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Proximity, collaborative relationship and entrepreneur's knowledge spill-over opportunity in a Malaysian regional innovation system

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Abstract:

This research focuses on the consequence of poor understanding of the social phenomenon of innovation and the effect immature social infrastructure can have in limiting the benefits of proximity and prevent the entrepreneurial process of knowledge spill-over opportunities. Interviews of system actors in technology firms in the new cluster city of Cyberjaya (Malaysia) revealed they had low levels of interaction amongst the system communities and weaker relationship with local universities than local government agencies. The research contributes to the theoretical concept of proximity, where a lack of richness of a social infrastructure and low density of informal (unplanned) social networks influence the proximity benefits and limits the opportunity density of entrepreneurs knowledge spill-over. For policy implications, this research highlights developing deeper collaborative relationships with universities, reducing the dependency on local public authorities and investing in a richer social infrastructure; or utilizes existing mature towns/cities in preference to greenfield developments.

Keywords: proximity, knowledge spill-over opportunity, innovation, innovation system, collaborative relationships

1. Introduction

Innovation, diversity and function were considered as crucial conditions in an innovation system to produce Porter's competitiveness determinants (Porter, 1990). The diversity of

system elements in innovation were considered less diverse if its functions (in micro and macro level) were less workable (Intrakumnerd et al., 2002; Patel and Pavitt, 1994). This research explores the conditions

of a Malaysian regional system focusing on an information and communication technology (ICT) and biotechnology cluster of Multimedia Super Corridor (MSC) region by looking at the consequences of social functions conditions with the role of actors and its relationship. The impact of poor social infrastructure was found to be one of major determinants in the MSC development in relations with the opportunity for entrepreneur's knowledge spill-over; and this was discussed in the chapter. This study concludes on the challenges for knowledge spill-over and the benefits of proximity cannot be fully utilised if the social functions was not ready for the system actors in regional and cluster development. Thus, influencing the effectiveness of the innovation process and technology transformation for Malaysia.

2. Proximity and innovation system

The success of innovation is not only judged by its products and/or services offered but also the effectiveness of the crucial components that supporting the innovation system itself such as the role of actors (institutions, governments, industries), supporting polices; learning and relationship patterns, common shared culture and geographic concentration (Etzkowitz, 2008; Porter, 1990; Staber and Sautter, 2011; Saxenian, 1985 and 1994; Oprime et al., 2011). By recognising the importance of effective components of an innovation system, innovation can be said to be well managed even though there are many challenges (nature of the business and institution organisations, the business environment, and the approach of technological innovation) that are inherent in the process (Dodgson, 2000). However, understanding the competitiveness and technological development in the wider environment that forms the

immediate innovation systems (i.e. national, regional, sectorial and/or technological system of innovation) could assist policy advisers and users in lowering the cost of said challenges.

According to Edquist (1997), increased interest on studying the concepts of systems of innovation started in the early 1990s with work by Freeman (1987), Lundvall (1992) and Nelson (1993) on national systems of innovation (NIS), followed by Carlsson (1995) on technological systems; and later Cooke (1996) from the perspective of regional systems. This evolution of the boundaries of the "innovation system" has refined understanding of the concept through investigations of various industry scopes, case studies and functions. Despite each system having a different emphasis, an appreciation of the various system mechanisms is essential to understanding and investigating the dynamics of innovation activities in context. This ability to manage the complexity of operationalizing the concept of innovation processes reduces risks when attempting to design an innovation system able to create, incubate, develop, diffuse and utilise knowledge for innovation and competitiveness (Lundvall, 1992 and Carlsson et al., 2002). Innovation systems represent a rich combination of innovation activities in the local innovative milieu; supporting policies, interaction and network linkages (Cooke, 2001) of participating system actors, such as institutions (universities), firms (industries) and government.

The geographical perspective (Carlsson et al., 2002) of specific physically boundaries at the nation or country level are classed as national level systems (NIS). The NIS concentrates on national local factors, interaction of system actors and how the nation learns in their unique practices and culture (Freeman, 1987; Lundvall, 1992; Nelson and Rosenberg, 1993; Patel and Pavitt, 1994; and Bryant et al., 1996). Further to this, Porter (1990) discussed the importance of national determinants and characteristics influence on competitive industries and individual firms. For example, "home demand conditions" such as the size, pattern of

growth and supporting policies can reinforce each other to form unique development paths for informed local firms.

The regional aspect were later added in the NIS literature as a subnational boundary system (Edquist, 1997) to investigate the complexity of innovation systems that are geographically or regionally (spatially) distinct. The analysis of regional innovation system highlighted the role of geographic proximity of firms with local system institutions such as universities, suppliers and government agencies that influence the competitiveness of individual organisations (Cooke, 1996). Related studies by Saxenian (1994) investigated the "regional industrial systems" of Silicon Valley and Route 128, with Marshall's (1930) concept of "industrial districts". The regional concept highlights the benefits of proximity for successful economic agglomeration (cluster) and high impact on specialism of local learning, interaction, networking and collaboration throughout the local milieu (Cooke and Morgan, 1994); which create its own unique identity over time. For instance, the closeness of individual firms and/or organisations with knowledge and research institutions i.e. universities provide opportunities in collaborative innovation arrangements (such as joint-research projects, utilisation of facilities and equipment, consultancies, and trainings) facilitates a rich transfer of knowledge. This is noted for enhancing the absorptive capacity (Cohen and Levinthal, 1990) of individual organisations (firms, universities or institutions) on knowledge and learning for innovation through its networking practices, opportunities for knowledge density spill-over, and enhances the closeness or trust based relationships.

A key component of a regional innovation system is the role of the regional government and its policies, especially those known to accelerate innovation activities in companies, such as financial aid (Cooke et al., 1997). This is based on the importance of a deeper understanding and vested interest in the regional situation from local regional policy developers and advisors. Local knowledge facilitates a greater awareness of the connective mechanisms,

local factors and competences to enable informed planning and implementation of supporting policies for the regional development. The local government or public sector interventions are necessary to influence regional growth and lower the risk of system and market failure (Saxenian, 1994; Cooke and Morgan, 1994; Cooke, 2001). Therefore, the issues of closeness of proximity benefit the degree of trust and relationship formation (formal and informal interaction) among firms (industries) and institutions (universities, agencies, and/or public sectors) that can influence the knowledge density spill-over.

A different, but related, sectorial approach on perspectives of innovation systems contrasts those of the geographical boundary systems (national and regional system). The "sectorial system of innovation" focused on innovation in specific sectors (industry) or technology. Carlsson's (1995) early studies on Swedish technological systems, such as pharmaceutical, electronics and computers formed the term "technological system" and highlighted its distinct features (Carlsson and Stankiewicz, 1995) based on the characteristics of specific technology including the organisations (firms and institutions), learning and interaction bounded within the system's components and relationships (Carlsson et al., 2002). These relationships evolve over time to enhance innovative capabilities that are not necessarily within the boundaries of a national or regional level (Malerba, 2004). Hence, the sectorial or technological system combines the geographical and sector or technology elements and functions of specific system actors, economic areas, networks and interaction. This is an assumption that sectorial systems of innovation overlap NIS (Malerba, 2002) and are very similar to Porter's (1990) concept of clustering for competitiveness.

Development of cluster studies can be and must be related to the understanding of innovation systems; in particular the regional approach (Vaz et al., 2014). The innovation system involves the characteristic of system actors (firms and institutions) and influenced by the behaviour and capabilities of learning, networks and interaction within or beyond local milieu

boundaries for innovation (Cooke, 2001). This also comes with the benefits of proximity or closeness between actors in their mutual environment which encourages and supports the healthy learning and the relationship ultimately promotes the entrepreneurial activities.

3. Collaborative relationship and knowledge spill-over

Close relationship with the actors i.e. university, industry and government in the closeness proximity represents an important aspect of social interaction and of working collaboratively (Clark, 1983) in order to achieve a common goal or working with a special agenda such as profit maximisation, technology breakthrough, and self-recognition; which is mostly mentioned in the literature of regional cluster studies (DTI, 2004). The active inter-organisational relationship among the actors in industrial cluster (Saxenian, 1985 and 1994; Oprime et al., 2011) could stimulate the development of cluster or region as knowledge resources become vigorous for organisations to be competitive (Porter, 1998). According to Etzkowitz (2008) the role of the actors such as universities, firms in the industry and government interconnecting with each other could support the regional development process from the *"knowledge, consensus and innovation spaces"* which mentioned in his Triple Helix concept of innovation relationship. This issue highlights the importance of social capital in the development of healthy relationship and interaction among actors that essential for effective and workable innovation system as well as entrepreneurial development and process.

Furthermore, Saxenian (1985) admitted that social interaction among Stanford University's scientists and local entrepreneurs spark the spin-off and local technology champions that created the success of Silicon Valley. However, there is chaos on the provision of local social infrastructure such as the shortages of residential properties, transportation networks and the

environment in the 70s when the production from the microelectronics industry was at its highest; before the big manufacturers relocated to other cheaper areas. Later, they left the North Silicon Valley as the high research and control centre, while the South and West became the growing microelectronic manufacturing centre. This showed that the social dimension influences organic cluster developments and it also matters for the engineered or planned development. This reinforces the importance of social capital as a contributing factor in cluster and regional development; and the theory has huge implications for economic development (Putnam, 1993) including forming innovation policies. Knowledge sharing through social networks within the proximity communities may be an essential topic to further understand how the regional innovation processes work (Storper, 1995); and thus stimulate the knowledge creation and dissemination beyond the spheres boundaries.

There are three major dimensions in social capital studies (Nahapiet and Ghoshal, 1998). Firstly, the structural dimension which is a pattern of connectivity between people such as the density of network, the uniqueness and bond strength to other actors. Secondly, the relational dimension, which incorporates the relationship of the actors including the personal relationship built with the contacts over the years; this is important for trust building between actors and its contacts. Thirdly, the least measurement of social dimension by Nahapiet and Ghoshal (1998) is the cognitive dimension; referring to the norms, shared language and interpretation. There is another social dimension which is not put forward widely in cluster and regional studies, the social infrastructure (Flora and Flora, 1993). This research will also explore the role of social infrastructure such as housing and transportation networks influence the social linkages among actors in relation with the proximity and the opportunity for knowledge spill-over to happen. The outcome can provide alternative indicators for policy and economic advisors in strategizing effective collaborative relationship with universities and industries.

Summing up, therefore, it can be stated that innovation system concept and approaches unmask the crucial benefits of proximity and it may triggers consequences on how the local system (including entrepreneurs) operates from learning (including knowledge spill-over), networking (formal and social), collaboration to innovation process e.g. regional actions and development. However, uncertainty remains on what influence the healthy learning and collaborative relationship among system actors in spatial proximity. Furthermore, there were limited literature documented the impact of social dimension as experienced in early years of Silicon Valley development (Saxenian, 1985). Most studies of collaborative relationship in innovation system (Etzkowitz, 2008; Porter, 1998; Clark, 1983), however, have focused on relationship in develop nations and poorly in developing countries like Malaysia. This study attempt to address these issue by investigating an MSC as a case to study.

4. Methodology

4.1 Method and data

The objective of this study is to examine the condition of Malaysian regional innovation systems focusing on the role of actors on how their collaborative relationship could influence the social interaction within proximity. Thus contribute to the understanding concept of proximity in innovation system. A case study approach has been used to explore greater depth explanation of the problem (Tashakkori and Teddie, 2003) and to conduct the interview investigation with main actors in innovation system (universities, government agencies, companies (ICT and biotechnology firms), intermediaries and financial institutions) of new city of Cyberjaya, Malaysia. The case of MSC region has been chosen for this study due to it being among the first designated regional development initiative focusing on high technology (including ICT), higher education and biotechnology (MALAYSIA, 1996). The MSC is

among national initiatives to promote Malaysia to become develop nation in 2020, where further details were expressed in section 4.2. In depth interview with system actors have been found to be an appropriate approach when the context and experience of system actors are critical (Barratt et al., 2011). This approach is also suitable when studying complex collaborative relationship (Farinha et al., 2016; Lundberg and Andersen, 2012) and has been chosen as the primary data collection method for this study. All the 21 interview respondents were carefully selected to represent the main actors in the system, and range from the senior directors of government officials, universities professors, CEOs of technology companies (ICT and biotechnology) to senior managers of local banks. The majority of interviewees had experience in collaborative relationship activities and were located within the proximity of Cyberjaya's city and Multimedia Super Corridor (MSC) region. This provides a degree of validation on comparison of different background and independent interviews in each organisation representing the system actors. Interviews were semi-structured and involved a number of open-ended questions intended to elicit views and tease out opinions associated with collaborative relationships among system actors in MSC region. Questions focused on the role of interviewees within their organisation and MSC; condition of MSC from its role as innovative cluster, contributions and its uniqueness (or weaknesses) as compare to other successful cluster in develop nations (e.g. Silicon Valley, US and Cambridge Silicon Fen, UK); and the synergies of collaborative activities and relationship among key system actors – university, government and industry. The face-to-face interviews were conducted between July and September 2011 and were on average approximately 60 minutes in length. The interviews were digitally recorded with permission and transcribe verbatim.

In terms of data analysis, an abductive approach was utilised to uncover various aspects of reality (Lunberg and Andersen, 2012; Jarvensivu and Tornroos, 2010; Dubois and Gadde, 2002) from innovation literature to collected data and available theory (Dubois and Gadde,

2002) which is suitable for the investigated case of MSC. The interviews were summarised using contents analysis to help in processing, developing and interpreting the meaning of coded text into themes that were reliable and valid use for the purpose of this research (Hsieh and Shanon, 2005; Boeije, 2010; Zhang and Wildemuth, 2017). The data analysis begins with understanding the transcribed text using coding process which looked for commonalities, key patterns and resulted in a range of theoretical concepts (35 concepts) which were later condensed and serves as core themes (11 themes e.g. role of government, motives of collaboration, technology cluster status) for this study. Before the coding process begin, all transcripts were reviewed and validated by four different qualitative researchers to ensure validity and reflected to real conversation (O'Connor and Gibson, 2003) for the quality of analytical process. Influence diagrams were used to displayed, visualise and interpret content analysis of narrative data and provide opportunity in identifying possible gaps in knowledge associated with this study (Boeije, 2010).

4.2 The Malaysian regional innovation system: The case of MSC

The Malaysian government has recognised the cluster-based development approach as one of the strategic development tools for the growth of its economy (Abdullah, 1993; Rahman, 1993). There are selected geographical areas identified as Free Trade Zones (no duty tax on products and services) which aim to boost the growth of local industry cluster especially the tourism industry in areas such as Labuan Island, Langkawi Island and Tioman Island. Furthermore, there were five new growth corridors identified during the Ninth Malaysia Plan (for year 2006–2010) which included objectives to balance the regional economic development and focus growth in the selected industry cluster and geographical areas. According to the Tenth Malaysia Plan (for year 2011–2015), the Malaysian government had identified the potential economic cluster in selected areas, also known as National Key Economic Areas (NKEAs) of each of these five corridors have the economic and geographic

advantages: (1) Iskandar Malaysia is to focus on education, healthcare, finance, creative industry, logistic and tourism industry -launched 2006; (2) Northern Corridor Economic Region (NCER) to focus on agriculture, manufacturing and services, tourism and logistics industry – launched 2007; (3) East Coast Economic Region (ECER) to focus on tourism, oil, gas and petrochemical manufacturing, agriculture and education industry – launched 2008; (4) Sarawak Corridor Renewable Energy (SCORE) to focus on heavy industry i.e. aluminium, glass, steel and timber industries, agriculture and aquaculture related industry, marine engineering, and tourism industry - launched 2008; (5) Sabah Development Corridor (SDC) to focus on tourism, manufacturing (palm oil and related products), oil and gas, agriculture and logistic industry - launched 2008 (MALAYSIA, 2010).

Other than the five corridors or regions mentioned earlier, focus is also given to the area called Greater Kuala Lumpur (Greater KL) cluster announced in Economic Transformation Programme in 2010 where this geographic areas contributes eight times the Gross Domestic Product (GDP) of any other city in Malaysia (EPU, 2010) and cover the areas of Kuala Lumpur (capital city of Malaysia) and its neighbouring cities, previously known as Klang Valley. Parts of Greater KL, an engineered cluster of Multimedia Super Corridor (MSC) was located and created in 1996 to spur the economic growth and introduce information and communication technology (ICT) industry as an industry that can move Malaysia towards high technology industry with talented skills while attracting foreign investment.

MSC was among the first regional economies project to concentrate on the ICT industry. Inspired by the success of Silicon Valley in California, coupled with the intention to be a developed nation under its Vision 2020 initiatives (MALAYSIA, 1992), the policymakers in Malaysia established the Multimedia Super Corridor (MSC) also known as MSC Malaysia in 1996 with a mission to transform Malaysia into a high-technology zone and knowledge-economy. In line with this project, the Malaysian government established the Multimedia

Development Corporation (MDeC) to develop, facilitate and oversee the MSC Malaysia project. The MSC covers an area of 50 x 15 km^2 zone, stretching from the PETRONAS Twin Towers in Kuala Lumpur which also referred to as the Kuala Lumpur City Centre (KLCC) to the Kuala Lumpur International Airport (KLIA). This zone includes Putrajaya (the official seat for federal government), Cyberjaya (national hub for information and communication technology (ICT); and research centre), Multimedia University, MSC Central Incubator (focusing on IT and multimedia) and Technology Park Malaysia (focusing on ICT and biotechnology).

The concept of MSC also being established to promote healthy linkages among actors in Porter's Cluster concept and the Triple Helix's innovation concept that could drive the innovation contribute to competitive advantage of nations and create sustainable economic growth. However there are challenges for Malaysia to pursue this project and it is of interest to this research to explore the high technology firms located within the MSC cluster. The Malaysian government has introduced a series of incentives to attract investors including in the 10 Bill of Guarantees (BoG) that give privilege for companies to locate within MSC and city Cyberjaya while enjoy tax rebate and less immigration restriction to employed foreign workers.

5. Actors and roles in the MSC development

The success of high technology clusters such as Silicon Valley is associated not only with strong linkages amongst its system actors; active involvement of venture capitalist and advantage of geographical concentration but also through the complex roles played by the system actors within the cluster. Dynamic relationships between the local firms (industry); university and government allow clusters to evolve and develop in a unique way (culture). On

the development of the MSC, interviewees indicated that the roles played by government and industry contribute significantly to MSC development. Overall, nine interviewees were in agreement with the notion that both government and industry are equally important in the development of the cluster. However, the perceived contribution towards the development of MSC from the university was minimal. Overall, the roles of actors or stakeholders in the MSC were identified in the analyses as emerging issues. Each stakeholder has a particular perspective on the others and it was found that the role of university was perceived as the lesser partner and contributor in the MSC development. The analyses also discovered that the role of government is seen as the dominant contributor in the development of cluster.

Overall, the role of university in MSC performs an important role in social and economic development in the regional or cluster intentionally or unintentionally. However, there is different emphasis and possible explanations of the role performed are related to the characteristics of the university including its organisational factors such as culture, leadership, structure, management style and motivation; the policy setting and the characteristic of the cluster itself. Furthermore the role of university in the MSC is seen as generating and supporting the development of cluster rather than transforming it leaves it far behind the hybrid type of helix. Meanwhile, the role of industry is seen as important in generating the economic growth of the cluster (MSC) including the labour pooling, agents to university and government, motivator for competition, and yet to produce competitive indigenous technology in local and global production. The local technology firms are required to upgrade their technological innovation processes, initiate innovative projects and utilise the local resources combined with knowledge-based capacity including experts from other firms, universities and institutions in clusters. This leaves an opportunity to investigate for future research the impact of cluster and collaborative relationships in producing indigenous technology.

However, the role of government in the engineered of MSC is important, not just in providing an economic environment, including local resources and policy initiatives, but also connects to industry and university to foster collaborative relationships. Although, there are changes in the university approach towards the evolution of Entrepreneurial University and industry involvement with the university in collaborative research activities; the role of government is still maintained as the dominant position in MSC. The role of the Malaysian government becomes more challenging in reducing the "red tape" to attract tacit technology knowledge and learning capacities for the local economies as these were found to be barriers to effective collaboration in MSC. This needs innovative policies that fit the requirements of the current economic development as suggest by Porter (1998: 673) that *"government policy must evolve so as to anticipate the needs of an upgrading economy"*. To do so, more investment in the MSC and other similar cluster initiatives are needed for future economic transformation. It seems that the vision of becoming a developed nation by 2020 will be impossible to achieve but perhaps possible in the next 20 years when the region or cluster is at the peak of its life cycle. *The role of intermediaries* in regional and cluster development according to Smedlund (2005) that there is needs to go beyond knowledge transfer and become adapted to the specific demands of the local priorities. Smedlund (2005) also claims that the regional level is the most crucial role since it connects the national and local level together with a mutual strategic formation, visioning process and support for the triple helix actors of university, industry and government. Despite the confusion regarding the role of intermediaries in MSC, interview respondents still indicate that they consider intermediaries as consultants for activities of facilitating, motivating, marketing and commercialising, project management and linkages with university, industry and government. These bridging activities of consultants (Bessant and Rush, 1995) are to primarily support industry and make them aware of current developments.

A summary of roles played by universities, industry (firms), government and intermediaries is presented in Table 1. It can be concluded that these are evolving, with the role of universities coming under some pressure from the other actors to improve on their weak collaboration position, while also addressing concerns regarding the quality of the courses offered and the graduates produced. As the main power in the region or cluster, the government, acting through its agencies and intermediaries, has a role to close the communication gap between the universities and industry, However, it has yet to develop the right agency design and policies; Smedlund's (2005) adaptation to local priorities.

Role of university	Role of government	Role of intermediaries	Role of industry
• Learning and teaching centre • Source of talent • Research and development centre • Collaborators for research and business • Spin-off and entrepreneur producer • Source of funding • Knowledge sharing provider • Problem solvers • Agent to government	• Source of funding • Policy planner and regulators • Connectors to market • Intermediaries • Provides support to industry and university • Provides economics environment	• Access of funding • Facilitator • Project manager • Agent for government • Problem solver • Marketing and commercialising • Training providers and educators • Business intelligent • Resources agent • Knowledge and technology transfer centre	• Sharing knowledge and resources • Corporate social responsibility • Adviser to government and academic council for university • Seeking and hiring skills and talent • Provides knowledge and technology transfer • Motivator for competition • Provides training for local skills • Engine of growth

Table 1: Summary views on role of actors in MSC cluster by interviewees respondents

6. Social dimension in MSC

The theories of Porter's Diamond Model and Triple Helix emphasise the influence and importance of strong relationship or linkages between actors for innovation (which were found to be a weakness in MSC). This weakness is not only because the MSC employs a top-down rather than bottom-up strategic development sequence but due to the lack of provision of social infrastructure as part of social dimension in the cluster space. Interview respondents confirmed that there is nothing interesting to do in Cyberjaya apart from working, this results in a massive swing of population between the day and night. Neither of the foundation concepts (Porter's cluster and triple helix) emphasise the importance of social dimensions of effective social infrastructure for enhancing the linkages among actors in a cluster. This research has found that the weakness in interaction between university and industry not only because of the limited skills, value of research activities, commercialisation difficulties, financial stress, collaboration activities and bureaucracy; but also the limited social infrastructure and services. Thus, the MSC actors have fewer social bonding spaces and opportunities that can enhance the social interaction and knowledge spill-overs among the communities involved in the MSC. The initial planning of the MSC project has neglected the importance of this aspect of social dimension for the MSC communities to interact and socialise. Clearly, the more that in known about the impact of the determinants for cluster development the greater the likelihood that engineered clusters will be successful - not only the developing countries, generally. A more comprehensive approach can be devised if cluster engineers and policy designers are aware of the soft determinants that can nurture and produce collaboration as well as the easier to measure and tangible factor conditions such as infrastructure and technology.

The social dimension in cluster building should not be ignored i.e. university, industry and government agency knowledge is in the heads of their employees, and knowledge transfers

are matters that contribute significantly to the innovative capability and economic transformation within the cluster. This social dimension not only includes the pattern or structure of the connections, type of relationship between actors and common understanding, but also the provision of social infrastructure that is needed to enable all of these social dimensions to work effectively. Without doubt, the role of government is crucial to utilise the resources available, identify national priorities and set innovative economic programmes that have resilient approaches in order to transform the economic and social condition of the country. This approach implicitly assumes the full engagement of the actors and institutions for cluster development, but generally the social conditions to enable high trust, social-context, human interactions are lacking in the design of green-field situations. An improved approach for creating a new cluster, i.e. one that has a greater probability of reaching the sustainment phase of the cluster lifecycle model, is to plan the location in a mature social space that offers an attraction to knowledge workers to live and socialize. Attempts to build on low cost, green-field and (usually) remote locations will result in a counterproductive social environment.

The summary of social dimension in the MSC is illustrated in Table 2 and this information is useful for the policy maker to understand the social condition of the actors involves in the MSC. This can provide a measure to analyse the appropriate strategy to improve the weakness of linkages among actors in cluster, and in particular, the social interaction between university and industry.

Social Dimension	**Feature**	**MSC's Social Dimension Condition**
Structural	Pattern of connectivity, density or size of networks, strength of tie between actors	University and research institution both have low density of connection, government, suppliers, foreign and local firms, financial institutions are all have strong value of connection. Intermediaries have medium value of connection.

Relational	Interconnection of relationship build over the years, previous experiences	Trust building start by informal meeting, risk of trust embedded in mutual agreement such as contract or MoU, previous experience counted for smooth business and social networking.
Cognitive	Similar norms, shared language and interpretation	Shared similar norms and languages.
Social infrastructure	Housing, school, convention centre, sport and recreational centre, health centre, transportation networks	Limited housing and residential area, limited bus services and workers commute with own or share car with colleague. Limited social and recreational centre in Cyberjaya resulting the population at night drop to 10000 compare during the day which is 50000 people. Access and choices to motorway are easy but charges apply. Commuters facing risk of road traffic during peak office hours linking Kuala Lumpur to main city of Cyberjaya. Transportation networks focus on Kuala Lumpur city centre.

Table 2: Social dimensions in the MSC cluster

7. Conclusion

This research has explored, investigated and analysed the relationship dynamics in the localised innovation system represented by the MSC Malaysia regional cluster case . The research has uncovered the possibilities of creating or developing technology clusters for the purpose of economic, social, technology and knowledge transformation for less developed and/or developing countries; and/or any interested regional or sectorial policy makers for strategic local policies framework. The main challenge faced by MSC are the issues of opportunity for knowledge acquisition and absorptive capacity for the organisations (firms and institutions) to acquire, utilise, transform and exploit the knowledge. In the case of MSC, it was found that the social infrastructure is a matter for the actors including entrepreneurs to interact and connect with their communities. The lack of social infrastructure and low

strength of collaboration ties and value result in disappointing impact to the effectiveness of social linkages activities between university and industry in particular. Thus this has influenced the effectiveness of interaction and linkages among system actors and the dynamics of the cluster in fostering entrepreneurial processes and activities. More comprehensive and robust measures are certainly required for MSC to further excel and this research can be used as an initial investigation. A mature social space that offers attractions to knowledge workers to live and socialise would probably be an improved approach for developing a new cluster. The outcome from this research and discussion provides new input on both theories used i.e. Porter's Diamond model and Triple Helix, thus contributes to the knowledge on the theoretical implications.

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