MGMT002 – TECHNOLOGY AND WORLD CHANGE

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COURSE DESCRIPTION

This course helps students understand how technological innovation comes about, and how socio-economic and environmental factors drive certain technologies to become world-changing ones. The interplay among technological change, individuals, institutions, and society at large is examined, with an added emphasis on the strategic management of technology from a corporation’s perspective. Specific examples may be drawn from the computer / telecommunications industry, the life sciences, energy and industrial production technologies, as well as other important or emerging industries. The course assessment will be based on participation and a combination of assignment(s), project(s) and examination.

PRE-REQUISITE

Please refer to the Course Catalogue on OASIS for the most updated list of pre-requisites / co-requisites for this particular course.

Do note that if this course has a co-requisite, it means that the course has to be taken together with another course. Dropping one course during BOSS bidding would result in both courses being dropped at the same time.

RECOMMENDED TEXT AND READINGS


The Kinokuniya bookstore and the Times bookstore in Funan Center keeps a small number of copies for Guns, Germs and Steel. A small discount is available through bulk purchase. There are various editions of this book, all of which are acceptable. SMU’s very own Book Link should have copies of Exploring Innovation.
In addition, two articles have been identified for class discussion and individual paper review. They can be obtained free from SMU electronic library resource <http://library.smu.edu.sg/>. Simply choose e-journals and then scroll down to find the correct journals, and then navigate to the correct issues and download the articles. These three papers are listed below and in the week-by-week course schedule:


Additional readings will be assigned. Students are encouraged to keep abreast of current developments by reading leading business periodicals such as the Asian Wall Street Journal, Far Eastern Economic Review, The Economist, Business Times and Business Week. You are welcome to bring topics up for discussion during appropriate times in the class.

ASSESSMENT METHOD

<table>
<thead>
<tr>
<th>Assessment</th>
<th>Weight</th>
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<tbody>
<tr>
<td>Individual class participation (in-class only)</td>
<td>20%</td>
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<tr>
<td>Individual report</td>
<td>10%</td>
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<tr>
<td>Group Presentation of a World-changing Technology</td>
<td>15%</td>
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<tr>
<td>Group Project</td>
<td>30%</td>
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<tr>
<td>Final examinations</td>
<td>25%</td>
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(1) Individual Class Participation (20%)

Each student is expected to participate actively in the form of posing insightful question, raising a thoughtful comment and responding to questions posed. Students are expected to develop skills in articulating detailed questions and opinions related to the subject area. A full 15% is roughly equivalent to three distinctive comments or insightful questions raised during each lecture. Unsubstantiated absences may lead to an automatic lowering of the students’ class participation grade.

(2) Individual Paper Review (10%)


The review will be graded on
- Level of understanding demonstrated, and
- Intelligent arguments / questions / critiques / insights presented.

A summary of the paper alone will not suffice. A short list of questions will be handed out as a reading guide for each case. However, the discussion does not have to be confined to this list of question.

While this is an individual assignment, group discussions are permitted. However, each student shall submit an individual and UNIQUE write-up of his/her review and to prepare for active participation in class. In addition to class participation, students are expected to submit one (1) written review of no more than 2 pages (A4 size, double space, 12 fonts, 1 inch margin on each border). The written review must be submitted prior to the start of the class to the TA.
Group Formation

Students shall form groups of 4 by the second lecture. Each group will have to submit to the TA:
- Details of their group members;
- Preferred presentation category and technology for the world-changing technology presentation; and
- Project option (A – business case analysis or B – business plan) (For option B, group should state the tentative topic, the exact topic can be finalized later)

The same group will apply to all group projects and assignments in the course.

(3) Group Presentation of a World-changing Technology (15%)

Choose from one of the three broad categories (Or they can be assigned):

i. “Ancient” technologies
ii. Energy, information and communication technology
iii. Life sciences and biotechnology

Within each broad category, each group will identify one (1) specific technology to work on. While a list of suggested technologies will be provided, students can propose technologies outside this list. Note that there are constraints as to the number of groups in each category; rules of first-come-first-served apply. A group may be forced to present on another technology / category.

The group presentations will take place in different weeks (please refer to the class schedule). Please sign up early with the TA for the presentation time-slot. All group members must be present during the session else a penalty will be levied. Questions will be directed at every group member.

For the chosen technology, students are expected to
- Identify any scientific principles associated with the technology, and to explain (in simple terms) how this technology works;
- Identify the series of scientific discoveries and/or inventions leading to the development of this technology;
- Differentiate between the invention and the innovation;
- Differentiate between the technological and the commercial development;
- Identify any competing or complementary technological/commercial development and/or any displaced technologies;
- Express how the technology has changed the world.

Insightful comments from detailed research are expected. Merely copying contents developed by others would not suffice.

Every group should submit a set of presentation slides with adequate annotations in the “notes page” format; no separate written report is required. The presentation should take around 15~20 minutes with 5~10 minutes Q&A.

For inspirations of world-changing technologies, students are encouraged to consult (no need to buy):
- Technology and Society – a Bridge to the 21st Century by Hjorth et al.,
- The Next Fifty Years – Science in the First Half of the Twenty-First Century edited by Brockman,
- The Economist also publishes excellent synopses of emerging technologies.

The world-changing technology presentation and submission will be graded as follows:
Contents (5/15);
Clarity (5/15);
Level of interest generated in class and the depth of insight put into the presentation (5/15).

(4) Group Project (30%)

Option A: 3 Case Reports & 1 Case Presentation

Students wishing to pursue Project Option A will focus on structured business case analysis.

Each group will work on 3 business cases. For the business case they are identified to be responsible for, they will submit a detailed report (8 pages maximum) and make an in-class presentation (15~20 minutes plus 5~10 minutes Q&A). For the remaining 2 cases, the group will submit shorter reports (4 pages maximum).

Real business cases will be examined, with an objective of alerting students to the strategic implications and often-ambiguous nature of technology-related business issues. While preparation for the business cases is a collaborative (group) effort, questions will be directed at every group member. A short list of questions will be handed out as a reading guide for each case. However, the discussion does not have to be confined to this list of questions.

The groups will be assessed based on the key recommendations and/or analytical insights supported by logical reasoning based on the materials presented (10/30 for the detailed report, 5/30 for each of the two shorter reports). The presentation should be professionally conducted, well reasoned and well defended (10/30). Note that it does not follow that every member of the group will receive the same score.

Option B: 1 Business Plan Presentation and Report

Students wishing to pursue Project Option B will focus on developing a viable, entrepreneurial business plan. While Option B is relatively unstructured task, the project grades of those groups choosing Option B will be no less than the lowest grade of those pursuing Option A, provided that sufficient effort has been committed and demonstrated.

The group shall identify a new line of business based on either (i) the use of technology, or (ii) innovation of a new product or process, or (iii) both. The group shall defend the viability of this business opportunity, and gauge how potentially world-changing this idea can be, including an estimate of the market size. This business opportunity can exist due to the greater efficiency of a new technique compared with an old one, or its ability to reach a previously un-tapped or under-served market. Students wishing to invent a new consumer product, for example, should also be aware of the additional cost involving in selling, marketing and distributing this product to end-customers.

The business plan shall consist of a concise report (8 pages maximum; 20/30), and a professionally-conducted presentation based on that business plan (10/30). The business plan will be assessed on the basis of its technical feasibility (simplicity is preferred) and potential market reach.

Good business plans will be submitted to SMU’s Business Innovations Generator (BIG) Committee, and the most promising ones may be invited to apply formally for seed funding and further mentoring support. A maximum of SGD $50,000 can be allocated for each promising business plan. Details of the Business Innovations Generator Programme (open to SMU students) can be found in: <http://www.smu.edu.sg/centres/smubig/>

Several sample business plan formats can be referenced at:
(5) Final Examinations (25%)

The final examinations will take place at the end of the term, and the format will be determined in due course. Exam questions will be set to test the students’ understanding of the concepts discussed in class, rather than pure memory.

CLASS TIMINGS

Thursday, 15:30 – 18:45

COURSE METHODS

To maximize learning, there will be a variety of course methods, including the presentation of theory and examples, business stories, case studies, in-class discussions, questions and answers, problem-based learning, readings and watching short videos. Students are strongly encouraged to read the assigned readings before coming to class because they would benefit much more from the in-class interactions.

CLASS SCHEDULE

<table>
<thead>
<tr>
<th>Week No. / Date</th>
<th>Topic</th>
<th>Readings, Assignments and Presentations (To prepare BEFORE class)</th>
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<tr>
<td>1 5 Jan</td>
<td>A) Natural experiment and its importance in social science research  B) Factors leading to guns, germs and steel  - Explore these Diamond’s basic hypotheses (as example of hypothesis formation and evidence gathering)  - Answers to Yali’s question  - Criticisms of Diamond’s book?</td>
<td>Read Diamond Ch. 2  Read Diamond Ch. 4, 6 (can read Ch. 6 after lecture)  Optional reading: Diamond Ch. 5, 7-9</td>
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<tr>
<td>II. Exploring Innovation: Its Nature and Implications for Organizations</td>
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<td>Date</td>
<td>Topic</td>
<td>Reading/Activities</td>
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<td>3 Jan</td>
<td>Nature of innovation&lt;br&gt;- What is an invention versus an innovation?&lt;br&gt;- What is new in innovations?&lt;br&gt;- What distinguishes the forms and types of innovations?&lt;br&gt;- What are the sources of innovation?</td>
<td>Student group presentation I (Ancient Technology)&lt;br&gt;Read Smith Ch. 1-2, 5&lt;br&gt;Read: How the Giants of Enterprise Seized the Future (Richard Tedlow) <a href="http://hbswk.hbs.edu/cgi-bin/print?id=2376">http://hbswk.hbs.edu/cgi-bin/print?id=2376</a>&lt;br&gt;Optional reading: Diamond Ch. 13</td>
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<td>4 Jan</td>
<td>Technological change and innovation process&lt;br&gt;- What characterizes technological change and long wave cycle?&lt;br&gt;- Why are some technologies more successful than others?&lt;br&gt;- What is the technology innovation process</td>
<td>Student group presentation II (energy, information, communication)&lt;br&gt;Read Smith Ch. 3 and 6</td>
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<td>5 Feb</td>
<td>A) Case discussion: Connect and Develop&lt;br&gt;- What is the “connect and develop” model of innovation?&lt;br&gt;- How does it compare with other models of innovation?&lt;br&gt;- How can we apply it in business?&lt;br&gt;B) Business plan guide</td>
<td>Student group presentation III (energy, information, communication + life sciences and biotechnology )&lt;br&gt;Read “Connect and Develop: Inside P&amp;G’s New Model for Innovation” Harvard Business Review, March 2006</td>
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<tr>
<td>6 Feb</td>
<td>A) Intellectual property and technology strategy&lt;br&gt;- Understand the various types of intellectual property right&lt;br&gt;- What is technology strategy?&lt;br&gt;- Innovation strategies as means of exploiting innovations&lt;br&gt;B) Issues in analyzing journal papers</td>
<td>Student group presentation IV (life sciences and biotechnology + remaining)&lt;br&gt;Read Smith Ch. 7-8</td>
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<tr>
<td>8 Feb</td>
<td>Mid-Term Break – no class.</td>
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### III. Applying and Managing Technology Innovation and Entrepreneurship in Modern Businesses

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<tr>
<th>Date</th>
<th>Activity</th>
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| 9 2 Mar | The role of technology standards in innovation and world change  
- What are technology standards?  
- What are their impacts in investment, adoption, manufacturing, consumer perception?  
- Case Discussion: VCR versus Betamax  
- Case Discussion: Invention of containerization  
Read: The Truck Driver who Invented Shipping  
http://hbswk.hbs.edu/cgi-bin/print?id=5026 |
| 10 9 Mar | Case discussion: Google Inc.  
Case discussion: Dell (mass customization)  
Prepare for, present and/or submit report for HBS Case 806-105 |
| 11 16 Mar | Case discussion: Innovation at 3M Corp.  
Case discussion: Encyclopedias (Brittanica, Encarta, Wikipedia)  
Prepare for, present and/or submit report for HBS Case 699-012 |
| 12 23 Mar | Case discussion: Airbus 3XX: Developing the World’s Largest Commercial Jet (A)  
Prepare for, present and/or submit report for HBS Case 201-028 |
| 13 30 Mar | Business plan presentations  
Student presentations and business plan submission |
| 14 6 Apr | Reading Week – prepare for exams, no class. |