

THE MALAYSIAN FURNITURE INDUSTRY  
CHARTING ITS GROWTH POTENTIAL

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Prof. Dr. Jegatheswaran Ratnasingam



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**PROFESSOR DR. JEGATHESWARAN RATNASINGAM**

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## **ABSTRACT**

The Malaysian furniture industry has come a long way since its humble beginnings in the mid-1980s. From a cottage-based industry, the industry has been transformed into a multi-billion ringgit export oriented industry, which outshines all other sub-sectors within the larger Malaysian timber industry. Through a series of Industrial Master Plans (IMPs), the government has played a pivotal role in incentivizing the industrial transformation process, through the provision of a steady industrial policy framework, with a strong focus on greater value-added products. In this context, it is thus not surprising that the Malaysian furniture industry has emerged as an important socioeconomic sector, providing employment to almost 80,000, while generating foreign exchange earnings in excess of US\$ 2 billion in 2015.

However, the rapid growth of the furniture industry has been fuelled by incremental capital inputs rather than through actual productivity gains. Therefore, increasing demand for factor inputs (especially raw materials and workforce) is apparent, despite the push towards a greater degree of automation and high technology machinery application. Analysis of the productivity data of the furniture industry, based on the Annual Manufacturing Survey, has shown that the trend of increasing factor inputs has been driving industrial growth, while other indicators such as labour productivity and capital productivity have remained stagnant, if not showing a decreasing trend. In fact, the research published by the author has revealed that the extent of value-addition and innovation within the Malaysian furniture industry has been on the decline over the years. Hence, the furniture industry in Malaysia remains as a large and well established contract furniture manufacturing hub, operating within the low-wage economy category.



The shift from the original equipment manufacturing (OEM) strategy towards original design manufacturing (ODM) and original brand manufacturing (OBM) is not apparent within the industry. Innovations sourced from buyers and suppliers are often inclined more towards cost reductions and the focus is more on finding alternative raw materials rather than applying new processes or implementing a new design scheme.

Therefore, in order to make the shift towards the manufacture of higher value-added, fashion-oriented furniture, several issues with regard to the factor inputs, policy directions, technology inputs and human capital development must be addressed, as research has revealed. This calls for a paradigm shift among the various stakeholders to ensure the sustainable and equitable growth of the furniture industry in the future.

This lecture is aimed at reviewing the performance of the Malaysian furniture industry in terms of its growth and productivity perspectives. The review is based on the multi research work carried out by the author and his collaborators at the Faculty of Forestry, Universiti Putra Malaysia, with the aim of identifying, enhancing and strengthening the Malaysian furniture industry's performance into the future, in an increasingly competitive global environment.

## **ABSTRAK**

Industri perabot di Malaysia telah berkembang dengan pesat sejak permulaannya pada pertengahan tahun 1980-an. Industri ini telah melalui transformasi dari industri desa kepada industri yang berorientasikan eksport yang bernilai berbilion ringgit, di mana prestasi industri ini mengatasi semua sub-sektor lain dalam industri perkayuan di Malaysia. Melalui beberapa siri Pelan Induk Perindustrian (IMPs), kerajaan Malaysia telah memainkan peranan yang penting untuk menggalakkan proses transformasi industri perkayuan melalui penyediaan rangka kerja dasar perindustrian yang stabil, yang menumpu kepada pengeluaran produk-produk kayu yang bernilai tambah yang tinggi. Dalam konteks ini, adalah tidak menghairankan bagi industri perabot di Malaysia untuk muncul sebagai sektor sosio-ekonomi yang penting, yang menyediakan peluang pekerjaan kepada hampir kepada 80,000 orang, dan pada masa yang sama merupakan sumber pendapatan pertukaran wang asing melebihi US\$ 2 bilion pada tahun 2015.

Namun begitu, pertumbuhan pesat industri perabot telah didorong oleh peningkatan input modal, dan bukannya daripada peningkatan produktiviti. Oleh yang demikian, peningkatan permintaan bagi input modal (terutamanya bahan-bahan mentah dan tenaga kerja) adalah begitu ketara, walaupun terdapat desakan ke arah penggunaan mesin yang berteknologi tinggi dan automasi. Analisis data produktiviti industri perabot daripada Penyiasatan Industri Pembuatan Tahunan menunjukkan bahawa peningkatan input modal telah mendorong pertumbuhan industri perabot, manakala faktor-faktor lain seperti produktiviti buruh dan produktiviti modal tidak menunjukkan sebarang perubahan, ataupun menunjukkan penurunan. Malah, hasil penyelidikan oleh penulis telah menunjukkan bahawa nilai tambah dan inovasi bagi industri perabot di Malaysia telah mengalami kemerosotan. Oleh itu,

industri perabot di Malaysia telah kekal sebagai pusat pembuatan perabot yang besar dan mantap berstatus kontrak, dan beroperasi dalam ekonomi bergaji rendah.

Justeru, peralihan industri perabot daripada strategi *original equipment manufacturing* (OEM) kepada strategi *original design manufacturing* (ODM) dan *original brand manufacturing* (OBM) adalah tidak ketara. Inovasi yang diperolehi daripada pembeli dan pembekal sering dikaitkan dengan pengurangan kos, yang biasanya diperolehi dengan mencari bahan-bahan mentah alternatif yang berkos rendah, dan bukannya dengan mengaplikasikan proses-proses baru atau pun melaksanakan reka bentuk perabot yang baru.

Oleh itu, beberapa isu seperti faktor input, polisi perindustrian, input teknologi dan pembangunan modal insan harus ditangani sebagaimana yang telah dinyatakan dalam penyelidikan penulis, dalam usaha untuk beralih kepada industri perabot yang bernilai tinggi dan berorientasikan fesyen. Ini memerlukan anjakan paradigma di kalangan semua pihak yang berkepentingan untuk memastikan pertumbuhan yang mampan dan saksama dalam industri perabot negara pada masa akan datang.

Syarahan ini adalah bertujuan untuk mengupas prestasi industri perabot di Malaysia dari perspektif pertumbuhan dan produktiviti. Kandungan syarahan ini memberikan rumusan hasil penyelidikan penulis, yang telah dilaksanakan selama ini dengan kerjasama rakan penyelidikan bukan hanya di Fakulti Perhutanan, Universiti Putra Malaysia tetapi juga dengan rangkaian peyelidikan antarabangsa yang aktif dalam bidang penyelidikan perabot, dengan tujuan untuk mengenal pasti, meningkatkan dan mengukuhkan prestasi industri perabot di Malaysia di masa hadapan dalam persekitaran global yang semakin kompetitif .

## INTRODUCTION

The beginnings of the timber industry in Malaysia can be traced back to the colonial period in the country, as comprehensively reported by Ratnasingam and Ioras (2006). The logging, sawmilling and plywood and veneer industries were the backbone of the timber industry during that period, and the outputs were predominantly for domestic consumption (Norini and Woon 2002). As the country developed rapidly after independence in 1957, the growth of the timber industry was further boosted. With extensive land expansion schemes carried out by various government agencies in the 1960s, a substantial volume of primary processed timber products were directed to exports (Lim *et al.* 2016).

The emergence of the timber industry as an important socioeconomic sector was recognizable as the transformation from an agricultural-based economy to a manufacturing-based economy gained momentum in the 1970s (Ratnasingam *et al.* 2013c). The industrial transformation was carried out through a series of Industrial Master Plans (IMPs) implemented from the mid-1980s, aimed at improving and enhancing the product-mix as well as the productivity of the manufacturing sector. The focus was geared towards a shift from primary processed timber products to value-added timber products (Ziaie *et al.* 2012).

The transformation and restructuring of the timber industry was successful as total exports of value-added products, especially furniture, moulding and builders' joinery and carpentry (BJC) began to soar (Table 1). The production of reconstituted panel products, such as particleboard and medium density fibreboard (MDF), also increased to meet the demand of the furniture and BJC industries (Ratnasingam 2000a).

**Table 1** Constituents of Wood Products Exports

<b>Year</b>	<b>Primary wood product (%)</b>	<b>Secondary wood product (%)</b>
1990	68	32
1995	59	41
2000	50	50
2005	49	51
2010	48	52
2011	49	51
2012	48	52
2013	58	42
2014	56	44
2015	53	47

Source: 1990-2010: Ratnasingam et al. 2013c  
2011-2015: calculation

Malaysia exports a wide variety of timber products (Table 2), and is currently one of the world's largest exporters of tropical timber and timber products. Since 2012, Malaysia has been ranked as the 10th largest exporter of furniture in the world (Lim *et al.* 2016).

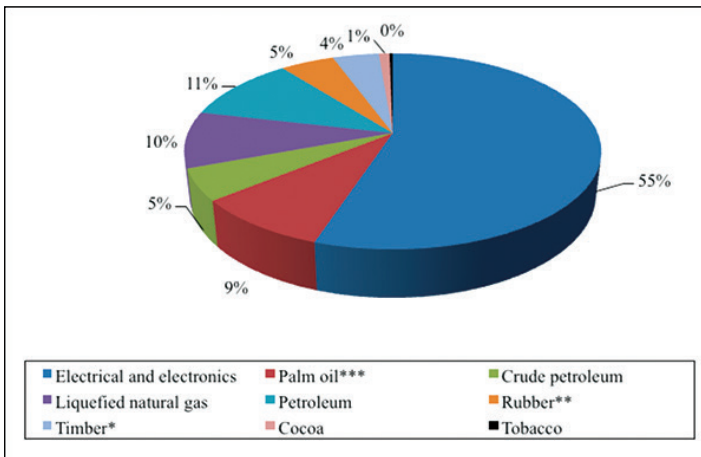
**Table 2** Export of Major Timber Products (RM million)

Year	Logs	Sawn timber	Plywood	Veneer	Mouldings	Chipboard/ Particleboard	Fibreboard	Wooden frame	Builders' Joinery & Carpentry	Wooden Furniture	Rattan Furniture	Other Products
2000	2,518.33	3,286.22	3,842.45	805.29	894.87	159.97	823.04	91.62	768.41	4,418.99	69.69	20.96
2005	2,464.97	3,446.86	5,574.89	420.82	698.12	232.63	1,106.66	126.91	1,161.73	5,831.63	63.57	378.23
2009	2,021.07	2,345.41	4,987.34	307.58	686.41	250.15	1,033.44	105.20	987.79	6,248.22	29.64	489.28
2010	2,142.32	2,534.83	5,147.86	338.08	715.86	288.59	1,202.15	123.82	954.73	6,521.65	31.16	516.47
2011	1,953.01	2,482.10	5,103.31	321.49	757.01	337.87	1,128.77	131.34	1,006.59	6,201.50	25.05	578.63
2012	1,691.31	2,455.65	5,136.53	333.23	711.91	339.20	1,149.41	142.41	993.05	6,528.77	21.22	694.27
2013	1,869.70	2,413.23	5,322.42	287.23	619.13	335.60	1,027.21	123.55	949.60	5,737.25	27.44	816.12
2014	2,074.81	2,655.46	5,202.29	305.67	722.04	341.47	1,058.29	124.09	1,007.80	6,363.38	38.16	895.79
2015	2,023.34	3,175.11	4,689.55	351.66	831.93	371.15	1,133.35	128.56	1,118.47	7,286.11	31.36	1,004.04

Sources: Ministry of Plantation Industries and Commodities (2008, 2012, 2014, 2016)

## The Malaysian Furniture Industry: Charting Its Growth Potential

The growth of the timber industry in Malaysia has been orderly, gradually progressing from focus on primary products, such as logs, sawn timber, veneer and plywood, towards more value-added products, comprising reconstituted panel products, mouldings, BJC and furniture (Ratnasingam 2000a). Inevitably, the timber industry has emerged as an important engine of economic growth and accounts for 2% of the country's gross domestic product (GDP). In 2015, timber and timber products contributed RM 22.14 billion out of Malaysia's total merchandise exports of RM 627 billion (MPIC, 2016). In fact, the timber industry stood out as the 8<sup>th</sup> largest contributor to the 2015 export earnings (Figure 1).

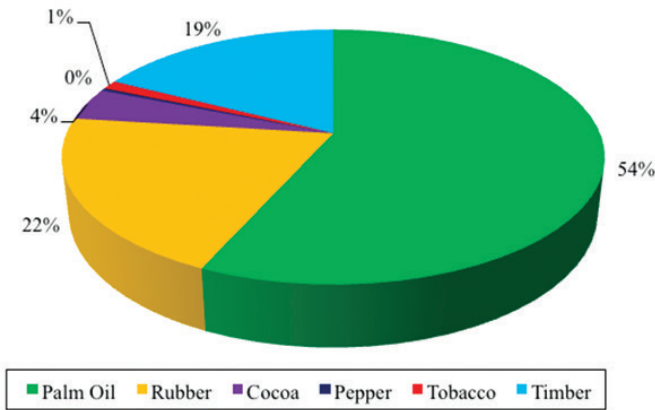


**Figure 1** The Major Export Earnings in 2015

Source: Ministry of Plantation Industries and Commodities (2016)

Notes: \* including timber-based products  
\*\* including rubber-based products  
\*\*\* including palm oil-based products

From the commodities perspective, export of timber products was the third largest after the palm oil and rubber industries, in 2015 (Figure 2).

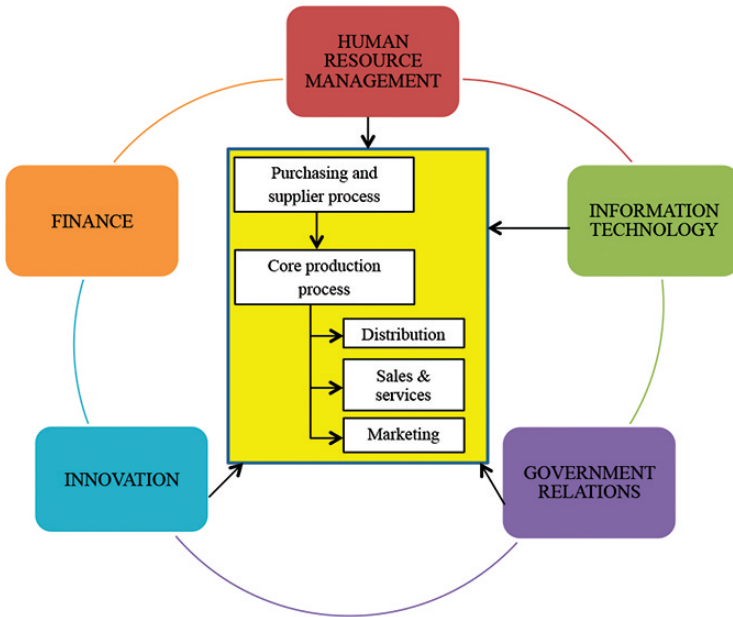


**Figure 2** Exports of Commodities in 2015

## MALAYSIAN FURNITURE INDUSTRY

The successful growth of the Malaysian furniture industry, from a domestic cottage-based production sector into a multi-billion ringgit industry, has received all-round praise. The implementation of the series of Industrial Master Plans (IMPs) and the relentless efforts of the government have resulted in the transformation of the furniture sector within three decades (Norini *et al.* 2009; NATIP 2009; Ziaie *et al.* 2012; Ratnasingam 2015). Inevitably, the sector has emerged as the fastest growing wood-based manufacturing sub-sector, in terms of its socioeconomic contributions (NATIP 2009; Azaze-Azizi 2010; Abdullah *et al.* 2013; Ratnasingam *et al.* 2013a). The business environment which resulted in the robust growth of the furniture sector is depicted in Figure 3.





**Figure 3** Furniture Industry Environment

Adapted from Ratnasingam (2015)

## Development Phases of Furniture Industry

The Malaysian furniture industry with its distinctive humble beginnings, gained prominence in the mid-1980s (Norini *et al.* 2009; Ziaie *et al.* 2012; Ratnasingam 2015). Table 3 shows the

Industrial Master Plans (IMPs) which were implemented from 1986, which paved the way for the development of the furniture sector in the country.

**Table 3** Furniture Industry Development Strategies under IMPs

<b>IMPs</b>	<b>Year Period</b>	<b>Development Strategies</b>
First Industrial Master Plan (IMP 1)	1986-1995	<p><b>Furniture Complex</b>                      The role of the furniture complex was to create a feasible manufacturing activity mass which comprised multiple production units relatively close to each other with common facilities used on a shared basis.                      Common service facilities such as kiln dryer, treatment plant, tools and parts maintenance workshop, training workshop, sales display centre, testing and quality control laboratory and warehouse services were to be provided within the furniture complex.</p>
Second Industrial Master Plan (IMP 2)	1996-2005	<p><b>Industrial Development by Cluster Approach</b>                      The cluster-based industrial development approach of the 2<sup>nd</sup> IMP was more important, with concurrent growth of supporting industries, which included the service sector. Emphasis was placed not just on the growth of the manufacturing sector.                      An agglomeration of inter-linked or related activities, comprising industries, suppliers, critical support business services, requisite infrastructure, and institutions, is called a cluster.</p>
Third Industrial Master Plan (IMP 3)	2006-2020	<p><b>Furniture Park</b>                      Facilities have been established in various states in order to promote the industry whereby five Furniture Industrial Parks have been established by the Ministry of Plantation Industries and Commodities in collaboration with the State Governments of Terengganu, Pahang, Perak, Selangor and Kedah, to develop SMEs in the furniture industry.                      In Melaka, one furniture finishing centre was established in an existing project. The industry is encouraged to shift from the production of Original Equipment Manufacturing (OEM) furniture products to Original Design Manufacturer (ODM) and Original Brand Manufacturer (OBM) furniture products.</p>

Source: MIDA/UNIDO, 1985; MITI, 1996-2016

During the 1<sup>st</sup> IMP (1986-1995), the focus was on shifting from primary processing to secondary processing (Ratnasingam and Chong 2010). The annual average rate of growth of the timber industry was 5.60 % during this period (Lim *et al.* 2016).

The policies during the 2<sup>nd</sup> IMP (1996-2005) were geared towards maximizing value-added wood products manufacturing, especially furniture and builders' joinery and carpentry (BJC). Exports from the Malaysian timber sector grew steadily at 5.00 % per annum during this period, while furniture exports registered a whooping annual average growth of 11.00 % (Lim *et al.* 2016).

Encouragement to increase value-addition activities in the timber sector was continued in the 3<sup>rd</sup> IMP (2006–2020), with a renewed focus on the adoption of higher technologies, competent human capital and design as well as product development imperatives (Ratnasingam *et al.* 2013c).

## **Industrial Structure**

Generally, furniture manufacturers in Malaysia can be classified into four groups:

1. small and medium scale industries established and operating in the furniture village
2. small scale industries established and operating outside the furniture village
3. medium and large manufacturing companies - local owned
4. large manufacturing companies - joint venture and foreign owned

Based on a previous study by Ratnasingam and Tan (2002), it is apparent that in natural resource-oriented industries, such as

furniture manufacturing, the locally-owned small and medium enterprises (SMEs) are predominant owing to the prevailing low-entry barrier (Ng and Thiruchelvam 2011a). These small and medium enterprises (SMEs) usually operate as contractors and furniture-parts producers, which is a proven industrial strategy employed by other furniture manufacturing nations, such as Italy, Taiwan and Denmark (Gustafsson 1995; Döngel *et al.* 2009). The characteristics of the furniture manufacturers based in this country are as shown in Table 4.

**Table 4** Industrial Classification of Malaysian Furniture Manufacturers

<b>Industrial Classification</b>	<b>Sales turnover (RM)</b>	<b>Number of full time employees</b>
Micro	< 300,000	< 5
Small	> 300,000 ≤ 15 million	5 ≤ 75
Medium	> 15 million ≤ 50 million	75 ≤ 200
Large	> 50 million	> 200

Source: Ratnasingam (2015)

These micro, small and medium enterprises (MSMEs) provide the much-needed support infrastructure and facilities for Malaysian furniture manufacturers to increase output volumes for mixed products.

Increasing demand from global buyers, retailers and wholesalers for Malaysian furniture is expected. The competitive pricing, short delivery time and capability to redesign furniture to meet customer preferences reflect the prevailing industrial competency (Ratnasingam and Hwang 1999; Ratnasingam and Scholz 2009; Ratnasingam *et al.* 2013a). In this context, the Malaysian furniture

sector is recognized as a leading furniture manufacturing hub in the South East Asian region (Ratnasingam 1998; Ratnasingam and Reid 2002).

Given this background, it is no surprise that the number of furniture manufacturers has grown over the years. Table 5 shows the number of furniture manufacturing mills in comparison to other wood products manufacturers in the country.

The information shown in Table 6 exemplifies the fact that a large proportion of the furniture manufacturers are located in Peninsular Malaysia as compared to in Sabah and Sarawak. The accessibility to production factors, better supporting industries and amenities, as well as the well-developed infrastructure are the primary reasons for the proliferation of the furniture sector in Peninsular Malaysia (Ratnasingam 2015). Within Peninsular Malaysia, furniture manufacturing is highly concentrated in Johor (Muar, Batu Pahat, Johor Bahru and Kluang), Selangor (Klang and Sungai Buloh), Melaka (Bukit Rambai) and Kedah (Sungai Petani and Kulim) (Ratnasingam 2015).

**Table 5** Number of Licensed Mills in the Timber-based Sector

<b>MILLS / YEAR</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>	<b>2015</b>
Sawmills	1,018	1,022	1,013	1,018	1,007	996	982	1,019	1,002
Plywood/Veneer/Blockboard	181	180	185	183	181	176	176	204	204
Mouldings	337	344	336	343	339	328	324	319	319
Chipboard / Particleboard	16	16	20	23	23	23	21	26	26
Pulp and Paper	1	1	1	1	1	1	1	1	1
<b>Furniture &amp; Woodworking</b>	<b>1,895</b>	<b>1,695</b>	<b>1,768</b>	<b>2,246</b>	<b>2,246</b>	<b>2,247</b>	<b>2,249</b>	<b>1,729</b>	<b>1,798</b>
Laminated Board	29	46	33	42	43	43	42	42	44
Woodchips	18	17	15	24	23	24	23	24	25
Builder's Joinery & Carpentry	21	29	27	24	24	24	24	24	26
Matches	2	2	2	1	1	1	1	1	1
Kiln Drying	222	236	245	222	223	215	212	215	213
Timber Preservation	97	150	113	101	100	99	94	99	97
Medium Density Fibreboard	14	14	15	14	14	14	13	14	14
Wooden Pellet	-	-	-	9	9	9	9	9	9
Bamboo & Rattan Furniture	-	-	-	1	1	4	5	6	8
Pencil	3	3	3	1	1	1	1	1	1
<b>TOTAL</b>	<b>3,854</b>	<b>3,755</b>	<b>3,776</b>	<b>4,253</b>	<b>4,236</b>	<b>4,202</b>	<b>4,173</b>	<b>3,562</b>	<b>3,788</b>

Sources: Malaysian Timber Industry Board (2010, 2012, 2016)

**Table 6** No. of Licensed Furniture Mills in Malaysia

<b>Year</b>	<b>Peninsular Malaysia</b>	<b>Sabah</b>	<b>Sarawak</b>
2007	1,298	200	397
2008	1,298	94	397
2009	1,298	60	410
2010	1,678	60	414
2011	1,812	60	419
2012	1,829	54	418
2013	1,829	52	420
2014	1,295	52	413
2015	1,281	52	411

Sources: Malaysian Timber Industry Board (2010, 2012, 2016)

## Production Characteristics

The common manufacturing strategies used within the furniture sector are summarized in Table 7.

**Table 7** Manufacturing Strategies

<b>Manufacturing Strategies</b>	<b>Descriptions</b>
Original Equipment Manufacturer (OEM)	An original equipment manufacturer, or OEM, manufactures products or components under contract for another company or retailer, under the purchasing company's brand name.
Original Design Manufacturer (ODM)	An original design manufacturer (ODM) is a company which designs and manufactures a product which is specified and eventually branded by another firm for sale. Such companies allow the brand firm to produce (either as a supplement or solely) without having a manufacturing outfit.
Original Brand Manufacturer (OBM)	An original brand manufacturer, or OBM, is typically a company that sells an entire product made by a second company, as its own branded product.

Source: SME Corp Malaysia, 2014

The original equipment manufacturing (OEM) strategy, also known as contract-manufacturing, adopted extensively in the Malaysian furniture industry, has harnessed the manufacturers' capabilities and capacity to reproduce furniture of established designs and themes. Doubtless, the OEM strategy is well suited for the prevailing mass-production environment in the country. In fact, contract-manufacturing is the predominant strategy employed throughout the furniture sector in the country and accounts for almost 77% of the total production volume (Ratnasingam 2015).



The loss of industrial competitiveness due to the rapidly expanding contract-manufacturing base has resulted in a steady decrease in average annual industrial growth. Increasing supply elasticity, lack of innovative designs and increasing pressure on price-points manifested in slower growth of the furniture sector during the period of the 2<sup>nd</sup> and 3<sup>rd</sup> IMPs (Ratnasingam 2015). Hence, the furniture sector in Malaysia must embark on shifting towards original design manufacturing (ODM), and eventually to the original brand manufacturing (OBM) strategies (Ziaie *et al.* 2012).

## **Export Trends**

The Malaysian furniture industry is highly export-oriented with over 90% of its production being exported. Among the furniture exported are kitchen furniture, bedroom furniture, upholstered wooden frame furniture, office furniture and garden or outdoor furniture (Ng and Thiruchelvam 2011b). Table 8 shows the export value of Malaysian furniture from 1986-2015. Overall, the average annual growth of the export value has been declining, revealing the maturity of the industry.

**Table 8** Export Value of Malaysian Furniture

<b>Year</b>	<b>Export Value (RM million)</b>	<b>Annual Growth (%)</b>
1986	4.5	-
1987	8.3	84
1988	161	93
1989	235	46
1990	372	58
1991	614	65
1992	841	40
1993	1,228	46
1994	1,788	46
1995	2,077	16
1996	2,577	24
1997	3,094	20
1998	4,064	30
1999	4,923	21
2000	5,597	14
2001	5,085	-9
2002	5,539	9
2003	6,009	8
2004	7,051	17
2005	7,505	6
2006	8,084	8
2007	8,241	2
2008	8,693	5
2009	7,623	-12
2010	7,959	4
2011	7,670	-4
2012	8,002	4
2013	7358	8
2014	8,145	9
2015	9,142	12

Sources: Ratnasingam (2015)

Malaysian furniture products are currently exported to over 160 countries all over the world and the important export destinations are presented in Table 9. The United States of America, Japan, Singapore, Australia and United Kingdom are the primary markets for Malaysian furniture.

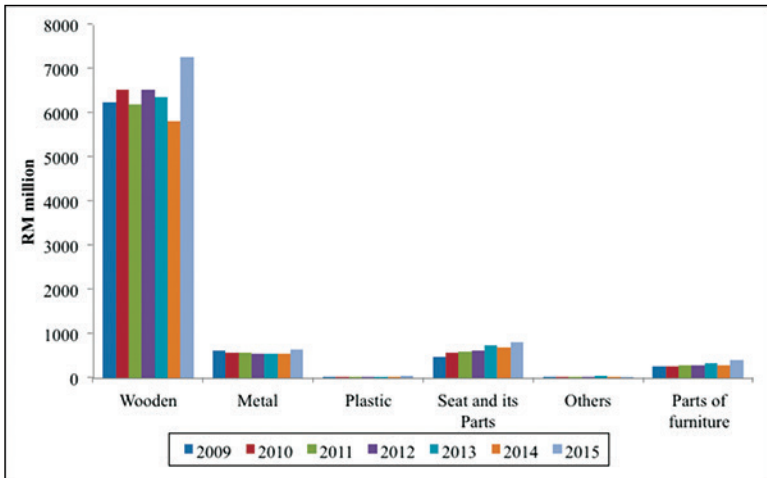
**Table 9** Top Ten Export Destinations of Malaysian Made Furniture

Rank	2009	2010	2011	2012	2013	2014	2015
	RM million						
1	USA 2169.8	USA 2310.5	USA 2016.8	USA 2236.2	USA 2100.70	USA 2301.7	USA 2835
2	Japan 808.3	Japan 709.5	Japan 893.0	Japan 822.6	Japan 668.2	Japan 603.6	Japan 758
3	United Kingdom 584.0	Singapore 585.1	Singapore 630.1	Singapore 614.6	Australia 601	Australia 544.8	Singapore 717
4	Singapore 510.0	United Kingdom 521.9	Australia 520.7	Australia 531.4	Singapore 592.1	Singapore 523.0	Australia 688
5	Australia 514.6	Australia 493.6	United Kingdom 401.5	United Kingdom 417.6	United Kingdom 306.5	United Kingdom 278.5	United Kingdom 417
6	Canada 252.1	Canada 316.7	Canada 278.3	UAE 292.2	UAE 263.3	U.A.E 241.0	India 345
7	UAE 230.4	UAE 281.3	India 273.3	Canada 266.8	Canada 221.6	Canada 203.8	Canada 342

8	India	India	UAE	India	India	India	U.A.E
	168.5	220.3	256.7	249.7	210.4	196.0	285
9	Saudi Arabia	Saudi Arabia	Saudi Arabia	Saudi Arabia	Saudi Arabia	Saudi Arabia	Saudi Arabia
	137.7	131.3	146.9	159.2	147.5	132.2	239
10	Netherlands	Germany	Algeria	Russia	Russia	Korea	China
	131.4	123.7	100.0	146.7	104.2	95.5	144

Sources: Malaysian Furniture Promotion Council (2009, 2010, 2011, 2012, 2013, 2014, 2015)

Although wooden furniture accounts for almost 85% of the furniture produced, furniture made from other materials, such as rattan, bamboo, metal, plastic, composites and other materials, are also growing in volume (Shangle 1997; Ratnasingam 2003a). Figure 4 reveals the proportion of furniture produced using different materials in furniture manufacturing in the country.



Sources: Malaysian Furniture Promotion Council (2009, 2010, 2011, 2012, 2013, 2014, 2015)

**Figure 4** Export of Furniture According to type of Material Used

On the global stage, China dominates as the largest exporter of furniture products, followed by Germany, Italy, United States and Poland. It must be noted that countries such as Italy, Germany, United States of America and the Scandinavian countries, which are regarded as traditional furniture producers and exporters, have had their positions challenged in the league table with the emergence of China, Vietnam and Malaysia (Table 10).

**Table 10** Major Exporters of Furniture in the World in 2015

<b>Ranking</b>	<b>Reporting Country</b>	<b>Billion USD</b>
1	China	98.7
2	Germany	16.3
3	Italy	12.8
4	United States	11.5
5	Poland	11.2
6	Mexico	9.9
7	Vietnam	7.6
8	Canada	5.3
9	Netherland	4.3
10	Czech Republic	4.2
11	France	3.8
12	United Kingdom	3.6
13	Spain	3.0
14	Turkey	2.8
<b>15</b>	<b>Malaysia</b>	<b>2.7</b>

Source: Furniture Today (2016)

## Import Trends

With increasing disposable income accompanied by demand for diversified furniture in the domestic market, the influx of imported furniture has been on the rise over the years. Table 11 shows the trend in furniture imports from 2002 to 2015. Although the largest market segments for imported furniture are the interior design, commercial and refurbishment segments, domestic household consumption of such furniture has also been growing, albeit much slower. In 2015, the total amount of furniture purchased per household was estimated to be RM 1421, which is about 14% of the total disposable income per household (Ratnasingam 2015).

**Table 11** Import Value of Furniture

<b>Year</b>	<b>Value (RM million )</b>	<b>Change (%)</b>
1989	25	-
1990	28	12.0
1991	39	39.3
1992	56	43.6
1993	57	1.8
1994	67	17.5
1995	75	11.9
1996	115	53.3
1997	120	4.3
1998	114	-5.0
1999	105	-7.9
2000	153	45.7
2001	379	147.7
2002	650	71.4
2003	723	11.2
2004	1032	42.9
2005	1254	21.4
2006	1319	5.2
2007	1331	0.9
2008	1460	9.7
2009	1092	-25.2
2010	1311	20.1
2011	1340	2.2
2012	1396	4.2
2013	1547	10.9
2014	1670	7.9
2015	2234	33.8

Source: Ratnasingam (2015)



Table 12 reveals the sources of furniture imports into the country and it is notable that China, Thailand and Japan are among the major suppliers.

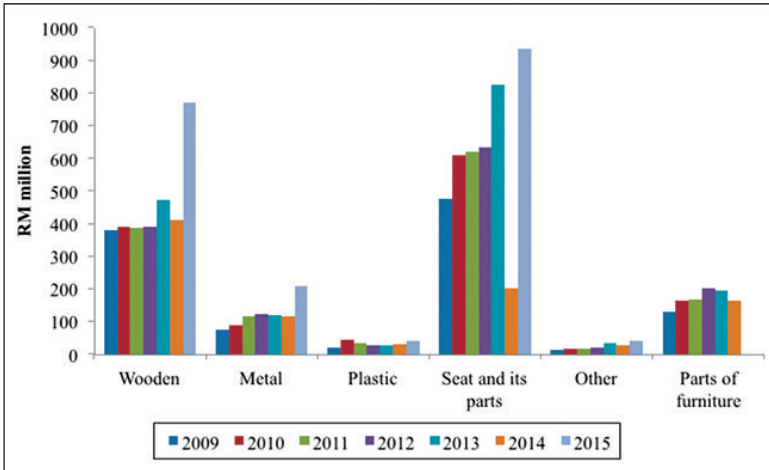
**Table 12** Import Sources of Furniture

Rank	2009	2010	2011	2012	2013	2014	2015
	RM million						
1	China 433.0	China 459.7	China 508.8	China 562.9	China 629.5	China 730.4	China 1,161
2	Japan 111.0	Japan 184.5	Japan 186.1	Thailand 135.4	Thailand 180.6	Thailand 193.5	Japan 183
3	Indonesia 100.7	Indonesia 119.7	Indonesia 103.6	Japan 153.0	Japan 167.3	Japan 165.1	Indonesia 127
4	Thailand 88.9	Thailand 106.3	Thailand 77.7	Indonesia 125.3	Indonesia 90.8	Indonesia 92.5	Thailand 127
5	Vietnam 74.9	USA 105.0	Germany 70.5	Vietnam 56.6	Germany 72.4	Germany 71.1	Germany 74
6	USA 53.5	Vietnam 78.3	Vietnam 70.4	Germany 54.7	Korea 67.5	Vietnam 68.5	USA 67
7	Germany 46.2	Germany 43.8	USA 51.6	Korea 44.5	USA 49.2	USA 50.2	Italy 61
8	Italy 27.6	Taiwan 31.7	Singapore 43.6	USA 36.1	Taiwan 38.9	Taiwan 47.0	Vietnam 61
9	Taiwan 24.4	Italy 26.4	Korea 38.1	Taiwan 34.1	Singapore 38.0	Korea 46.7	Korea 51
10	Singapore 18.4	Singapore 24.7	Taiwan 37.2	Singapore 30.8	Italy 28.5	Italy 36.3	Taiwan 49

Source: Malaysian Furniture Promotion Council (2009, 2010, 2011, 2012, 2013, 2014, 2015)

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As depicted in Figure 5, the largest proportion of imported furniture are seats and its parts, followed by wooden furniture, which more often than not is consumed by the interior design and refurbishment market segments (Ratnasingam 2015).



Source: Malaysian Furniture Promotion Council (2009, 2010, 2011, 2012, 2013, 2014, 2015)

**Figure 5** Furniture Imports According to Type of Material

## **PULL FACTORS OF THE FURNITURE INDUSTRY**

The rapid expansion of the Malaysian furniture industry is attributed to: (1) availability of raw materials; (2) workforce; (3) capital outlay; (4) low entry-barriers; (5) policy measures; and (6) government incentives.

### **Availability of Raw Materials**

Several types of raw materials are consumed by the Malaysian furniture industry, including wood, plastic, metal, rattan, bamboo and other resources (Ratnasingam 2003a). Among the resources available, wood is the predominant raw material for the furniture industry. The local wood resources are not only from natural forests, but also from plantation forests (Ratnasingam 2002a).

#### ***Wood Resources***

The wood resources from natural forests supplied to the furniture industry are mainly the Dipterocarp species (Ratnasingam *et al.* 2015b). Table 13 shows that the volume of logs produced from natural forests over the years has been declining. The initiatives taken by the government to conserve the forest environment and ecosystem through the implementation of the Sustainable Forest Management (SFM) system has resulted in a steady decline in logging activities, hence reducing the supply of raw materials from natural forests (Ratnasingam 2002b).

**Table 13** Production of Logs ('000 m3)

<b>Year</b>	<b>Peninsular Malaysia</b>	<b>Sabah</b>	<b>Sarawak</b>	<b>Total</b>
1990	12,818	8,443	18,838	40,099
1995	9,030	6,520	16,292	31,842
2000	5,072	3,728	14,274	23,075
2001	4,155	2,588	12,179	18,922
2002	4,510	4,436	12,259	21,205
2003	4,419	4,959	12,150	21,528
2004	4,572	5,416	12,051	22,039
2005	4,405	5,958	12,000	22,363
2006	4,693	5,336	11,864	21,893
2007	4,220	5,941	11,890	22,051
2008	4,029	4,718	11,513	20,260
2009	3,687	4,252	10,368	18,037
2010	4,162	3,484	10,151	17,797
2011	4,172	2,212	9,601	15,985
2012	4,468	1,966	9,459	15,893
2013	4,084	1,631	8,211	13,926
2014	4,295	1,565	8,715	14,575
2015	4,235	1,186	8,200	13,621

Sources: Ministry of Plantation Industries and Commodities (2008, 2012, 2014, 2016)

The reduced exportation of logs to other countries came into effect to off-set the growing demand for raw materials from the rapidly expanding domestic timber industry (Ratnasingam 1998, 2000a, 2002b, Ratnasingam and Ioras 2009).

However, the shortfall in the supply of raw materials to the timber industry necessitated the government to embark on forest plantations, with extensive cultivation of fast growing timber species such as the Acacia (*Acacia mangium*), Batai (*Paraserianthes falcataria*) and Sentang (*Azadirachta excelsa*), aimed at ensuring sufficient raw material supply for the growing timber industry. However, private investors have shown less interest in establishing large scale forest plantations owing to the lack of quality of the planting-stock, land-tenure issues as well as the much dreaded long-gestation period of such ventures (Ratnasingam 2011).

Despite the uncertainty of the commercial success of large scale forest plantations, rubber cultivation has continued to boom throughout the country (Table 14), albeit at a slower rate due to the more profitable oil palm cultivation (Ratnasingam 1995). Nevertheless, the rubber trees planted primarily for latex production, has emerged as the most important wood raw material source for the value-added timber industry, including the furniture, mouldings and panel industry. Rubberwood (*Hevea brasiliensis*) presently accounts for almost 85% of the raw material used in the furniture, builders' joinery and carpentry (BJC) and panel industries in the country (Shigematsu *et al.* 2011; Ratnasingam *et al.* 2012b; Ratnasingam *et al.* 2015a). The success of rubberwood as an important furniture raw material is attributed to its light colour, pleasant appearance, low cost, good working properties and environmental-friendly status (Hong 1995; Ratnasingam and Scholz 2009). Its strength properties have been found to be comparable to other established furniture raw materials, such as Oak (*Quercus sp.*), Beech (*Fagus sp.*), Kembang Semangkok (*Scaphium sp.*), Meranti (*Shorea sp.*) and Nyatoh (*Palaquium sp.*) (Ratnasingam and Scholz 2009).

**Table 14** Rubber Plantations in Malaysia ('000 ha)

Year	Small holdings	Estates	Total
1990	1488.0	348.7	1836.7
1992	1478.2	314.1	1792.3
1994	1462.1	275.0	1737.1
1996	1420.4	223.9	1644.3
1998	1363.7	179.9	1543.6
2000	1306.9	123.8	1430.7
2001	1293.8	95.5	1389.3
2002	1264.0	84.8	1348.8
2003	1247.4	78.5	1325.9
2004	1214.4	64.4	1278.8
2005	1213.9	57.4	1271.3
2006	1209.4	54.2	1263.6
2007	1194.7	53.4	1248.1
2008	1185.9	61.1	1247
2009	967.1	61.1	1028.2
2010	956.2	64.2	1020.4
2011	962.8	64.2	1027
2012	975.3	65.9	1041.2
2013	979.9	77.4	1057.3
2014	985.5	80.1	1065.6
2015	992.5	86.1	1078.6

Source: RRIM

## *Other Materials*

### **Metal**

Application of modern technology in the furniture manufacturing industry has enabled the use of high quality metal with stylish designs for production and exports (Ratnasingam 2015). It was estimated that almost 130,000 kg of metal, mostly in the form of tubes and casings, was consumed by the furniture industry in 2015.

### **Plastic**

In 2015, the industry used 85,000 m<sup>3</sup> of plastic materials for the manufacture of low-cost furniture. The plastic furniture is normally supplied for children, fun and modern markets (Ratnasingam 2015).

### **Rattan and Bamboo**

Rattan and bamboo furniture is niche, exotic tropical furniture, often meant for exclusive markets. The varied creativity shown in rattan designs has astounded experienced theme decorators as well as interior designers. Despite uncertainty in the supply of these materials, approximately 250,000 poles were consumed by the furniture industry in the country (Ratnasingam 2015).

### **Upholstery**

Upholstery provides comfort in furniture, in the form of lavish upholstered furnishings and coverings of different fabrics, leather, faux suede and microfiber, which leads to higher value-added products. Almost 200,000 m<sup>2</sup> of upholstery materials was consumed by the furniture industry in 2015, with focus being more on creativity and value-adding activities (Ratnasingam 2015).



## Workforce

Furniture manufacturing is a labour intensive industry (Scott 2006), and the characteristics of the labour force determines the success of the industry, as well as its socioeconomic contributions. The number of workers in the furniture manufacturing industry is shown in Table 15, and it is evident that the furniture industry employs a proportionately higher number of workers compared to the other wood product sectors.

**Table 15** Labour Force in the Furniture Industry

Year	Workers	Sawmilling and Moulding	Furniture (Wooden and rattan)	Panel Products	Others including BJC
2000	Local	30,654	37,644	31,013	14,676
	Foreign	6,972	15,938	33,778	3,626
2005	Local	28,753	34,611	22,396	10,806
	Foreign	9,649	33,351	48,919	4,525
2008	Local	39,661	48,440	22,784	15,323
	Foreign	17,474	62,727	85,378	8,713
2009	Local	39,661	48,440	22,784	15,323
	Foreign	13,979	50,182	68,302	6,971
2010	Local	21,515	31,352	17,854	20,089
	Foreign	10,797	33,680	42,872	9,029
2011	Local	30,588	39,896	20,319	17,706
	Foreign	12,388	41,931	55,587	8,000
2012	Local	28,410	38,670	21,760	17,900
	Foreign	13,800	43,200	52,800	7,850

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2013	Local	27,900	38,250	21,900	18,100
	Foreign	13,900	43,650	49,900	7,900
2014	Local	27,950	37,100	22,950	18,000
	Foreign	14,100	44,050	51,100	7,750
2015	Local	26,700	37,850	22,870	18,050
	Foreign	13,700	43,050	49,050	7,500

Sources: DOS, NATIP (2009) and Ratnasingam (2015)

From Table 3.3, it is obvious that almost 65% of the workforce in the furniture manufacturing industry are foreign-workers. In fact the number of foreign workers in the industry has grown since 2008, surpassing the number of local workers employed in the industry. These workers are mostly from neighbouring countries, such as Indonesia, Bangladesh, Nepal, Myanmar and Vietnam. Employed predominantly to take up lower-skilled monotonous production jobs, they are also increasingly moving up the management ladder to take up supervisory and junior managerial positions within the industry (Ratnasingam 2015). Inevitably, the dependence on foreign contract workers, not only erodes the skills-retention within the industry but also adversely affects the overall industrial productivity (Ratnasingam 1999).

Two factors have been identified as the dilemma facing the local workforce aspiring to work in the furniture manufacturing industry. One is the prevailing low-wages offered by the industry. The wood-based industry is considered a low-wage industry, and the low wages offered is a reflection of the value the products manufactured captures in the market. Such low-paying jobs are not attractive to the younger generation and school leavers, who prefer to take up career opportunities in comparably higher paying sectors,

such as Information and Communications technology (ICT), sales or even other manufacturing jobs (Ratnasingam *et al.* 2013b).

The other deterrent for school leavers seeking employment in the furniture industry is the prevailing 3D syndrome (dangerous, demeaning, and dirty) associated with the industry (Ratnasingam *et al.* 2012a). Such poor working conditions are usually not acceptable to the Generation Y and millennials, who would prefer a clean working environment, even if they have been trained professionally in the woodworking field (Ratnasingam *et al.* 2013b). It is thus no surprise that the number of knowledgeable and technically-competent local workforce in the furniture industry is on the decline, and manufacturers are forced to resort to employ foreign-contract workers.

It is clear that the lack of quality human capital is indeed a challenge in the furniture manufacturing industry. Human capital that is knowledgeable and skilled can be applied to increase economic value (Ratnasingam *et al.* 2010e). Without such a competent workforce, the application of automation and mechanization may not yield the necessary results in terms of increased productivity and value-addition within the industry. The extensive use of foreign-contract workers is a double-edged sword – on one hand, it ensures competitive production for the industry, but on the other, it depletes the much needed transition towards greater value-added manufacturing due to insufficient skills and creativity (Ratnasingam 2015).

Although the government has been emphasizing on the importance of human capital in the country, the labor-intensive sectors, such as furniture manufacturing, continue to rely on foreign-contract workers in order to remain viable, as local workers shy away from these industries. On the other hand, the more experienced foreign workers are beginning to fill up supervisory roles and junior

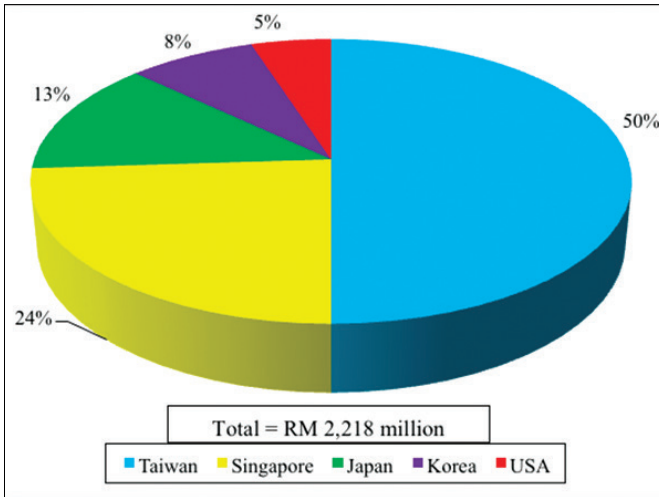
management positions through the learning-curve and picking-up useful knowledge and skills on the job (NATIP 2009). In order to ease the pressure of insufficient workers, the government has extended the contract of experienced foreign workers, while at the same time allowing the employment of new foreign workers for sectors that are faced with labor shortages (Lim *et al.* 2016).

Although the government must be commended for setting up woodworking skills training centers, such as the Wood Industry Skills Development Centre (WISDEC), Industrial Training Institute (ITI) and Furniture Industry Technology Centre (FITEC), to develop a continuous pool of semi-skilled and skilled workforce for the furniture industry, the uptake among the younger generation has been rather lukewarm (Lim *et al.* 2016). Hence, these training centers resort to promoting their training facilities to neighboring countries, where the woodworking industry is growing rapidly. In view of this there is an urgent need to re-evaluate the skills training programs and human capital development schemes, to arrest the increasing dependency on foreign contract workers by the manufacturing sectors in the country (Ratnasingam 2015).

## **Capital Outlay**

The Investments Act (1986) was introduced to stimulate the investment activities in manufacturing industries in the country, including the furniture sector (Ratnasingam and Ioras 2009). With the reducing exports of wood materials from Malaysia, in line with the promotion of domestic processing activities, the traditional importers of wood materials, such as Taiwan, Japan Singapore and South Korea, were forced to relocate their furniture manufacturing outfits to this country (Ratnasingam 2002a). The wave of foreign investments from these countries in the mid-1980s to the early

1990s, expanded the manufacturing capacity of the Malaysian furniture industry significantly. The distribution of foreign investors in the Malaysian furniture industry over the past 30 years (1986 – 2015) is shown in Figure 6.



Source: MIDA (2016) and Ratnasingam (2015)

**Figure 6** Foreign Investors in the Malaysian Furniture Industry - 1986–2015

In fact, foreign direct investments (FDI) has played an important role in contributing to the high percentage of gross fixed capital formation in the Malaysian furniture manufacturing industry (Ratnasingam 2015), not only in terms of capacity expansion but also in terms of technology acquisition, adoption of automation techniques as well as, the exploitation of waste materials and alternative biomass.

In reality, however, domestic investments in the furniture manufacturing industry accounted for approximately 70% of the total investments in the sector over the period 1980 to 2015. The

matured furniture industry, typified by increasing operating costs, has forced many foreign investors to relocate their manufacturing outfits to neighbouring countries that offer a lower-cost base, such as China and Vietnam. According to Ratnasingam (2015), interests of foreign investors in the Malaysian furniture industry began to wane due to: (1) increasing labour cost; (2) uncertainty in raw materials supply; and (3) the overall reducing industrial competitiveness.

### **Low Entry Barrier**

The Malaysian furniture industry has relatively low entry barriers compared to other medium or high-technology industries, such as pharmaceuticals, electronics and electrical, machinery and equipment and other manufacturing industries. This low entry barrier is beneficial to local entrepreneurs and manufacturers to participate in the industry. Hence, almost 83% of the furniture manufacturers in the country fall under the micro, small and medium enterprises (MSMEs) category, which are predominantly locally-owned. These manufacturers often operate as sub-contractors, component producers or specialty service providers to larger manufacturing mills. Such an industrial cluster/network strategy is the hallmark of success within the furniture manufacturing industry, and is an established strategy employed in the traditional furniture manufacturing nations, such as Italy, Taiwan and Denmark (Ratnasingam 2015).

### **Supporting Agencies**

Several government-related agencies and trade organizations have been established to enhance and boost the competitiveness of the furniture industry in the country. Table 3.4 summarizes the role of agencies and trade organizations in the development of the Malaysian furniture industry (Ratnasingam 2015).

**Table 16** The Role of Agencies and Trade Organizations in the Malaysian Furniture Industry

Agencies / Industries	Role
Malaysian Timber Industry Board (MTIB)	Initiates the development of various sectors of the timber industry and provides technical, marketing and other forms of assistance to ensure their continued growth within a rapidly industrializing Malaysian economy. It is also the lead licensing authority in the timber industry.
Malaysian Timber Council (MTC)	Promotes the development of the timber-based industry in Malaysia and the marketing of timber products
Ministry of Plantation Industries and Commodities (MPIC)	Oversees the development of the primary commodities sector covering research and development (R&D), production, processing and marketing of timber, palm oil, rubber, coca, pepper, tin, copper and other materials
Malaysia External Trade Development Corporation (MATRADE)	Focal point for Malaysian exporters and foreign exporters to source for trade-related information
Malaysian Timber Certification Council (MTCC)	Develops and operates the voluntary Malaysian Timber Certification Scheme (MTCS)
SME Corp.	Develops capable and resilient Malaysian SMEs to be competitive in the global market through coordinated policies and programs
Malaysian Furniture Council (MFC)	The national furniture trade body that plays a catalytic role in assisting both the private and public sectors in the promotion and dynamic achievements of the Malaysian furniture industry in the global marketplace

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Forest Research Institute of Malaysia (FRIM)	Promotes sustainable forest management and the optimal use of forest resources through the knowledge and technology generated from the various researches conducted
Malaysian Industrial Development Authority (MIDA)	Promotes and coordinates industrial development in the country for the manufacturing and service sectors
Ministry of International Trade and Industry (MITI)	Plans, legislates and implements international trade and industrial policies that will ensure Malaysia's rapid development towards achieving the National Economic Policy and Vision 2020
National Institute for Occupational Safety and Health (NIOSH)	Ensures a safe and healthy working environment for all employees and others involved in or affected by its operations taking into account statutory requirements and relevant national and international standards and codes of practices
<i>Scientific and Industrial Research Institute of Malaysia</i> (SIRIM)	The government's mandated machinery for research and technology development, and the national champion of quality
Majlis Amanah Rakyat (MARA)	Leads in the field of entrepreneurship, education and investment for Bumiputera equity share
SME Bank	A development financial institution to nurture and meet the unique needs of small and medium enterprises (SMEs) through the provision of financial and non-financial services
Malaysian Productivity Corporation (MPC)	Serves as the leading agency on productivity-related issues in the country, with the objective of assisting businesses improve their performances

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Forestry Department Peninsular Malaysia	Responsible for the management, planning, protection and development of the Permanent Reserved Forests (PRF) in accordance with the National Forest Policy (NFP) 1992 and the National Forestry Act (NFA) 1984
Sarawak Timber Industry Development Corporation (STIDC)	Stimulates, by all possible means, the planned expansion of wood-based industries throughout Sarawak consistent with the overall interest of the economy, the availability of capital and technical expertise and effective management of the forest resources
Sarawak Timber Association (STA)	Promotes, fosters and enhances the relationship between all members of the timber association in Sarawak
Sarawak Forest Department	A technical and scientific department which is concerned with forest management, forest protection, efficient and effective utilization of the forest resources and the preservation and conservation of the flora and fauna of Sarawak
Sabah Forest Department	Manages all forest reserves in the state of Sabah according to the Sustainable Forest Management (SFM) principles
Association of Bumiputera Entrepreneurs in the Wood and Furniture Sectors (PEKA)	Serves as the national association representing Bumiputera entrepreneurs in the wood and furniture sectors

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Sources: Ratnasingam (2015)

### ***National Timber Industry Policy (NATIP)***

The National Timber Industry Policy (NATIP), formulated in 2009, is the guiding principle and framework for the development of the timber industry in Malaysia, within all sub-sectors. The policy is the focal point which outlines the way forward for the industry and determines the appropriate policy directions for critical aspects of the timber industry. By adopting the policy, the timber fraternity will be able to align their operations and long term plans according to the strategies prescribed in the NATIP and take an active part in the mainstream development of the industry. The policy direction of NATIP sets the path for sustainable development of the timber industry in the medium (2015) and long-term (2020) to achieve the target of RM53 billion in export earnings.

### **Government Incentives**

As one of the largest trading economies in the world, the Malaysian government has made available several incentives and supporting infrastructure to strengthen the ability of Malaysian furniture manufacturers to expand their activities, improve their operational efficiency and increase their export competencies. Fiscal and financial policies have also been laid out to incentivise the furniture industry to greater heights (Ratnasingam 2015), accorded based on the nature and type of investments made. The type of incentives available include: (1) incentives for the manufacturing sector; (2) re-investment incentives; (3) export incentives; (4) incentives for environmental protection/management; (5) incentives for research and development (R&D); and (6) incentives for training and human capital development.

## UNMASKING THE CHALLENGES TO SUSTAINABLE GROWTH

Table 17 and Table 18 show the Malaysian furniture industry's performance over the last 24 years. These statistics were compiled and tabulated based on the Annual Manufacturing Surveys published by the Department of Statistics of Malaysia (DOSM), for the product categories HS 9401 and HS 9403, which refer to wooden furniture and related products.

**Table 17** Cost of Input and Value of Output in the Malaysian Furniture Industry

Year	Number of Establishments	Value of gross output (RM'000)	Cost of input (RM'000)	Value added ('000)	Total number of persons engaged during December or the last pay period	Salaries & wages paid ('000)	Value assets owned as at 31 December ('000)
1990	374	663,140	434,954	228,186	17,668	102	329,827
1991	424	997,277	637,904	359,373	25,131	153	504,074
1992	446	1,209,709	788,148	421,561	28,281	196	604,190
1993	554	1,706,539	1,110,729	595,810	35,643	266	700,673
1994	540	2,030,336	1,304,831	725,505	37,453	305	795,968
1995	1,719	2,949,235	1,973,528	975,708	47,885	420	1,105,766
1996	1,405	3,274,481	2,147,297	1,127,185	45,709	446	1,399,115
1997	1,725	3,641,057	2,356,123	1,284,934	46,132	496	1,601,043
1998	1,671	3,122,053	1,994,019	1,128,034	44,980	501	1,581,011

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1999	1,652	4,595,365	3,013,193	1,582,171	49,271	568	1,698,446
2000	1,449	6,647,367	4,534,598	2,112,769	68,876	812	2,418,995
2001	1,443	6,157,000	4,219,000	1,938,000	63,318	763	2,376,000
2002	1,351	7,368,000	5,520,000	1,848,000	71,968	908	2,824,000
2003	1,385	7,403,000	5,599,000	1,803,000	70,136	930	2,648,000
2004	1,409	8,966,000	6,897,000	2,069,000	78,173	1,043	3,093,000
2005	1,793	10,186,000	7,786,000	2,400,000	88,337	1,217	3,282,000
2006	1,999	10,842,000	8,296,000	2,546,000	90,708	1,272	3,397,000
2007	2,070	11,799,000	9,156,000	2,643,000	104,484	1,533	3,973,000
2008	2,082	12,145,000	9,312,000	2,833,000	101,218	1,556	3,968,000
2009	2,001	11,993,017	9,181,583	2,811,434	102,838	1,614	3,816,010
2010	1,932	10,292,000	7,410,000	2,882,000	108,064	1,641	3,170,000
2011	1,910	10,311,040	7,501,030	2,810,010	114,015	1,711	3,106,000
2012	1,891	10,289,000	7,378,500	2,910,500	126,080	1,748	3,185,000
2013	1,910	10,304,800	7,439,800	2,865,000	135,800	1,810	3,414,000
2014	1,890	10,288,010	7,488,192	2,799,818	131,850	1,780	3,318,000

Source: DOSM (2014)

**Table 18** Performance of the Malaysian Furniture Industry

Year	Productivity	Labour Productivity (RM'000 / worker)	Capital Productivity	Capital Turnover	Capital Intensity (RM'000 / worker)	Labour Cost per Employee (RM / worker)	Labour Cost Competitiveness
1990	1.52	12.92	0.69	2.01	18.67	5.77	2237.12
1991	1.56	14.30	0.71	1.98	20.06	6.09	2348.84
1992	1.53	14.91	0.70	2.00	21.36	6.93	2150.82
1993	1.54	16.72	0.85	2.44	19.66	7.46	2239.89
1994	1.56	19.37	0.91	2.55	21.25	8.14	2378.70
1995	1.49	20.38	0.88	2.67	23.09	8.77	2323.11
1996	1.52	24.66	0.81	2.34	30.61	9.76	2527.32
1997	1.55	27.85	0.80	2.27	34.71	10.75	2590.59
1998	1.57	25.08	0.71	1.97	35.15	11.14	2251.56
1999	1.53	32.11	0.93	2.71	34.47	11.53	2785.51
2000	1.47	30.67	0.87	2.75	35.12	11.79	2601.93
2001	1.46	30.61	0.82	2.59	37.52	12.05	2539.97

Jegatheswaran Ratnasingam

2002	1.33	25.68	0.65	2.61	39.24	12.62	2035.24
2003	1.32	25.71	0.68	2.80	37.76	13.26	1938.71
2004	1.30	26.47	0.67	2.90	39.57	13.34	1983.70
2005	1.31	27.17	0.73	3.10	37.15	13.78	1972.06
2006	1.31	28.07	0.75	3.19	37.45	14.02	2001.57
2007	1.29	25.30	0.67	2.97	38.02	14.67	1724.07
2008	1.30	27.99	0.71	3.06	39.20	15.37	1820.69
2009	1.31	27.34	0.74	3.14	37.11	15.69	1741.90
2010	1.39	26.67	0.91	3.25	29.33	15.19	1756.25
2011	1.37	24.65	0.90	3.32	27.24	15.01	1642.32
2012	1.39	23.08	0.91	3.23	25.26	13.86	1665.05
2013	1.39	21.10	0.84	3.02	25.14	13.33	1582.87
2014	1.37	21.23	0.84	3.10	25.16	13.50	1572.93

Sources: Author's Calculations

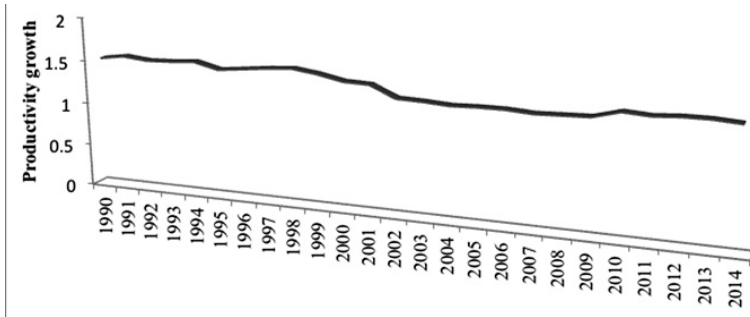
## Productivity Growth

Industrial growth driven by productivity is the key to sustainable industrial growth. Productivity is described as a ratio between output and input, displaying the efficiency and competitiveness of the industry (Ratnasingam 2015).

$$\text{Productivity} = \text{Output} / \text{Input}$$

It must however be emphasized that productivity is related to the utilization of resources to produce a given output, rather than simply the rate at which inputs generate outputs (Ratnasingam and Reid 1996). It is a good measurement of the efficiency of resource consumption in an industry, which in turn drives industrial growth (Norini *et al.* 2009).

Figure 7 reveals the productivity trend of the Malaysian furniture industry over a 24 year time-period. It is apparent that the productivity of the furniture industry has been declining steadily, particularly since the economic crisis in 1998. Consequently, the Malaysian furniture industry is trailing in terms of competitiveness compared to the overall performance of the manufacturing sector in the country. This in turn reaffirms the argument that productivity growth in the furniture industry in Malaysia is driven by incremental capital inputs, rather than actual productivity gains (Ratnasingam and Ioras 2005).



**Figure 7** Productivity Growth in the Malaysian Furniture Industry

In economic analysis, the productivity factor is a function of several different inputs. The crucial inputs of productivity growth can be categorized into: (1) the average quality of the labour force; (2) the amount of capital goods employed per worker labour hour; and (3) the efficiency at which, labour, capital and other inputs are combined. Table 19 briefly describes the determinants of productivity growth often used in industrial economics.

**Table 19** Productivity Growth Factors

<b>Factors</b>	<b>Descriptions</b>
Labour quality (human capital)	Labour education, skill, training Health and vitality Age-gender composition Better work environment for labour Attitude and job satisfaction
Quantity of physical capital	The amount of capital (equipment) available per unit labour



Efficiency	<p>Technological process (computer, mass-production assembly line techniques or computerized system, robotics, automobiles, containerized shipping)</p> <p>Greater specialization as a result of scale economies</p> <p>The reallocation of labour from less to more productivity uses</p> <p>Changes in a society's institutional, cultural and environmental setting and in its public policies</p>
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Source: Ratnasingam and Chong (2010)

Ratio analysis of the various inputs has been used extensively to describe the performance of each of the inputs and its influence on productivity growth. These ratios, usually referred to as productivity indicators, which comprise of: (1) labour productivity; (2) capital productivity; (3) process efficiency; and (4) competitiveness, are enumerated for the Malaysian furniture industry to describe its productivity performance. The productivity indicators used are summarized in Table 20.

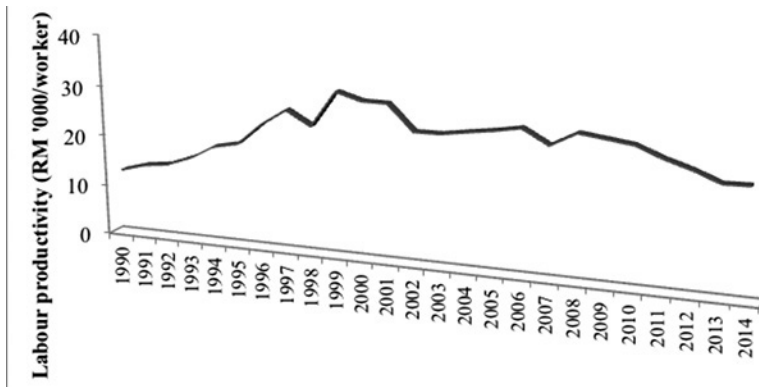
**Table 20** Productivity Indicators

<b>Productivity Indicators</b>	<b>Measurement</b>
Labour productivity	Labour productivity
Capital productivity	Capital productivity Capital turnover
Efficiency	Capital intensity Process efficiency
Competitiveness	Labour cost competitiveness Labour cost per employee

### *Labour Productivity*

Being a labour-intensive sector, the labour factor has an important influence on the productivity performance of the furniture industry (Ratnasingam and Ioras 2003). Labour productivity reflects the amount of wealth created by the enterprise or industry relative to the number of workers employed. The labour productivity, expressed as value-added per employee (VAE), of the furniture industry, is presented in Figure 8, and the increasing trend throughout the years is attributed to the increasing number of employees employed. However when compared to other furniture producing nations in the ASEAN region, the labour productivity in the Malaysian furniture sector is significantly lower due to the high dependence on contract foreign-workers and the prevailing low skills among these workers that hinder the manufacture of high value-added products (Ratnasingam 2015).

$$\text{Labour productivity} = \text{Value-added} / \text{Number of employees}$$

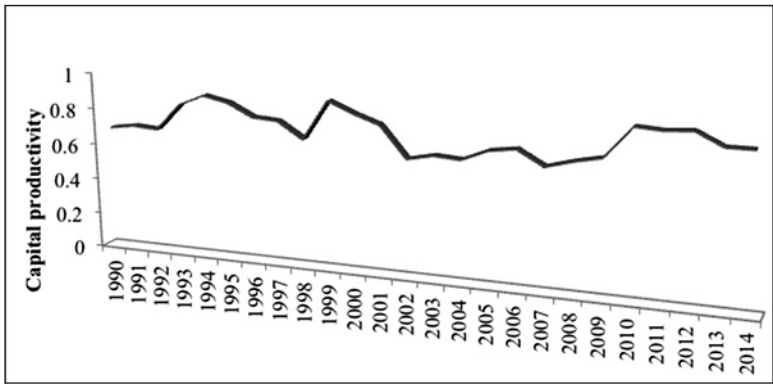


**Figure 8** Labour Productivity in the Malaysian Furniture Industry

### *Capital Productivity*

Figure 9 shows the capital productivity of the Malaysian furniture industry. Capital productivity describes the degree of utilization of tangible fixed assets. Based on the analysis, the reducing capital productivity in the Malaysian furniture industry does not augur well for the industry as it implies that assets (which also encompass machinery, technology and other manufacturing capacities) are not being used efficiently to increase outputs. The reduced capacity utilization among furniture manufacturers is well documented since the emergence of Vietnam and China as the prominent furniture exporters in the Asian region (Ratnasingam 2015).

$$\text{Capital productivity} = \text{Value-added} / \text{Fixed assets}$$



**Figure 9** Capital Productivity in the Malaysian Furniture Industry

### Capital Turnover

Capital turnover reflects the efficiency of capital (*i.e.* inventories and raw material stocks) utilization. As presented in Figure 10, capital turnover in the Malaysian furniture industry has a negative trend, clearly underlining the fact that the industry is dominated by those operating as contract-manufacturers, who often require large inventories and stocks. Ratnasingam (2015) has argued that the over-emphasis on the original equipment manufacturing (OEM) strategy within the Malaysian furniture industry hinders high capital turnover as the movement of stocks and inventories are slow in contract-manufacturing environments, due to the high supply elasticity of products.

$$\text{Capital turnover} = \text{Output} / \text{Fixed assets}$$

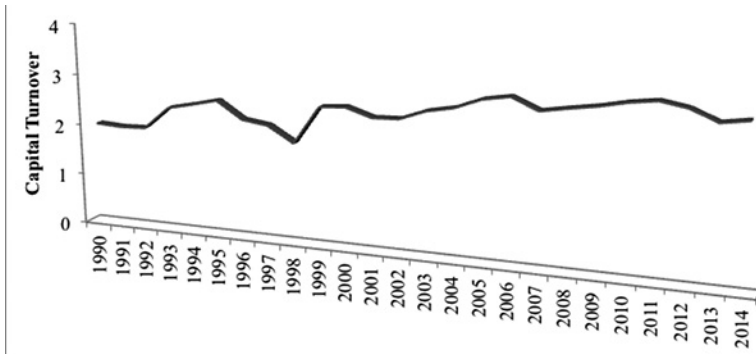
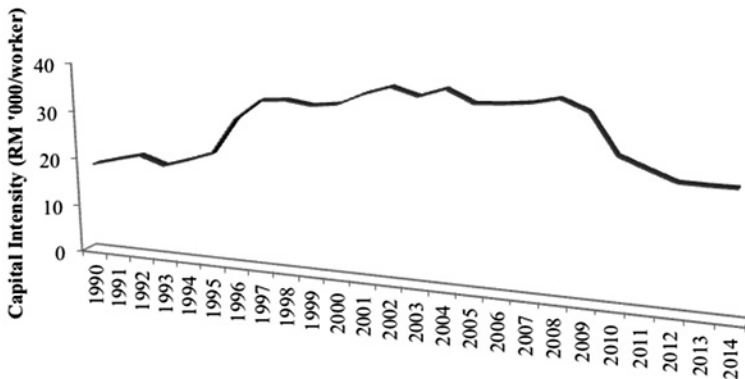


Figure 10 Capital Turnover in the Malaysian Furniture Industry

## Efficiency

Capital intensity reflects the status of the industry, *i.e.* whether the industry is capital or labour intensive. Figure 11 presents the capital intensity in the Malaysian furniture industry, which shows that the industrial growth over the years has primarily been driven by incremental capital inputs, as reflected by the increasing capital intensity. The increasing trend in capital intensity can be attributed to the increasing number of manufacturing establishments in the industry, although investments in new state of the art technologies and machinery have remained subdued over the years (Ratnasingam and Ioras 2014). In other words, the increasing trend in capital intensity over the years can be attributed to the growth in manufacturing capacity (*i.e.* both in terms of new manufacturing establishments as well as expansion of existing factories), in relation to labour, which grew at a much lower pace.

$$\text{Capital intensity} = \text{Fixed assets} / \text{Number of employees}$$



**Figure 11** Capital Intensity in the Malaysian Furniture Industry

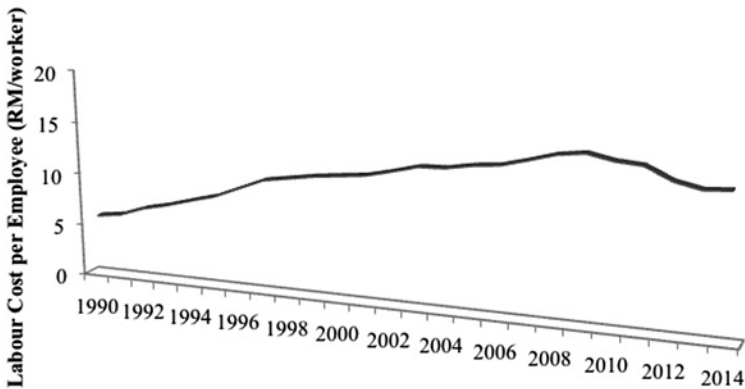
### *Competitiveness*

The competitiveness of the Malaysian furniture industry can be explored from the perspectives of labour cost competitiveness and labour cost per employee, as labour cost remains the most important cost-variable in the furniture manufacturing sector due to its labour-intensive characteristic (Ratnasingam 2015).

#### **Labour Cost per Employee**

Labour cost per employee shows the average remuneration per employee. Similar to the labour productivity trend, labour cost per employee in this sector depicts an increasing pattern (Figure 12). This growth reflects the increasing numbers as well as wages in the labour factor. This is of particular importance as the Malaysian government has continued to raise the minimum-wage for workers in recent years, whereby it presently stands at RM 1000 per month.

$$\text{Labour cost per employee} = \text{Total labour cost} / \text{Number of employees}$$



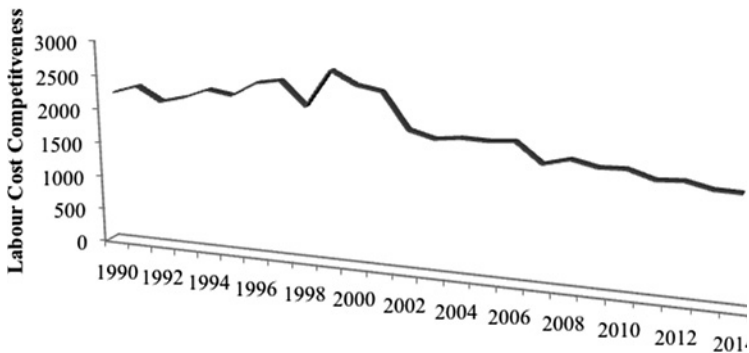
**Figure 12** Labour Cost per Employee in the Malaysian Furniture Industry

Against this background it is apparent that the Malaysian furniture industry no longer enjoys comparative advantage in terms of labour, due to its increasing dependence on contract foreign workers as well as its increasing labour cost (Ratnasingam 2015).

### Labour Cost Competitiveness

Labour cost competitiveness describes how competitive the industry is in terms of its labour costs. Figure 13 exhibits the labour cost competitiveness of the Malaysian furniture industry. It appears that labour cost competitiveness has stagnated, which could be explained by the fact that although cost per labour has increased over the years, the corresponding labour productivity has been on the decrease. This indicates that the perceived advantage of low-costs attributed to the overwhelming employment of contract foreign workers is not justified, and has taken a toll on the overall industrial productivity of the Malaysian furniture industry (Ratnasingam 2015).

$$\text{Labour cost competitiveness} = \text{Value-added} / \text{Labour cost}$$



**Figure 13** Labour cost competitiveness in the Malaysian furniture industry

## **Innovation Capacity**

The rapid growth of the Malaysian furniture industry in the 80s and 90s has been attributed to comparative advantages such as an abundant supply of wood materials and low-cost workforce being available in the country. These advantages have however been lost to the fiercely competitive manufacturers with lower production costs in China and Vietnam (Ratnasingam *et al.* 2013c). The over-reliance of the Malaysian furniture industry on the OEM strategy, that essentially transformed the industry into a large contract-manufacturing hub, producing large-volumes of products of established themes, has become the curse of the industry. Adoption of such a strategy has not only hindered the move of the industry up the value-chain, but also nullified the need for in-house research and development (R&D) and innovation activities (Abdullah *et al.* 2013; Ratnasingam 2015). Although the government has long recognized the shortfall of innovative capabilities within the furniture industry in the country and have provided various platforms and incentives to boost value-addition and innovation growth in the industry, the responses from the industry have not been encouraging. The Malaysian Furniture Design Centre (MFDC) and the newly established TANGGAM program are ample testimony of the government's initiatives to help boost innovation capability within the industry (Ratnasingam 2015).

Despite such efforts, growth of productivity, value-addition and innovation within the Malaysian furniture industry over the years have remained negative, as shown in Table 21.



**Table 21** Innovation Capacity

<b>Year</b>	<b>Productivity</b>	<b>Value Addition Ratio</b>	<b>Innovation Ratio</b>
1990	1.52	0.52	2.05
1991	1.56	0.56	2.13
1992	1.53	0.53	2.07
1993	1.54	0.54	2.07
1994	1.56	0.56	2.11
1995	1.49	0.49	1.99
1996	1.52	0.52	2.05
1997	1.55	0.55	2.09
1998	1.57	0.57	2.13
1999	1.53	0.53	2.05
2000	1.47	0.47	1.93
2001	1.46	0.46	1.92
2002	1.33	0.33	1.67
2003	1.32	0.32	1.64
2004	1.30	0.30	1.60
2005	1.31	0.31	1.62
2006	1.31	0.31	1.61
2007	1.29	0.29	1.58
2008	1.30	0.30	1.61
2009	1.31	0.31	1.61
2010	1.39	0.39	1.78
2011	1.37	0.37	1.75
2012	1.39	0.39	1.79
2013	1.39	0.39	1.77
2014	1.37	0.37	1.75

Source: DOSM, Author's Calculations

It is apparent that the extent of value-addition in the Malaysian furniture industry over the years has been reducing, reflecting the fact that the furniture being produced did not fetch higher values but instead suffered a continuously reducing price-point (Ratnasingam 2003b). Although the price-point for furniture is a market phenomenon, it may also be adversely influenced by fluctuations in currency exchange rates (Tissari *et al.* 2005). The fact that furniture is fashion, and the over reliance of manufacturers on a few wood species as the predominant raw material does not auger well for the industry. The lack of furniture based on mixed-materials construction or even innovative designs have resulted in maintaining the role of Malaysia as a leading contract furniture manufacturing hub (Ratnasingam 2015). In Table 4.3, the innovation ratio is derived by adding the productivity ratio to the value addition ratio, which is used as a proxy to measure the innovation performance of the furniture industry (Ratnasingam and Ioras 2009). From the analysis, it is apparent that the extent of innovation in the Malaysian furniture industry has been reducing marginally over the years, clearly reflecting the fact that the Malaysian furniture industry is struggling with the original design manufacturing (ODM) and original brand manufacturing (OBM) strategies, which are driven by value addition and innovation (Ratnasingam 2003b).

Unlike the traditional furniture manufacturing powerhouses, such as Denmark, Italy, Taiwan, United States of America and Germany, the Malaysian furniture industry has suffered due to its own success. Owing to the rapid growth of the industry in the early years, the accelerated build-up in manufacturing capacity created a high supply-elasticity of similar products that is continuously under pressure to reduce price-points. To offset the reduced pricing, economies of scale is widely practiced within the industry, which negates the need for product diversification and creativity. Even the

formation of extensive furniture clusters and the use of computer numerical control (CNC) machines are all geared towards mass production, with the sole focus of remaining price competitive (Gawroński 2013; Ratnasingam 2015).

It is thus no surprise that furniture design activities are not well received by the manufacturing fraternity at large. Most furniture design and prototyping activities in the sector are confined to the use of traditional materials and construction techniques with modified design themes that are not attractive to potential buyers (Gustafsson 1995; Ratnasingam 2003a). So new furniture designs and prototypes showcased at the annual furniture shows and exhibitions in the country unfortunately do not translate into successful production pieces in most instances. Despite the vigorous efforts of some quarters, development of furniture design in the country is very much at an infancy stage and the lack of impetus, especially from the industry, has left many aspiring furniture designers without the necessary opportunities to develop their ideas and designs further (Ratnasingam 2015).

Given these scenarios, it seems clear that the Malaysian furniture industry's growth trajectory is fuelled by incremental inputs rather than productivity gains, which is an unsustainable pathway. The over-dependence on cheap production inputs has retarded the industry's transformation into a high value-added furniture manufacturing sector, producing innovative and exclusively designed furniture for the high-end markets worldwide (Ratnasingam 2015). Failure to embark on further value-adding strategies to move up the value-chain, will result in an industry that remains a "low-wage" economy. In order to overcome these challenges, a paradigm shift within the industry is necessary, that will allow the infusion of research and development (R&D) outputs and knowledge-workers into the sector.

## **DIVIDENDS FROM RESEARCH ACTIVITIES**

The growth of the Malaysian furniture industry, in terms of productivity and innovation over the last two decades, has stagnated if not eroded which has seriously undermined its competitiveness in the global furniture market. This has far reaching implications for the profitability of the industry, which is well documented as steadily eroding over the years (Ratnasingam 2015). As elaborated previously, the primary challenges that continue to impinge on the productivity and innovation performances of the industry are: (1) wood raw materials; (2) workforce; (3) complying with diversifying markets; (4) policy directions; (5) automation and technology adoption; (6) extent of innovation and creativity; and (7) human capital development (Barcic et al. 2011; Ng and Thiruchelvam 2011b; Ratnasingam 2015).

### **Wood Raw Materials**

While Malaysia has traditionally been hailed as a low-cost production base, the comparative advantages previously derived from the abundant supply of wood raw materials and cheap workforce are no longer available. The significantly reduced supply of sawn-logs from the natural forest, the overwhelming demand for plantation wood resources, particularly rubberwood (*Hevea brasiliensis*), and increasing importation of hardwoods from North America and the Oceania reflect the short supply of wood raw materials to cater for domestic needs (Ratnasingam *et al.* 2013c).

Studies have shown that the attributes of wood species are important for furniture wood materials, as these features create the “feel good factor” among potential customers. In this context, the over reliance on rubberwood as the primary source of wood material has emerged as a boon as the material is perceived as a

cheap alternative to the traditional forest wood species due to its waste-wood stature (Shigematsu *et al.* 2011; Ratnasingam *et al.* 2011b; Ratnasingam *et al.* 2015a). In the same report, it was also highlighted that among the 7 most commercially abundant wood species available in the market place (*i.e.* Nyatoh (*Palaquium spp.*), Dark Red Meranti (*Shorea siamensis*), Light Red Meranti (*Shorea siamensis*), White Meranti (*Shorea bracteolate*), Yellow Meranti (*Shorea acuminatissima*), Rubberwood (*Hevea brasiliensis*) and Mixed Hardwood, only rubberwood has a uniformly light colour that suits furniture manufacturing. The lack of diversity in the raw materials used in its furniture manufacturing has taken a toll on the price-point of furniture exported from the country. As there are no other local wood species that share similar wood attributes as rubberwood, which is available in abundance, furniture manufacturers are forced to use imported wood species as a strategy to move along further up the value-chain (Ratnasingam *et al.* 2007).

Studies have shown that the success of rubberwood as a premier furniture wood raw material is not due to its excellent working properties or its environmentally-friendly nature, but rather due to its low cost (Ratnasingam 1995). As a result, furniture manufactured from rubberwood is often perceived to be low-cost and the price-points offered by buyers for such products are relatively lower compared to similar products made from other wood materials, even after tough negotiations. A case in point is the classic English Windsor chair that fetches only US\$ 11.20 per piece if made from rubberwood, while picking up a price-point of US\$ 19.40 per piece if made from European Beech, although the cost of the two wood species is only marginally different (Ratnasingam 2015). The perceived attributes of the wood species can thus have far reaching implications on product development and marketing activities for furniture, as clearly demonstrated by the case of the rubberwood.

Even extensive rebranding exercises to rename rubberwood as “Malaysian Oak” did not succeed in shedding its low-cost image that has negatively impinged on its value proposition.

Against this background, perhaps liberalizing the importation of wood resources to meet the demands of the local furniture industry, while at the same time encouraging raw materials diversification, may be the long term solution to transform the Malaysian furniture industry into a manufacturer of high value-added products.

## **Workforce**

The Malaysian furniture industry’s reliance on contract foreign workers to fulfil its labour-force requirements does not auger well for the industry as it has eroded the overall productivity of the industry. The claimed “low cost” advantage of these foreign workers is also not justified, as analysis of the labour productivity figures has shown otherwise. The unfavourable working conditions prevailing in the furniture industry, associated with the 3D syndrome ‘dirty, dangerous and demeaning’, has led to reluctance among local workers to work in the industry (Ratnasingam *et al.* 2012a). On the other hand, the foreign workers adversely affect skills retention, which adversely affects innovation within the industry (Ratnasingam *et al.* 2013c). The National Timber Industry Policy (2009) has recognized these drawbacks associated with the employment of foreign contract workers in the furniture industry and has laid out a plan to absorb more local labour-force into the sector through apprenticeship schemes and other forms of training for school-leavers. Nevertheless, lack of improvements in working conditions, related to the high levels of dust emission (Ratnasingam and Scholz 2004; Graham and Ratnasingam 2007; Ratnasingam and Scholz 2008; Ratnasingam *et al.* 2009a; Ratnasingam *et al.* 2010d; Ratnasingam *et al.* 2011c; Ratnasingam *et al.* 2014; Ratnasingam

and Scholz 2015; Ratnasingam *et al.* 2016), noise (Ratnasingam and Scholz, 2008; Ratnasingam and Ioras 2010; Ratnasingam *et al.* 2010c), chemical pollutants (Ratnasingam and Scholz, 2008; Ratnasingam *et al.* 2010c) and the risk of industrial accidents (Ratnasingam *et al.* 2010a; Ratnasingam *et al.* 2011a; Ratnasingam *et al.* 2016), makes the furniture industry not deemed an attractive employment sector by the younger generation and school-leavers, even those from rural communities. This fact is further attested to by the high turnover rate recorded among the young local labour-force employed in the furniture industry, as they prefer to venture into other manufacturing sectors that offer “greener pastures”.

Studies on safety and health issues and the prevailing safety climate in the furniture industry have also been well documented (Ratnasingam and Ioras 2010; Ratnasingam *et al.* 2010a; Ratnasingam *et al.* 2010b; Ratnasingam *et al.* 2012a). It is apparent that the Malaysian furniture industry has a relatively poor safety climate, where the workforce is frequently exposed to high levels of environmental contaminants that have far reaching implications on the safety and health of the workers. The prevailing poor safety climate in the furniture industry increases occupational safety and health risks, whereby it has been reported that the furniture industry has one of the highest industrial accident rates in the manufacturing sector (Holcroft and Punnett 2009; Annik *et al.* 2009; Ratnasingam *et al.* 2016). According to the Social Security Organization (SOCSO) of Malaysia, the compensation payments for industrial accidents within the furniture industry approximates RM 350,000 per annum, which is among the highest recorded for similar manufacturing environments.

The furniture industry is prone to increased incidence of industrial accidents due to the inferior quality of the workforce employed. Most of the contract foreign workers have no prior

training let alone exposure to the woodworking industry, and therefore have to start from scratch. Although on-the-job training is the primary mode of skills acquisition in the furniture industry, the inherent characteristics of the workforce is crucial in harnessing the skills and knowledge required. Gender, country of origin, work attitude and communication skills have a pronounced effect on skills acquisition and eventually, the mastery of skills to avoid undue safety and health issues in the working environment (Mikkelsen *et al.* 2002; Clarke 2006; Holcroft and Punnett 2009; Ratnasingam *et al.* 2010b).

One of the main contributors towards the poor safety climate prevalent in the furniture industry in Malaysia is the lack of enforcement of the necessary occupational safety and health (OSHA) regulations and standards applicable. Studies have shown that almost all aspects of the working environment in the furniture industry exceed the stipulated standards for contaminants (i.e. dust, noise, chemical pollutants), and yet, the number of such non-compliant manufacturing enterprises brought to book is marginal (Ratnasingam *et al.* 2010a). In fact, in many furniture manufacturing enterprises, the use of personal safety gadgets is not mandatory and the workers along the manufacturing line have to take care of their welfare themselves. Unlike the highly regulated work environment in the developed world, the work environment in the Malaysian furniture industry is relatively unregulated, which inevitably jeopardises the overall productivity of the industry.

Against this background, the labour-force has emerged as a crucial challenge for furniture manufacturers, as they not only have to train the foreign workers to handle woodworking machinery without disrupting production, but also have to face the stark reality of not being able to attract local labour-force into the industry. Furthermore, with increasing economic improvements in their



home countries, there is increasing unwillingness among workers from Indonesia, Nepal and Myanmar to seek employment off-shore (NATIP 2009). The tightened labour recruitment policy imposed is also increasing the shortage of foreign workers in the local manufacturing sector, especially the furniture industry. Although imposed to ensure the welfare and social well-being of these workers, the imposition of measures such as the revised minimum wage to RM 1000 per month and other regulatory obligations, has not resulted in the much anticipated relief (Ratnasingam *et al.* 2010b).

It is obvious that overcoming the challenges of factor inputs, especially wood raw materials supply and labour-force calls for concerted solutions that address the pertinent points related to consistent supply, desired attributes, favourable cost and most importantly, long-term equitable growth.

## **Complying With Diversified Markets**

In recent years, the increasing environmental consciousness among countries in the developed world, particularly Scandinavia, Western Europe and the United States of America, has required manufacturers and suppliers of furniture to embrace the green furniture and green manufacturing concepts. The use of certified wood raw materials is among the most extensive practices being adopted in the global furniture trade (O'Brien and Teisl 2004; Ratnasingam *et al.* 2008b; Ratnasingam *et al.* 2008a; Ratnasingam 2009a; Cai *et al.* 2013).

Forest certification and chain of custody (CoC) certification are not only requirements specified by specific markets but have also emerged as important marketing tools for furniture manufacturers exploring environmentally-conscious markets. Sawn timber producers are concerned with issues of certification, to ensure that

the sawn timber can be verified to have originated from a legal and sustainably managed forest (Baharuddin and Simula, 1996; Menon, 2000; Ratnasingam *et al.* 2013c).

It should be noted that the challenge faced by the manufacturers is not in the supply availability of certified sawn timber, but the related cost of the certification process. Studies have revealed that direct costs of forest management certification of up to US\$ 2.50/m<sup>3</sup> is incurred, depending on the size of the certification unit and local conditions. Further, another US\$ 2.20/m<sup>3</sup> may have to be added for the certification of chain-of-custody (CoC) (Ratnasingam *et al.* 2008a; Ratnasingam *et al.* 2013c).

However, the extent of certification and CoC adoption within Malaysia is growing at a relatively slow pace, as the green premium price-point accorded to certified products in the global market is relatively low (Ratnasingam *et al.* 2008b). The initial investment cost to obtain certification is another factor that deters forest products manufacturers from embarking on such schemes, which explains the relatively low participation in the CoC scheme, as shown in Table 22.

**Table 22** Number of Holders of FMC, CoC, CFMC and CoC, and CWFM under PEFC and FSC Forest Certification Systems in Malaysia (2015)

<b>Forest Certification Systems</b>	<b>FMC Holders</b>	<b>CoC Holders</b>	<b>Combined FMC and CoC</b>	<b>Controlled Wood Forest Management</b>
PEFC/MTCS	9	167	-	-
FSC	0	177	7	2

Sources: PEFC (Pan European Forest Certification), FSC (Forest Stewardship Council), MTCS (Malaysian Timber Certification Scheme)

Note: FMC (Forest Management Certificate), CoC (Chain of Custody), CFMC (Combined Forest Management Certificate), CWFM (Controlled Wood Forest Management)

Further, the number of CoC certified furniture manufacturers is lower as compared to the other wood-based product manufacturers, as listed in Table 23. This is most likely attributable to the low prevailing price premium for certified furniture in the global market (Ratnasingam 2015).

**Table 23** Chain of Custody (CoC) Holders

<b>CoC Holders</b>	<b>Number of Holders</b>
Logs and sawn timber	209
Plywood, particleboard, medium density fibreboard (MDF), veneer	32
Doors and window frames	23
Paper products	17
Furniture	12
Flooring	11
Finger joint and mouldings	39
Woodchips	1

Source: Ratnasingam (2015)

Increasing the level of awareness regarding market requirements is therefore important to ensure the competitiveness and market access of Malaysian furniture into the global market.

Likewise, the market requirements for ISO 9001 (manufacturing practices) certified and ISO 14001 (environmental management) is also on the rise globally. Studies by Ratnasingam *et al.* 2009b; Ratnasingam and Wagner 2010; Ratnasingam and Ioras 2014 have shown that the Japanese, Scandinavian and Western European markets imposed higher requirements for such certifications compared to the markets in the United States of America and the Middle East. In fact, it has been reported that ISO 9001 certified

furniture manufacturers appear to enjoy preferential access to the Japanese market, where quality consciousness is an ingrained part of the culture (Ratnasingam and Ioras 2014). Although ISO 9001 certification does not guarantee excellent product quality, it serves as a mark of confidence that the furniture manufacturer employs a systematic manufacturing process that ensures product consistency, which will significantly reduce quality variations.

The ISO 14001 certification often serves as a precursor for the adoption of either the Forest Stewardship Council (FSC) or Programme for the Endorsement of Forest Certification (PEFC) chain of custody (CoC) certification for the wood raw materials used in furniture manufacturing. In a recent study by Ratnasingam *et al.* (2009b), it was found that ISO 14001 certified manufacturers are not only more environmental conscious, but also adopt practices that would reduce energy consumption and waste and improve the overall working conditions in the manufacturing enterprises.

However, within the Malaysian furniture industry the number of ISO 9001 and ISO 14001 certified furniture manufacturers were 87 and 61, respectively, as of 2015 (Ratnasingam 2015). These numbers are relatively small compared to the total number of furniture manufacturers in the country, suggesting that the desire to obtain such certification is not strong within the industry due to the limited benefits to be gained through such certification schemes. In other words, the Malaysian furniture manufacturing industry is reluctant to adopt new manufacturing systems and protocols, and would prefer to remain with their established but not systematic manufacturing systems. One possible reason for this reluctance is the prevailing family-ties and communal culture so pervasive in the industry, where many of the first generation entrepreneurs paid greater attention to hands on training rather than formal education (Ratnasingam and Ioras 2014).

## Policy Directions

Although the government should be lauded for its far sighted industrial policies that transformed the timber sector into a large down-stream focused manufacturing hub over a period of three decades, some of the policies implemented could have been better planned to ensure more sustainable and equitable growth. Although, the general policy framework applicable to the manufacturing sector also covers the furniture manufacturing industry, specific policy instruments and incentives for the furniture manufacturing industry were not made available. In fact, specific policy guidelines for the furniture manufacturing industry became apparent only after the National Timber Industry Policy (NATIP) was implemented in 2009.

The wood-based industry in Malaysia comes under the purview of several Ministries, such as the Ministry of International Trade and Industry (MITI), Ministry of Plantation and Commodities (MPIC), Ministry of Human Resources (MOHR), Ministry of Agriculture and Agro-Based Industry (MOA) and the Ministry of Home Affairs (MOHA). Unfortunately, the policy directions of these ministries often contradict each other, which in some instances have clouded the overall focus of the furniture industry, which in turn adversely affected productivity and overall industrial competitiveness. For instance, workforce being a crucial production input is often subjected to unrealistic demands, with a prime focus on the employment of local workers (Ratnasingam *et al.* 2013c).

The reluctance of local workers to seek gainful employment in the furniture industry has created a gap which has to be filled up with foreign-contract workers. On the other hand, this results in the prevailing low-wage economy within the furniture industry, which precludes much interest from local workers. Until this scenario is changed and addressed appropriately, any restriction on

the employment of foreign-contract workers could halt the overall productive capacity of the industry as a whole (NATIP 2009).

Against the background of an insufficient workforce, the need for automation technology is increasingly apparent. Although reports have shown that labour cost accounts for an average of 18% of the total manufacturing cost, through the adoption of automation technology it is likely that the labour cost factor in the total manufacturing cost could be further reduced (Ziaie *et al.* 2012). However, in the prevailing poorly capitalized manufacturing environment and limited interest among manufacturers towards the adoption of automation technology, incentivising such measures would offer a better proposition to woo furniture manufacturers to look at this option seriously (Tissari *et al.* 2005).

The growing restrictions, especially with regards to importation of wood raw materials from some parts of the world, such as Africa and South America, due to increased phyto-sanitary scrutiny, also frustrates furniture manufacturers who are embarking on the use of diverse raw materials to boost value addition (Ratnasingam 2015). It must be realized that furniture being fashion and the use of diversified wood raw materials, especially wood species that are well established among the customers, such as Oak (*Quercus spp.*), Beech (*Fagus spp.*), Pine (*Pinus spp.*), Walnut (*Juglans regia*), Sapele, (*Entandrophragma cylindricum*) etc., due to their extensive use in the manufacture of various renowned design and craft pieces, is important to ensure that Malaysian furniture is able to move further up the value-chain (Ratnasingam 2003a).

In essence, what is required is a concerted policy guideline that would pave the way for a more sustainable furniture industry in the country, fuelled by increased value-addition and creativity.

## **Automation and Technology Adoption**

The Malaysian furniture industry is lagging in terms of its adoption of automation and high-technology manufacturing processes (Ng and Thiruchelvam 2011a). The fact that labour cost has remained affordable, especially with the employment of foreign contract workers, the need for automation and adoption of state of the art technologies within the industry is relatively low. According to the Malaysian Woodworking Machinery Suppliers Association (WMSA), the market for such technologies in Malaysia shrank to less than US\$10 million over the last few years and coupled with the fact that the country has to import most of the machineries from either Italy, Germany, Taiwan or China, the domestic tools and die industry has remained very much in its infancy stage (Ratnasingam 2005).

Without a strong domestic tool and die industry, opportunities for process innovation and adoption of new technologies is severely hampered. Generally, innovations in the furniture industry is achieved through design attributes, process technologies or material diversification. In this context, it is no surprise that without the necessary technology in place, the Malaysian furniture industry offers innovation predominantly in the form of new or alternative raw materials, without much modification in design or process attributes (Ng and Thiruchelvam 2011b; Ratnasingam and Bennet 2012; McKinnoth *et al.* 2013)

The lack of skilled technicians to optimally operate these state of the art technologies has resulted in many of these machines being used exclusively in mass production environments, rather than for product diversification (Ng and Thiruchelvam 2011a). In a study by Ratnasingam 2009b it was noted that almost 83% of the furniture manufacturers in the Klang and Muar furniture clusters,

who had some form of automation and computer numerical control (CNC) machinery did not fully understand the capabilities of the technology. Inevitably, the technology served specific purposes along the manufacturing line, but its capability was not fully exploited to ensure the highest possible returns on the investment. Inevitably, it also explains the prevalence of a relatively large workforce content in the Malaysian furniture industry, despite the numerous calls for more automation and high technology adoption in the industry.

Without the necessary impetus towards automation and high-technology adoption, the Malaysian furniture industry will continue to remain a relatively low technology sector, with a relatively large workforce (Ratnasingam 2015).

## **Extent of Innovation And Creativity**

As stated earlier, the extent of innovation within the Malaysian furniture industry is limited, and the most common sources of innovation and design ideas are buyers and suppliers (Ng and Thiruchelvam 2011a). Inevitably, the furniture industry is more likely to copy, research and modify (CRM) existing designs and products rather than invest in long-term research and development activities. Due to issues surrounding intellectual property protection (IPP), furniture manufacturers in the country are reluctant to embark on design development and other creative activities, unless some form of financial assistance is extended to cover the costs involved. In a recent study on the engagement of professional design services among furniture manufacturers in Peninsular Malaysia, only 19% of the respondents, from a total sampling population of 600 manufacturers, indicated that they had used such services at some time or other. Further, only 4% of the respondents indicated that



they had permanent design personnel within their manufacturing enterprises and are constantly engaged in some form of product development (Tamyez *et al.* 2012).

The training programmes for furniture designers is also limited within the country as existing design programmes are often based on a general industrial product design curriculum, with minimal focus on furniture design. This situation is further aggravated by the fact that studies on design history and art and craft movements in the country are very much at an infancy stage, and no clear design identity has emerged to reflect a typical Malaysian furniture design that depicts local themes, motives and design philosophy. In essence, the so-called Malaysian furniture designs shown at furniture fairs often comprise design perspectives from a variety of sources that cannot be claimed to be truly Malaysian in nature (Ratnasingam 2003a).

Recognizing the lack of innovation and creativity within the furniture industry, the government has provided support to many public institutes to undertake research and development (R&D) activities as well as to facilitate up-scaling and commercialization of such research outputs. It has been reported that almost RM 50 million has been provided as financial support to boost design capabilities within the furniture industry through various programmes, such as internships for young designers, engagement of professional designers from abroad, provision of design mentorship schemes for manufacturers as well as participation in internationally acclaimed design shows in important design centres around the world (Ng and Thiruchelvam 2011b).

Unfortunately, most of the research and development (R&D) activities undertaken thus far have not yielded the desired results, as the outputs were often considered irrelevant by the furniture industry. The closure of the Malaysian Furniture Design Centre

(MFDC) and the Malaysian Furniture Promotion Council (MFPC) are testaments to the fact that the efforts by these agencies were not highly regarded and did not receive continuous support from the furniture industry. Perhaps these agencies also had misaligned agendas that did not fulfil the overall needs of the industry. The many uncoordinated research and development activities of the various agencies entrusted to boost the innovative and creative capacity of the industry have often resulted in “reinventing the wheel”, with minimal impact on the industry (Ratnasingam *et al.* 2013c).

The limited networking between industry and academia also stifles innovation activities as the research outputs have limited commercial potential. Despite the provision of large research grants and the availability of extensive research facilities, the lack of networks and quality human capital have been cited as the main deterrents to the development of innovative new products. In essence, without a concerted and coordinated policy framework, boosting the innovative capacity of the wood-based industry may remain a long-term work-in-progress (Ratnasingam *et al.* 2013c).

In a study by Ratnasingam (2013c), it was found that less than 5% of the innovation and creative ideas within the industry were sourced directly from research activities, undertaken both in house or by dedicated research institutes. Therefore, as stated previously, there is an urgent need to rethink the innovation and creative platforms presently available, to ensure greater industry relevance.

## **Human Capital Development**

In an extensive report by Ratnasingam *et al.* (2010e) it was shown that the human capital development agenda for the woodworking industry in Malaysia is focused primarily on producing upper middle-managers, when in reality the need is for more highly skilled workers at the lower middle managerial levels. The prevailing highly

theoretical-oriented programs offered at the institutes of higher learning and the hands-on vocational operational level programs do not necessarily fulfill the needs of the industry. Ratnasingam (2015) underlined the glaring weaknesses in the human capital development for the wood-based industry as being plagued not only by low interest among the younger generation and fresh school-leavers, but also the lack of opportunities provided within the industry due to the ownership structures, cultural differences and the higher importance accorded to work experience.

Previous studies have shown that there is a declining number of students enrolling for Wood Science and Technology (WS&T) related studies in many institutions of higher learning throughout the country (Ratnasingam 2000b; Ratnasingam *et al.* 2013b). Apart from them being put off by the 3D syndrome (dirty, dangerous and demeaning) associated with the woodworking industry young school leavers are increasingly less attracted to seek employment within this industry compared to other cleaner working environments offered in other manufacturing sectors (Ratnasingam *et al.* 2013c). In a survey of 1000 furniture manufacturers in the country, only 23% of the respondents were aware of the availability of professionally qualified personnel in this field, while only 7% had engaged at least one such formally trained personnel within their manufacturing enterprise (Ratnasingam *et al.* 2013b). The skills mismatch, lack of industrial exposure, cultural differences and most importantly, a poor understanding of the industry, have all been reported as possible deterrents for employment of these professional personnel.

Further, the interest shown by young school leavers to participate in the Human Resource Development Fund (HRDF) apprenticeship and training schemes in this field has been lukewarm. Despite higher enrollment numbers compared to that in professional programs, the sustained employment of such trainees is not encouraging, as

shown by tracer studies of previous trainees (Ratnasingam *et al.* 2013b). The prevailing low wages, unclear career path and the slow accession towards higher positions in the company, have all been cited as reasons that frustrate these trained workers forcing them to move out of the woodworking industry into other manufacturing sectors.

The proposition of taking up a career in the furniture industry must be revisited and realigned to be more attractive to the younger generation if the human capital issues of the industry are to be managed.

## CONCLUSIONS

The Malaysian furniture industry has come a long way since its humble beginnings in the 1980s. Through a series of Industrial Master Plans (IMPs), the government's efforts to transform the furniture industry from a cottage-based sector into a multi-million dollar mass production industry has indeed been an overwhelming success. The relentless efforts of the government, prevailing comparative advantages of input factors coupled with a growing demand from the global market, continued to spur the upward growth of the furniture industry over the years.

However, with the increasing competition in the global marketplace fuelled by the emergence of other low-cost manufacturers, especially China and Vietnam, the competitiveness of the Malaysian furniture industry is becoming increasingly questionable. In-depth research on the performance of the furniture industry over the last two decades has shown that the industry growth has been driven primarily by incremental capital inputs, rather than by actual productivity gains. The stagnating innovation and value-addition within the industry implies that the Malaysian furniture industry is still largely a contract furniture manufacturing

hub, which draws its competitiveness from large volume production. Without concerted efforts to shift from the original equipment manufacturing (OEM) strategy towards strategies focused on design and brand, the Malaysian furniture industry will continue to remain a low-wage sector, with reducing profitability. In order to make the shift towards higher value-added, fashion-oriented furniture, several issues with regards to the factor inputs, policy directions, technology inputs and human capital development must be addressed, as research has revealed. A paradigm shift among the various stakeholders is necessary to ensure sustainable and equitable growth of the furniture industry in the future.

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## **BIOGRAPHY**

Jegatheswaran Ratnasingam obtained his B.Sc. (Forestry) in 1988 and M.Sc. (Wood Industries Technology) in 1989, from Universiti Pertanian Malaysia. Soon after, he joined the furniture manufacturing industry as a young executive. He was quickly recognized for his sound technical and management skills, which enabled him to move up the management hierarchy, occupying various technical and management positions in international furniture companies, including HONG KONG TEAKWOOD (Malaysia), KING-FURNITURE (Indonesia), DRAGON FURNITURE (Vietnam) and IKEA ASIA (Hong Kong). During his industrial tenure, he gained further qualifications in Operations Research and Accounting & Finance. He obtained his Ph.D. in Furniture Engineering from Brunel University, United Kingdom in 1998. His professional academic career began when he was appointed as a lecturer at the Faculty of Forestry in Universiti Putra Malaysia in 1998, where he now teaches several undergraduate core subjects in Wood Science and Technology, namely, Furniture Manufacturing Processes, Wood Machining Processes, Quality Management in the Wood Industry and International Forestry Issues. He also teaches postgraduate courses, such as Furniture Design and Manufacturing and Advanced Wood Processing. To date, he has supervised 56 undergraduate students in their final year projects as well as 16 M.Sc. students and 7 Ph.D. students until completion. He has also been appointed as internal/external examiner for postgraduate students from Universiti Putra Malaysia (UPM) and other universities.

Jegatheswaran is an ardent teacher/instructor and has developed many innovative teaching aids, learning kits as well as E-books over the years. His in-depth knowledge, practical expertise and resourcefulness in the field of Furniture Manufacturing and Management (FMM), has earned him the reputation as a leading



instructor in the furniture industry, not only in Malaysia, but also throughout the Asian region. His reputation as a leading woodworking industrial expert-trainer in the region is attested to by his inclusion in the recommended list of experts in woodworking technology by the FAO, UNIDO, ADB and ITTO, which are agencies under the United Nations, since 2010. To date, he has conducted 53 international technical and management training programs in 17 Asia-Pacific countries.

Jegatheswaran is recognized as the first Ph.D. holder in the field of Furniture Engineering in Malaysia (1998). With his in-depth knowledge of the industry, his critical thinking and unequivocal opinions about the industry have resonated well both with policy makers and industrialists. In view of his knowledge and expertise, he was appointed to the Malaysian Forestry Research and Development Board (MFRDB) from 2013- 2015, by the Hon. Minister of Natural Resources and Environment of Malaysia. His in-depth knowledge and industrial expertise gained international recognition when he was appointed a member of the Sustainable Forest Industries International Advisory Committee at the Food and Agriculture Organization (FAO) of the United Nations in Rome, Italy for the period 2013 – 2016. Recently, he was appointed to the Board of the Forest Products Society (FPS) in Madison, Wisconsin in the United States, which is the oldest forest products research society in the world.

His research capabilities in the field of Furniture Manufacturing and Management (FMM) is well acknowledged nationally and internationally. As a recipient of many local and international competitive research grants, with a total value of RM 2.1 million, he has 580 publications to his credit. He is the author of 64 ISI journal articles and 46 citation-indexed journal articles. He has authored 25 academic books in the fields of Furniture Manufacturing Technology

and Wood Machining Processes, 8 global market study reports and 4 technical training manuals. He has also published 240 articles on various issues in trade journals, such as ASIAN TIMBER and FDM ASIA. He has presented 60 refereed conference papers and 80 other publications, including seminar papers and mass-media articles. He is also regularly invited as key-note speaker at international furniture conferences throughout the world. Due to his extensive contributions to the field of Furniture Technology, he was appointed as Advisor to the ASIAN TIMBER trade journal, Associate Editor for Holztechnologie (Scopus and ISI-Thompson) and is also a constant reviewer for other reputed journals, such as Bioresources, Wood Material Science & Engineering, European Journal of Wood and Wood Products and the International Forestry Review. At Universiti Putra Malaysia, he regularly reviews articles submitted to the Pertanika Journal of Science and Technology (Scopus).

Jegatheswaran is an academician of international repute. He lectures regularly at the National School of Furniture, Buckinghamshire University (UK), Brunel University (UK), University of Applied Sciences, Rosenheim (Germany), Nanyang Technological University (Singapore) and the Ecole Superior du Bois (France). His passionate and dedicated contributions to the field of Furniture Manufacturing and Management has earned him many accolades. He was appointed a Fellow of the Institute of Wood Science, United Kingdom (2000), Fellow of the Institute of Work Study, United Kingdom (2007) and Fellow of the Indian Academy of Wood Science (2009). In 2010, he was appointed Honorary Professor of Furniture Technology by the Buckinghamshire University, United Kingdom, which enabled him to expand his collaborative research network to include the prestigious Royal College of Arts, the Victoria and Albert (V&A) Museum of Furniture History. Subsequently, in 2015, he was awarded an Honorary

Professorship in Wood Processing Technology by FH-Rosenheim, Germany after 15 years of intensive collaboration, both in teaching and research activities. In fact, the collaboration between UPM and FH-Rosenheim, Germany, has been the most active international partnership in the Faculty of Forestry at UPM, which culminated in the signing of a Memorandum of Understanding (MOU) in 2016 to foster closer cooperation between the two organizations.

Over the years, Jegatheswaran has become a highly regarded extension-specialist in the Asian furniture industry field. He carries out regular performance appraisals of the furniture industry for the CIMB and HSBC banking groups. His analysis of the furniture industry is often quoted by many national and international organizations, including FAO, UNIDO, ITTO, ITC and ADB. To date, he has successfully completed 6 turn-key projects to design, build and commission 6 medium-sized furniture training cum manufacturing facilities in Guatemala, Liberia, Zambia, Vietnam, Ghana and South Africa, which were funded by the respective national governments with the support of the World Bank, FAO and USAID.

As an undisputed furniture expert, he has a busy schedule during furniture fairs in the ASEAN circuit. His seminars on the various aspects of the furniture industry have become an integral feature of the annual Malaysian International Furniture Fair (MIFF) since 2007. Through this network, Universiti Putra Malaysia is the only institution of higher learning in the country that is accorded space to showcase its academic programs and research outputs. This activity is indeed an excellent promotion platform for UPM to reach out to the global community as the fair attracts more than 50,000 visitors annually. Since 2010, he has been appointed as a Judge for the Furniture Design Competition held in conjunction with the annual Export Furniture Exhibition (EFE), which is acknowledged as the

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most important platform for budding young furniture designers in the country to showcase their creative skills.

Despite his many achievements and acclaimed successes in the furniture industry, Jegatheswaran continues to explore and research new perspectives of the industry, in line with his motto: *this is not the end, and it not even the beginning of the end, but it is only the end of the beginning!*



## **ACKNOWLEDGEMENTS**

I thank GOD for steering me to this stage in my academic career. His infinite divine compassion at every stage of my life has been so fulfilling. I am also grateful to all my teachers, my students at the various institutes that I have taught and my many industrial colleagues, who have constantly shaped and challenged my understanding and perspectives of the furniture industry. I also wish to place on record my sincere appreciation to the management of Universiti Putra Malaysia and the Faculty of Forestry, for the support extended to me. Special word of thanks goes to my father, the late Mr. Paramoo Ratnasingam and my mother, Mrs. Rajeswari Kandiah for their constant encouragement. I also wish to record my heartiest appreciation to my wife, Dr. Vidiya Natthondan, who despite her very taxing medical career has always been supportive of all my endeavors. Finally, my appreciation and thoughts to my little boys, Natkuncaran and Ayenkaren for creating an excellent environment of curiosity at home.



## LIST OF INAUGURAL LECTURES

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