Module Outline

Module Code   : MNO4761D, MNO4313K
Module Title   : Industry 4.0, Technology, and Management Implications
Class Date   : Mondays, 12 to 3pm
Semester   : Semester 1, Academic Year 2022/2023
Faculty   : Adjunct Professor Virginia Cha
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Overview

Technology and innovation platforms are now significant drivers of value creation. In the late 19th century, innovations such as the telephone, automobile (an internal-combustion engine), and electricity have ushered in the second industrial revolution with explosive growth due to rapidly lowering costs while unleashing demand across multiple sectors. The third industrial revolution created new technology giants with ubiquitous access to information technology, smartphones, and the internet. It brought innovations as a value creation driver to the forefront. Today, especially with post-COVID, digitization and newly emergent technologies will usher in a new growth curve. Klaus Schwab, executive chairman of the World Economic Forum, termed the upcoming change Industry 4.0[1]. As final year business students, you need to understand the new emergent technologies, familiarize yourself with the use cases, and develop a set of skills and knowledge around the management implications in the next generation of growth drivers.

This module will bring a fresh view on emergent technologies to prepare our final-year business students for the post-COVID workforce – where management efficiencies and value creation from technological innovations are critical success factors. This module does not require the students to have a technical background. Yet, it provides a management overview on how to evaluate exponential technologies and their management implications (with an emphasis on profit, productivity, process, and human factors).

Module Objectives

1. Understanding why changes around us, in the context of digital transformation and Industry 4.0, upends the traditional leadership model. Explore what the new leadership model is.
2. Explore what Exponential Technologies/Innovations are and How they create new value. Examine Incremental Innovation and understand the differences between the two types of innovations. Explore what ambidextrous thinking is at the organizational level and the individual level.

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[1] Primary Drivers of Industry 4.0 (Source: Wikipedia https://www.wikiwand.com/en/Fourth_Industrial_Revolution)

- Digitization and integration of vertical and horizontal value chains — Industry 4.0 integrates processes vertically, across the entire organization, including processes in product development, manufacturing, structuring, and service; horizontally, Industry 4.0 includes internal operations from suppliers to customers as well as all key value chain partners.[29]
- Digitization of product and services — integrating new methods of data collection and analysis–such as through the expansion of existing products or creation of new digitised products–helps companies to generate data on product use in order to refine products[29]
- Digital business models and customer access — customer satisfaction is a perpetual, multi-stage process that requires modification in real-time to adapt to the changing needs of consumers

3. Deep dive into the use cases/applications for the following technologies: AI, IOT/Extended Reality, Brain-Computer Interface, Synthetic Biology, and Quantum Computing.
4. Understand the model of exploration vs. exploitation in emergent technologies and **how to deploy these techniques in an organizational context, especially in Industry 4.0**
5. Develop an understanding of the **assessment of Industry 4.0 readiness** and be able to apply the methodology.
6. Based on the operating context and readiness assessment, **develop an action plan** for the deployment of industry 4.0.
7. Understand the **human factors** in organizational resistance to innovations – develop a new **leadership model** to support the deployment of Industry 4.0 with effective change management.
8. Understand how to pitch new value creation opportunities from Industry 4.0.

Assessment

Assessment Components	Weightage
Team Assessment	50%
1. 40%: Project deep-dive on a specific technology and the value drivers on a targeted industry/enterprise with particular emphasis on industry 4.0. This includes the readiness assessment, the action plan, and change management strategies. The student team must also make projections on the impact and support these projections with data and/or sound, logical arguments.	
2. 10%: Strategic Narrative on the proposed value drivers from industry 4.0 – pitched to an executive audience for budget and resources support.	
Individual Assessment	50%
1. 20%: Class Interaction & Participation & Personal Reflection	
2. 30%: Case Analysis Deck on a specific framework taught in class	
Total Marks	100%

Schedule and Outline

Part A: Introduction to Industry 4.0 and its Landscape
1. Module Orientation + A Historical Perspective Leading to Industry 4.0
   Workshop Assignment: Major Advances of Industry 4.0
   In Class Workshop: NUS Libraries – Use of library resources for market research
2. Exponential Technologies and How They Create New Value (with Use Cases in Digital, Sustainability and Manufacturing)
   Workshop Assignment: Industry Structure of Selected Technology Use Case (Digital, Sustainability, Manufacturing); Top 3 Trends in Each Use Case.
3. Imperative and Management Implications of Industry 4.0
   Workshop: Project Scope of Team Project

Part B: Industry 4.0 Readiness
4. Diagnostic Tool: Smart Industry Readiness Index (SIRI)
5. Action Framework: The Prioritization Matrix
6. Discussion of Use Cases in Digital, Sustainability and Manufacturing + Field Work Briefing & Consultation

Part C: Innovation for Industry 4.0
7. Student Team Presentation: Insights, Learnings, and Recommendations from applying SIRI and Prioritization Matrix to an Organization.
8. Innovating for Industry 4.0
9. Opportunities and Risk in Innovating for Industry 4.0

Part D: Implementing Solution and Effecting Change
10. Strategic Narrative – How to Tell a Story on Industry 4.0 Innovations
11. Explore and Answer key MORE[2] Questions
12. Putting the factors together – Key opportunities, challenges, and risks from Industry 4.0 deployment. What does this mean for Jobs 4.0
13. Student Team Final Presentation

General Guide & Reading

1. https://www.pwc.com/gx/en/industries/industries-4.0/landing-page/industry-4.0-building-your-digital-enterprise-april-2016.pdf
2. https://www.wikiwand.com/en/Fourth_Industrial_Revolution
3. https://www.edb.gov.sg/en/about-edb/media-releases-publications/advanced-manufacturing-release.html

Academic Honesty & Plagiarism
Academic integrity and honesty is essential for the pursuit and acquisition of knowledge. The University and School expect every student to uphold academic integrity & honesty at all times. Academic dishonesty is any misrepresentation with the intent to deceive, or failure to acknowledge the source, or falsification of information, or inaccuracy of statements, or cheating at examinations/tests, or inappropriate use of resources.

Plagiarism is 'the practice of taking someone else's work or ideas and passing them off as one's own' (The New Oxford Dictionary of English). The University and School will not condone plagiarism. Students should adopt this rule - You have the obligation to make clear to the assessor which is your own work, and which is the work of others. Otherwise, your assessor is entitled to assume that everything being presented for assessment is being presented as entirely your own work. This is a minimum standard. In case of any doubts, you should consult your instructor.

Additional guidance is available at:
1. http://www.nus.edu.sg/registrar/adminpolicy/acceptance.html#NUSCodeofStudentConduct
2. Online Module on Plagiarism: http://emodule.nus.edu.sg/ac/

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[2] **Moat** – How do you gain a defensible competitive advantage with the new innovation/technology platform?
Optionality – What new categories in your industry or adjacent industries are you exploring and experimenting with?
Resilience – Where are the points of inflection for you in seizing new emerging markets so you can build resilience to eventual displacement of existing market?
Efficiency – What long-term margin enhancer can you deploy from the new technologies that give you a large step-up in profit/productivity?