

**A Workforce Value Chain Analysis in High Tech Multinational
Corporations' Electronics Manufacturing in Penang**

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Abstrak

Pulau Pinang telah menjadi pusat kepada syarikat-syarikat multinasional semenjak tahun 1970an. Syarikat-syarikat berteknologi tinggi segera mengiktiraf Pulau Pinang sebagai kanchah pelaburan luar pesisir mereka dalam sekitaran inovasi yang sangat baik, berasaskan kedapatan tenaga kerja teknikal berkemahiran tinggi dan struktur-struktur berkos rendah.

Sebagai hub teknologi yang aktif selama lebih 30 tahun, Pulau Pinang sedar akan kebergantungan tenaga kerjanya yang tinggi terhadap pelaburan terus luar negara (FDI). Semenjak awal Januari 2009, banyak syarikat multinasional milik luar telah memberhentikan pekerja-pekerja mereka akibat kemerosotan ekonomi, yang turut menjejaskan ekonomi Amerika dengan teruk. Kadar pengangguran akan meningkat disebabkan keadaan yang dinyatakan; pengangguran adalah petunjuk kelembapan, dan akan hanya meningkat apabila masalah ekonomi mulai meningkat. Dalam keadaan demikian, bagaimakah kita dapat menstabilkan kadar pekerjaan dan tenaga kerja secara menyeluruh tanpa bergantung sepenuhnya kepada kemelesetan ekonomi Negara-negara penyumbang FDI? Penasihat Perniagaan KPMG, Woon Tai, dan Pengerusi Industri Elektronik Malaysia-Amerika, Datuk Wong Siew Hai, melantunkan pendapat bahawa kestabilan pekerjaan dalam FDI syarikat elektronik dan elektrik (E&E) dijangka mengembang dan meningkat dalam rantaian nilai tenaga kerja.

Penyelidikan ini bertujuan untuk meneroka syarikat pelaburan MNC peneraju dan menyelidik rantaian nilai tenaga kerjanya untuk kelestarian dan kemandirian syarikat. Pelaburan MNC ini dianalisa dan dinilai akan pengaruh dan kesannya untuk memberi dorongan ekonomi dan politik untuk reformasi struktur tenaga kerja. Juga akan diteroka ialah sama ada hasil luaran yang dijana oleh FDI memberi kesan positif untuk mendorong kerajaan

Malaysia m elakukan perubahan polisi tenaga kerja dengan segera, dalam aspek pendidikan dan aspek-aspek lain.

Abstract

Penang has been a hub for multinational companies (MNCs') in Asia since the 1970s (Malaysian Business, 2004). High-technology companies quickly recognised Penang as the hotbed for their offshore investment due to the vast pool of technical talents and low-cost structures, and thus provides an excellent environment for innovation.

Penang, as the thriving technology hub for more than 30 years, is highly aware that the workforce dependency to foreign direct investment (FDI) is tremendous. Since the beginning of January 2009, many foreign owned MNCs' had laid off their workers due to the economic recession, which hit the American economy badly. The escalated unemployment rate is a lagging indicator, which often starts to rise only after economic trouble starts mounting. As such, how can we possibly stabilise the employment rate and the workforce in totality without fully depending upon the FDI host countries' economic fluctuation? KMPG Business Advisor, Woon Tai, and the Malaysian American Electronics Industry's chairman, Datuk Wong Siew Hai echoed that the employment stability in FDI especially the electronics and electrical (E&E) companies are expected to expand and move up the workforce value chain.

The present research aims to explore the depth in the pioneer MNC investment company and to investigate on workforce value chain for sustainability and survival. Influence from the MNCs' investment is analysed, and evaluated if it exert strong economic and political push for a workforce structural reform. Another exploratory area is on whether the externalities generated by the FDI have positive effects to create enough urgency to the Malaysia government for human capital policy change either in education or in others.

CHAPTER 1 INTRODUCTION

1.0 Background of the Study

Malaysia began as an agro-based economy after its independence in 1957. In a span of three decades, and by mid-1980s, manufacturing had overtaken agriculture as the main contributor to the country's Gross Domestic Product (GDP) (StarBiz, April 2009). Manufacturing contributed approximately 80 percent of an overall country's export, and this placed Malaysia as the 17th country in the world as an exporting nation (Raja Musa, FMM, 2009). The high inflow of Foreign Direct Investment (hereafter FDI) made possible for Malaysia to break away from its overdependence on commodities. However, a recently published Economic Report from the Finance Ministry has put this sector at the crossroad as GDP; employment rate contributing by this manufacturing sector is losing out as the crucial component in this economy (Raja Musa, FMM, 2009).

The focus on Penang, as one of the major contributing states in Malaysia's foreign direct investment (FDI), is crucial, due to the vast manufacturing investment by many foreign-owned multinational corporations (MNC's) in the state. Being the third largest economy in Malaysia, Penang's manufacturing sector contributed 42.9 percent of the state's GDP in 2005 (Penang Economy Statistics, 2005). Ironically, this sector has become a double-edged sword, especially during the current economic downturn. Penang, which was once a leading state in Malaysia with an international presence and outlook, is currently experiencing a gradual decline of its FDI. The indicator dropped from RM 3.9 billion in 2006, or number two amongst the states in Malaysia, to RM 3.1 billion in 2007, or number five amongst the states, went down in the pecking order to states such as Johor, with RM 6.7 billion, Kedah, with RM 6.1

billión, Selangor, with RM 4.2 billion, and Terengganu, with RM 3.3 billion (Penang Economic Statistics, 2005).

The FDI in Penang is largely evolved in the electronic and electrical (E&E) sector, which is the largest manufacturing investment in Penang. There are 190 registered companies in the E&E sector out of the 2965 companies spread across in 19 sectors (Invest Penang, 2009). The sector recorded an employment of 32.7 percent during Q3, 2005, and evolved as the highest employment sector (Penang Economy Statistics, 2005). Similarly, this sector was also the major retrenchment contributor in 2008, with a record high of 18,655 Malaysians being released by their companies (StarBiz, April 2009), since Penang's unemployment outlook is 'symbiotically' related to the FDI. There has been a call for the Government to review the structural issues in the nation's workforce. The Chairman of the Malaysian American Electronics Industry, Datuk Wong Siew Hai, believed that efforts in enhancing the country's human resource skills, and addressing the skills set gap between the industry needs and the universities curricula were critical to the development and value of the local workforce (NST, November 2007). Penang has to address the issues direct to the human capital investment and moving up the workforce value chain. It is inevitable if the trend continues and eventually the state would be losing its grip in terms of cost competitiveness to manufacturing competitor countries like China and Vietnam (Malaysian Business, 2007).

Hence, is shifting the workforce value chain the primary focus to address the workforce sustainability when it comes to FDI issues in the E&E sector in Penang? The most apparent Government policy on human resource capital investment is in the Second Industrial Malaysia Plan (IMP2) 1996 – 2005, which is to invest and push the whole value chain to a higher level through productivity-driven growth in utilising

high technology (Malaysian Business, 2007). The apparent results of this policy in assisting the state in weathering foreign economy influence when it comes to workforce resilience need to be examined. Is this Plan showing significant push towards workforce structural reform?

The research will explore a pioneer research and development (R&D) company Altera Corporation as a model reference, looking into its workforce structure and the way knowledge is managed within the organisation. The uniqueness of the work affects how the firm manages its employees, particularly regarding how they work together and how they are compensated (Lepak and Snell, 1999). The skills set gained through innate abilities or formal education, and industry or task skills accumulated by working in one industry for different firms are differentiated. An R&D deployment company like Altera Corporation will provide a clear view of its philosophy in human capital value, especially the high degree of intensive specific learning, and knowledge gained, which is difficult to duplicate. The potentials of training programmes that the organisation has developed to bring changes on the human capital in Penang, especially through the transformation of the E&E manufacturing environment into a high technology R&D facility are deliberated. The research will conclude with the importance of value workforce to transform the sector, in order to create a sustainable and quality workforce contributing to FDI in the E&E sector, primarily in Penang.

1.1 Problem Statement

Penang, for the past 30 years in the E&E sector is involved in “screwdriver” activities, mainly to assemble the components and test the parts for quality check (assembly and test) (StarBiz, June 2009). A statement addressed by the Vice

President of Noordin Sopiee and Associates Sdn. Bhd. Madam Tan Siok Choo (StarBiz, June 2009, pp.SBW9), "Malaysia needs to re-evaluate whether it wants to remain an assembly and test site for MNCs', fit the overall Penang profile for the past thirty years. She also mentioned that for Malaysia to stay competitive in the E&E sector, moving up the value chain in the overall workforce reform might be the solution.

The issues addressed is timely because Penang is slowly seeing the investment out-flowing to countries like China and Vietnam, and the biggest investment company, Intel Corporation, is signalling the tide of change by pulling the resources out from Penang to reinvest in Vietnam as the green field for the test and assembly site. In this decision, 1000 employees were affected by the manufacturing plant consolidation (ZDNet Asia, January 2009). These are the many opinions and 'bad news' received when the global economy is hit by a financial crisis. Taking this a step forward in analysing the workforce pattern and value chain will be a proactive step towards a more sustainable development and with this research; I intend to foster the linkage between these factors.

The present study involves investigation on the approach of human capital investment and on how these factors correspond with the foreign owned MNCs' investment structure in Penang. In particular, it seeks to understand in what way the value chain should be built upon as the platform to develop the Penang workforce that are heavily dependent on the foreign owned MNCs. One way is to learn from and adopt the strategies of the pioneer MNC, by investing in human resources in a well-facilitated R&D plant to stay competitive towards other developing green fields that are more cost competitive in terms of manufacturing in this sector.

In summary, the crucial factors are workforce disposal and the quality of the organisation's workforce that will be vital in providing a competitive advantage over competitors. The long standing Government policies and implementations push in human resource development in focus of manufacturing sector need to be addressed and assessed on ways in improvising the sustain the MNCs' investments within.

1.2 Objectives

This research commences with the study on a firm that may gain from its human capital; it depends on the potential of the human capital to add to the firm's core competencies or competitive advantage (Lepak and Snell, 1999). Altera Corporation, which is a foreign-owned MNC, pioneering in R&D facilities in Penang, will be used as a benchmark company in reflecting the human capital investment. Reviewing the value chain of Altera's workforce versus other major MNCs' in steering a change in the business structure and investment profile is crucial for this research under the workforce value-chain aspect. The following success indicators are used as a fundamental guide in constructing the interviews questions. With these outline, it will act as a primary guide to probe deeper into the human capital value chains activities.

- I. Recruitment composition – job descriptions for vacancies.
- II. Hiring ratio – manufacturing versus R&D.
- III. Areas of future project development.
- IV. Investment projections – facilities and human resource capital.

The researcher intends to gather and analyse the above-mentioned information through a preliminary case study on Altera's human capital structure and its core value towards the investment in Penang.

CHAPTER 2 INDUSTRY HISTORY AND OVERVIEW

2.0 Introduction

This chapter is providing an overview of the manufacturing environment in Penang. The state has vast FDI influence and it's the key for business development and growth. A typical FDI dependent resource and also a good study environment in terms of the human capital disposal. The subsequent intro is focusing on Altera Corporation as the main company for this case study. Reason being of this selection is its pioneering business investment structure as a fully R&D centre in the E&E sector. That will provide a better understanding and ground in terms of value in the knowledge workforce versus a low technology manufacturing environment. Literature adaptations in human capital intellectual, knowledge management and organisational competitiveness, and the Munich Knowledge management model are a few identified primary theoretical considerations for this research. The relevancy of connecting the knowledge management and the understanding of what exactly the capital intellectual perceived, will explore the value for FDI in terms of human capital sustainability.

2.1 Industry Overview

The semiconductor industry is the major sector in Penang's manufacturing environment. The E&E sector in Penang particularly revolved around the semiconductor industry. Companies like Intel, Advanced Micro Devices (AMD), Fairchild Semiconductor, National Semiconductors, Altera Corporation, and Motorola are amongst the big MNCs' that assert influence in the FDI for Penang. There are 46 registered companies categorised in assembly and testing, which account to 63

percent of the total registered companies. Other growing sectors in semiconductor are silicon wafer processing, wafer fabrication, and chip design that required a higher technical knowledge employment base, as compared to the assembly and test environment.

FDI in the manufacturing sector has accounted to 17.7 percent share from the total FDI investment capital, and this sector alone has 30 percent total workforce contribution in the overall employment market (MIDA, 2008). Hence, this proportion indicates a very significant contribution of this sector towards the general economic value reflected in the GDP of the country.

In reviewing the industry's significant presence in Penang, the PESTLE analysis tool will provide an insight on the changes from political, economic, social, technological, legal, and environmental aspect of the effects towards Penang and Malaysia as a country, specifically in the manufacturing sector.

Malaysia has embarked on the industrialisation drive since the 1970s, with the focus in promoting labour-intensive and export oriented industries. By the end of the decade, many semiconductor companies had set up their assembly operations in Malaysia and, in particular, Penang has the largest pool of foreign-owned MNCs in this sector. On the political ground, the government had implemented policy for this industry, through the Industrial Master Plan (IMP) One, from 1986 to 1995, IMP Two from 1996 to 2005, and the recent IMP Three from 2006 to 2020, with policies emphasising on transforming the manufacturing sector and moving up the value chain towards value-added activities, including R&D and product design, distribution and marketing. The sustaining growth of IMP 3 momentum is to ensure that the manufacturing sector develop at 5.6 percent per annum and contribute about 28.5 percent to the country's GDP by year 2020 (Malaysian Business, September 2007).

The policies implementations no doubt brought the economy change as vibrant towards the growth of Penang economy in areas of economy trends, market and trade cycle, and internal finances.

Penang, known as the "Silicon Island" of Malaysia, has totally transformed from a backward agricultural island into a dynamic industrial hub until the present. These changes on the economy entity subsequently lead as a catalyst to gear the market and trade cycle towards the development in the manufacturing sector. A sociological and economic change that brought about 33 percent employment sustained by this sector with total investment of RM 15 billion with over 81 percent from the total investment came from FDI from 2001 to 2005 (Ninth Malaysia Plan, 2006-2010). The internal finances growth brought to lifestyle changes with Penang GDP per capita of RM 27, 148.91 (SERI, 2005), versus the average Malaysia GDP per capita of RM 25, 796 (MIDA, 2008). This indicator clearly indicated that Penang has a standard of living that is above the national average. Penang is ranked number two after Kuala Lumpur in terms of state development and level of economic activity and quality of life in 2005 (Ninth Malaysia Plan, 2006-2010). This indicates a higher level of economy activity and quality of life in these 2005 overall assessments.

Penang was declared as a Cyber City on 21 June 2004, which include the development areas include Bayan Lepas Industrial area, a portion of Bayan Baru and Sungai Nibong coastal areas. The Cyber City status is with the intentions to make Penang as a hub for economic activities related to manufacturing, information and communication technology, life sciences and arts. With such investment in Information and Communications Technology (ICT), the aim is to move the industries in Penang to a higher value chain by harnessing the power of cyber technology (The

Star, July 2007). To date, 116 companies had been granted the Multimedia Super Corridor (MSC) status in the 923 hectare areas listed in Penang Cyber City 1.

On the legal aspect, Penang's industrialisation has been more visible, with the passing of the Investment Incentive Act in 1968 and the Free Trade Zone Act in 1971 (SERI, June 2009). These acts allow foreign direct investors, through multinational companies, to gain incentive by placing the company's manufacturing in the Bayan Lepas zone and providence of abundant cheap and easily trained labour. This eventually made Penang as the manufacturing base of choice that subsequently brings foreign technology, capital and modern management of the industrial organisation that came along with FDI.

The scope of quality of life encompasses personal advancements, a healthy lifestyle, access and freedom to pursue knowledge, attainment of standard of living that is more than the basic psychological needs of an individual, achieving a level of social well-being compatible with the nation's aspirations. As such, the quality of life encompasses a huge aspect of economic development, social, psychological, cultural, and political and the environment (Malaysia Quality of Life Report, 2005). The PESTLE analysis mentioned in the above findings clearly indicated that the manufacturing sector in Penang, which is the second most influential standing in terms of economic value and employment, draw a significant footprint into many aspects of life and society development.

Therefore, with an overview of Penang development, this research will gear towards the focus of knowledge economy that has been identified in the above PESTEL analysis that clearly brought the prosperity in terms of economy development to the state. Bringing Altera Corporation as a company in the next section will provide the insight on the company development in terms of human

capital and its growth as a foreign owned MNC that Penang is greatly depend on for its economy capability. The changes of this company brought into in the aspect of R&D that develops knowledge capital as a role model. The possibilities that hit the state in revisiting the present growth model for the human capital support in the future. Is increasing the human capital value chain remains an idea or is a must for transforming the state economy value for future workforce sustainability.

2.2 Company Overview

The development of Free Trade Zones in Malaysia has resulted in a rapid growth of the E&E industry, particularly in Penang. Over the years of development, the industry's core competencies began to shift towards higher value-added manufacturing activities. In response to the ever-increasing competitive cost pressures from other countries like China and Vietnam, the existing MNCs continue to evolve into areas of key value added activities, as in R&D, Supply Chain and Shared Services Hubs.

Altera Corporation (M) Sdn. Bhd. in Penang will be the company of focus for this research due to its pioneering business investment structure as a fully R&D centre in the E&E sector. Studying the company's human resource capital investment, in particular the structural formation and the management decision that makes Penang as a leading R&D hub will be an intriguing factor. The workforce value chain will be investigated by looking into the internalities and externalities that Altera has brought to Penang's E&E sector.

Altera Corporation in Penang was established in 1996, focusing on chip design that is similar in operations as MIMOS. Penang houses the largest offshore R&D Technical Centre in the Asia Pacific Manufacturing office. There are approximately 914 employees, and 94 percent of whom are engineers working with cutting-edge,

sub-micron fabrication technology and computer aided design (CAD) tools in designing Altera programmable chips, namely the Programmable Logic Devices (PLD) and Field Programmable Gate Array (FPGA) devices (MIDA, 2004). The aspects of R&D functionalities include Very Large-Scale Integration (VLSI) Design, Layout Design, Test Engineering, Software Development Engineering, and Intellectual Property (IP) Design¹. The facility spans 240,000 square feet and is equipped with the state-of-the-art R&D facilities (Altera Corporation).

In February 2009, Altera Corporation invested in a new centre, adjacent to the present facility (The Star, February 2009). The new investment is to make Penang as an R&D centre that is capable of running full research activities, from product architecture, product planning, and circuit design to rollout (The Star, March 2009). The latest facility has an approximate built-up area of 225,000 square feet and is capable of accommodating 600 engineers. This new centre is the latest RM 100 million investments by Altera Corporation, which eventually places Penang as a crucial R&D centre on par with other research facilities in San Jose, Toronto, and Britain. With this latest investment, Altera Penang is officially the largest offshore investment by Altera Corporation in Asia.

Altera Corporation has a technical forum website to assist students and university lecturers and professors by sharing materials pertaining to PLD and Altera devices. Software and students trial devices can be obtained complimentary with further assistance from the company engineers in regards to academic findings (Altera Forum). Altera Penang has emulated this practice in Malaysia, particularly by training the students to be competent in the E&E sector. The University Education Program is accessible throughout Malaysia. Altera leverages the digital design

¹ The organisation chart cannot be published officially due to the company concern towards the probability the talent may be acquired outside of this organisation. Thus, the information has to be concealed.

software, development and teaching boards to professors and instructors, with ready-to-teach laboratory exercises and tutorials, enabling a complementary set of prototyping and design tools to teach alongside the curriculum. Spending over of RM 3 million for the last 13 years, Altera Penang has equipped hundreds of local graduates with practical, real-world skills in digital and system-level design through effective teaching and learning in this University Education Program.² As quoted by the Penang Chief Minister, YAB Lim Guan Eng

“Altera has been able to personify Malaysia's evolution from a manufacturing-based semiconductor economy to one based on Research & Development in leading edge VLSI engineering.”

(Opening Speech, YAB CM Lim Guan Eng, February 12, 2009)

2.3 The Human Capital Intellectual and Knowledge Management: A Theoretical Consideration

Workforce value chain revolved in the activities of human capital intellectual. The theoretical considerations provide the types of identified intellectual. How this knowledge transformed into the organisation and the way organisation managing these flow of knowledge. A clear fundamental framework is crucial in this research to ensure a well defined understanding towards the spiral of knowledge management in an organisation in contact with the value chain framework.

This model and theories will provide the fundamental of how human capital intellectual is defined, segregation of types of knowledge and of all the connection of organisation and technology influence the value in knowledge management. The

² Referring to the opening speech of Altera Corporation new facility officiating ceremony by YAB, Chief Minister of Penang. “Speech by YAB CM Lim Guan Eng”, February 12, 2009.

entire concepts are connected to this research and therefore are in the interest of this research to understand the various theories involved in knowledge per se.

2.3.1 Porter's Value Chain Framework

Human capital intellectual has various aspects of values and relationships and how its link to the value chain concepts provide the fundamental evaluation in this research. The value chain framework laid an understanding towards competitive advantage of an organization and the ability to perform crucial activities along the value chain versus its competitors. Porter's value chain framework can be added into the human capital attributes in order to formulate a much in depth guide on the importance of value chain activities in an organization environment.

The value chain of Porter is an independent system or network of activities, connected by linkages (Porter, 1990). The value chain links the primary activities with the secondary activities which it subsequently links the value of the organizations' activities with its main functional area. Final assessment will be in the contribution of overall added value of the business is made (Lynch, 2003). The analysis for this research will only cover area in the secondary activities solely in functional area of Human Resource Management. Breaking down the workforce key activities and assessing the potential of adding value through the means of cost advantage or differentiation was the key for knowledge management. The used of value chain framework is the checklist to analyze each activity in business with some depth (Pearson, 1999). However the Porter's generic strategies analyse the value perceived in its theoretical context (Svensson, 2003). Whereby in actual evaluation the value can only be weighted at the final customers which in this research will be the organization. The recommendation in conjunction with the value chain framework is to focus on the comprehensive analysis of a country's overall strategy,

planning and execution. Hence, a much thorough focus was analyzed in the aspects of country's regulations in managing the workforce will open to a much insight of what value chain in human capital intellectual entailed.

2.3.2 Human Capital Intellectual

The theoretical framework has the focus in the value of human capital assessment. The conceptualisation of value is closely related to the intellectual and human capital and knowledge management, which is commonly reviewed in many strategic human resource management literatures (Nonaka and Takeuchi, 1995; Edvinsson and Malone, 1997; Marsick and Watkins, 1999). Value of human capital is perceived as an intangible asset to an organisation as what individuals bring are tacit knowledge rather than standardise, routine and formal knowledge. This value is only added when personal knowledge is integrated well into knowledge management systems that organisation created and used (Marsick and Watkins, 1996).

The level of intellectual and human capital capabilities are of value when it integrates well with the financial objectives (Garrick and Clegg, 2000). This is fully supported by Steward as he defined intellectual capital as intellectual material in area of knowledge, information, intellectual property, and experience that are put into used in the process of creating wealth (Steward, 1997). There are two elements involved in intellectual capital, they are human capital and intellectual assets and both of these attributes are utilised by the organisation in converting into profits (Sullivan, 1999).

Another approach of the human capital intellectual definitions revolved in measuring the intellectual focus in closed association with an organisation. The functionality of the value is created due to the different management approaches in managing the thinking and non-thinking assets in human capital (Roos et al., 1997). Edvinsson and Malone agreed that organisation played an important role in signifying

the human capital value. Knowledge in the firm represents the independent of people that is the system component and the market component represents the relationship between the organisations and outsiders. Human capital in the upper hand is the employees and managers in the organisation. The three segments have to be integrated when human capital intellectual is defined (Edvinsson and Malone, 1997). Intellectual capital perceived by Kaplan and Norton are in focus of the three linked perspective in customers, internal business processes, and learning and growth (Kaplan and Norton, 1992). Mayo focuses are in areas of capability, knowledge, and experience with the ability to achieve results and growth. Motivation, leadership, organisational climate in particular of culture that allows an individual for freedom to innovate is human capital defined (Mayo, 2000). Haanes and Lowendahl advocate the distinction between intangible resources of competence and relationships. Competencies manifested in the ability perform in individual and organisational level whereby relationship is in area of reputation of a company and customer loyalty (Haanes and Lowendahl, 1997).

Intellectual capital consists of an invisible asset and their capacity to act in wide variety of situation internally and externally (Sveiby, 1997). Brooking also condoles to the idea that human capital is an asset that can be separated into market assets, human centred assets and infrastructural assets (Brooking, 1996).

Human intellectual capital can be categorised in between thinking and none thinking assets. The major splits of aspects are between external, internal and human capital dimensions (Thomas et al., 2001). Stewart (1997), Sullivan (1999) were the few with the notions that the capital intellectual can only be valued if it has the ability in creating wealth, but a few in particularly much modern theorist like Mayo is viewing human capital abilities measurements are transcended via a platform which is

the organisation. It defines the ability to achieve results in the forms of aspirations, ambition, drives, work motivations and productivity, work group effectiveness in the form of supportiveness that can be obtained from an organisational climate. Nevertheless, the conventional definitions by Sveiby (1997) and Brooking (1996) are keeping the definitions at the superficial level in viewing the characteristics as assets in many terms of attributes like skills, experience, and education.

In the overview of human capital, many theories are focusing on the importance of individual knowledge and how it has assimilated, and aligned with the organisational practices and structure for an attainment of a sustainable competitive advantage. The different stages of which knowledge are attained and presented are a strategic analyse on the importance of human capital that will in due churn the wealth towards the gain and profit to an organisation. These conceptual frameworks were providing the importance factors of how the human capital is playing such an important aspect by differentiating the value type of knowledge. In analysing the value human capital brings, that will provide a ground on the need of a value chain transformation in view of a global efficient economy.

2.3.3 Knowledge Management and Organisational Competitiveness

In viewing the intellectual capital and its value chain, the exploration of the conceptual framework within the organisation is crucial in this research where R&D Company is in focus. The researcher will explore deeper into the organisational human capital framework based on a combination of three perspectives: knowledge management, intellectual capital, and strategic human resource management (Snell et al., 1999). This perspective framework will explore the different forms of human capital within a two-dimension matrix of uniqueness and strategic value. This is closely associated with organisation that value and focus their human capital that link

closely with the organisational profit and competitiveness especially industries that involved with technologies whereby time to market the products are crucial to sustain competitive advantage.

Tangible assets no longer provide the sustainable competitive advantages. As claim by Prahalad (1983), competitive advantage depends more on "people-embodied know-how." The fact that employee knowledge, skills and abilities constitute one of the most significant renewable resources which a company can take advantage of, the strategic management of this capital resource has greater importance than ever (Ulrich, 1991).

Based on the theory, firm is view as a resource based and exam in manner how organisational resources are applied and combined will determine the attainment of such competitive advantage (Barney, 1991; Peteraf, 1993; Ventura, 1996). Resources are assets of different types that enable the firm to conceive and implement strategies to improve efficiency and effectiveness, and eventually increase its competitiveness (Grant, 1991; 1996; Amit and Schoemaker, 1993).

Barney (1991) argues that in order the organisational resources become a sustainable competitive advantage; these resources must be rare, valuable, without substitutes and difficult to imitate. Moreover, Dierickx and Cool (1989) suggested a different characteristics that revolved around that such capital cannot be commercialised, strong intrinsic character, the origin has to lie within the organisational skill and learning. This capital must have high immobility and strongly link to the firm, and the development of such capital is path dependent, that is being conditioned on the level of leaning, investment, stocks, and previous activities.

When we explore the notion of human capital value, the most talk about under human resource journal will evaluate between tacit and explicit knowledge. "*Tacit*

knowledge is defined as a knowledge that acquire through experience. It is a form of knowledge that we are intimately familiar. It can be acquired through entering a new organisation, or when we begin an activity that is different from what we are accustomed to” (Spender, 1996 a,b). Polanyi (1966), however, viewed that explicit or codified knowledge is transmittable through formal, systematic language, and may adopt the form of computer programs, diagrams, patents or similar (Hedlund, 1994). Essentially as explained by Polanyi (1996), tacit knowledge should not be considered independently from explicit knowledge, as there is a tacit dimension in all forms of knowledge.

<i>Tacit knowledge (subjective)</i>	<i>Explicit (objective)</i>
Knowledge of experience (body)	Knowledge of rationality (mind)
Simultaneous knowledge (here and now)	Sequential knowledge (there and then)
Analog knowledge (practice)	Digital knowledge (theory)

Source: Nonaka and Takeuchi (1995, p. 61)

Figure 2.1: Two Types of Knowledge (Nonaka and Takeuchi, 1995)

As Bateson (1973) concluded that tacit knowledge is a continuous activity in organisations, and represents what denominated “analogical” quality as opposed to explicit knowledge, which is discretional or “digital”.

With the understanding of the underlying type if knowledge, the researcher would like to address the link how these knowledge value by an organisation. The first step is to determine the form of human capital exist in a firm and how they can be a source of competitive advantage. According to Snell et al. (1999) and Ulrich and

Lake (1991), this analysis can be strategically viewed in two dimensions: uniqueness and value. Figure 2.2 shows a matrix that presents a conceptual framework for classification of different forms of human capital that may possibly exist in a firm. This framework is important to study how these forms of human capital should be managed to maximise their contribution to the firm.

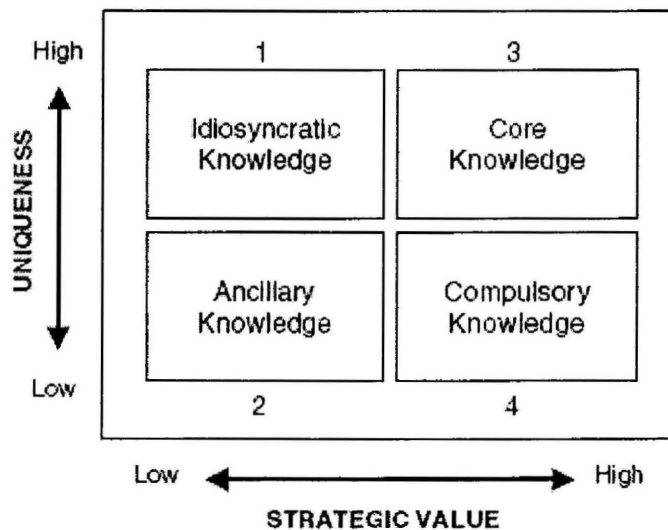


Figure 2.2: Forms of Human Capital (Snell et al., 1999)

(i) Idiosyncratic Knowledge (high uniqueness, low value)

Quadrant 1 represents human capital with strong uniqueness but not especially useful to the customer value. Thus, the most important task for a firm is to develop the potential value of the human resources while preserving its uniqueness. Due to this is a long-term investment and many firm will take up the decision to disinvest in such form of human capital. The dilemma of the management is that the manager will have to strike a balance of return of investment by not over invest in this form of human capital and at the same time they must warrant the competitiveness in the long run. Suggestion by Snell et al. (1999) is to have a human resource system based on

collaboration to support the development of lateral relations, exchange programmes, group-based rewards, team building and rotation of jobs.

(ii) Ancillary Human Capital (low uniqueness, low value)

This quadrant of matrix represents the form of human capital generated as a result of the firm's activity. This form of human capital is unskilled or semi-skilled employees that offer no source of competitive advantage. The firm tends to automate this knowledge by substitution using technology to replace the employees. The firm may turn to external sources to reduce administration cost and flexibility in due to focus the investment into other form of human capital that may bring better potential and gain to build a competitive advantage. Therefore, investment in this form of human capital can be considered null.

(iii) Core Human Capital (high uniqueness, high value)

When both uniqueness and value are high, they provide strategic benefits that exceed the bureaucratic cost in developing human capital. Investment in this form of human capital is to maximise the value creating potential and differentiating characteristics. Rousseau (1995) and Tsui et al. (1995) suggested that firms implement commitment-based human resource systems that focus on internal development of skills and long-term relationship. Employed direct, skills-based pay systems and development performance appraisal may be used to develop the competencies and knowledge for this form of human capital. At the same time, internal training and cross-functional career path are provided to encourage employees to build idiosyncratic knowledge.

(iv) Compulsory Human Capital (low uniqueness, high value)

Compulsory human capital is deemed as a form of human capital that is not specific to any particular organisation and employees are free to sell their talents

wherever they can achieve the greatest return (Rousseau, 1995). Due to such mobility in this form of human capital, firms will be likely to invest (Becker, 1964). The firm will have to recruit this form of potential human capital that can contribute immediately to productivity. This is to take advantage of their valuable talents immediately. These practices characterise a market-based human resource system (Lepak and Snell, 1999). Nevertheless, for this quadrant of human capital, there is a possibility to move up to quadrant 3, where the human capital can possibly be transformed into firm specific human capital, when investment in specialised skill development may bring strategic value (Snell et al., 1999).

In view of the four quadrants of human capital, it can be viewed that development of such capital that are most indispensable by an organisation are those in the core knowledge form, that is, with high uniqueness and high strategic value. Thus, examining the structural needs of an organisation will create a pattern of their human capital needs in such form. In many R&D investment firm, knowledge is the driver to sustainable competitive advantage and this research will explore on the conceptual framework for employees in this field.

There are various types of knowledge management model, including the Genf Knowledge Management Model, which is the building block of knowledge management (Probst et al., 2000). This model focuses the six central processes of knowledge: *knowledge identification, knowledge acquisition, knowledge development, knowledge sharing, knowledge utilisation and knowledge retention*. They are the building blocks of knowledge goals and knowledge evaluation that completed the processes as a cycle.

Another famous model by Nonaka and Konno (1998) is the SECI Model, also known as the knowledge spiral. It revolves around the process of knowledge between

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explicit and implicit knowledge on various levels that leads to creation of new knowledge by an individual. Through the process of *socialisation, externalisation, combination, and internalisation*, knowledge is transformed from the organisation to an individual and becomes implicit knowledge. It also touches on how knowledge process flow and how it is connected to a specific context to maintain the productivity of the knowledge spiral.

In the context of this research, these two models are not deliberated in depth, since the focus of the models is in the transformation of implicit knowledge into explicit knowledge. The basic framework for analysing this subject matter may not be sufficient, as the scope is not diversified enough, since the process and cycle of knowledge transformation are not the main area in leading the knowledge management in relation to an R&D organisation.

The focus for knowledge management in the present research is to determine the form of human capital in a firm, and how it can be a competitive advantage, in reference to the four quadrants in human capital. This fundamental provides a contextual organisational scenario in differentiating the levels of workforce in a human capital value chain in an R&D environment.

2.3.4 The Munich Model of Knowledge Management

To understand how the organisation and technology are affecting the knowledge type in the model above, the Munich Model will provide a better viewpoint. Trying to connect how this knowledge is in value to the organisation by not just identifying the quadrants of knowledge, but to researching in the context of organisation will provide a realistic picture when it comes to workforce value. This model employs a holistic approach by establishing a long-term strategy for

individuals and organisations by the three basic pillars, namely, knowledge, organisation, and technology (Reinmann-Rothemeier and Mandl, 1999c).

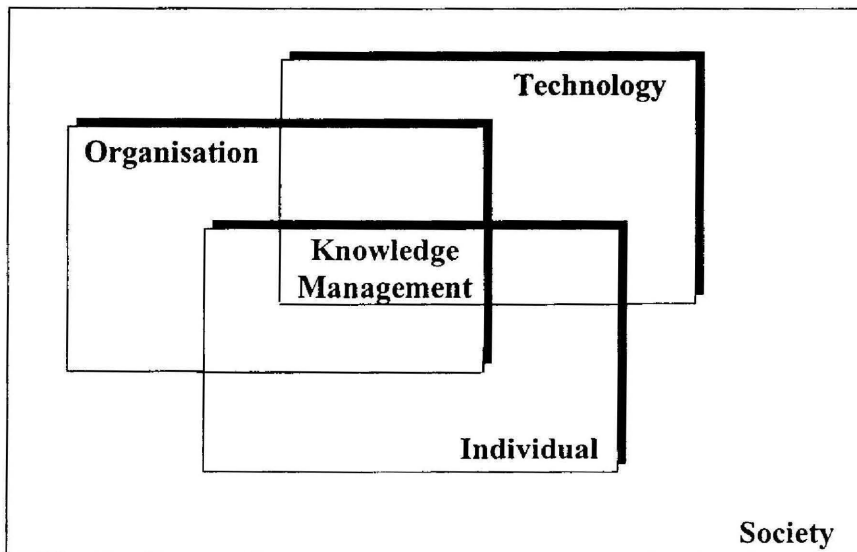


Figure 2.3: The three pillars of knowledge management

(Reinmann-Rothmeier and Mandl, 2000)

The first pillar as referred in Figure 2.3 is the individual, who is the driving force in the continual learning processes. It acts as the promoter and creator of information, skills and competencies of the members of the organisation. In this model, the individual is the core element in knowledge management (Reinmann-Rothmeier et al., 1999). At the organisational level, it involves in creating the necessary structural requirements for the exchange of knowledge. It acts as a platform that provides a condition for interaction with the resource of knowledge. The third pillar, technology, refers to the implementation and creation of information and communication structures and tools that support the knowledge-based process efficiently in a user-friendly environment (Reinmann-Rothmeier et al., 2000). In this model, there is an integration between an organisation's processes at both an individual and an organisational level, and determines the success of knowledge