

Gregory framework of technology management



There are several technology management models. The Gregory framework has been proposed in 1995 by M. J. Gregory. This process has been built based on previous work on technology management. There are several elements have been identified previously link to the technology management within organizations. Competence and capability are important to be analyzed within the organization to understand the strength and weakness. They also reflect how well the organization can satisfy the customers and how fast the organization may response the market. According to this analysis, the company can identify the suitable technology strategy. Organization learning is also widely used concept in technology management. R&D development and new product introduction are the processes which technology is applied in. Innovation activities are taken to deliver the customer satisfaction. [Gregory, 1995] However, there is no agreed framework for technology management has been proposed.

Based on the literature research on previous work and the development of technology management in many companies, Gregory proposed the 5 processes framework for technology management. The 5 processes have been identified as below:

Identification

Selection

Acquisition

Exploitation

Protection

It aims to identify the suitable technologies can be used now or in the future in the identification phase. The identification will be conducted through a systematic review of existing technology, emerging technology and in-house developed technology. [Leonard, 1992] The information needed in this phase to conduct review includes external drivers, marketing analysis, stakeholder information, and futurology understanding, etc. A group of approaches may be applied here, such as PESTEL.

Selection is the process to determine the technology can be developed within the company. The process will be aligned with company's strategy. The criteria in this phase are usually from different sources. Technology audit, SWOT analysis, and R&D portfolio analysis are the approaches usually can be used in this process.

It aims to find out the suitable method to acquire the technology and applied in the organization in the acquisition phase. There are several means to obtain the technology. Companies may choose to develop the technology by itself by R&D activities or organizational learning. They also may choose to collaborate with others as suppliers, or partners. Technology may also be purchased via brokers or licenses, etc. The acquisition means should be considered to be suitable with company strategy by considering the complexity of R&D, risk management, and financial limitation, etc.

The exploitation process is to convert the obtained technology into the practical production to gain the financial profit. The key point here is to apply the scientific technology into products can gain the maximum profit.

Technology fusion is an important concept here to explore new function. The

exploitation is the only process in this framework able to generate profit to cover all the technical investment.

The protection phase is about how to protect or maintain the knowledge and relative expertise in the manufacturing process. The traditional way to protect the technology is the legal method as licensing or patenting.

[Gregory, 1995]

This process framework is a general model for technology management to be used in organizations. This process is not a defined model but comes from the process those companies apply the technology. It reflects the routine the management takes to manage technology within the company. The framework also associates all the relative activities which include innovation, product technology, production technology, etc. into the model. This framework also enables the company to align the technological considerations with business strategy. Every process in this framework needs a set of activities and criteria to implement. Thus this framework also enables the management to evaluate the whole processes and manage the relative dimensions. Furthermore, a process-based model can make the technology management process in company visible and transparent. [WMG, 2010]

However, few companies may apply this model into their business. The process framework includes a variety of activities in different process and related to different function. But in many companies, the activities have been included in other business process as new product introduction,

marketing strategy setting, etc. Thus there is a challenge for companies to apply this model entirely. [WMG, 2010]

Holistic approach in technology management

‘ Management of technology links engineering, science, and management disciplines to address the planning, development, and implementation of technological capabilities to shape and accomplish the strategic and operational objectives of an organization’ [National Research Council, 1987]

Refer to the definition of technology management, it requires collaboration of the R&D, manufacturing, service and operation function, marketing, finance, and HR function in the company. Thus a holistic approach needs to be taken to manage technology in the company. It will be divided to several reasons to explain in below paragraph and what are the benefits.

Firstly, technology management involves multi-functions within the organization. In a company, not only engineering department or R&D department is responsible for technology management, all the functions within the organization are more or less related to technology. [WMG, 2010]

Thus technology management requires a system of integration within the organization. For example, the product development and design process has been considered as a traditional technical activity. Engineers and designers can work individually towards the goals. However, this kind of isolated work can result an unsatisfied output. The engineering department may complain the marketing department for the poor data; the production department may complain engineering department for design need rework. Without

crosscutting functions, it will not only raise the cost but also cause the friction between departments.

Secondly, technology management requires broad knowledge within the organization as business strategy, marketing, customers, competitors, existing product and service, SWOT, etc. Thus it is important to understand the overall sense to manage technology effectively. Furthermore, it is important to consider technology relative issues with the internal information and external information: how technology may influence the operation within the business; how the limitations and requirements of the business may affect the technical decision. If the technology management can't achieve the system integration, it may lead to products can't meet the market's requirements and customer's expectation since the technology management hasn't been associated with marketing activities; project may last for long time with back and forth process because necessary technical information hasn't been input; as well as cost will be increased; company may response to the market slower. Consequently the company may gain fewer profit compare to it could gain. [Steele, 1989]

Thirdly, technology is not the isolated content within technology management. The key elements in technology management are management of innovation process, development of technology, technology utilization to obtain profit. [Badawy, 2009] The activities of technology management include development and research; design; manufacturing and operation; organizational learning; technology transfer, etc. Based on this perspective, technology management is not only a process to be applied in R&D but in a broad range of functional area. All the activities within

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technology management are used to align the technology strategy with company strategy. The company structure and business strategy are the important factors to determine the technology strategy. [Pavitt, 1999] The technology strategy may be set to align with company's long-term profitable project or short-term project to compete with other companies on the market. The technology management would consider all the parts inside of the organization to ensure it can align with business strategy.

Fourthly, Technology is a method instead of objective. [WMG, 2010]

Technology can only be applied through a fundamental structure instead of existing alone. [Wyk, 2005] Alternatively, the technology has to be implemented to enable the firm's profitability and growth. The process to utilize technology is insisted of a set of cross function activities. Thus the technology would not be existed isolated or developed without business objectives.

As above analysis, it can ensure the maximum profitable though a holistic approach in technology management. For example, the operation management aims to drive the whole processes as quick as possible while eliminating mistakes, delays, etc. The effective operation management not only requires the output can satisfy customers but also generates profits to company. A proper technology strategy here can enable the operation processes to proceed faster and effective by avoiding unsuitable product strategy has been processed. Holistic approach can also ensure the output is marketable by avoid the lack of external information, which cause high risk to fail in the market. The holistic approach also can ensure the technology strategy to align with the overall business strategy. Furthermore, it also

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helps the company to identify the proper way and pace to adopt the technology.

The collaboration case study between Sony and Ericsson

Nowadays, it's very common for companies from different countries and sector to work together. In 2001, a joint venture company - Sony Ericsson Mobile communication has been established by a Japanese electronics company Sony Corporation and Swedish telecommunications company Ericsson. [Caroline & Sanja, 2007] The aim of this cooperation is to produce the mobile phone with multimedia communication solution to customers all over the world. The initial for this collaboration is to associate the Sony's multimedia consumer electronics expertise and Ericsson's technical knowledge in telecommunications. Once Sony Ericsson established, both of the companies stopped their individual mobile business. The Sony Ericsson Mobile Communications is a London-based 50: 50 joint venture business. Before the collaboration, Ericsson ran its mobile business in the market for years and obtained 10. 7% in the handset market in 2000. It has a great loss when faced the cheaper mobile phone producer as Nokia. Mobile phone is one of the core businesses in Ericsson. Thus they can't abandon this part of business. Ericsson had the advantage of the leading infrastructure. Meanwhile, Sony had just 10% market share in Japanese handset market and 1% in all over the world. However, Sony obtained the multimedia technology enable to enter the global market. Sony Ericsson employed 2500 staff from Ericsson and 1000 staff from Sony. [III-Vs Review, 2001] Sony and Ericsson both obtain 50% of the capital. And each of them obtains half of the board's positions. This business had been expected to take over all the mobile phone

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technology from the parents and to be able to compete with Nokia and Motorola in the market.

How does the collaboration between Sony and Ericsson conducted

The initial of Sony is to look for a partner to explore the GSM and CDMA technologies. Sony had soft alliance with Qualcomm and Siemens in the 1990s. In the experience with Qualcomm, Sony developed CDMA technology together with Qualcomm, but products have been sold separated under two brand name. The competition leaded this soft alliance to the end as well as the collaboration with Siemens. However, Sony realized it's a huge investment to conduct R&D alone in telecom technology. Before Sony and Ericsson arrived a Memorandum of Understanding, many partner candidates as Motorola, Alcatel and Nokia had been considered. At that time, Ericsson gained a big operation loss in 2000. And it was looking for a partner to take over the handsets operations. There were many potential candidates had been chose. Sony was one of them. Sony held the advantage of the multimedia consumer electronics expertise but had been limited on designing and innovations. Initially, Sony want to take over all the operation include the core technology, design, distribution and marketing. However, the top management of Ericsson didn't want to abandon the core technology of handset, which was developed in Ericsson Mobile Platforms (EMP). Thus Ericsson proposed soft alliance which had been turned down by Sony who insisted the joint venture deal.

Ericsson

Sony

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Original staff numbers in 2001 in Joint venture

3000

1500

Market knowledge - Telecom operating

valuable

Limited

Market Knowledge - multimedia consumer electronics

limited

valuable

Handset technology

valuable

Don't want cash contribution

Fig1. Sony-Ericsson partnership when merge

According to the Fig1, Ericsson obtained the core handset technology, however Sony at that moment don't want any cash contribution. In that time, Ericsson played the major role in that deal according to its global market share and handset technology. Thus the Ericsson Mobile Platforms has been excluded in the joint venture deal. Thus EMP has to reduce the operating cost and sell technology to other company as LG.

The final agreement was finalized in the end of 2000 between the two companies. Then followed a group of discussion on how to conduct this collaboration in terms of management, manufacturing, Research and Development, and governance, etc. The board of the joint venture was formed 50-50 from two companies, and with a president to be named by Sony. 1, 500 staff came from Sony and Ericsson brought its organization of products, sales and marketing. The new joint venture has been named Sony Ericsson Mobile Communications. There were many challenge issues for two big company's collaboration. The intellectual property rights (IPR) is one of the critical issues. Since it was very difficult to identify how much the two companies should transfer IPR to the joint venture at the beginning. Sony built up a team called Functional Integration Team to tackle the joint venture issues. Sony decided to take over the management of manufacturing by controlling the Sony-Ericsson's own production plant with Chinese partners. And Sony also is in charge of the supply chain management which Ericsson had long-term operational experience in. Thus Sony took many important positions in Sony-Ericsson management: Sony executives had been transferred to take over the business units and supply chain management. While Ericsson ex-executives took over HR and other departments. The operation of the joint venture started at Oct-1 2001. [Sigurdson, 2004]

There are three main issues occurred at the beginning of collaboration in Sony-Ericsson. Design is one of the issues. Sony's designers had different understanding on the outlook and functions with the Ericsson's designers. For example, the Sony designers proposed that streamline shape of mobile phone is better than straight line mobile phone. However, it's difficult for

Sony's designers to explain this concept to Ericsson's designers. In Sony, the information of design philosophy is tacit instead of explicit, thus in the joint venture, designers from each company can't understand the in-house words from each other. This was solved by re-designing a new set of internal terms in Sony-Ericsson. The few number of published mobile phone model lead to a big loss in the first two years. However, another side, the conflicts between the two types of culture also enabled Sony-Ericsson to enter the international market. There was an argument on the product design in Japanese market. The Sony designers claimed that design is the most important part and Japanese market need attention due to the customers' high standard needs. Japanese market is the most advanced mobile phone market and more than 10 major mobile phone manufacturers existed in the market at that time. Sony-Ericsson obtained a lot of important experience, and also able to learn the technology trends from Japanese market.

The second issue in Sony-Ericsson is the supply chain management, which didn't work well. Firstly, the manufacturing had been divided into three manufacturing facilities in Sony-Ericsson: Ericsson manufacturing contracts with EMS, Sony manufacturing company, Ericsson manufacturing plant in China. There was a huge challenge on managing the manufacturing since it's very difficult to manufacture products ordered and meet the requirement of quality. Especially the outsource supplier - EMS, which met great challenge on delivering qualified products on time. The different type of manufacturing source brought Sony-Ericsson a critical problem. Secondly, Time to market is a very important criterion in mobile phone market due to the fierce competition. The management of platform in Sony-Ericsson is a weak point

compare to the other competitors as Samsung and Nokia. Due to lack of management, in the platform, it was found the new orders were laid without organization. This became worse when the marketing strategy had been set to increase the market share. The issue occurred because Sony-Ericsson lack the knowledge on management of production process and supply chain management.

The third issue was technology transfer. Sony contributed the screen and camera technology to Sony-Ericsson. All the related technology was explored in Japan and transferred to Europe. It took a long time for the technology can be applied based on the telecom infrastructure in Europe. The core handset technology came from Ericsson. EMP combined the software and chip as product, which is a new business model. As above information indicated, EMP didn't be included in the joint venture deal. And the cost of EMP was really high because of the exploration of 3G and GSM at the same time. Thus EMP served Sony-Ericsson as customer, as well as Siemens, LG, and Samsung.

In the first year of the joint venture's operation, Sony-Ericsson lost 292 million and didn't made profit until 2003. Sony and Ericsson were not satisfied with the performance of the joint venture. However, they still tried to inject capital into Sony-Ericsson in 2003. The Sony-Ericsson walkman branded mobile was doing well at the beginning. However, it had been over taken by music mobile from other manufacturer as iPhone and other brand recent years.

The collaboration between the two big companies has been considered as one of the most complex one. It took long time to implement and

consolidate. Compare to the previous soft alliances, Sony aimed to build a stable collaboration to expand the mobile business. In summary, the joint venture is able to combine the technical strength from both sides. As identified before, Sony is good at the multimedia customer electronics. The first series of products is walkman portfolio. Sony transferred their multimedia technology to Sony-Ericsson. While Ericsson contributed the core handset technology and telecom infrastructure which enable Sony-Ericsson to release series of mobile phone based on cooperation with telecom operators. But due to Sony don't want to invest at the beginning. The core handset technology still has been kept in EMP. This is one of the mistakes of Sony in this collaboration. EMP was focusing on integration of software to system. And it became one of the advanced research center on GSM and 3G. However the operation cost of EMP kept on increasing. Sony-Ericsson purchased chip with software from EMP, which was a high-cost component. Even though, EMP couldn't balance the cost and income. It had to supply other mobile companies for sustaining. Sony-Ericsson can't involve the management of the EMP. This will become a weak point in the future.

The managers of Sony-Ericsson initially came from Sony and Ericsson, but the management was isolated from Sony and Ericsson. The challenge issue here is the different culture of the two companies. Globalization is a common phenomenon everywhere. Even difference of culture can be solved in personal level. It's quite difficult to merge a big group of people with totally different culture. Sony is a big international company. However, it still holds a perspective of business strategy, marketing, design, and product development, etc different with other western companies. Compare to Sony,

Ericsson is a low masculinity organization which has low work stress, high gender quality, equality between employees, and team work. In traditional Japanese company, staff can't question the boss's instruction which is observation in western company. Thus Sony-Ericsson created their own company value as ' Passionate, Innovation and Responsive'. [Caroline & Sanja, 2007]

Phase1

Culture Awareness

Phase2

Creating new culture

Phase3

Managing SEMC Culture

Seminar Workshop Leadership Programs

Fig2. Developing Sony-Ericsson culture [Caroline & Sanja, 2007]

The Fig2 indicates how Sony-Ericsson's own culture has been developed. The difference of business strategy between the two organization cause many friction in the collaboration. The CEO of Sony mentioned this issue in 2008, that if the Sony-Ericsson can't work towards the same goal, it's very difficult for this collaboration to continue. Generally speaking, the joint venture ran with several issues at the first two years. This directly affected the financial performance of Sony-Ericsson. Due to this bad performance, it almost led to an end of the collaboration. However, finally both Sony and Ericsson injected a certain amount of capital to the joint venture. Sony-Ericsson

performs relatively well. But this collaboration didn't enable Sony-Ericsson to compete with Nokia and Samsung in the market.

Discussion on outcome from Sony and Ericsson's point of views in terms of success and failure of this collaboration

From both of Sony and Ericsson's point of views, it is benefit to look for a partner to establish a joint venture. This alliance can bring advantage as risk reduction, international expansion, technology transfer, sharing capital facilities and equipment. Once the joint venture establishes, the tangible and intangible assets will be transferred from parents to the joint venture. The tangible assets include capital facilities and equipment, technology and patents. The intangible assets may include the brand name, explored market, reputation of company, etc.

Sony was in a reasonable good place in Japan before the collaboration. And they found the mobile business is a growing business. However, Sony was not a major player in GSM market in the global market. However, Sony is very excellent on product design. It wouldn't be difficult for Sony to gain more market share from the initial 2%. But if Sony want to be a major player, it's not enough to rely on product design and multimedia expertise only. According to the previous experience on soft alliance, Sony realized joint venture would be the best choice to work with partner in this business. The benefit to conduct this collaboration with Ericsson is Ericsson is experienced in European market; It obtains the infrastructure of telecom and it has handset technology; in 2000, Ericsson rank number 3 in mobile phone market. Sony can enter European market easily with this partner and also

can built the brand name for other business of Sony as TV. Sony doesn't have to invest on infrastructure and technology on this deal. However, the failure of this collaboration to Sony is the EMP. Sony didn't want to invest in EMP initially in 2000. Consequently Sony is not able to learn from the Ericsson for the core handset technology. Furthermore, EMP is one of the most advanced research center for GSM and 3G technology. To sustain the operation, EMP sells products to Sony-Ericsson, Samsung, and Nokia. And Sony-Ericsson didn't have any advantage from it. From Sony's point of view, it's able to enter the international mainstream market of mobile phone via the joint venture. In this collaboration, Sony can utilize the advantage of product design. Sony also learn a lot from western company on business management for example supply chain management, which contributes a lot on Sony's global expansion. The experience of collaboration also has been considered as internal ' good practice '. After collaborated with Ericsson, Sony also collaborates with companies as DoCoMo in other business.

[Sigurdson, 2004] The performance of Sony-Ericsson compare to the initial purpose isn't so good. Especially in 2008, Sony and Ericsson had to inject 1.8 million Euro to Sony-Ericsson again to overcome the economic crisis. And Sony showed disappoint on this collaboration in terms of disagreement on business strategy. Up to now, even Sony entered the mainstream market. It still can't compete with other major competitors in the market.

Before the collaboration, Ericsson obtained 10% market share in the mobile phone market. But Ericsson kept on losing money and market share.

Meanwhile, the high operation cost of EMP drive the company to seek for a partner to share or take over the operation cost. Ericsson has a good base in

terms of infrastructure, handset technology, and operator relationship.

However, the mainstream of mobile phone became multi-functional mobile.

Ericsson has no experience and strength on that. Sony became the best choice to cooperate. The initial idea of Ericsson is to sell all handset business include the core technology. But top management didn't want to abandon the mobile business and then it's very important to keep the technology within the company. The collaboration with Sony enables Ericsson to focus on 3G technology development. From Ericsson's point of view, the collaboration with Sony brought them technology of multimedia expertise which Sony is one of the advanced companies in the world. However, all the Research and Development of screen and camera are conducted in Japan directly. Ericsson has not been involved in it. The success point of this collaboration to Ericsson, it's able to produce the mobile phone to satisfy customers' increasing needs. Through the collaboration, Ericsson also learned product design from Sony, which is different with Ericsson. And the Japan-based company enable the company understand the trends from the advanced mobile market. Furthermore, Ericsson also learned management skill from the Japanese company. But according to the performance of Sony-Ericsson, the market share can't catch with Nokia and Samsung. They have fiercely competition with Motorola and LG in the main market.

From both of their view, this collaboration is not easy to be conducted. Due to many issues and conflicts, Sony-Ericsson can't achieve a maximum profit and increase the market share as expected. Technically, Sony Ericsson combined the core technology from Ericsson mobile business and Sony's multimedia technology. This form of collaboration worked well in the first 3

years. Walkman mobile phone was released very successful. However, today's mobile phone has been expected a lot from customers. Sony-Ericsson didn't cooperate well to work on the R&D on new technology. The two companies still have a lot of conflicts on the business concept, and the inefficacy management on that may lead to an end of the cooperation. From the point view of the profitability, this collaboration didn't achieve the expectation in the first two years until the third quarter of 2003. During the economic crisis period, Sony-Ericsson experienced tough time. The parent companies have expected payback in the last 10 years. The further research can be conducted to discuss whether Sony-Ericsson can be more successful. And it also can be compared to the collaboration between Siemens and BenQ.