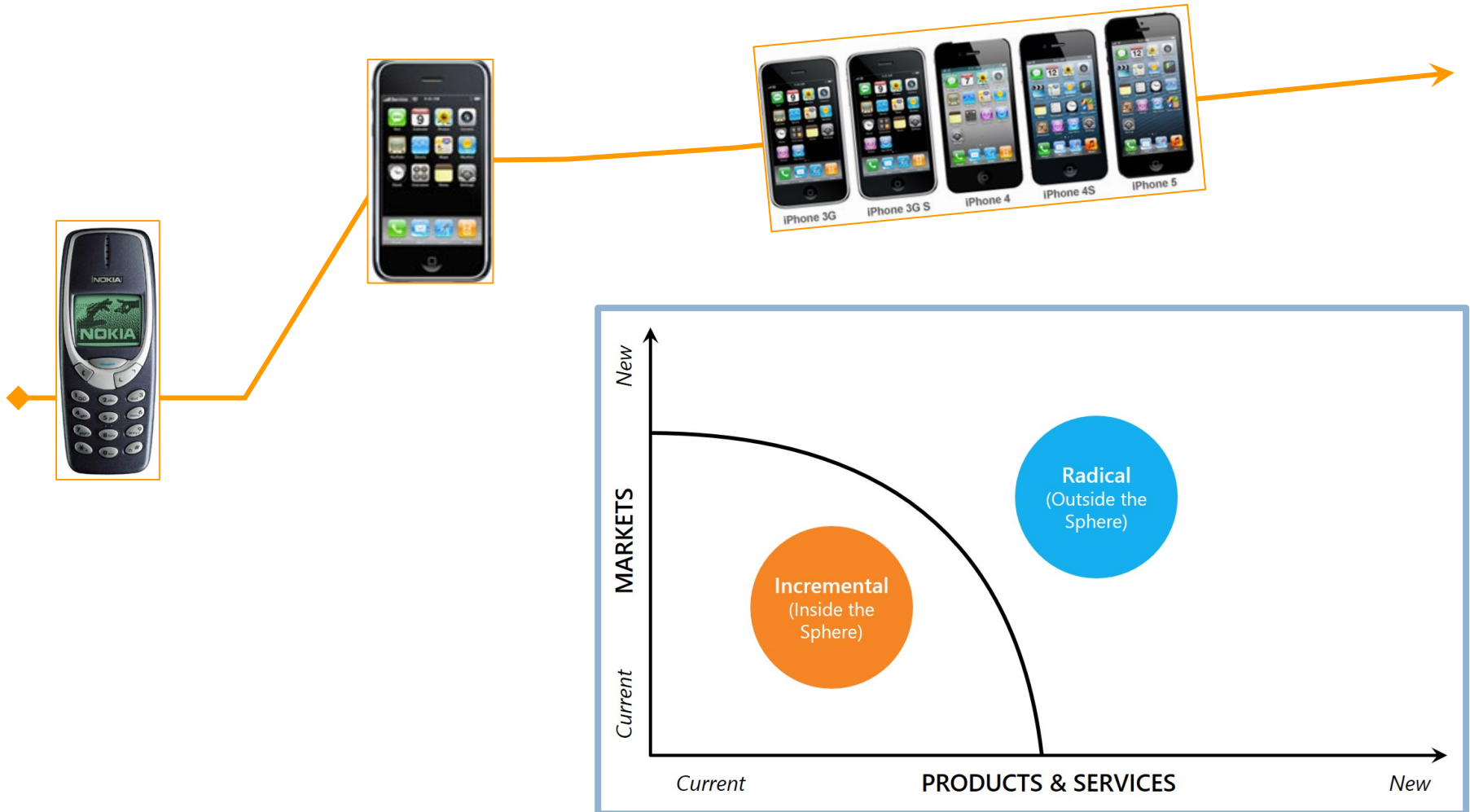
"I CALL IT 'HOW MANY HOURS ED WORKS 4.0'..."



Source: Plastics News

Organizational change may be (i.e. usually is) **slower** than **technical** change

What are we going to talk about?



Innovating organizations do not exist in vacuum,
but are embedded in complex social patterns.

Exam and evaluation

- Date: Tuesday, **January 14th**, 2020
- Time: 09.00 – 10.30am / 90 minutes
- Location: ONA E7 (in Oerlikon!)
- Type: multiple choice + case + concept questions
- Repetition exam **February 17th**, 2020
 - The usual ETH rules for eligibility apply
- Details:
 - **Online exam**
 - **Closed book examination: no written or printed material!**
 - English questions and answers (multiple choice and short open questions)
 - No dictionaries and electronic devices allowed (cellphones, calculators etc.)

You got to do what you got to do...

Exam preparation:

- Readings
- Interactive case discussions:
 - September 30th (session 2) – Semiconductor industry
 - October 28th (Session 6) - ARECO
 - November 25th (Session 10) – 3D Printing
 - December 9th (Session 12) – Music industry
- Slides

Format

- The exam is 55 points.
- 5 questions will be multiple choice. They are worth 2 points each.
- The rest are a combination of case questions, applied and memory based questions.

Memory and application

Science, Technology & Innovation, and Measuring Innovation & Performance (Sessions 2 and 3)

- Of which three parts does R&D consist (as discussed in class)? Give an example of each type of activity (3 points)
- Innovating persistently (rather than innovating sporadically) has a positive impact on which two firm-related factors? (1 point)
- Cefis & Cicciarelli (2005) find that there exist differences in performance between non-innovators and innovators, but they also distinguish *persistent* innovators that perform even better. What is the mechanism that makes *persistent* innovators perform better? (2 points)

Reference: Cefis, E., & Ciccarelli, M. (2005). Profit differentials and innovation. Economics of Innovation and New Technology, 14(1-2), 43-61.

1. Basic research, applied research, experimental development
2. profitability and survival
3. “These results support the view that innovating firms have developed internal competencies and behavioral pattern that allow them to face the challenges of the market better than the non-innovating firms” (p. 44 in the paper)

Multiple choice

According to Cefis & Marsili (2006), which of the following is true?

Note: in the examples below, with ‘importance of innovation’, we mean the height of the *innovation premium*: the effect of innovative activity on firms’ survival probability

Reference: Cefis, E., & Marsili, O. (2006). Survivor: The role of innovation in firms’ survival. Research Policy, 35(5), 626-641.

- 1: small and young firms have a relatively high risk of failing, and innovation is less important for these firms than others
- 2: small and young firms have a relatively low risk of failing, and innovation is more important for these firms than others
- 3: small and young firms have a relatively high risk of failing, and innovation is more important for these firms than others.
- 4: small and young firms have a relatively high risk of failing, and innovation is equally important for all firms

Multiple choice

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Memory and application

Exploration & Exploitation (Session 4)

- How does an ambidextrous organization (as described by O'Reilly & Tushman, 2004) solve the exploration-exploitation problem? (2 points)

Reference: O'Reilly, C. A., & Tushman, M. L. (2004). The ambidextrous organization. Harvard business review, 82(4), 74-83.

By:

- 1) separating explorative and exploitative units, and
- 2) having an integrating function at the top of the organization to bring the two together

Case questions (Sessions 7, 10, 12)

Socialization and spinouts (session 7):

ARECO (for Air Refreshing Control) is a company that spun out of its parent company, IMRA Europe. This process started in 1997 when Michel Gschwind developed a venture proposal. This proposal was based on technology developed in IMRA, but IMRA didn't want to pursue this venture plan. In the end, Michel Gschwind negotiated a spinout construction for his venture, ARECO.

- What were the advantages for IMRA, and for ARECO, to engage in a spinout construction? Describe one advantages for IMRA and two for ARECO. (3 points)

Advantages for IMRA: could make money off IPR they were not using themselves (p.5), signaling goodwill to the community (p.5)

Advantages for ARECO: freedom to pursue project outside corporate bureaucracy (p.3), capitalize on an opportunity not taken (p.4), backing by a large firm for IPR and technology (p.5-6)

Multiple choice

Socialization and Spinouts (session 7)

Which of the following is NOT a supported claim, in Cirillo, Brusoni & Valentini's (2013) study on spinouts?

Reference: Cirillo, B., Brusoni, S., & Valentini, G. (2013). The Rejuvenation of Inventors Through Corporate Spinouts. Organization Science, 25(6), 1764-1784.

- 1: Inventors that join a spinout increase the extent of exploration in their inventive activities
- 2: Inventors that join a spinout decrease the extent to which they rely on parent organizations' knowledge
- 3: Long-tenured employees benefit more from the spinout experience than short-tenured employees
- 4: Inventors that join a spinout do so because they want to explore new technological fields

Multiple choice

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Memory and application

Modularity & Integrality (Session 8)

- What are the two core principles of modularity? (1 point)
- What are the main advantages and disadvantages of designing and making modular products? Name two advantages and two disadvantages (2 points)
- What do Sanchez & Mahoney (1996) mean with 'embedded coordination'? (2 points)

Reference: Sanchez, R., & Mahoney, J. T. (1996). Modularity, flexibility, and knowledge management in product and organization design. Strategic Management Journal, 17(S2), 63-76.


- How do Henderson & Clark (1990) describe architectural innovation? And why do established firms find it hard to cope with? (2 points)

Reference: Henderson, R. M., & Clark, K. B. (1990). Architectural innovation: The reconfiguration of existing product technologies and the failure of established firms. Administrative Science Quarterly, 9-30.

1. One-to-one mapping between components and functions; Standardized interfaces
2. Advantages: increased efficiency, increased flexibility (more detailed: specialization, coordination, parallel search, upgradeability, substitution)
Disadvantages: costly to put in place (needs thorough understanding), variety at cost of performance, danger of hold-up by suppliers, transaction costs, tradeoffs in learning
3. From the paper: 'hierarchical coordination' without the need to continually exercise authority-enabling effective coordination of processes without the tight coupling of organizational structures.
Simpler put: products design the organizations that make them
4. Description: a change in the linkages between components, rather than the components themselves
Challenge: because the product architecture defines the organization's (information) structure, which would have to change too.

Multiple choice

Ecosystems (session 10)



Note! Not required
reading anymore

According to Adner & Kapoor (2010), which of the following is true about component challenges and complement challenges?

Reference: Adner, R., & Kapoor, R. (2010). Value creation in innovation ecosystems: How the structure of technological interdependence affects firm performance in new technology generations. Strategic management journal, 31(3), 306-333.

When it comes to the *performance advantage of technology leaders...*

- 1: ... component challenges are more problematic than complement challenges, because they hold up the entire value chain
- 2: ... component challenges are more problematic than complement challenges, because they restrict the focal firm's potential for learning
- 3: ... complement challenges are more problematic than component challenges, because they erode the firm's leadership advantages
- 4: ... complement challenges are more problematic than component challenges, because they force firms to redesign their products when they are already finished

Multiple choice

Ecosystems (session 10)

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Reference: Adner, R., & Kapoor, R. (2010). Value creation in innovation ecosystems: How the structure of technological interdependence affects firm performance in new technology generations. Strategic management journal, 31(3), 306-333.

When it comes to the *performance advantage of technology leaders*...

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- 4: ... complement challenges are more problematic than component challenges, because they force firms to redesign their products when they are already finished

Bonus question 1

Socialization & Spinouts (session 6)

What is socialization in an organization, and how is it related to exploration?

Answer:

Socialization is that (over time) people understand how an organization works, and behave the way the organization demands.

High socialization reduces exploration, because if everyone thinks the same there is no scope for exploration

Bonus question 2

Innovation, Science, Technology (session 2)

Arora et al. (2015) discuss a decline in research: describe the trend and why it matters

Reference:

Arora, A., Belenzon, S., & Patacconi, A. (2015). Killing the golden goose? The decline of science in corporate R&D (No. w20902). National Bureau of Economic Research.

Answer:

The share of basic research in R&D is declining. Firms still invest in technology, but not in the science behind it, and reduce the value of scientific capabilities. (alternatively: number of patents are going up, number of publications down)

It matters because science is still important for inventions, absorptive capacity is becoming more important, and it is becoming easier to protect scientific knowledge (more generally: there are no good reasons for this decline)

Final words on the online exam

- Remember (or bring) your Moodle password, and bring your legi.
- Default physical keyboards are CH layout, fill in the poll on Moodle by Thursday (19.12.2019) if you prefer a US keyboard
- You will have assigned seats, based on your names



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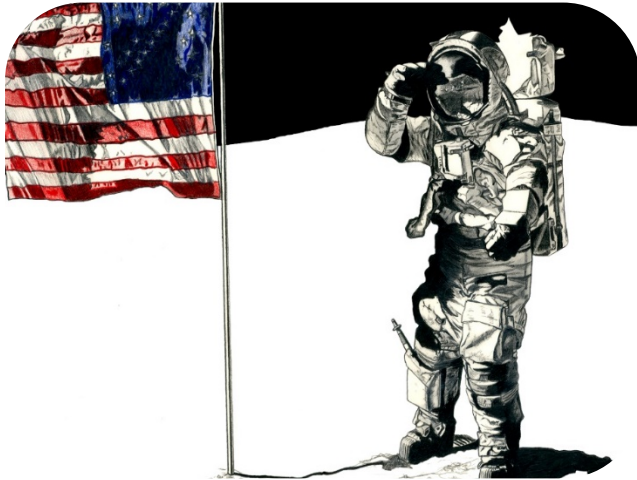
Content of this Course

- Understand how stability and change interact within organizations
- Learn how firms manage the shift from phases of stability to phases of change
- Discuss and make sense of the interplay between technological and organizational change



Sources of pictures: google images

Changing industrial leadership [?]



A combination of factors related to:

- Development of managerial and organizational capabilities
- Role of anti-trust legislation
- IPRs protection and enforcement
- Size of demand (both public and private)

New ways of organizing for production and Innovation



The role of scientific and technological knowledge in fostering growth and industrial applications



The (persistent) role of individuals in initiating change processes



The (pervasive) importance of 'context' to explain success

Learning objectives

Key concepts

- Acquire the basic jargon necessary to discuss, in a precise and concise manner, innovation processes and their outcomes

Methods

- How to study and assess the relationship between cognitive and organizational processes and their innovative outcomes

Abilities

- Analyse the appropriateness different organizational settings and behaviors in terms of their likely innovative and strategic outcomes

Questions?

