MT574 Assignment 1 for Semester 2 of 2022/23

Objective: The objective of this assignment is for you to carry out some independent reading and apply your learning from the first few classes to explain three topics that we covered in these classes.

Due Date: The due date for this assignment is 12:00 on 2nd March 2023

Mark Weighting: This assignment is weighted at 30% of the overall mark for MT574. So, each of the three notes is weighted at 10% of the overall mark for MT574.

The Assignment: Write short notes to apply your learning from the first classes of MT574 to explain each of the three topics below

You should use **<u>one</u>** of these three examples to illustrate your explanation for each note: The evolution of successive generations of one of … (1) a sweeping brush, or (2) a device to measure temperature, or (3) a device to tell time – **all of these in a household context**. You can use the same example to illustrate points that you make in each of the three notes below, or you can use a different example for each note – whichever you find easier.

Note that the objective of the assignment is for you **to explain your knowledge and understanding of each of the three topics below**.

- The three devices **are just examples** which you can use to illustrate and apply your knowledge of the three topics. You just need to explain three topics (Arthur's theory, S-curve, and dominant design) – using any combination of the three devices listed above.
- Don't expand too much on the brief. That could make the assignment more difficult and obscure the objective. Stick to the context that I have given – i.e. a household context.

The three topics that you should write short notes about are:

1) **Brian Arthur's theory of technology:**

> ***"There are three 'fundamental principles' of technology*** *(see the notes, pg 7)*
>
> ***A technology has a purpose, a combination of components, an architecture, and embodies a base principle that exploits some base phenomenon***
>
> ***To understand a Technology means to understand its base principle and how this translates into components that share a working architecture"***
>
> *(Arthur, 2007)*

   Apply Brian Arthur's theory to explain how each of the elements in the quotes above can be applied to your chosen example. Explain briefly what key phenomenon was 'captured and put to use' and whether and how each of the elements in his explanation above changed with evolution through successive generations of your chosen example.

   Note: you do not need to explain the detailed science of the phenomena involved – just identify at a high level what the basic phenomenon was in each example and whether / how it changed with each successive generation of your chosen example.

2) **The S-Curve:** Explain how the concept of an S-Curve can be helpful to a manager to make sense of the evolution of the performance of the technology over time or with input of resources such as research & development.

   In your explanation you should **<u>be particularly careful about the labels applied to the horizontal and vertical axes of the S-Curve</u>**. So, you should think about the performance

parameters on the vertical axis, and how they evolved and changed as the underlying technology evolves and changes, and as the needs and wants of the main markets evolve and change.

3) **A dominant design: (**Abernathy & Utterback, 1975). Use examples to explain the significance of this concept to a manager. For example, what could a manager ***do*** with the insight about a dominant design in your explanation?

Each note (i.e. one for each of three topics) should be about 600 – 1,200 words not including references. For each of your notes on the three topics you should

- Assume that you are preparing a briefing note for managers in a business
- Identify, define, and explain the key concepts as well as the relevant analytical frameworks or theories and appropriate diagrams
- I have given some references below but you should do some research in the library to identify other relevant and recent resources that will help in your analysis

Some Readings

You should find these readings useful to start your work but effective reference to other relevant readings that you find yourself will probably enhance your mark.

Arthur, W. Brian. "The Structure of Invention." Research Policy 36, no. 2 (March 2007): 274–287.

Schilling, Melissa A., and Melissa Esmundo. "Technology S-Curves in Renewable Energy Alternatives: Analysis and Implications for Industry and Government." Energy Policy 37, no. 5 (May 2009): 1767–81.

Schilling, Melissa. "What's Your Best Innovation Bet? By Mapping a Technology's Past, You Can Predict What Future Customers Will Want." Harvard Business Review 95, no. 4 (August 2017): 86–93.

Byun, Jeongeun, Tae-Eung Sung, and Hyun-Woo Park. "Technological Innovation Strategy: How Do Technology Life Cycles Change by Technological Area." Technology Analysis & Strategic Management 30, no. 1 (January 2, 2018): 98–112.

Sood, Ashish, and Gerard J. Tellis. "Technological Evolution and Radical Innovation." Journal of Marketing 69, no. 3 (July 2005): 152–68.

Anderson, Philip, and Michael L. Tushman. "Technological Discontinuities and Dominant Designs: A Cyclical Model of Technological Change." *Administrative Science Quarterly* 35, no. 4 (December 1990): 604–33.

Abernathy, Frederick H., and James M. Utterback. "Patterns of Industrial Innovation." Technology Review 80, no. 7 (July 1978): 40–47. (the pdf is on the Web, not in the Library)

Utterback, James M., and William J. Abernathy. "A Dynamic Model of Process and Product Innovation." *Omega, The International Journal of Management Science* 3, no. 6 (1975): 639–56. (the pdf is on the web, not in the library)

Murmann, Johann Peter, and Koen Frenken. "Toward a Systematic Framework for Research on Dominant Designs, Technological Innovations, and Industrial Change." *Research Policy* 35, no. 7 (September 2006): 925–52.

Srinivasan, Raji, Gary L. Lilien, and Arvind Rangaswamt. “The Emergence of Dominant Designs.” *Journal of Marketing* 70, no. 2 (April 2006): 1–17.

Stolwijk, C. C. M., E. den Hartigh, W. P. M. Vanhaverbeke, J. R. Ortt, and C. van Beers. “Cooperating with Technologically (Dis)Similar Alliance Partners: the Influence of the Technology Life Cycle and the Impact on Innovative and Market Performance.” *Technology Analysis & Strategic Management* 27, no. 8 (September 14, 2015): 925–45.

Nokelainen, Tomi, and Ozgur Dedehayir. “Technological Adoption and Use after Mass Market Displacement: The Case of the LP Record.” *Technovation* 36–37 (February 2015): 65–76.