

**THE OPEN UNIVERSITY OF SRI LANKA**  
**FACULTY OF ENGINEERING TECHNOLOGY**  
**MASTER OF TECHNOLOGY IN INDUSTRIAL ENGINEERING – LEVEL 7**  
**FINAL EXAMINATION – 2010/2011**  
**MEX 7118 – TECHNOLOGY MANAGEMENT**



**DATE** : 13 March 2011  
**TIME** : 0930 hrs – 1230 hrs  
**DURATION** : Three (03) hours

**Answer five (05) questions including Question 01**

1. Case Study: "Plug into Technology"

In 1967, Dr. Kim Joo Jin was teaching in the United States when his father, a Korean businessman, asked for his help with a new business idea, semiconductor packaging. Thus, in 1968, Anam Industrial Co. came into being as a semiconductor (or chip) packaging firm in Korea. It is one of the largest semiconductor packaging firms in the world. In 1992, its sales were US \$1.8 billion and it employed over 6,000 staff. Anam now controls about 40% of the world market for contract semiconductor packaging. Its customers include Motorola, Philips, Siemens, NEC and Toshiba.

When Anam was first established in 1968, Korea did not have an electronics industry. Thus, Anam could be said to have started off with a clear strategy of pursuing expert-led development.

From 1968 to about 1980, Anam offered low cost operation for semiconductor assembly. The firm started off by utilizing depreciated equipment shipped over from American customers. It also imported the wafers from Texas Instruments and RCA. Most of the design skills and related production skills were obtained as part of the subcontracting operation. Very little product and process innovation was carried out during this period, Anam established a reputation for being a very reliable Original Equipment Manufacturer (OEM).

During the early 1980s the chip industry boomed throughout the world. In 1982, Kim joined the board of VLSI, a California-based semiconductor firm, that has since helped Anam get into the application specific integrated circuit (ASIC) design business. During this period there was very little product innovation at Anam. However, incremental process innovations, to improve output rates, were introduced with the assistance of the big overseas buyers. During this period, other than subcontracting, Anam used people-based mechanisms, such as focused training of existing staff, recruitment of PhD's and hiring of experts as consultants, extensively for acquiring technology.

During 1984 to 1985, the demand on Anam for better quality output increased. To respond to the increased demands, people-based mechanisms for acquiring technology were strengthened. Also, in 1984, the firm commenced organized R&D efforts by establishing its Engineering and R&D Department (ERD) with the assistance of its largest US client – Texas Instruments. The establishment of ERD witnessed the beginning of product innovation but still the emphasis was on process innovations aimed at developing improved processes for packaging.

From 1985 to 1988 Anam went through a period of “accelerated in-house learning”, which reflected its desire to firmly establish itself as a major international player in semiconductor packaging. Anam continued to emphasize people-based mechanisms. The hiring of expatriate nationals was emphasized in addition to extensive training of its engineers. Increasing complexity of packaging, rapid growth in demand, and intensifying pressures for high quality and reliability led to process and product innovations on a much higher scale than in the previous stage. However, Anam still emphasized process innovation during this period.

Since 1980, Anam has been trying to gain recognition not only as a leading chip packager, but also a major product innovator. Anam has established alliances with IBM, Texas Instruments, and Motorola to jointly develop future packages and processes. Extensive use is made of CAD facilities for circuit designs and process modeling. Anam also does complex ASIC design work for Samsung and Lucky Goldstar (LG), two leading Korean firms in the electronics industry. Today, Anam makes semiconductors for a variety of applications that includes computer memory cards and cellular phones.

Kim has also formed corporate engineering, automation and mechanization teams in South Korea, Europe, and United States to keep Anam at the cutting edge of relevant technologies. These teams, which include highly trained PhDs, have been trained to anticipate customers’ needs one to two years in the future.

Today Anam is expanding with a view towards getting into trunked radio systems for use by commercial vehicles. Its technology partner in this venture is Geotek Communications inc. Anam is also working with Australia’s Cedcom Network Systems on a very energy efficient wireless networking system aimed at the portable computer market. These are untested, unproven technologies. Yet, Kim believes that if Anam waits until products become successful the large corporations will get the business. Kim says that his recipe for success is to plug in very early into future technologies with great potential, before others clamber upon the bandwagon. Considering Anam’s track record, there seems to be no reason to doubt the eventual success of Kim’s new thrusts.

- a) Discuss how the company has accumulated its technological capabilities over the years with specific references to key milestones in the development of the company. *(14 Marks)*
- b) Comment on the suitability of their technology acquisition methodologies. Suggest any other suitable means of technology acquisition, if the current methods are not the most appropriate. *(18 Marks)*
2. "Technological components and technological capabilities are two sides of the same coin". Explain using an industry known to you. *(17 Marks)*
3. Illustrate how technology can influence the competitive forces that determine an industry structure (using Michael Porter's five forces model) based on the example of an industry known to you *(17 Marks)*
4. Explain the importance of technology forecasting and briefly compare different methods of forecasting. *(17 Marks)*
5. (a) Briefly describe the stages of the technological innovation process. *(7 Marks)*
- (b) Identify the possible stakeholders in a cluster that can be formed in an industry known to you and comment on the advantages of forming the cluster for that particular industry. *(10 Marks)*
6. Select two methods of technology transfer most appropriate for the industry you are engaged in and compare the advantages and disadvantages of employing these methods for technology transfer. *(17 Marks)*
7. Discuss how a developing country firm could develop its research and development capabilities under the current economic environment. *(17 Marks)*

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