Korea Advanced Institute of Science and Technology
School of Business and Technology Management
Course Syllabus, Fall 2019

Course Information

- Course Title: **Technology Management**
- Course Number: **MSB204**
- Prerequisites: N/A
- Meeting Time: Tuesday and Thursday, 10:30 – 12:00
- Classroom: Building E11, Room 101
- Course Web Pages: http://klms.kaist.ac.kr/

Instructor Information

- Name: Jae-Yong, Choung
- Office: Building N22, Room 404
- Phone: 042-350-6314
- E-mail: innovation@kaist.ac.kr
- Office Hours: By appointment
- TA: TA: Mr. Inje Kang, 4th floor, N22
  E-mail: ijkang@kaist.ac.kr

Course Description and Learning Objectives

- Technology plays a dominant role in all modern businesses and is also a cornerstone of wealth creation for a nation. Therefore, effective management of technology is essential for the survival of businesses as well as the sustainability of national prosperity in a fiercely competitive world.
- Management of Technology can be defined as the set of activities associated with bringing high technology products to the marketplace i.e. (new product development (NPD) at the business and national level. Technology Management aims to integrate management of market, technological and organizational change to improve the competitiveness of firms and effectiveness of organizations.
- In line with these, the course covers a range of issues that are central to the management of technology at the firm and national level. (Hargadon and Sutton, 1997): *"creates new products that are original combinations of existing knowledge from disparate industries"*

Expected Learning Outcomes

- Students are expected identify technology management issues
- Students are expected to understand theory and applications
- Students are expected to build logic and organization skills
- Students are expected to present the current technology management issues and possible solutions
- Students are expected to build effective leadership, communication skills and collaboration through term projects

Course Materials

- The required texts for the class along with some additional readings which will be distributed in class are laid down. Since the academic discipline of technology management is very dynamic, complex, and an emerging one, students are required to keep up with current events by reading newspapers, magazine, and other academic articles.

Supplementary Readings

- 정재용 외 (2006), 공학기술과 경영, 지호 출판사
- Joe Tidd, John Bessant, Keith Pavitt(2005), Managing Innovation, Wiley.
- Dennis Lock and Nigel Farrow(1998), The Gower Handbook of Management(4th Edition), Gower Publishing Ltd.
- Melissa Schilling(2017), Strategic Management of Technological Innovation 5th Edition, McGrawHill

Grading Policy

- Final Exam: 40%
- Quiz (6 Times) 30%
- Term Project Presentation: 30%

Course Management

- There will be three elements which will determine the students' course grade; **quiz**, **final examination**, and **term project group presentation**.
- **Midterm examination is replaced by weekly quiz** (taken in the beginning of class in Tuesday) on materials covered in the previous week. This quiz-based assessment will **last for the duration of the first six weeks of the course**.
- For final examination, answers are expected to be written in **essay format**. These questions for the examination will cover the complete body of knowledge that is to be absorbed and understood by students. The **final examination will be based on materials covered during week 8 – 13.**

Term Project

- Each student will join a group (at most 6 students) for completing a term project. Each group will select a technology-intensive venture firm referring to DART *(http://englishdart.fss.or.kr or http://dart.fss.or.kr/main.do)*.
- Analyzing its product, organization, patents, management and other categories covered in the lecture, each group should present successful process of certain product at innovation aspect. Process of development and innovation strategies required for the firm should be included. The firm's success or failure will need to be **analyzed from the perspective of technology management** (i.e. the role of IPR on the firm's competitive strategy).
- Extra points will be given to teams that choose cases that have rarely been studied before (i.e. the success of Samsung, LG, Hyundai, Celltrion etc. has been extensively studied in the past. More unique case study is expected). Students will be randomly designated into teams of approximately six individuals. Each team will have **15 minutes to present**, followed by 5 minutes of Q&A.

- 1-page report demonstrating the selected case and elements of Why and Plans (**Due date: 6PM, 1st Oct (Tuesday)** to TA, ijkang@kaist.ac.kr)
- PPT and final report (**Due date: 6PM, 2nd Dec (Mon)** to TA, ijkang@kaist.ac.kr)
- **Deliverable**: PPT file (or PDF) in English (15min. presentation and 5 min. Q&A)
- **Evaluation**: Joint Assessment
- **Final Report Length**: 5 pages (excluding title page and reference)

Class Participation

- Finally, class participation being an important component for a successful interactive and learning class will be based on regular attendance along with proper class preparation. Thorough individual preparation will generate much better class discussion and in turn higher marks as results.
- Class participation monitoring will be substituted by quiz (6 times) and its contents will be based on prior lecture.

Academic Honor Code of BTM (School of Business and Technology Management)

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Academic dishonesty includes but is not limited to the following:

- **Cheating**: Copying from another's examination paper, solutions, assignments, or allowing another to copy from one's own.
- **Plagiarism**: Using another person's original work without giving appropriate credit to or acknowledging the authors or sources
- **Self-plagiarism**: Submitting one piece of work in more than one course without the explicit permission of the instructors involved.
- **Misrepresentation of authorship**: Submitting work as one's own which has been prepared by or purchased from another.
- **Unpermitted collaboration or aid**: Giving or receiving unpermitted aid on exams or assignments.

Any member of the BTM community who believes that violation of academic dishonesty has occurred should bring the matter to the attention of the department chair. The department chair will assign members of Academic Review Committee (학사심의회) to conduct a thorough investigation and, if necessary, request a due process to university.

Module Topics

The course will move through the following 12 modules and it integrates both theoretical and practical aspects underpinning the connection through relevant case studies.

Week	Date	Description

W1-1	09.03.Tue	Introduction: Overview of Technology Management Course
W1-2	09.05.Thu	The Concept of Technology Management
W2-1	09.10.Tue	History of Technology Management
W3-1	09.17. Tue	Structure of Technology Management
W3-2	09.19. Thu	Successful Technology Management
W4-1	09.24. Tue	Technology Management Failure
W4-2	09.26. Thu	Types of Innovation
W5-1	10.01. Tue	Actors of Innovation
W6-1	10.08. Tue	New Product Development Process
W6-2	10.10. Thu	R&D Organizations
W7-1	10.15.Tue	Role of CTO
W7-2	10.17.Thu	Building Innovative Organization
W8	10.22-24	**Mid-term Exam Week**
W9-1	10.29 Tue	Technology, Market, and Competitor Analysis
W9-2	10.31.Thu	Product Strategy for Each Industry
W10-1	11.05.Tue	Technology Strategy
W10-2	11.07.Thu	Effective Product Development Process
W11-1	11.12.Tue	Measuring Innovation
W11-2	11.14.Thu	Commercialization Process
W12-1	11.19.Tue	IPR Strategy
W12-2	11.21.Thu	Standardization
W13-1	11.26.Tue	Technology Marketing
W13-2	11.28.Thu	Cancelled (Undergraduate Admission Interviews)
W14-1	12.03.Tue	Technology Management in Korea– Private/public sector
W14-2	12.05.Thu	Term Project Presentation and wrap up
W15-1	12.10.Tue	Term Project Presentation

W15-2	12.12.Thu	Term Project Presentation
W16	12.17-19	**Final exam**

This schedule is subject to change if necessary.

Course Outline

Lecture 1: Introduction and course overview

Topics to be covered:

- A basic overview of the course describing the scope and philosophy of the course as well as course requirements:
- Course outline, exam, team project and schedule of the lecture to be explained

Upcoming class talks:

- Find the definition of innovation and adequate examples explaining it
- What is dominant design

Lecture 2: The concept of technology management

메모 포함[강인1]: Supplementary readings

White, M. A., & Bruton, G. D. (2010). *The management of technology and innovation: A strategic approach*. Cengage Learning. / Ch.1

Topics to be covered:

- Definition of technology management and innovation management
- What is innovation
- Overviewing key issues of this lecture through text mining.

Core Readings

- http://www.referenceforbusiness.com/management/Str-Ti/Technology-Management.html
- Dodgson, M. Gann, D. and Salter A. The management of technological innovation: strategy and practice, Oxford University Press, 2008., chapter 1

Upcoming class talks:

- Find representative scholars of technology management, innovation management through Wikipedia and other sources

Lecture 3: History of technology management

Topics to be covered:

- The historical flow of innovation management and technology management with statements of representative scholars

Core Readings

- Tushman (2004), "From Engineering Management/R&D Management, to the Management of Innovation, to Exploiting and Exploring Over Value Nets: 50 Years of Research Initiated by the IEEM-TEM", IEEE Transaction on Engineering Management, 51(4), pp.409-111

Upcoming class talks:

- What kind of innovation management and technology management issues are covered in recent newspapers?

Lecture 4: Structure of technology management

Topics to be covered:

- Reviewing the structure of technology management such as R&D, human resource, process improvement
- What kind of academic topics do in leading international conferences?

Core Readings:

- Gaynor(1996), 'Chapter 1. Management of Technology: Description, scope, and implications', in Gaynor (1996), *Handbook of Technology Management*, McGraw-Hill: NY.

Upcoming class talks:

- What factors enabled the success of Korean industries such as semiconductor, TFT-LCD, television, mobile phone, automotive, shipbuilding? Are these success factors sustainable in the future? If not, what should be improved to maintain success? Explain from the perspective of management and technology management.

메모 포함[강인2]: Supplementary readings

White, M. A., & Bruton, G. D. (2010). *The management of technology and innovation: A strategic approach*. Cengage Learning. / Ch.2

Phaal, R., Farrukh, C. J. P., & Probert, D. R. (2001). Technology management process assessment: a case study. *International journal of operations & production management*, *21*(8), 1116-1132.

Gower(1992) – Handbook of management, PART 2, 5, 6,9

Karol&Nelson(2007)-New Product Development for Dummies, Ch.1

Lecture 5: Successful technology management

Topics to be covered:

- Successful history of Korean semiconductor: integration of various factors for the success
- IPR strategy, human resources, technological linkage, relationship with government, investment, Product Life Cycle

Core Readings:

- *Tinno Case 1401-001:* National and Sectoral Technology and Innovation Capability Build-up; the Case of Semiconductor Industry in Korea.

Upcoming class talks:

- What kind of failure cases did Korea experience? Look for factors that led to the failures in cases such as Cyworld, WiBro, etc.

메모 포함[강인3]: Supplementary Readings

Phaal, R., Farrukh, C. J., & Probert, D. R. (2004). Technology roadmapping—a planning framework for evolution and revolution. *Technological forecasting and social change*, *71*(1-2), 5-26.

Lecture 6: Technology management failure

Topics to be covered:

- Example of technology management failure with technology transition, core rigidity, platform issues

Core Readings:

- Dan Steinbock (2013), 'Nokia's Failure: No flexibility in US, emerging market', CNBC, 2013. 09. 17
- Daniel Thomas(2014), 'Nokia smartphone sales continue decline', Financial Times, 2014. 01. 23

Upcoming class talks:

- Choose the most innovative product and explain the reasons for your selection

Lecture 7: Types of innovation

Topics to be covered:

메모 포함[강인4]: Supplementary Reading

Fagerberg, J. (2003). Innovation: a guide to the literature. Oslo: Centre for Technology. *Innovation and Culture, University of Oslo*. (MSB510)

Evangelista, R., & Mastrostefano, V. (2006). Firm size, sectors and countries as sources of variety in innovation. *Economics of Innovation and New Technology*, *15*(03), 247-270.

- Typology of innovation through cases of smart phone and personal computer
- Radical/incremental, product/process, component/architecture innovation

Core Readings:
- David Smith (2005), 'Chapter 2. Types of Innovation' in: David Smith(2005), Exploring Innovation, McGraw-Hill: NY.

Upcoming class talks:
- Which is more innovative between large conglomerates and small enterprises? Or are there certain sections that they are more innovative?

Lecture 8: Actors of innovation

메모 포함[강인5]: Supplementary Reading

Mazzucato, M., & Parris, S. (2015). High-growth firms in changing competitive environments: the US pharmaceutical industry (1963 to 2002). *Small Business Economics*, *44*(1), 145-170.

Evangelista, R., & Mastrostefano, V. (2006). Firm size, sectors and countries as sources of variety in innovation. *Economics of Innovation and New Technology*, *15*(03), 247-270.

Topics to be covered:
- Size and innovation of the company
- Appropriate innovation management for large firm and small firm (Mark Ⅰ, Mark Ⅱ)

Core Readings:
- Jan Fagerberg (2012), 'A Guide to Schumpeter', Confluence, 20.

Supplementary Readings:
- 정재용, 황혜란, 이병헌 (2006), 공학기술과 경영, 3 장

Upcoming class talks:
- What are the required processes for developing innovative product?(idea commercializing process)

Lecture 9: New Product Development Process

메모 포함[강인6]: Varela, J., & Benito, L. (2005). New product development process in Spanish firms: typology, antecedents and technical/marketing activities. *Technovation*, *25*(4), 395-405.

Karol&Nelson(2007)-New Product Development for Dummies

Topics to be covered:
- Process of developing new product and general product developing process
- Current/linear process, information gathering, technology selection and evaluation

Core Readings:
- Tidd and Bessant (2009), '9.1. Process for new product development' in: Joe Tidd and John Bessant (eds), *Managing Innovation*, John Wiley & Sons: UK

Supplementary Readings:
- 정재용, 황혜란, 이병헌 (2006), 공학기술과 경영

Upcoming class talks:
- Design organizational structure suitable for developing innovative product

Lecture 10: R&D organizations

메모 포함[강인7]: Supplementary Readings

Gower(1992) – Handbook of management, Ch.4

Topics to be covered:
- Types of organization. R&D structure of general companies and government research institutes
- Traditional organizational structure, product organization, network/matrix structure etc., role of CTO

Core Readings:
- Tidd and Bessant (2009), '3.2. Appropriate Organization Structure' in: Joe Tidd and John Bessant (eds), *Managing Innovation*, John Wiley & Sons: UK.

- Vittorio Chiesa (2001), '5.1. The Structure of R&D Units' in: Chiesa, V. , *R&D Strategy and Organisation: Managing technical change in dynamic contexts*, Imperial College Press: London.

Upcoming class talks:

- Making CTO avatar: imagine you make an avatar for project CTO. What kinds of capacities and techniques would you like to embed?
- Select the best CTO in Korea

Lecture 11: Role of CTO

메모 포함[강인8]: Supplementary Readings

Herstatt, C., Tietze, F., Nagahira, A., & Probert, D. (2007). The chief technology officer (CTO) in literature and practice—A review and results from field research in Japan. *International Journal of Innovation and Technology Management*, *4*(03), 323-350.

Gower(1992) – Handbook of management, Ch.4

Topics to be covered:

- Role of R&D project CTO
- Technology, human resources, technology flow. Understanding product and its process. Overall view of commercialization process

Core Readings:

- Rom Berray and Raj Sampath (2002), 'The Role of the CTO: Four Models for Success', available at http://www.brixtonspa.com/Career/The_Role_of_the_CTO_4Models.pdf
- 'Job Description – Samsung R&D, Electronics Giant', available at https://www.linkedin.com/

Upcoming class talks:

- Select essential factors for innovative organization. Select one company and imagine yourself became executive

Lecture 12: Building innovative organization

메모 포함[강인9]: Christiansen, J. (2000). *Building the innovative organization: Management systems that encourage innovation*. Springer.

Day, J., Mang, P., Richter, A., & Roberts, J. (2001). The innovative organization. *The McKinsey Quarterly*, *2*, 21-31.

Karol&Nelson(2007)-New Product Development for Dummies, Ch.5

Topics to be covered:

- Organization configuration for facilitating innovation
- Strategies to promote innovative outcomes

Core Readings:

- O Reilly, Charles A., and Michael L. Tushman. "The ambidextrous organization." Harvard *business review* 82.4 (2004): 74-83.

Upcoming class talks:

- How would you forecast associated industries and markets?

Lecture 13: Technology, market and competitor analysis

메모 포함[강인10]: Karol&Nelson(2007)-New Product Development for Dummies, Ch.3, 4

Topics to be covered:

- Market analysis, technology forecasting, competitor analysis, market/technology trend
- Big paradigm composed in the order of industry, various factors and product

Core Readings:

- North Carolina Small Business and Technology Development Center, 'How to Conduct an Industry Analysis', available at http://www.sbtdc.org/pdf/industry_analysis.pdf (Edited)

- Aditya Shah and Abhinav Dalal (2009), 'The Global Laptop Industry', available at http://srl.gatech.edu/Members/ashah/laptop_industry_analysis_aditya_abhinav.pdf

Supplementary Readings:

1. Carlota Perez(2009)Technological revolutions and techno-economic paradigms, *Cambridge Journal of Economics*

Upcoming class talks:

- What factors are important to accelerate technology innovation in each biotechnology, construction, nuclear power and automobile industry?

Lecture 14: Product strategy for each industry

Topics to be covered:

- Technology innovation for each industry and for Complex Product System(CoPS)
- Characteristics of industries, product strategy and differences of mass-produced products and complex product system

Core Readings:

- Paul Nightingale, Roger Miller, Joe Tidd and Mike Hopkins (2008), 'Why Patterns of Technical Change Differ: Further Steps Towards an Integrated Typology', ESRC Research Center for Social, Technological, and Environmental Pathways to Sustainability.

Upcoming class talks:

- Find suitable strategies required for successful companies to maintain their flourish

Lecture 15: Technology Strategy

Topics to be covered:

- R&D planning method
- Technology strategy and plan (develop/buy), variety of technology strategies

Core Readings:

- Vittorio Chiesa (2001), '2.1. The Positioning Approach to Strategy' in: Chiesa, V. , *R&D Strategy and Organisation: Managing technical change in dynamic contexts*, Imperial College Press: London.
- Vittorio Chiesa (2001), '7.1. Introduction' in: Chiesa, V. , *R&D Strategy and Organisation: Managing technical change in dynamic contexts*, Imperial College Press: London.
- Vittorio Chiesa (2001), '7.2. Organisational Forms for External Technology Acquisition' in: Chiesa, V. , *R&D Strategy and Organisation: Managing technical change in dynamic contexts*, Imperial College Press: London.

Upcoming class talks:

- What is the most important factor for developing new product effectively?

Lecture 16: Effective Product Development Process

메모 포함[강인11]: Karol&Nelson(2007)-New Product Development for Dummies

Topics to be covered:

- Key elements of new product development process
- Industry characteristics, product properties, systematization method

Core Readings:

- Alan MacCormack, William Crandall, Paul Henderson, and Peter Toft (2012), 'Do You Need a New Product-Development Strategy?', *Research-Technology Management*, pp. 34-43.

Supplementary Readings:

- Steven C. Wheelwright and Kim B. Clark (1992), 'Creating Project Plans to Focus Product Development', *Harvard Business Review*.

Upcoming class talks:

- What can measure the performance of R&D or innovativeness?

Lecture 17: Measuring Innovation

메모 포함[강인12]: European Innovation Scoreboard

global innovation index

Wonglimpiyarat, J. (2010). Innovation index and the innovative capacity of nations. *Futures*, *42*(3), 247-253.

Topics to be covered:

- Concept of innovation indicators
- Examples of indicators (ex. Oslo Manual, Frascati Manual, Patents)

Core Readings:

- Langdon Morris(2008), 'Innovation Matrix: The Innovation Process and How to Measure It', An *Innovation Labs White Paper*.

Supplementary Readings:

- Keith Smith (2005), 'Chapter 6. Measuring Innovation', in: Fagerberg, J. et al. (eds.): The Oxford Handbook of Innovation.

Upcoming class talks:

- How can new ideas be commercialized? Think about the stages of commercialization process.

Lecture 18: Commercialization Process

Topics to be covered:

- Company Establishment - Contents of business plans
- Business Model

Core Readings:

- Tidd and Bessant (2009), '8.5 Anticipating the Resources', in: Joe Tidd and John Bessant (eds), Managing Innovation, John Wiley & Sons: UK, pp. 373-375.
- Bob Zider (1998), 'How Venture Capital Works', Harvard Business Review, pp. 131-139.
- Official Website for the State of Illinois, 'Outline of a Business Plan', available at http://www.illinois.gov/dceo/BizDevelopment/Documents/bizplan.pdf
- Department of Trade & Industry Philippines, 'Business Plan Format', available at http://www.dti.gov.ph/dti/uploads/file/Business%20Plan.pdf

Upcoming class talks:

- Review the articles dealing with the patent suit between Apple and Samsung Electronics. Look for the detailed process and characteristics.

Lecture 19: IPR Strategy

메모 포함[강인13]: Gower(1992) – Handbook of management, Ch.51

Topics to be covered:

- Overall intellectual property right creation and management

- Patent categories and strategies
- Patent evaluation and infringement

Core Readings:

- World Intellectual Property Organization (2000), 'Intellectual Property Policies for the Twenty-First Century', pp. 33-51.
- World Intellectual Property Organization (2006), 'Inventing the Future: An Introduction to Patents for Small and Medium-sized Enterprises', pp. 1-13.

Upcoming class talks:

- Why did some firms fail in spite of their products' superiority? Look for the cases and think about the reasons.

Lecture 20: Standardization

Topics to be covered:

- Implication and need of international standard
- Standardization process and strategy

Core Readings:

- APEC(2010), 'Standardization: Fundamentals, Impact, and Business Strategy', pp. 7-11, 27-35.

Upcoming class talks:

- Search the cases where non-technological factors influenced on the success or failure of technology commercialization and export.

Lecture 21: Technology Marketing

메모 포함[강인14]: Gower(1992) – Handbook of management, PART.3

Topics to be covered:

- Technology adaptation cycle model and consumers
- Concept of chasm and relevant strategies
- Various marketing strategies for products (ex. CoPS)

Core Readings:

- Rowland T. Moriarty and Thomas J. Kosnik (1989), 'High-Tech Marketing: Concepts, Continuity, and Change', Sloan Management Review, pp. 7-17.
- Geoffrey Moore, 'Crossing the Chasm – and Beyond', in: Robert Burgleman et al.(eds.), Strategic Management of Technology and Innovation, Harvard Business School Press: MA.

Upcoming class talks:

- What can be the most representative case of Korean firms' success?

Lecture 22: Technology Management in Korea – Private/public sector

Topics to be covered:

- R&D planning method
- Technology strategy and plan (develop/buy)

Core Readings:

- *Tinno Case 1401-002:*Cross-Industry Spillover of Technology Capability: Positive Effects of DRAM sector on TFT-LCD sector in Korea.

- *Tinno Case* 1401-*003:* Developing Complex Products and Systems(CoPS); Case of Korean TDX and CDMA development.

Upcoming class talks:

- What kind of policy did Korea use to support technology management?

Lecture 23 & 24: Student Presentation

FINAL EXAM!

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