

TR2202

NATIONAL UNIVERSITY OF SINGAPORE

TR2202 – TECHNOLOGICAL INNOVATION

(Semester I : AY 2003-04)

Time Allowed: 3 Hours

INSTRUCTIONS TO CANDIDATES

1. This examination paper contains **THREE (3) Questions**. You must answer **ALL THE QUESTIONS**.
2. You will be rewarded for writing answers that are thoughtful, creative and concise.
3. The total score for this examination is 100 marks. Please pay attention to the number of marks awarded for each question in deciding how much time to spend on it.
4. This is an open book examination. Students are allowed to bring in any books and any amount of notes. Students were told beforehand to bring in copies of all five case studies discussed during the semester.

QUESTION 1: (50 Marks)

*Instructions: for this question, you are encouraged to refer to the Harvard case study on **Dell**, which you brought into the examination hall.*

Imagine that you are working as a Partner at a venture capital firm. It is now October 1993. During the "October Meeting" (page 12 of the case study), managers at Dell were trying to decide among the 3 battery choices. Realizing that they were running out of cash quickly, the Dell managers tried to approach you, the Venture Capitalist, for funding.

1.1 Being the Venture Capitalist, what criteria would you use to evaluate the investment opportunity, and would you invest?

(10 marks)

1.2 Regardless of whether you decide to invest, you have been asked by Dell managers to provide them with recommendations. Given your understanding of the newness of Li-Ion technology and the newness of the portables market to Dell,

1.2.1 what strategies would you recommend Dell to consider to enter the new portables business?

1.2.2 what are the upside and downside potentials of your proposed entry mechanisms?

1.2.3 what kind of development team should be in place for new product development in Dell?

(30 marks)

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1.3 Ten years pass by... it is now October 2003. Michael Dell yawns and stretches on his couch, happily observing that his stock portfolio is doing well. Suddenly, the telephone rings. It is the new CEO of Ballard Systems (the Canadian fuel cell company that you discussed in class).

Ballard has just learnt that Toshiba and several other companies will soon be replacing the batteries in notebook computers with fuel cells. Toshiba recently demonstrated a prototype that can run on a notebook computer for five hours (it expects to extend that to 40 hours within two years). NEC has been able to shrink these fuel cells so that they can even fit a PDA or mobile phone. Both NEC and Toshiba expect to ship computers running on fuel cells by the end of next year. Apparently, Casio, Sony, Hitachi and Samsung are also working on fuel cell technology. Even Intel recently demonstrated a laptop operating on a fuel cell made by PolyFuel, a company in which it has invested.

Meanwhile, Dell has not invested much in this technology and doesn't even have a patent in that area.

Experts believe that fuel cells will take off as wireless networking encourages more people to buy notebooks instead of desktops. It is nice to have a computer that allows extended periods of use, and doesn't have to be recharged regularly. However they are worried about the safety aspects of carrying methanol (a flammable substance) around as a fuel, especially for passengers bringing notebooks computers onto aircraft.

Ballard would like to know if Dell would like to collaborate with them.

What should Michael Dell do? What options does he face, and which should he pursue? Clearly explain your answer.

(10 marks)

--- END OF QUESTION 1 ---

Question 2: (25 Marks)

An operating system is the basic set of programs and utilities that make your computer run. For any operating system to be useful, we need software vendors to provide useful applications that can run on that operating system, such as office suites, text editors, games, spreadsheets, email programs, graphics applications, scientific programs, documentation, digital camera applications, Web editors and browsers, etc.

Some examples of operating systems include IBM AIX, Sun Solaris, Hewlett Packard UX, and Microsoft Windows. Recently, Linux has emerged as a new and increasingly popular operating system. Linux is being used to run many network servers and as a platform for software development. It is also used by end-users as a desktop, running office suites and web browsers.

Unlike many traditional operating systems, Linux is developed under the GNU General Public License and its source code is freely available to everyone. This however, doesn't mean that Linux and its assorted distributions are free of charge -- companies and developers may charge money, as long as they make the source code available to the public.

While the Linux operating system itself must be distributed with source code, applications that run under Linux may or may not be developed under GPL. It is acceptable to sell software applications that run on linux without distributing the source code itself. For example, applications such as Oracle (a popular database system) and Staroffice (a replacement for Microsoft Office) are not distributed with the source code.

(Sources: www.linux.com and www.linux.org)

According to Christensen, "managers can be extraordinarily effective in managing even the most difficult innovations if they work to understand and harness the principles of disruptive innovation."

2.1 Would you consider Linux a disruptive or sustaining technology? Why?

(5 marks)

2.2 Which are the established firms that are under threat by the emergence of Linux, and why?

(5 marks)

2.3 Suppose you were a manager at an established firm under threat,

- What technology and product-market strategies would you adopt to deal with Linux?
- What kind of organization and team structures would you use to implement your strategies?

(15 marks)

--- END OF QUESTION 2 ---

Question 3 (25 Marks)

PLEASE READ THESE INSTRUCTIONS FIRST:

- Each paragraph below presents a viewpoint.
- State whether you agree or disagree with each viewpoint. Briefly explain your reasons.
- Hint: If you agree, provide supporting evidence; if you disagree, provide an alternative viewpoint. Use the concepts and frameworks discussed in class.
- For each statement below, your explanation should not exceed two handwritten pages.

Viewpoint 1: The creation of standards through network externalities operates just like computer viruses. The more of my friends have computers infected by a particular virus, the more likely it is that my computer will also catch it from them. This allows the virus to eventually become a de-facto standard.

-- 10 marks

Viewpoint 2: In the movie "startup.com", Tom and Kaliel did not place enough importance to managing intellectual property. Instead, they tried a strategy of building up complementary assets such as branding and distribution channels. That is why they failed.

-- 10 marks

Viewpoint 3: The emergence of a dominant design is often accompanied by a shift from product to process innovation, as well as a move to mass-production and economies of scale. At that point, it is important for a manager to aim for efficiency and stop encouraging creativity.

-- 5 marks

- END OF PAPER -