The Management of SMEs' Human Capital from the Perspective of SECI Model: A Case Study in the Multimedia Super Corridor (MSC) Status Companies in Malaysia

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ABSTRACT

With the commencement of the Ninth Malaysian Five-year Plan (9MP) in 2007, Malaysia now has thirteen (13) years in which to achieve Vision 2020. The next questions to address are as follows: - "Is Malaysia on the right track to become a developed nation by the end of the next decade? Are Malaysians really ready for this, and what will happen in the years ahead?" The National Vision Policy (NVP) and Ninth Malaysian Plan (9MP) are entrusted to build on the success of its predecessor and set the pace for the country to be fully developed by the year 2020. In this regard, the Multimedia Super Corridor (MSC) status companies consisting mostly the small and medium enterprise (SMEs) are now considered as the growth engine for making the Sixth Challenge of Vision 2020 into a reality. Here, their knowledge workers and/or human capital have been highlighted as the most important asset for these companies. Thus, this paper provides an understanding of how best to manage them

ISSN 0128-5599

contributes towards the achievement of this vision from the perspective of SECI Model. It had been emphasized by the model that strengthening of their human resource management and knowledge management functions are crucial for the continuous success of the Multimedia Super Corridor status companies in particular and the nation in general.

Keywords: *Small Medium Enterprise (SMEs), Knowledge Workers, Human Capital, Multimedia Status Companies (MSC), Human Resource Management, Knowledge Management*

Introduction

According to MSC Impact Survey (MSC IS) report in 2003 (p. 3) up to 86 percent of the jobs created within the Multimedia Super Corridor status companies were filled by knowledge workers. This indicating a high demand for this group of workers by the Multimedia Super Corridor status companies. Furthermore, in the case of occupational grouping (Table A and B, see Appendix 1), it can be seen that software developers and programmers carry the largest number of workers, 3,278, as well as the greatest number of job vacancies, 659. This is followed by the technical support staff, which number 2,128 with 342 vacancies. With the total number of vacancies at 3,428 as at May 2003, serious attention by any related authorities is indeed needed. This is to assure the formation of the Multimedia Super Corridor status companies to put into operation all the seven flagship applications, in order to make the success of this venture a reality. Therefore, the shortage of knowledge workers within the Multimedia Super Corridor status companies has become a great concern not only for the companies but also for the Malaysian Government (MSC IS 2003 and 2004; Tyndall, 2002: p. 188). This scenario has motivated the current investigation into understanding and managing knowledge workers efficiently. It is hoped that the findings of the current study will help in retaining and creating knowledge workers as the crucial asset for human capital, for the purpose of the Multimedia Super Corridor's success, which will bring Malaysia international acknowledgment. In addition, conducting a thorough survey of suitable management approaches in smaller companies, which now form the majority of the Multimedia Super Corridor status companies, would also help the Multimedia Development Corporation (MDC) to provide further

suggestions on how these companies can survive longer in the competitive world and retain their Multimedia Super Corridor status. Furthermore, this effort is not seen to interfere with the individual Multimedia Super Corridor status companies, but to help them to grow together and compete better. In this view, it would be beneficial to introduce the knowledge management concept to all Multimedia Super Corridor status companies.

Literature Review

Knowledge Workers as an Asset for Human Capital

In the local context of Malaysia, the Malaysian Development Corporation defines knowledge workers as follows: "A knowledge worker is an individual who possesses one of these qualifications: five or more years' professional experience in multimedia/information and communication technology (ICT) business or in a field that is a heavy user of multimedia; a university degree (in any discipline) or a graduate diploma (multimedia/ ICT) from a professional experience in multimedia; and a master degree or higher in any discipline." (KEMP, 2002: p. 43). Accordingly, all Malaysian workers who possess any higher qualification are considered by the government to be knowledge workers, even when they do not continue to work in their own fields. In addition, the Malaysian definition of knowledge workers seems to focus on information technology, though it is known that information technology is only a tool to enable knowledge workers to perform their tasks faster and more efficiently (Davenport and Prusak, 2000; Kermally, 2002; Solimon and Spooner, 2000)**.** Also, looking at this definition, Malaysia should have more than enough knowledge workers in the future, as there will be many university graduates with diverse backgrounds who will finish their schooling by the year 2020 (Malaysia 2001: pp. 104-106).

However, currently Malaysia is still reporting a lower proportion of the required knowledge workers, especially given that its economy needs to be globally competitive in the information age in order to sustain the accomplishments achieved during the industrial phase (Norsaidatul et al., 1999: p. ix) and knowledge based economy (MSC IS 2003 and 2004). In addition, various authors have come up with different views on the characteristics of knowledge workers. It has been argued that being a new occupational group, knowledge workers are different from production workers (Amar, 2002; Beaumont and Hunter, 2002; Darr, 2003; Drucker,

1988 and 2003; Newell et al., 2002; Tymon and Stumpf, 2003). For instance, according to Amar (2002) and Drucker (1988), knowledge workers are those who resist the command-and–control practices; they should not be told to complete their tasks. On the other hand, production workers are those who are usually stuck with repetitive tasks, such as on the shop floor of a manufacturing factory. Due to these dissimilarities between knowledge workers and production workers, Tymon and Stumpf (2003) also argued that taking good care of knowledge workers' social capital (i.e. resources including information, ideas, business opportunities, power, emotional support, goodwill, trust, and co-operation) will become a way to achieve an excellent company. They argued that:

> *"Success in this century for the growing number of knowledge workers will be determined not just by what they know, but by how fast they can learn and share their learning. Success will be characterized not by how much information they can access, but how they can access the most relevant information, and then differentiate it from the exponentially multiplying masses of non-relevant information. Success will be based not on the possession of a set of skills and tools, but by demonstrating a high degree of adaptive problem solving in dealing with technology and people…[ ] ...success in the twenty-first century will be more social and relational than it has been since clans were the predominant social structure of society." (p. 12)*

Bearing this in mind, it could therefore be argued that this group of workers needs to be managed differently from others, i.e. knowledge management is required for managing knowledge flow among knowledge workers (Beijerse, 2000; Davenport and Prusak, 2000; Gupta et al., 2000; Hunter et al., 2002; Nonaka and Takeuchi, 1995; Nonaka and Konno, 1998; Ordónez de Pabloz, 2002; Smith, 2001; Suk Choi, 2000; Wiig, 2002). Basically, these authors defined knowledge management as managing the transfer of knowledge within a company. It is not only about formal systems and up to date technologies. Its focus is on how to help and/or encourage knowledge workers to appreciate and utilise the knowledge that they have for the sake of both self-enhancement and the benefit of the company. The authors concluded that the transformation process of knowledge transfer is crucial for individual workers as well as for the company's success. This is because knowledge has been claimed to be a strategic resource that can lead a company towards competitive advantage (Nonaka and Takeuchi, 1995; Newell et al., 2002). This

knowledge can reside everywhere within or outside the company. However, the review of the literature indicates that workers are the focal point wherein the knowledge usually resides. For example, Von Krogh et al. (1998) argued that, "When knowledge becomes the dominant resource, we must face the fact that the worker is the owner of the resource…" (p. 15).

In this regard, knowledge is the product of human reflection and experience, and is located mostly in the individual worker rather than the company (Drucker, 2000; Von Krogh, 1998; Davenport, 2001). Therefore, the knowledge and/or understanding of how to utilise workers' knowledge and the effort made to transfer it into explicit knowledge, as emphasised by Nonaka and Takeuchi (1995), could perhaps contribute towards the company's performance. This is because, according to Nonaka and Takeuchi (1995) and Nonaka and Konno (1998), the failure of explicit knowledge to become practical knowledge will have a negative impact on individual workers in terms of applying their experience and contextual understanding of the meaning of this knowledge, and will limit the action taken to utilise it, i.e. managing knowing. This then places a key emphasis on human resource management (HRM) to support an appropriate organisational context for knowledge workers (Hislop, 2003; Hunter et al., 2002; Newell et al., 2002; Thite, 2004), especially in terms of assuring the smoothness of their social capital needs being well taken care of while they are in the company (Tymon and Stumpf, 2003). In this view, human resource management is known as the utilisation of human resources to achieve a company's objectives via its strategic plans, recruitment, selection, training, compensation, rewards etc. Thus, areas where human resource management can support knowledge management must be explored in order to assure the successful implementation of knowledge management and the companies. Here the more consistent analysis of the SECI Model by Nonaka and Konno (1998) as shown in Figure A (see Appendix 2 is the most appropriate way to explain the elements of socialization, externalization, combination and internalization of knowledge management. However, others may use terms like acquiring, selecting, using, externalising, internalising (Joshi and Holsapple, 1999); or coordinating, protecting, acquiring reasoned applications (Gold, 2001); or identification, acquisition, development, distribution and knowledge retention (Probst et al., 2000) and acquisition, domination, knowledge transfer, knowledge creation and knowledge application (Yahya and Goh, 2002).

In linking this model to the current case study, *socialization* describes the implicit sharing of tacit knowledge among knowledge workers that involves capturing knowledge through physical distance, as in talking, discussion, meetings, presentations etc. Meanwhile, *externalization* converts the knowledge workers' tacit knowledge to an explicit form and translates it into greater detail, so that their peers can understand it easily. This is normally done by preparing reports, working papers or written documents, i.e. memos, notes, etc. At the same time, the conversion of explicit knowledge into more complex sets of explicit knowledge occurs in the *combination* stage. Here, the communication and diffusion processes occur, and thus the systematisation of knowledge is required to ensure that the knowledge is imparted correctly. During this time, the help of information, communication and technology (ICT) facilitates and increases the efficiency of the process. Finally, at the *internalization* stage, knowledge is transferred back to a tacit form. Here, the activities of transmitting and interpreting knowledge by knowledge workers within the Multimedia Super Corridor status companies should continuously be based on "learning by doing". The overall analysis of these elements of the knowledge management process reveals that human resource management plays an important role in ensuring that all these elements are conducted effectively.

Multimedia Super Corridor (MSC) in Malaysia

The Multimedia Super Corridor is now entering the 2nd phase of development, particularly with regard to setting in motion the Seven Flagship applications. Recently, Penang (Pulau Pinang) and Malacca (Melaka) have also been awarded the status of second and third Multimedia Super Corridor states. These achievements have shown the dedication of the Malaysian government in working to support the continuous excellence of the Multimedia Super Corridor status companies and their benefits to the country. In this view, the Multimedia Development Corridor is trusted to leverage the products of the Multimedia Super Corridor in two ways. Firstly, the products that come out of Multimedia Super Corridor will increase the productivity of the other sectors, such as manufacturing, banking, insurance, education and health, thus improving Malaysia's global competitiveness. Secondly, the locally developed products could be exported, thereby improving the balance of payments position (MDC, 1999).

SMEs are the Highest Percentage of MSC Status Companies

Currently, it had been realised that the small medium enterprises (SMEs) have become the highest percentage of Multimedia Super Corridor status companies (see for example MSC IS 2003 and 2004). This significant interest in SMEs had actually began in the 1980s. According to Marlow (2000: p. 140), this could be due to the shift towards overcoming tension and conflict in larger companies. Since then, the SMEses have become an important element in contributing towards the success of the nation (Bacon et al., 1996; Catherine et al., 2002; Hamzah and Ho, 1994; Marlow, 2000). According to Bacon et al. (1996: p. 251) in the United Kingdom, 96 per cent of companies employ fewer than twenty people (i.e. one-third of the private sector workforce). Furthermore, during the 1980s, the small companies sector grew at a faster rate in the United Kingdom than in the rest of Europe, Japan and the United States of America (p. 252).

In the case of Malaysia, Hamzah and Ho (1994: p. 27) argued from the manufacturing companies' point of view that "the National Development Policy's strategies for manufacturing companies is to further promote and upgrade small and medium industries (SMIs) to make them an important and viable vehicle for industrial expansion". Therefore, small manufacturing companies have to create inter-industry linkage and support, in order to increase the value-added of these SMEs to the country up to the level of 40 per cent and 50 per cent respectively, within the next decade, from the current positions of 20 per cent and 30 per cent respectively (see for example The Malaysian Eight Plan: pp. 235-264). This illustrates the faster change and/or growth of the SMEs in Malaysia. In fact, the same scenario is also happening in the Multimedia Super Corridor project, whereby the majority of the Multimedia Super Corridor status companies are small companies (see for example MSC IS 2003: p. 1 and 2004: p. 3). These increased numbers of small companies thus require practical knowledge of managing human resources within these companies. This knowledge is crucial to identifying the success factors that contribute to competitiveness (Brand and Bax, 2002; Marlow, 2000; Sohail and Boon Hoong, 2003). However, to date, not much is known about the exact ways of managing human resources in these small companies (Bacon et al., 1996; Brand and Bax, 2002; Marlow, 2000). Therefore, strategic human resource management has been highlighted as the important element in helping the company to achieve sustainable

competitive advantage (Boxall, 1999; Marlow, 2000; Schuler et al., 1993; Ulrich, 1997). Brand and Bax (2002) have further argued that strategic human resource management within the small companies is still fragmented. In the literature, it would appear that there are two different camps of understanding of these SMEs. The first camp has tried to prove that there is not much difference between small and large companies in terms of managing knowledge workers. This implies that human resource management or strategic human resource management could fit both the large or small companies in similar ways. A study on 560 small companies in Leicestershire, United Kingdom, affirmed that the practice of "new management" is yet to be established, as many authors have suggested (Bacon et al., 1996: p. 267).

This shows that there is not much difference between managing workers in the big and small companies. The only real difference is that big companies have a lot more money and resources compared to SMEs. In a way, SMEs are more direct and flexible, as well as being flatter in structure and much more informal and organic than larger companies. Both have advantages and disadvantages. On the contrary, the second camp has tried to prove that SMEs do indeed need a "new style of management", especially in the field of managing knowledge workers in the new technology-based companies. This is due to differences in the pace of change, the rise of research and development (R&D) and their industrial networks (Keogh and Evans, 1999). Furthermore, Keogh and Evans (1999: pp. 344-345) found that "innovation" i.e. the transformation of an idea into a new or improved saleable product or operational process in industry or commerce, "internalisation" i.e. flexible shared processes that involve internal and external communication, "human resources" i.e. keeping the valued staff and "collaboration" with the main customers are the main barriers for the growth of the new technology-based SMEs. It has been suggested that strategic human resource management should play an important role in providing the policies that will meet the needs to solve or perhaps to reduce these barriers (Keogh and Evans, 1999; Marlow, 2000). In addition, Marlow (2000: p. 140) also pointed out that, "the critical precept of strategic human resource management is that labour must form a central part of the companies' strategic policy…re-evaluated as a resource to develop, rather than a cost to control". To do this, according to her, the company should consider being more flexible and managing workers informally on a short-term basis (p. 146). In this case, she emphasised that training and development and employees' participation are the critical aspects that should be considered by the

small companies. Overall, understanding is that, up to now, there is no best way of managing these groups of workers in the small companies. Some authors have also pointed out the need to practise strategic human resource management and some suggest that there could be another new form of management, namely "knowledge management". Perhaps the combination of both will maintain the Multimedia Development Corporation's a crucial role in encouraging the Multimedia Super Corridor status companies to implement knowledge management.

Research Method

Two types of research design underpinning this study were that the exploratory and descriptive approaches. These designs were based on the paradigm of realism, which allows the authors to see the world as it is, rather than becoming too subjective or too deterministic. This was then taken together with the method employed for this study, namely the triangulation method. It was hoped that the questionnaire survey and in-depth semi-structured interviews used in this study could be regarded as valuable methods, contributing towards rigorous results. The questionnaire survey also helps the authors to explore what is known about the current issues on managing knowledge workers and/or so called human capital in the local context. In addition, an in-depth semi-structured interview is considered as a "deep" inductive approach that appears to be similar to ethnographic and phenomenological studies, and provides detailed observations of behaviour within a number of individual knowledge workers. In this view, the qualitative research of 78 in-depth interviews offered a greater depth of information to complement and extend the earlier quantitative survey results of the 171 returned questionnaires. Thus, these methods definitely contribute towards the acquisition of detailed information, as normally required by all. Furthermore, Hakim (1997: p. 32) has pointed out that one common linkage between qualitative and quantitative research is that the results of the two linked studies are sometimes presented in a single report.

Findings

The results obtained from the questionnaire survey and in-depth semi-structured interviews in response to the current issue support the early

expectation that human resource management play a vital role in ensuring the success of knowledge management practices in MSC status companies. The valuable findings derived from the current study are, firstly, that knowledge management is all about workers' interaction and the transfer of knowledge between them. In particular, what has been learned from this study, as shown in Figure B, is that human resource management is the key in informing the nature of workers' interaction within the company (i.e., team-based work). In fact, it is potentially also central in terms of providing training and development of knowledge workers' knowledge. Apart from that, human resource management is responsible for planning efficient programmes for selecting and recruiting knowledge workers, as well as preparing competitive compensation and rewards packages. At the same time, the Multimedia Development Corporation may have little influence on knowledge workers' interaction, but potentially, perhaps, it can influence the processes of knowledge management and elements of human resource management in managing knowledge workers. Presumably, the Multimedia Development Corporation can at least influence the training, schooling and education system to ensure the production and adequate supply of the knowledge workers required by the country in general and Multimedia Super Corridor status companies in particular.

Next is also seen in its further analysis of the applicability of the SECI Model (Nonaka and Konno, 1998) in the Malaysian context. Thus, the current study, which is similar to the work of Suk Choi (2002), has had the opportunity to provide findings on the perception of the importance and implementation of knowledge management by knowledge workers. However, in contrast to Nonaka and Konno (1998), even though most of the knowledge workers showed a strong awareness of the importance of knowledge management, sharing knowledge via socialisation activities is not particularly favoured by knowledge workers in Malaysia. They show a greater preference for the externalisation process. This means, from the local context point of view, those knowledge workers will only share their knowledge with others when they are explicitly told to do so. This could be due to their concerns about personal performance, or they may be expecting rewards at the end of the day. Overall, the following can be learned from this model: firstly, the SECI Model is particularly important in appreciating and focusing on tacit knowledge among knowledge workers. Secondly, although the model cannot be generalised to explain how the Malaysian knowledge workers share their knowledge, it still encourages continuous learning and innovation in order to enable

knowledge workers to contribute towards competitive advantage. Thirdly, the importance of managing a proper *"ba"* for knowledge creation within the company will assure the full participation of knowledge workers, especially during the externalisation process. And this clearly link to issues of human resource management. Therefore, these findings benefit the policy makers and the Multimedia Development Corporation in observing the steps taken by the Malaysian high tech industry towards becoming knowledge-based.

Furthermore, as shown in Figure B, the Multimedia Development Corporation could provide ideas via human resource management with regard to how the Multimedia Super Corporation status companies can best utilise the externalisation process, as mentioned in the SECI Model, to manage this group of workers effectively. For instance, encouraging small team based work in completing any programming project will encourage knowledge workers to share more than will individual tasks. As well as discouraging individual competition among knowledge workers, this effort could encourage a more "family-friendly" working environment and create greater harmony in the company. Up until now, little research has been conducted on knowledge workers, knowledge management and human resource management (Amar, 2002 and 2004; Thite, 2004; Yahya and Goh, 2002). Therefore, this case study has provided a way for human resource management to assist knowledge management in leveraging the knowledge that resides in workers' minds. In relating to the SECI Model by Nonaka and Konno (1998) and to the work of Solimon and Spooner (2000), this case study has further argued that the assumption of human resource management as a service provider no longer suits the current needs of the business scenario.

Apart from that, even though it has been concluded that human resource management in the knowledge-based era needs to become a strategic business partner in supporting the processes of the SECI Model, "knowledge mapping", as outlined by Soliman and Spooner (2000), may not be sufficient to explain the reality of how strategic human resource management can work with knowledge management. This is due to limitations in terms of how exactly human resource management can monitor, measure and influence activities such as the construction, dissemination, use and embodiment of knowledge workers' knowledge, from the SECI Model perspective. Thus, again the case study in particular presents further crucial empirical evidence for the specific roles to be played by human resource management in supporting the practice of knowledge management. As shown in Figure B, human resource

management in a company needs to support knowledge management in terms of providing an effective informal settings for socialisation activities; followed with a great attention given to the crucial importance of team based work during externalisation process, especially providing competitive initiatives and 'flat' management for knowledge workers to share more. Apart from that, human resource management needs also to assure the readiness of an information technology system for knowledge workers to leverage their knowledge efficiently during combination process. Finally, a main concern also needs to be considered at the requirement for knowledge workers to improve themselves via self - internalisation (i.e., Training Programme in the company). Having said this, perhaps compensation and rewards are not the only crucial factors, as reported by Despres and Hiltrop (1995) and Hunter et al. (2002): several more findings, such as training, flexibility, freedom, work challenges etc. are also potential factors that should be considered. This case study also confirms the work done by Von Krogh (1999), who said that many companies are still lacking in knowledge-based theory. Thus, this study could also assist the same parties in supporting the Multimedia Super Corridor status companies to provide information technology based initiatives while at the same time creating awareness of the benefits of knowledge management that could lead the Multimedia Super Corridor status companies towards achieving sustainable competitive advantage. In this view, as mentioned frequently, this study takes a step further in assisting the Malaysian government to identify the potential recommendations for the future success of the country, especially in achieving Vision 2020. It is expected that the Malaysian government would give continuous support to the Multimedia Super Corridor status companies via its development agency, namely the Multimedia Development Corporation. Support should be given to the role of human resource management in assisting the successful implementation of knowledge management in the Multimedia Super Corridor status companies. Other than that, providing more research grants for research and development (R&D) would be helpful in terms of enabling small sized companies to survive in the knowledge based economy. Moreover, a further role of the Malaysian government could be to assure that the end objective of creating the Multimedia Super Corridor is realised.

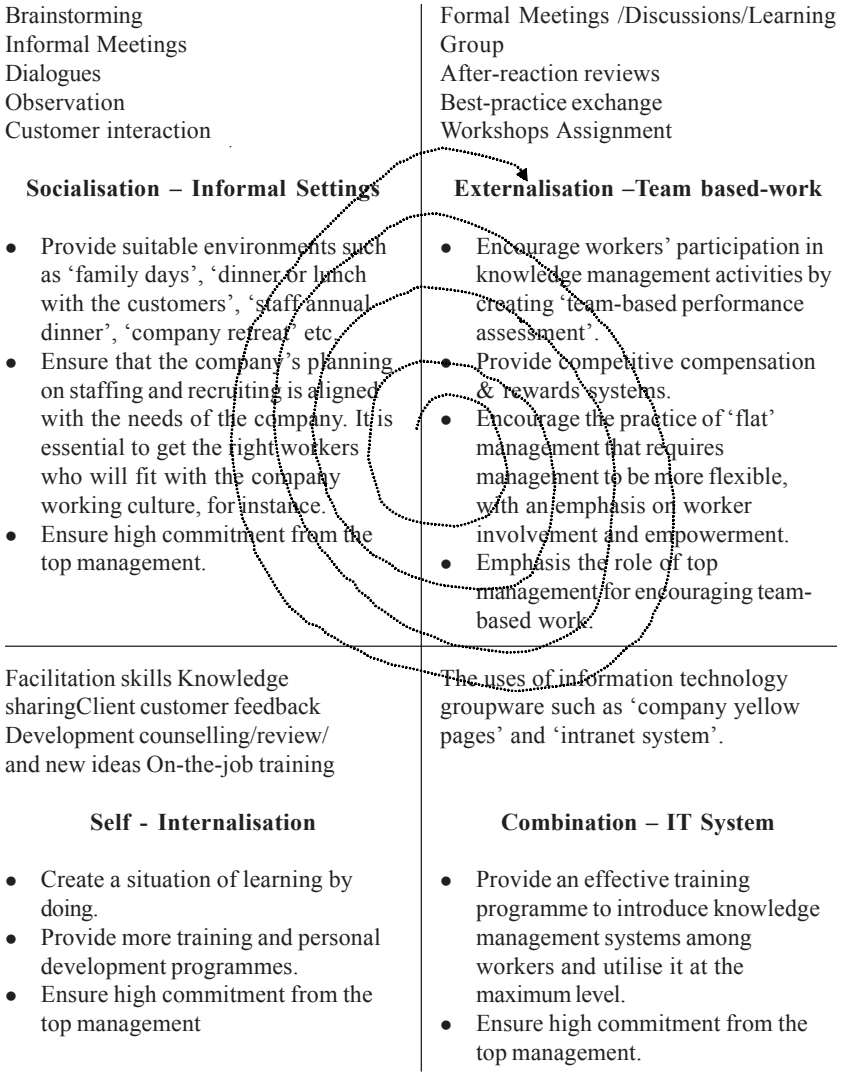

Figure B: The Relationships between strategic human resource management and knowledge management in appreciating tacit and explicit knowledge of knowledged Workers

Overall, looking back at the resource based theory, knowledge based theory and SECI Model applied in this case study, it has been found that the first two theories are relatively static. They do not necessarily recognized change very well. By introducing the important of human resource management and in particular knowledge workers, then the authors have the notion of investment in and change on resource based theory knowledge. Apart from the dilemma in attainable resources not being sustainable, thus, there is a need of a continuous support in becoming dynamic strategically. This can be done by focusing on knowledge as the superior resource. This then leads to the dynamic capabilities emphasized by Teece et al. (1991). Here, by developing capabilities based on sequence of path-dependent (continuous) learning, thus firms still can stay ahead. So, the case study suggests that the issue of dynamic capabilities is very important and that have been reasonably considered the need of other theory to back up this work. Thus, the SECI model in this research again kind of consistent. But by introducing human resource management into the picture it emphasized the importance of context which Nonaka and Konno (1998) mentioned in terms of *'ba'* and emphasized across the socialization, externalization, combination and internalization-depending on context. It has been seen that the preferred *'ba'* by Malaysian knowledge workers is very much during the externalization process compared to the Japanese, who favor more socialization process.

Conclusion

In conclusion, knowledge workers themselves agree that it is vital that companies have an optimum understanding of how to manage them well. Also, it is important for knowledge workers to know how best to contribute in order to add value to the success of their companies. Therefore, it is hoped that the findings of this case study will contribute to the authors' own understanding, the country in general and the SMEs in particular. Furthermore, along with continuing to support Malaysia towards the status of a developed nation by the year 2020, the Malaysian government needs to strengthen its human resource management and/or development functions. What is currently happening in most companies is the realisation of the idea that people are their most important resource. They have realised that managing this human capital well is critical for their success and ultimately, their survival. They have also realised that in order to

gain a competitive advantage, they will have to perpetually attract, train, motivate and retain a highly competent group of knowledge workers. Therefore, there is a further question with regard to how this can be done successfully. Companies capable of doing this effectively will inevitably be the survivors. This is a fundamental issue, and therefore, achieving excellence must to a large extent be dependent on the company's human resource management philosophy, especially with regard to the issue of assisting in the management of knowledge in the company (i.e. knowledge management). Thus, attracting and retaining skilled knowledge workers is both a priority and a problem for SMEs such as those that make up the Multimedia Super Corridor. This can be achieved by promoting and adapting SECI Model into the formation of a unique style of human resource management that could allows SMEs to manage and leverage their workers' knowledge for the sake of achieving success and a competitive advantage. It needs to be recognised that knowledge workers i.e., human capital that represents the core asset of the economy in the 21st Century: they hold the key to the success of companies, and human resource management has to take this seriously.

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Appendix 1

Table A
Growth in Jobs Created and Percentage of Knowledge Workers

	2002	**2003 (filled)**	**2003 (includes vacancies)**	**2004**
Growth in Jobs Created	17,000	17,854	21,270	22,398
Percentage of Knowledge workers	86 per cent	86 per cent	86 per cent	**88 per cent**

Source: MSCIS (2003: p. 3)

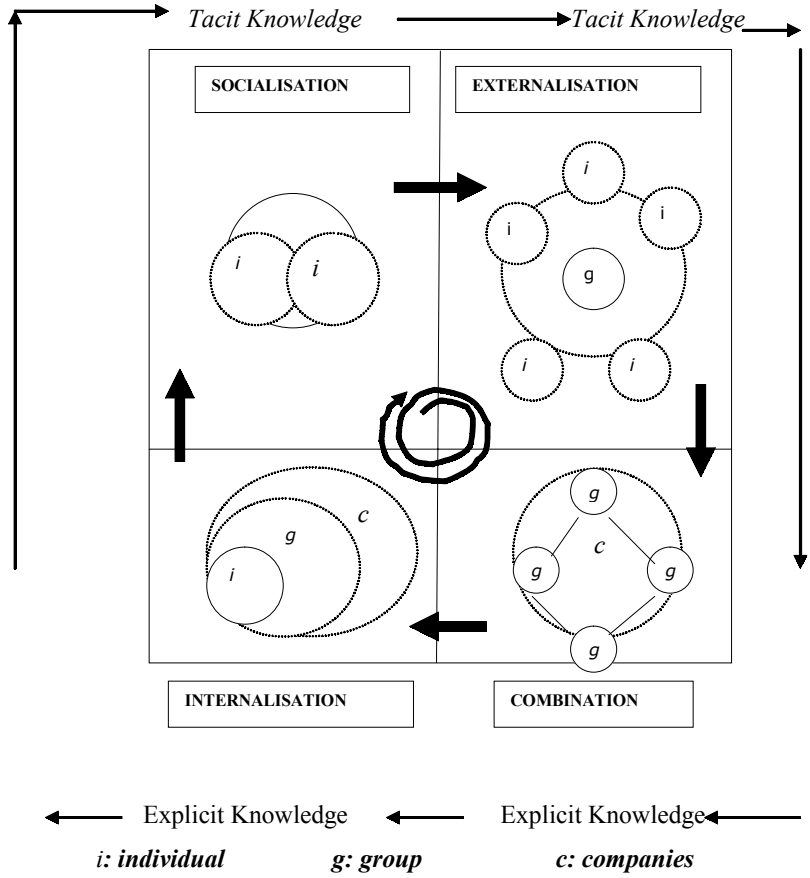
Table B
Occupational Grouping

	As at end 2002	**As at May 2003**		**Projected 2004**
	Total	Filled	Vacant	Total Staff
MANAGEMENT				
CEO/MD/CTO/COO/CFO	1,057	1,103	101	1,188
Sales/Finance/Marketing/MIS	1,740	1,780	421	2,340
Other Managerial Staff	1,421	1,434	256	1,640
TECHNICAL				
Software	3,278	3,591	659	5,133
Developer/Programmer				
System Analyst/Designer	875	880	245	1,192
Business	852	925	199	1,023
Analyst/Consultant				
Systems/Hardware	954	1,080	283	1,271
Engineer				
Web Designer/Developer	353	336	146	503
Technical Support Staff	2,128	2,315	342	2,731
Film Director/Editor	238	236	17	253
Animator/Graphic	230	230	64	563
Designer				
Content Developer	199	177	76	425
Other Technical Staff	1,200	1,248	221	1,481
Support Staff	2,375	2,519	398	2,655
GRAND TOTAL	**17,000***	**17,854**	**3,416****	**22,398**

Source: MSCIS (2003: p. 3)
Notes: * - The exact total as end 2002 is 16, 900 and not 17, 000.
**- The exact total of vacancies as at May 2003 is 3, 428 and not 3, 416.

Appendix 2

Spiral Evolution of Knowledge Conversion



Source: Nonaka and Konno (1998: p. 43)