Technological knowledge, learning and linkages in the wooden furniture industry in Malaysia: a spatial innovation perspective

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This paper examines technological knowledge, learning, and linkages in the wooden furniture industry in the Muar cluster of Malaysia in terms of a spatial innovation perspective. The furniture manufacturers form a close partnership with their immediate business environment (the suppliers, customers, retailers and support industries) to enhance the process of interactive learning. The mutual exchange and shared learning process in the cluster are best described as socially constructed and socially embedded processes that are highly associated with the element of trust within the cluster; in addition, tacit knowledge tends to become embedded in the local milieu. The relationship among the community and the furniture industry players is also close. There is a strong social capital and mutual understanding among competitors to see one another as partners, especially in advancing their knowledge in the international markets. The achievement of the Muar furniture cluster is built upon the collective efforts of the entire Muar furniture industry. Firms are always ready to share business opportunities and information. However, the cluster still lacks the design and technological capabilities to move to the original design manufacturing and original brand manufacturing stage.

Keywords: innovation systems; social capital; trust; low-tech industry; furniture cluster

1. Introduction

Technological innovation is a highly socio-economic-technical hybrid that evolves through time and space. As such, innovation success no longer depends on individual investors but on systematic laboratory research, availability of an educated workforce, and a knowledge management system that are together able to integrate technology and markets in a complex, dynamic and interactive combination (Kline and Rosenberg 1986; Mowery 1995). Knowledge in this context is the heart of innovation (Lundvall 1992; Nelson 1993; Asheim and Coenen 2005) that plays a crucial role to establish and sustain the long-term capabilities and performance of firms and organizations (Howells 2002). For Feldman (1994), innovation (perhaps even more than other economic activity) depends on knowledge. As a whole, research that emphasizes the spatial innovation perspective recognizes the importance of the interaction between actors that manifest from different configurations in space that play an important role in technological learning, such as proximity, regional differences, social capital and trust.
Despite the progress in previous literature, relatively little knowledge is available from the spatial innovation perspective on the importance of such interactions over time and space, especially in the low-tech industries in emerging countries. For instance, according to Fan and Scott (2003) and Townsend and Felkner (2011), spatial agglomeration is less understood in emerging countries. More importantly, there is a need to substantiate new evidence by examining new cases in developing countries, especially in low-tech industries. In the view of Chaminade and Vang (2008), clusters in developing countries differ from those of the developed world in the following aspects of dynamics, organizational set-up, geographical distribution, and position in the global value chain. Currently, pockets of comprehensive empirical studies on the dynamics innovation among the furniture clusters in the Southeast Asia region are available such as the Jepara cluster in Indonesia (e.g. Indarti and van Geenhuizen 2005; Loebis and Schmitz 2005; Chaminade and Vang 2008), the Cebu cluster in Philippines (e.g. Beerepoot 2004; Beerepoot 2008) and the Bangkok cluster (e.g. Scott, 2008) in Thailand. Placing these studies in perspective through a systematic examination and adding a new case study on the Muar furniture cluster in Malaysia is the main contribution of this paper. This study fills a gap in the literature of spatial innovation in the Southeast Asian furniture industry and consequently provides policymakers with more insight on the importance of spatial innovation to technological learning. A comparative analysis of the experiences of various furniture clusters allows policymakers to understand the critical predicaments of development that are industrial, location, and country specific.

This paper provides an empirical investigation of the patterns of learning process and linkages in the Muar wooden furniture cluster in Malaysia. In addressing the aims, this paper investigates the following research questions: (1) What are the significant roles played by the various actors in the process of learning? (2) What are the characteristics and level of linkages among these actors? (3) What are the level of technological capabilities development as well as the effectiveness of the existing policies and programmes? (4) How does social capital and trust contribute to the learning processes and linkages in the cluster? The case study for this paper is situated around the idyllic town of Muar, acknowledged as the furniture capital of Malaysia, and which has contributed 40% of the MYR8.7 billion earned by the Malaysian furniture industry in 2008 (Muar Furniture Association 2008). This paper contributes in the following ways. First, it provides additional case evidence to the literature of spatial agglomeration (especially to deduce more lessons for empirical generalizations, if possible) or even to understand the similarities and differences in the patterns of learning. This is important since the process of learning is highly industrial and location specific. Second, the study examines the less understood aspects of the furniture industry in Malaysia. Lastly, the findings provide useful empirical evidence for policymakers in the formulation process of inclusive science, technology, and innovation policies in developing countries.

This paper is structured as follows. Section 2 presents the conceptual background of spatial innovation as well as the importance of technological knowledge, learning process, and linkages in spatial innovation and the trust and social capital determinants of the success of spatial innovation. Section 3 discusses the background of the furniture industry with specific references to the furniture clusters of the Southeast Asia region. Section 4 describes the framework and methodology while Section 5 discusses the main findings. The paper ends with a discussion and policy implications.

### 2. Spatial innovation perspective

Numerous bodies of literature and a (direct or indirect) spatial perspective framework on knowledge and its learning processes in innovation studies are available. The literature recognizes that knowledge and innovation are spatially bound in that their development paths evolve through time and space. More importantly, the knowledge and learning paths are principally dependent
on the interaction between different actors of innovation systems as well as between the national, regional, and sectoral systems of innovation demonstrated in different space configurations (Oinas and Malecki 2002). Scholars examined the dynamics of industrial innovation from a spatiality perspective using different terminologies. Attention is provided to the cluster spatially (or spatial agglomeration) of the innovation approach as well as a systems approach towards innovation. This includes the industrial district (e.g. Markusen 1996; Park 1996), cluster (e.g. Porter 1985; Porter 1998; Chaminade and Vang 2008), geography of innovation (e.g. Feldman 1993; Breschi 2000) and regional innovation systems (e.g. Cooke, Uranga, and Etxebarria 1997; Ashim and Coenen 2005). In addition, national innovation systems (e.g. Lundvall 1992; Nelson 1993; Freeman 1995) emphasized the inter-firm networks and interactive learning on a national geographical space as the building blocks within the systems of innovation. These terminologies are generally used interchangeably and scholars have attempted to establish the differences. The cluster concept is substantially narrower than the regional innovation systems concept because of the strong sectoral connotation in clusters, whereas a regional innovation system can transcend multiple sectors. This body of literature suggests that innovation at a fundamental level may be viewed as a communication process that bridges different disciplines with distinct vocabularies and unique motives (Feldman 1994). In addition, there is an emerging importance of location as a unit of analysis on empirical grounds since innovative activity tends to cluster in industries where new economic knowledge plays an especially important role (Audretsch and Feldman 1996; Porter 1998). In the embedded and trust perspectives, spatial agglomeration is believed to reinforce mutual commitments and contain inclinations towards opportunism. Furthermore, a knowledge spillover is accelerated, and tacit knowledge tends to become embedded in local milieu (Malmberg 1996).

We adopt a more generic definition of ‘spatial innovation’ in this paper since we do not attempt to critically contrast the theoretical basics of the various concepts and foundations in the economics of agglomeration innovation. The commonalities of the various terminologies that are dealt together with the technological learning process and linkages among the actors within the realm of agglomeration innovation are placed in harmony toward the establishment of the analytical framework of this paper. Most of the approaches principally enlighten the importance of spatial dimension, proximity, and interactions among firms to explain their successful performance and competitiveness (Lastres and Cassiolato 2005). These are drawn on the common rationale that spatial agglomeration provides the best context for an innovation-based globalizing economy because of localized learning processes and ‘sticky knowledge’ grounded in social interaction (Ashim and Coenen 2005). In addition, innovation is expected to exhibit a strong geographic clustering because the process of bringing new products to market relies on specific scientific and technical knowledge (Feldman 1993). Although numerous spatial elements are available within the literature, in this paper, we limit our analysis of the Muar furniture industry to the spatial elements that relate to proximity, trust and social capital, and location and its actors.

2.1. Technological knowledge, learning process and linkages

Exploring and accessing how spatial innovation reciprocally influences knowledge activity is of continuing interest to scholars (e.g. Howells 2002). Asheim and Coenen state that the innovation processes of firms are strongly shaped by their specific knowledge base (2005); subsequently, the analysis of the importance of different types of spatial innovation systems must take place within the context of the actual knowledge base of various industries in the economy. Feldman (1993) established an argument on the relationship between geographical perspectives and types of technological knowledge. Feldman postulates that standardized and reasonably stable technological
knowledge are translatable in standard codes that allow long distance transmission to take place at a low cost; however, long distance standardized transmission is not possible when technological knowledge is complex and evolves rapidly. In such cases, locations close to sources of technology will allow firms to translate information into useful knowledge. Harrison, Kelley and Gant (1996) believe that proximity may reduce the cost of negotiating and monitoring contracts. Howells (2002) emphasizes that the biggest challenge in spatial innovation is how these knowledge sets interact, configure, and harness within a wider organizational realm to create a common knowledge context. As such, issues of localization and contextualization of knowledge in the spatial innovation become the focal point for discussion in various studies (e.g. Asheim 2002; Asheim and Coenen 2005; Vang and Asheim 2006).

Localized learning, according to Asheim (2002), constitutes ‘sticky’ or ‘disembodied’ knowledge and know-how that are highly immobile and not embodied in machinery. It is generally based on high levels of individual skill and experience, collective technical culture and a well-developed institutional framework. Porter (1998) points out that the enduring competitive advantages in a global economy lie in local things, i.e. knowledge, relationships and motivation that distant rivals cannot match. McDonald and Vertova (2001) provide a comprehensive view on the types of firms and their linkages in an industrial district. According to them, an industrial district is composed of three different types of firms, namely the ‘final firms’ that are producing for the final market, ‘stage-firms’ that are involved in only one stage of production and ‘others that work in a different industry which defines the district but, nevertheless, belongs to the same vertically integrated sector’ as the final firms. These firms are linked with three kinds of network, namely horizontal networks, vertical networks, and other networks.

For Asheim (2002), close cooperation with suppliers, subcontractors, customers, and support institutions within a cluster will enhance the process of interactive learning and create an innovative milieu that facilitates localized learning, innovation, and continuous improvement. This point of view is the small- and medium-sized enterprise (SME)-centric universe framework suggested by Woolgar, Vaux, Gomes, Ezingeard and Grieve (1998) where firms (particularly the SMEs) interact most often and most closely with their immediate business environment such as customers, machinery and material suppliers, retailers and exporters, and supporting industries. Universities and government organizations lie outside the attention of small firms. In the same vein, the roles of different firms, local and state government, trade associations, universities, and other public institutions as agents for the formation and evolution of new industrial districts are also discussed by Park (1996).

Trust and social capital also play an important role within the spatial innovation. According to Park (1996), networks and embeddedness are regarded as central factors in the functioning and formation of industrial districts. Geographical proximity is a crucial factor for trust formation because repeated interactions are required to build trust. Evidence from SMEs and firm-level studies suggests that a key driver for small firms to be innovative and competitive is that they should have the social capital capabilities (the ability to establish connections in a social network) and the trust, reciprocity, and resource sharing qualities of those connections (Landry, Amara, and Lamari 2002; Westlund 2004; Partanen, Möller, Westerlund, Rajala, and Rajala 2008). For Cooke and Wills (1999), social capital is a communal property involving civic engagement, associational membership, high trust, reliability, and reciprocity in social networks. It is capable of being identified in social, political, and economic contexts, often associated with strong communities. The social capital of an enterprise is made up of three types of actors: the enterprises themselves and their organizations, the politically governed sector, and the civil society and its organizations (Westlund 2004). From the perspective of an innovation systems framework, social capital plays an important role in facilitating the process of learning and knowledge exchange among actors (Lundvall 1992). Lundvall stresses that innovation rarely occurs in
isolation; it is a highly interactive process of ‘learning by doing’ activity within the organizations as well as the marketplaces. In this regard, cultural space is important in the sense that it allows the establishment of institutional framework, that is, ‘sets of habits, routines, rules, norms and laws which regulate the relations between people and shape human interaction’ in innovation and learning. Moreover, since learning and innovation are interactive processes, their success is closely dependent on trust and other elements of social cohesion. In summary, social capital can take different forms of trust, norms, and networks. Trust is developed over time through a repeated series of interactions. Norms of appropriate behaviour also develop over time due to a series of interactions and exchange of resources. Networks develop as actors develop reliable and effective communication channels across organizational boundaries (Landry et al. 2002).

3. Patterns of innovation in the furniture industry of Southeast Asia

Based on research and development (R&D) intensity (i.e. R&D intensity < 0.9), the furniture manufacturing industry is classified as low-tech industry (Organization for Economic Cooperation and Development 2007). A cross-country comparison of the Schumpeterian patterns of innovation of the furniture industry in Germany, France, the United Kingdom, Italy, Japan, and the United States showed that the furniture industry is consistent in the Schumpeter Mark I camp (Malerba and Orsenigo 1997). The patterns of innovative activity in the furniture industry are mainly generated by entrepreneurial activity and the creativity of small and new firms (see Boon-Kwee and Thiruchelvam 2011). In the same vein, Kautonen (1996) asserts that in the furniture industry, innovation is primarily a process of diffusion of best practices on the use of capital goods and intermediate inputs, while in-house R&D expenditures and other endogenously generated opportunities are rather limited.

Besides Malaysia, other Southeast Asia countries such as Indonesia, Philippines and Thailand have a long tradition in furniture manufacturing. One common similarity of furniture manufacturing in these countries is that the industry is heavily based on hardwood (or rattan based) operating within a form of a cluster. The district of Jepara in Central Java is the main furniture cluster that consists of approximately 2000 SMEs (Chaminade and Vang 2008). Metro Cebu is a conglomeration of four cities (i.e. Cebu City, Mandaue City, Lapu Lapu City and Talisay City) located in the island province of Cebu in the central Philippines and is the main furniture cluster for the Philippines and provides direct employment to more than 45,000 people (Beerepoot 2008). In Thailand, Bangkok is the main location for the hardwood furniture industry.

In Indonesia, according to Indarti and van Greenhuizen (2005), product innovations (such as new product designs and new types of products) are considered the most important type of innovation in furniture industry. New knowledge is partly developed within the firms and partly derived from external sources. Learning-by-doing and buyers are considered the most important knowledge sources for furniture manufacturers; consultants and research institutes or universities are viewed as not important. The role of government in providing knowledge to support innovation is limited. Trust that allows the exchange of high quality knowledge is created through face-to-face contact with buyers and suppliers on a frequent basis; however, social capital provides the platform to disseminate the knowledge acquired from the international buyers to other firms in the cluster (Chaminade and Vang 2008). They believe that interactive learning through the horizontal networks among enterprises is limited. However, the network with a large firm or trader that acts as a broker between the group of SMEs and the large international buyers might facilitate the acquisition of new knowledge that can be rapidly spread to other firms in the network. For Loebis and Schmitz (2005), there are two ways for local enterprises to compete in the global economy. The first is by taking the low road: competing by paying the lowest possible wages, disregarding environmental standards and avoiding taxes. The
second is by taking the high road: competing by upgrading processes and products. The Jepara furniture cluster shows examples of both.

In the case of Cebu in the Philippines, the industry operates at a slightly more industrial level than artisanal production and has a rich heritage of craft skills such as woodcarving, weaving of various indigenous materials, and rattan framing. These skills and knowledge are often transferred through informal mechanisms such as apprenticeship-like relationships. The abundance of cheap labour in the Cebu cluster provides a disincentive to invest in mechanization and skills development (Beerepoot 2008). The industry provides employment to many people with sophisticated skills, but limited formal education. The majority of the workers have learned their skills through informal mechanisms, with only a small number of workers depending on the formal training for their knowledge and skills. The furniture cluster in Cebu is a low technological industry. Many furniture exporters have a strong foothold in the informal sector through the outsourcing of work to small contractors and home-workers. Workers in the lower strata of the production hierarchy have limited access to the formal upgrading of skills and the development of tasks. The opportunity to accumulate knowledge is limited in such a low technological position (Beerepoot 2004).

Furniture production occurs throughout Thailand; however, its principle centre of gravity coincides with Bangkok. Much of the rest of the industry is concentrated in the secondary ring of Changwat and provinces surrounding the metropolitan area of Bangkok. A notably large cluster of producers linked to export markets is evident in the Sukhumvit area in the Wattana district just to the east of central Bangkok. The industry is characterized by a greater degree of operational flexibility than producers located in other parts of the country. They are also geared to relatively high-quality production. The furniture industry in Thailand today remains locked in low-productivity and low-grade craft production for domestic markets; however, the industry has demonstrated a significant capacity for pulling itself up by the bootstraps, moving in the direction of global standards of managerial performance and product quality. Producers in and around Bangkok have been notably open to upgrading due to circumstances that can be ascribed (at least in part) to two intersecting and complementary factors (Scott 2008).

Evidence suggests that the furniture manufacturing in Southeast Asia is generally low-tech and low-grade craft oriented. The learning process is through learning-by-doing or apprenticeship-like training. Informal networks (particularly among the manufacturers and their suppliers and customers) are the most frequently used channel to obtain both technical and market information. Similarly, strong trust and social capital within the cluster (based on kinship and family ties) play an important role. Collective action is common as shown in the Jepara cluster. However, the Cebu cluster shows serious problems of human capital development whereby the workers are trapped in the lower strata of the production hierarchy and have no access to formal skills upgrading programmes.

4. Research methods
The broad definition of spatial innovation serves as our basic framework of analysis. We favour the broad definition of innovation system (Lundvall, Vang, Joseph, and Chaminade 2009) and the 10 expected important activities for innovation (Edquist 2005) since they are more appropriate for developing economies than the narrow approach. The broad approach perceives innovation from the perspective of interactive learning, inter-dependence, and non-linearity where institutions play the central role (Lundvall et al. 2009). The approach allows us to capture the innovation content in the context of developing countries as well as the traditional industry better than if it is defined strictly in the scope of intensive science and technology-based research. Indeed, the 10 important activities for innovation systems (research and development, competence-building, formation of
new product markets, articulation of user needs, creation and changes of organizations, networks around knowledge, creating and changing institutions, incubating activities, financing innovation, and consultancy) provide some guidelines on the execution of heuristics assessment on the innovation patterns at various levels (see Edquist 2005; Lundvall et al. 2009).

The nature of this study is exploratory in its examination of the learning process and linkages in the Muar furniture cluster in Malaysia. The research method adopted for this study is qualitative, whereby we interviewed multiple companies as well as other actors within the system. Each case within the multiple case study research design can be treated as an independent experiment that allows us to trace an emerging trend of events from our qualitative data (Eisenhardt 1989; Yin 2003). Our qualitative data was obtained through secondary resources and observations during site visits, as well as from in-depth interviews with senior representatives from various innovation actors that played some significant roles in the development of the Muar furniture industry located in the Muar District in the northwestern state of Johor, Malaysia. These actors are the SMEs and large-scale furniture manufacturers such as the Muar Furniture Association (MFA), Muar Municipal Council (MPM), Malaysian Furniture Promotion Council (MFPC), Forest Research Institute Malaysia (FRIM), industrial training institutes, and schools. The first author of this paper conducted 20 interviews between April and August 2010; subsequently, interviews with firm managers were followed with a tour of the production facilities. We used a variety of data sources (as well as cross-checked data from multiple sources) in order to ensure the validity and reliability of the qualitative data.

5. Results
We present our findings by first providing an overview of Malaysia’s furniture industry and the emergence of the Muar furniture cluster. Consequently, we examine the main innovation actors and their linkages as well as technological capabilities, competency building, and learning in the furniture cluster.

5.1. Overview of Muar furniture cluster, Malaysia
The Malaysian furniture industry started in the late 1970s and early 1980s with a natural advantage of abundant forest resources and a skilled workforce. It was also the result of intensive government efforts to have more value-added products produced locally with an added advantage of an abundant supply of raw materials (see Boon-Kwee and Thiruchelvam 2011). With a remarkable expansion in overseas markets, the export of Malaysian furniture surged from MYR317 million in 1990 to MYR8.7 billion in 2008. This made Malaysia the tenth largest exporter of furniture, third in Asia, and second in the Southeast Asia region (Malaysian Furniture Promotion Council 2009; Ministry of Plantation Industries and Commodities 2009). SMEs constitute almost 95% of the total establishments in the Malaysian furniture industry (Department of Statistics 2009). They are typically highly specialized in a narrow range of products. Many of the SMEs do not manufacture complete products; they specialize in making certain components or just completing certain processes. The types of furniture produced range from the traditional to the contemporary, as well as furniture designed by overseas buyers under international brand names.

The Muar furniture cluster, located in the northwestern state of Johor, is the furniture capital of Malaysia. The cluster has been around for more than three decades. Across a span of 30 years, it has witnessed the rise of furniture manufacturers along with upstream and downstream industries. The Muar furniture cluster development was characterized by three main phases: (1) the infant stage in the 1970s, (2) the industrialization stage in the early 1980s, and (3) the export era in the late 1980s to 2000s (Table 1). Presently, many of the furniture manufacturing enterprises
are under the stewardship of second-generation entrepreneurs. At present, 300 to 350 furniture manufacturers operate in the Muar cluster (Muar Furniture Association 2008) with the majority of ownership held by the local Chinese community.

The cluster is supported by a wide array of supporting industries, such as coating, varnishing, finishers, fabrics, foams, adhesives, glass and mirror, and wood products (such as wood dowel, and round rod). The machinery and equipment suppliers supply a wide range of imported, new, or reconditioned wood working machines and tools from China, Taiwan, Italy and Germany. The machines commonly supplied are the finishing line system, dust extraction systems, and wood working machines. The suppliers provide what is needed in the furniture manufacturing process, such as machinery, equipment and wooden materials. Retailers and exporters are mostly original equipment manufacturers (OEMs); they are the suppliers of the finished products or semi-finished furniture to their buyers, who are mostly overseas retailers. These retailers

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<th>Period</th>
<th>Development</th>
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<td>Infant stage (1970s)</td>
<td>The industry was generally cottage-based and operated in the traditional way. There were no industrial associations and the workers were mostly unskilled and illiterate. Their earnings were seasonal and workers were not trained to manage the business. At this stage, a pool of highly skilled carpenters and furniture makers had been produced. These elite furniture artisans became one of the main drivers of the Muar furniture cluster in the early 1980s.</td>
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<td>Industrialisation stage</td>
<td>Furniture industry was the first preference for those who did not intend to venture into either the agriculture or construction sectors. Many of the apprentices (after years of experience) formed independent companies and supplied furniture parts to their former employers. The furniture makers began to adopt semi-automated manufacturing processes in their production. Besides the internal drives mentioned above, the investment and relocation of the Taiwanese furniture enterprises to Muar were the main external factors that contributed to the industrialisation stage in Muar. Muar, which had a pool of skilful furniture makers, abundant tropical woods, and a cheaper workforce, became one of the favourite choices for Taiwanese furniture enterprises. Another advantage of Muar (compared to other regions) was that most of the furniture makers there were Malaysian Chinese who could speak fluent Mandarin. In this regard, they had no communication barriers with their Taiwanese counterparts.</td>
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<td>Export era (late 1980s, 1990s and 2000s)</td>
<td>This was the beginning of the export era of the Muar furniture industry. The main reason for this was that the limited local market was not able to absorb the exponential production growth of the furniture manufacturers due to industrialisation. Knocked-down furniture was introduced by some of the innovative manufacturers in order to solve the shipment problems of large furniture items. This innovation provided the solution for packaging and shipping, and helped to boost the sales and exports of furniture. Other main drivers of the export growth was the establishment of the Muar Furniture Association (MFA) in 1983 that enhanced cooperation among furniture manufacturers as well as protect the long-term interests of industry players. The MFA has organised many furniture exhibitions. In 2008, the idyllic town of Muar contributes 40% of the MYR8.7 billion to the Malaysian furniture industry (MFA, 2008).</td>
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Source: Authors’ compilation.
are either large multi-store retailers or small-scale retailers. Retailers are crucial for marketing purposes while the customers are the product recipients of the furniture manufacturers. The supporting industries – fabric, painting, vanishings, finishers, foams and adhesives – provide support in terms of adding value to the value chain of furniture manufacturing. All these four pillars of the immediate business environment are crucial. The absence of any party will lead to the failure of the industry.

Some of the Muar furniture enterprises (particularly large and medium-sized) have formed subsidiaries to market products. Most of the rubber wood in Muar is secured from neighbouring districts or states while the main wood material (wood suppliers) used are high- and medium-density fibreboard, particle board, veneer, and plywood. MFPC carries out programmes that include the promotion and development of new markets, enhancement of design capabilities and capacities, collection and dissemination of market information, and trade statistics to the industry. The Malaysian Timber Industry Board (MTIB) promotes and coordinates the overall development of the timber industry. One of the MTIB programmes that directly benefits the Muar furniture industry is the establishment of the Furniture Resources Centre located in the Wood Industry Skill Development Centre (WISDEC). The centre allows the industry to obtain updates on the latest developments in furniture design and manufacturing. The cluster works closely with the MPM to solve problems related to industrial land, illegal factories, foreign workers, and environmental issues.

In terms of the industry association, the linkage with the MFA is most significant. Through the MFA, manufacturers have worked on numerous occasions with furniture associations and organizations from other countries to develop the local industry. The exchange programmes and interaction promote advancement in management skills, technology, and design to help the industry become more competitive. For instance, in 2001, the MFA worked with the German Furniture Dealers’ Association to discuss the development of the industry in terms of the design of the products, sales trends, and trade information. In 2003, it saw the association interacting with the Ghana authorities to promote bilateral trade. In addition, the MFA sent a delegation to Western China in 2005 to study the development of the furniture industry.

5.2. Technological capabilities

R&D on the basic characteristics of rubber wood, rubber wood processing (sawing and drying), and chemical/preservative treatment of rubber wood (to control fungal and insect attacks) tends to happen in the upstream activities; for wood and timber manufacturers, but less at the furniture production and manufacturing stage. The furniture manufacturers largely depend on imported capital equipment such as wood processing machineries from China, Taiwan, Germany and Italy (with machines from China and Taiwan being preferred due to cost). However, German and Italian machines are mostly preferred for high-end production due to their long-established international reputation and quality. The development of local wood-working machine manufacturers in Muar (or even in Malaysia) is still limited and it is not economical to manufacture wood-working machines locally as the local market is too small. Manufacturers are more interested in importing machines, or reconditioning used machines to suit in-house production lines.

There is no clear distinction between large manufacturers and SMEs (in terms of the technological capabilities) since technological knowledge is embedded in imported technology and easily accessible. Standard capital equipment is used to manufacture furniture by both large manufacturers and SMEs; subsequently, size becomes irrelevant for any significant technological differences. This suggests that firm strategy is more important than firm size, age, or category. The differences lie only in the scale of production and the degree of automation. However, the manufacturers in Muar do not have the view that the use of automation and computer numerical control machinery can guarantee
better product quality. For them, high-tech machines will only be able to increase the production volume while the nature of a furniture industry heavily based on design (art) will not benefit from the implementation of high-tech machineries because skilful craftsmanship is more important. The value of furniture is determined by the quality of its aesthetic appeal and the craftsmanship of the furniture makers. This includes the material that goes into the furniture such as the fabric, cushions and other upholstery. It is for this same reason that the industry does not require a large number of engineering and technical personnel. It is obvious that such a perception is due to the weak interaction between machine suppliers and furniture manufacturers to explore any meaningful or viable opportunity for radical innovation or modification of capital equipment to a specific product category. As such, proximity (since local manufactured equipment is limited and is always imported) plays an important role to limit a close working relationship.

Process innovation on the production line is limited. Furniture manufacturers remain captives in duplicative imitation mode producing knockoffs and clones (not creative imitation) and fail to move to the original design manufacturers (ODM) and original brand manufacturers (OBM) stage, which creates few value-added activities. There is a critical shortage of design and research personnel and most of the enterprises do not have internal in-house professional design teams. Furniture design is principally based on experience and information gathered from local and international furniture exhibitions. Little progress is documented due to the unwillingness of the industry, despite the Malaysian Investment Development Authority’s initiatives, to move the industry beyond simple operations; the furniture cluster in Muar remains incarcerated in the imitation stage because the designs are easy to copy. Adoption of product innovation triggers immediate imitation in this industry and this has been the generic characteristic of the furniture industry since product and design complexity are low. Firms realize that design innovation is a crucial element for market expansion, however, the drive to imitate a successful design is stronger and subsequently erodes the uniqueness of the original design.

For many firms, what makes the performance of the furniture industry stand apart is the dissimilarities in the marketing capability or complex social network (unseen competency that is difficult to imitate) and not the product design (seen and observable competency that is easy to imitate). In addition, a newly developed design or product runs the risk of being imitated due to a lower imitation cost. What is significant in the differences among manufacturers is product differentiation in terms of material used (e.g. wood or fabric). The low brand loyalty of customers discourages firms from devoting their efforts significantly in product innovation. However, the firms in Muar tend to build a collective brand that is embedded based on location, in the ‘Muar furniture’ brand. They tend to collectively promote the Muar-made furniture as a preferred brand through their distribution channels (mainly retail stores) elsewhere.

One way to ensure the quality of the furniture products is through laboratory tests. For example, the Forest Research Institute Malaysia (FRIM) provides such facilities to local manufacturers; however, the take-up rate for FRIM’s Furniture Testing Laboratory (FTL) by the local manufacturers (including those from Muar) is low for two main reasons. First, the services are poorly promoted and highlighted; in addition, most of the manufacturers are unaware of the services. Second, unlike electronic and electrical products, the standard test for furniture products is not mandatory in local or international markets. Manufacturers do not view a standard test as important unless it is required by the buyer (usually international buyers). For the local market, it is generally assumed that the product is safe.

5.3. Competency building and learning
In-house and on-the-job training become the main channels of competent building and learning. Due to the path dependency, knowledge is accumulated through experience gained from everyday
work in the industry. Similarly, apprentices joining the firm will be guided and trained by the senior staff and after gaining sufficient experience will be promoted to supervisor. Those with sufficient capital are also in the position to establish their own factories. New starts-ups are by employees who have gained sufficient experience in the industry. As a whole, tacit skills accumulated through experience seem to be more valuable than academic qualifications. Another distinct feature of the cluster is the sharing of experience and knowledge. Interaction between firms is high, and collective knowledge sharing and skill development are clearly important. Similarly, ethnic composition (Chinese origin) and trust play important roles in forging interactions and sharing practices. The players in the industry have worked hard collectively to reach where they are today.

Some institutions currently offer courses relevant to the needs of the furniture industry (for instance Universiti Putra Malaysia and Lim Kok Wing University); however, most of the industry practitioners are not able to benefit from these courses. The reasons for this are that the entry level for courses requires some academic pre-requisites, and the majority of the Muar furniture industry workers are from Muar itself. They are reluctant to leave their families behind to study in institutions located in the Klang Valley and Kuala Lumpur. As discussed in the earlier part of this paper, most of the enterprises prefer to provide their workers with in-house and on-the-job training. This might also be due to the mindset of the owners of the enterprises who are afraid that the workers will not return to their employers upon the completion of the training course. Thus, they prefer that higher education institutions (or vocational schools) in the county train the workers before sending them to the industry, rather than the industry sending their workers for training in the institutions. This might explain why, despite there being a vocational training school located in Muar, the furniture enterprises there seem to have no interest in the programme.

Furniture fairs and exhibitions are another important channel of learning that allows industry players to learn the latest design and market requirements. Fairs and exhibitions are an avenue to keep abreast of the market as well as a key segment to develop and enhance marketing capabilities; in addition, the Muar furniture industry is able to benchmark products with competitors.

6. Discussions and summary
The Muar furniture cluster clearly exhibits the characteristics of a low-tech traditional industry. It provides empirical evidence to support Malerba and Orsenigo (1997) who postulate that such an industry is mainly driven by SMEs. Most SMEs have proven their competencies in establishing close linkage as well as securing orders from international buyers. This scene is observable during the international furniture fairs organized biannually in Malaysia. In comparing the Muar cluster with other furniture clusters in the Southeast Asia region, the characteristic of the Muar cluster is similar to its counterpart in the Jepara cluster of Indonesia. Both clusters have compatibly skilled workers that enable them to compete in the global market. As in the case of the Jepara cluster, the process of innovation in the cluster mainly involves small incremental product upgrading, and most products go to international markets. Similar to the Jepara cluster, both the low road and the high road (Loebis and Schmitz 2005) enable the cluster to compete in the global economy. However, the Muar cluster does not exhibit the problem of workers in the lower strata of the production hierarchy not having access to a formal upgrading of skills, unlike those in the Cebu cluster in the Philippines (e.g. Beerepoot 2004).

The importance of knowledge and the learning process in the process of innovation (e.g. Lundvall 1992; Nelson 1993) are widely acknowledged in the Muar cluster despite the cluster being low-tech in nature. The Muar cluster exhibits interactive learning through the horizontal
networks among the enterprises. Learning-by-doing and buyers are considered the most important knowledge sources by furniture manufacturers. In this regard, the type of knowledge that has been accumulated and developed is mainly a type of synthetic knowledge (derived from existing knowledge or through new combinations of knowledge) and R&D is regarded as less important (Asheim and Gertler 2005). This standardized and reasonably stable technological knowledge, as suggested by Feldman (1993) and Harrison et al. (1996), is easier and less costly to transmit within geographically concentrated manufacturing activities, as in the case of the Muar cluster. This is also in line with Breschi’s (2000) viewpoint that the more the knowledge base is tacit (as well as complex) and part of a large system, the more geographically concentrated the population of innovators will be. Besides, the case of the Muar cluster is in conjunction with an idea that traditional manufacturing activity is concentrated in villages and small towns (Henderson, 1996).

The relationship between the SMEs and large Muar furniture manufacturers is symbiotic and mutually beneficial. The furniture manufacturers form a close partnership with their immediate business environment (suppliers, customers, retailers, and support industries) to enhance the process of interactive learning. The trend mirrors the previous findings on SMEs and traditional industry, such as Asheim (2002), Woolgar et al. (1998) and Kautonen (1996). Again, the mutual exchange and shared learning process in the Muar cluster can be best described as a socially constructed and socially embedded processes (Harrison et al., 1996; Park, 1996) that are highly associated with the element of trust within the cluster; in addition, tacit knowledge tends to become embedded in the local milieu (Malmberg 1996). In the case of the Muar furniture cluster, the relationship among the community (and the furniture industry players) is close. There is a strong social capital and mutual understanding among competitors to see each other as partners on their way to advancing to greater heights in the international arena. The achievement of the Muar furniture cluster is built upon the collective efforts of the Muar furniture industry and many of the component-part suppliers are ex-employees of the bigger companies that retain a considerable amount of trust and loyalty.

As a policy implication, the government needs to promote and enhance the local design and branding capacity and capability through training institutions. In order to promote a design culture within the industry, design-related competitions can be organized by the relevant related agencies. In addition, ‘design clinics’ can be held in major furniture clusters in Malaysia with the collaboration of MFPC and industrial associations to provide consultancy services to furniture manufacturers. In addition, fostering effective public–private partnership is vital. The government has provided various incentives as well as supporting infrastructure to stimulate the technological capabilities of the industry. However, the lack of effective cooperation and mutual understanding between the government and the industry has resulted in poor take up of offers (particularly in terms of R&D and technology upgrade funding) as well as human capital development programmes. Efforts should be made to foster effective government–private partnership based on mutual trust and a continuous active exchange of information and views rather than just a formal hosting of dialogues, workshops, and ad-hoc round-table discussions. Government agencies and related trade associations need to undertake awareness programmes on a regular basis to update the industry on the latest incentives, financial assistance and grants provided by the government.

Acknowledgements
The authors wish to thank all interviewees and organizations for sharing their views and experience. We are grateful to the editor and two reviewers for constructive comments. This research was funded by Fundamental Research Grant Scheme (FRGS), Ministry of Higher Education Malaysia (FP006-2012A).
References


