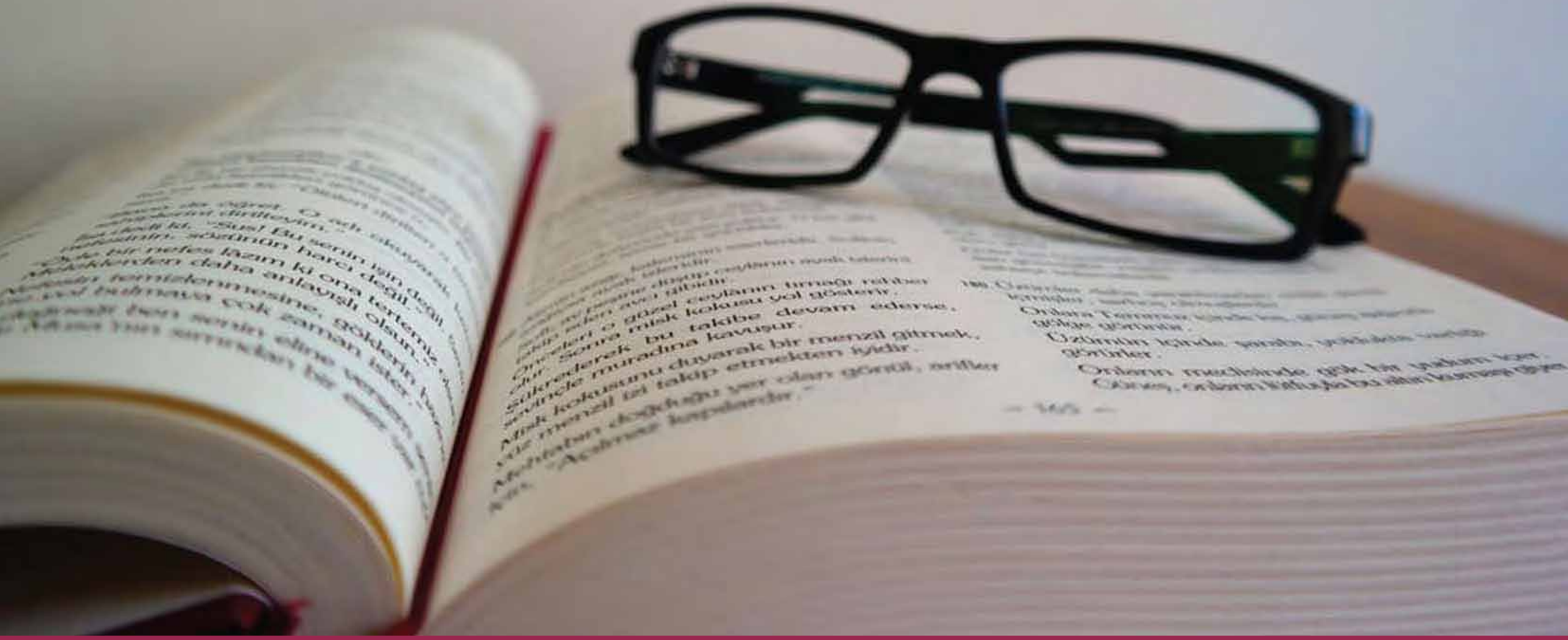
CHAPTER 13

KNOWLEDGE CONTENT OF THE EDUCATION INDUSTRY



CHAPTER 13
Knowledge Content of the Education Industry

13.0 Introduction

Education is a priority for the Malaysian Government because it needs a highly skilled and educated workforce to drive the nation towards its goal to become a developed nation by 2020. The education sector gets one of the largest allocations in the annual budget. In addition, Malaysia aspires to become a centre of excellence for education. As one of the 12 NKEAs, the government is planning major reforms across the whole education industry – from preschool education to primary and secondary school and higher education. These reforms are mapped using the Malaysia Education Blueprint. The most recent blueprint sets forth the plan for 2013 to 2025, which aims to raise education standards to a level where Malaysian universities are among the top ranked internationally. The education blueprint is designed to address concerns across the whole education system and is a step in the right direction as the nation deals with issues of English language proficiency, graduate employability and skills training.

In order to achieve its education goals, government has encouraged greater private sector participation in providing alternate pathway to primary and secondary education in Malaysia. Close to 106 international schools have been established in the country with an enrolment of close to 45,000 students, of which 55% are Malaysian students (Economic Transformation Programme [ETP], 2016).

Several international brands such as Tenby Schools, St. Joseph Institution, Marlborough College schools and Epson College have established operations in Malaysia and the demand for high quality primary and secondary education is envisioned to increase over the years. The growth is spurred by the demand for school system that provides more innovative teaching methods and a sound command of the English language, and prepares students for higher education.

Since the 1980s, the demand for higher education in Malaysia and the region has also increased in tandem with growth in income level among the middle income. The public university system was unable to cope with the demand for higher education; and this increased the outflow of students to foreign countries that provided high quality education such as UK, USA, Canada, Australia and New Zealand. To overcome the inflow of foreign exchange reserves, the Malaysian government permitted the establishment of "twinning-programmes", which enabled local colleges and institutions to provide undergraduate programs from foreign universities in Malaysia through "1+2", "2+1" and "3+0" arrangements.[5]

To raise the quality of higher education, the Private Higher Education Institution Act was enacted in 1996 to encourage reputable foreign universities to establish their campuses in Malaysia. This Act transformed the private higher education landscape from just twining programmes to fully accredited degree programmes in Malaysia. This Act and stringent quality control has established Malaysia as an education hub for the region.

The Malaysian higher education sector today consists of 20 public universities, 53 private universities, 6 international branch campuses, 403 private colleges, 30 polytechnics and 73 public community colleges providing tertiary education to 89,686 domestic students studying abroad in foreign universities and 93,000 international students (StudyMalaysia.com, 2015). Of the public universities, five universities were classified as research universities (Universiti Malaya, Universiti Kebangasaan Malaysia, Universiti Sains Malaysia, Unversiti Putra Malaysia and Universiti Teknologi Malaysia. More recently, University Petronas was classified the six research university in Malaysia.

As the quality of Malaysia's education improves and its reputation globally recognised, local students will be more willing to pursue their education at home at a lower cost compared to that incurred when studying overseas. In addition, more foreign students will consider Malaysia as an education destination, hence creating the potential for contribution to the nation's GDP.

While the university and colleges provide a wide range of courses from undergraduate degrees to doctoral training, the Malaysian government also recognised the need for manpower with technical and vocational skills. Oversight for the skills development programs is provided by the Ministry of Human Resources (MoHR), which is governed under the National Skills Development Act 2006. The skills development programs are conducted by ministries, government agencies in partnership with industry.

The education sector at the school level is regulated by the Malaysian Education Ministry (MOE) and the tertiary education by the Ministry of Higher Education (MOHE). The MOHE's vision is to make Malaysia a centre of education excellence by 2020. Among the key regulations that were important in shaping the national education ecosystem include the following:

- The Education Act 1996 (Act 550)
- The Private Higher Educational Institutional Act 1996 (amended 2009)
- The National Council of Higher Education Act, 1996
- The Malaysian Qualification Agency Act 2007 (replaced the National Accreditation Board Act 1997, which was repealed)

[5]The "1+2" degree programmes will enable students to enroll in local institution for one year of study and subsequent 2 years of study in the partner universities. Students enrolled in "2+1" and "3+0" degree programmes would complete 2 years and 3 years of study in the local institutions.

- The Universities and University Colleges (Amendment) Act 1996 (amended in 2009)

- The National Higher Education Fund Corporation Act, 1997 (amended in 2000)

13.1 Key Developments and Initiatives

Malaysia is progressing well towards building a sound reputation for its education industry. Although Malaysia has only recently entered the international education market, it has quickly progressed to become the world's 11th most preferred place to study (ETP, 2014). Malaysia has become an attractive destination for international students because of its quality higher education and relatively low cost in terms of fees and cost of living. Malaysia is also a favourable destination for Muslim students because of its hospitable Muslim environment and access to halal food. Hence, Malaysia has its sights on Middle East and other Islamic countries to market itself as an education destination.

Education Malaysia Global Services (EMGS) was established in 2014 to provide a one-stop centre for foreign students applying to study in Malaysia. EMGS plays a key role in reaching quality foreign students and ensuring a smooth transition into the Malaysian lifestyle. Malaysian Qualifications Agency (MQA) oversees the quality assurance practices and accreditation of higher education.

The ministry's concerted and well-planned approach used to achieve its targets has paid off, having met the targets of priority areas across the education system (ETP 2014). This section notes some key developments in higher education since the HE industry is specifically relevant to the development of human capital and to the development of Malaysia as an education hub for the region.

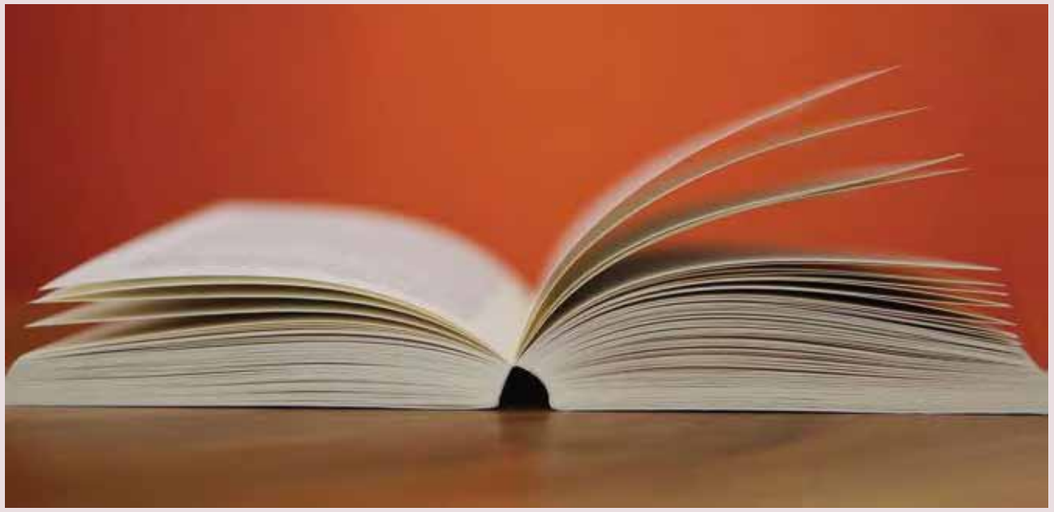
- **Education Blueprint (2015-2025):** The Blueprint clearly lays out the government's plan to lift the whole education industry (from primary to higher education) to become globally recognised as a provider of quality education.

- **Islamic Finance and Business Education Centre:** Malaysia is well placed to achieve its goal to be an international centre of excellence for Islamic finance and is globally recognised as a forerunner in the development of Islamic Finance education. The establishment of the International Council for Islamic Finance Education (CIFE) in 2014 with the support of Bank Negara Malaysia (2011), MoE and local higher institutions gives global recognition to the importance of Islamic finance and business education to Malaysia.

- **Technical and Vocational Education Training (TVET):** the current preference for more academic education programmes has led to a shortage of technical skills in Malaysia. Education NKEA recognises the importance of technical and vocational training to ensure there is sufficient technical and vocational skills to meet the demand for a skilled labour force as Malaysian industries move up the knowledge economy. In the Education Blueprint greater emphasis is given to developing skills of the younger generation to TVET and other technical education that will enable the development of the technological base of the country. Malaysia also hopes to encourage collaboration between the private industry and education institutions in research and skills training particularly in its technical vocational education and training (TVET) programmes. TVET is crucial to Malaysia because of the shortage of technical and vocational skills. At the same time as meeting the need for human capital, the TVET programmes have also attracted international students with 2700 enrolled in these programmes.

- **Educity at Iskandar:** as part of its target to recruit 200,000 international students by 2020, Malaysia has invested in developing an edu-city in Iskandar, Johor which has attracted foreign universities to establish campuses there (University of Southampton, Newcastle University, Netherlands Maritime Institute of Technology).

- **Quality Standards and Ratings:** The recent implementations of SETARA and MyRA have raised the education and research quality standards respectively. These quality rankings have provided the impetus for Institutions of Higher Learning to improve its standards in both education and research output.

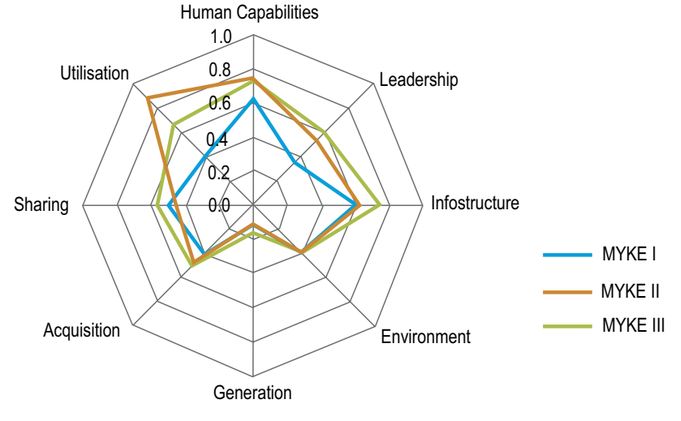


13.2 Knowledge Content

The mapping of the knowledge ecosystem for the education industry was based on the following samples for the MYKE-2 and MYKE-3 studies, respectively: 73 and 58 as shown in **Table 1.1**. The number of SMEs and large players for the three sample periods were as follows: (SME, Large) are (48, 37); and, (25, 21), respectively.

The knowledge resource foundations provide guidance as to the level and trajectory of development of the education industry. **Figure 13.1** shows changes that have taken place over the period 2003 to 2014, at the three points of time defined by MYKE I, II and III assessment. One observes small but positive progress along most of the dimensions for the two categories of Knowledge Enablers and Knowledge Actions, except for knowledge utilisation, which shows a fall during the MYKE II and MYKE III period. Detailed discussion of the elements in each of the two categories of Knowledge Enablers and Knowledge Actions is presented next.

Figure 13.1: Overview of Knowledge Enablers and Knowledge Actions for MYKE I, II and III Education Services



13.3 Knowledge Enablers

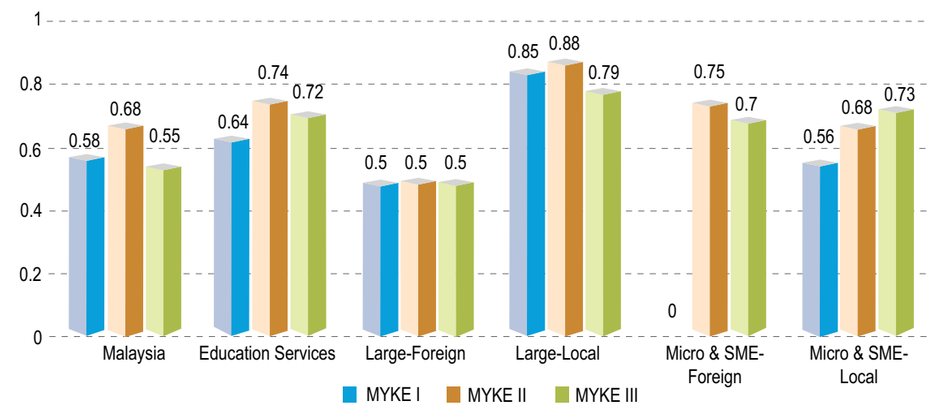
13.3.1 Human Capabilities

The 11th Malaysia Plan's main theme "Anchoring Growth on People" and the inclusion of human capital development as a strategic thrust highlight the importance of human capital in the education industry. Thus, given the emphasis on human capital, it is not surprising that human capability in the education industry is better than the national aggregate over the period of 2003 to 2014. The sharp increase in human capability in the education industry between MYKE I and MYKE II, at with an index of 0.64 and 0.74 respectively, suggests the effectiveness of the government's plan to improve the knowledge content in the education industry. However, a very slight decline is registered in MYKE III period with an index of 0.72.

Further analysis reveals some interesting characteristics. Both large and small local education institutions are much better in attracting talent with degrees and spend more on training their employees than the large foreign institutions, which remained consistently low across all three MYKE periods at 0.5. This feature may be because over the period of 2003 to 2014, the number of large foreign institutions has not changed significantly and at the same time, the development of the public education industry became a national priority. Total number of academics employed in public universities increased from 26,700 in 2010 to 33,140 in 2013, and the total number of academics with PhDs increased by 31.6% from 2010 to 2013 (11th Malaysia Plan, p11 chap 5). In addition, the largest proportion of the government's budget (16%) is devoted to education, which increased from RM36 billion in 2012 to RM56 billion in 2015.

Only the local SMEs show a upward trend (0.56 to 0.68 to 0.73) over the three MYKE periods in human capability, suggesting that these institutions, supported by the government, are upskilling their employees and recruiting mostly degree holders as educators to meet the MoE and MQA standards as Malaysia ranks its institutions of higher learning (SETARA). This trend may also be a reflection of the government's aim to improve the quality of Technical, Vocational Education and Training (TVET).

Figure 13.2 Human Capability of the Education Industry



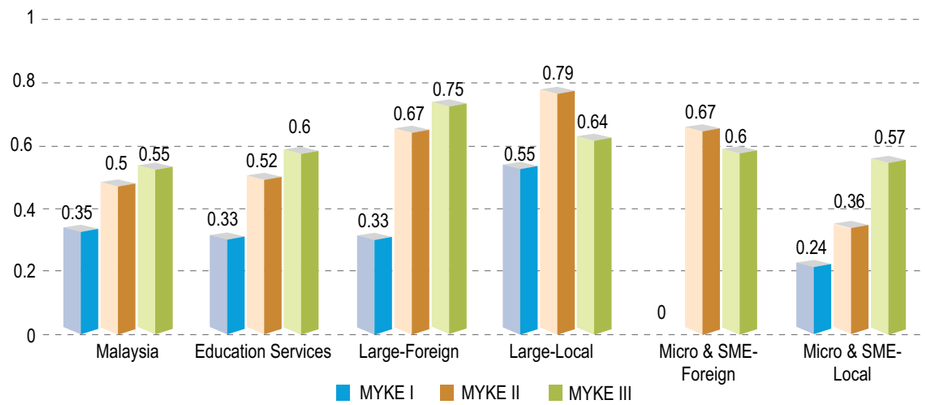
13.3.2 Knowledge Systems and Leadership

Figure 13.3 shows that knowledge leadership within the education industry is trending upwards over the three MYKE periods with an index of 0.33, 0.52 and 0.6 respectively. Unfortunately, this small but consistent improvement is only evident for large foreign institutions (0.33 to 0.67 to 0.75) and small local institutions (0.24 to 0.36 to 0.57). This continuous improvement in knowledge systems is in response to the government's aim to raise the standard of education and necessary to facilitate the liberalisation of the Malaysian education industry.

Although the large local institutions were way ahead of the rest in 2003 and 2007 with an index of 0.55 and 0.79 respectively, it declined to 0.64 (below large foreign institutions) in 2014.

Looking at the latest index, while the differences between all the institutions is not huge, large foreign institutions (with the highest index of 0.75) are evidently the largest advocate for formal knowledge management systems. Such capabilities are vital in order for them to remain competitive in the Malaysian education space, which is increasingly saturated with private, foreign institutions.

Figure 13.3: Knowledge Leadership in the Education Industry



13.3.3 Technology and Infostructure

Technology and infostructure of Malaysian education institutions is above the national aggregate and while there was no improvement between 2003 and 2007 at 0.62, it increased to 0.74 in 2014. Large foreign firms appear to be better endowed with computers for its employees than all the others, however it is interesting to observe that the index declined from a nearly perfect score of 0.98 in 2003 to 0.73 in 2007, increasing to a more realistic index of 0.81 in 2014. The small foreign firms did not improve its infostructure between the MYKE II and MYKE III (0.75 and 0.72 respectively). In contrast, both the large and small local education institutions have shown consistent improvement in their infostructure status.

13.3.4 Knowledge Environment

At the aggregate level, the education industry was slightly below the national aggregate in 2003 and 2007, but managed to climb up to the same level as the national aggregate in 2014. However, an index of 0.37 shows that the education industry is not making huge strides in its effort to engage with industry or government. In fact, all companies, except the small local education institutions registered an increase in its engagement with industry or government from 0.27 to 0.37 between MYKE II and MYKE III. Foreign firms too have improved from 0 (zero) in MYKE II to 0.33 in MYKE III. While the government is taking steps to improve collaboration between industry and universities by establishing research grants for industry-university research (e.g. CREST grant), attention is still required.

Figure 13.4: Technology and Infostructure of the Education Industry

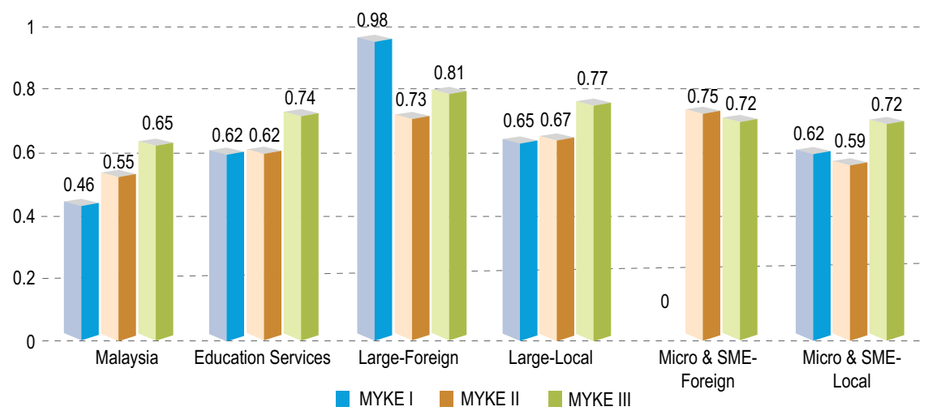
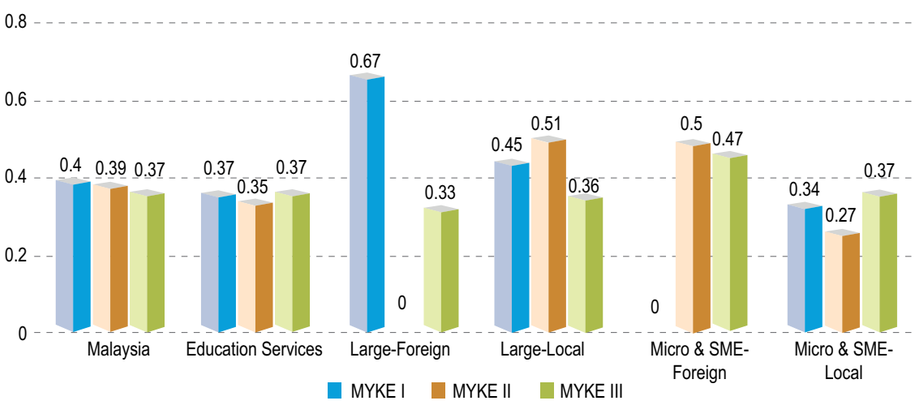


Figure 13.5: General Environment Awareness of the Education Industry



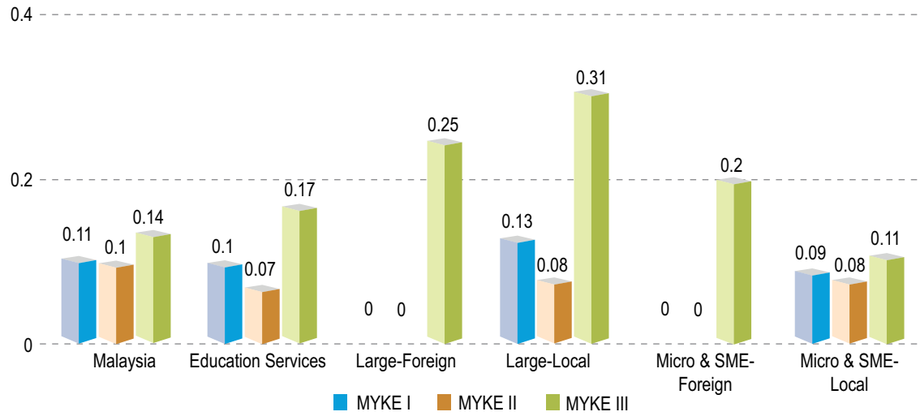
13.4 Knowledge Actions

13.4.1 Knowledge Generation

Knowledge generation in the education industry was below the national aggregate for both periods of MYKE I and MYKE II, and only an improvement in 2014 brought the education industry (0.17) to just slightly above the national aggregate of 0.14. This is of concern since the education industry should be at the forefront of research and development. The government's initiatives to encourage R&D through MOSTI and MOE grants have made slight improvements in R&D, number of patents and copyrights filed between MYKE II and MYKE III assessment periods.

Until recently, most education institutions focused on teaching, evidencing the leap in knowledge generation between MYKE II and MYKE III of large local (0.08 to 0.31). Both large and small, foreign education institutions (0 to 0.25 and 0 to 0.2 respectively) show the shift in focus from teaching to a more balanced portfolio of research and research-led teaching. Only the smaller local institutions show less improvement in knowledge generation (0.08 to 0.11) over the MYKE II and MYKE III periods. The introduction of MyRA (Malaysia Research Assessment) in 2011 has encouraged universities to invest in research and development. This, together with the other government initiatives, should see this upward trend continue, especially for the larger institutions.

Figure 13.6: Knowledge Generation Activity in Education Industry

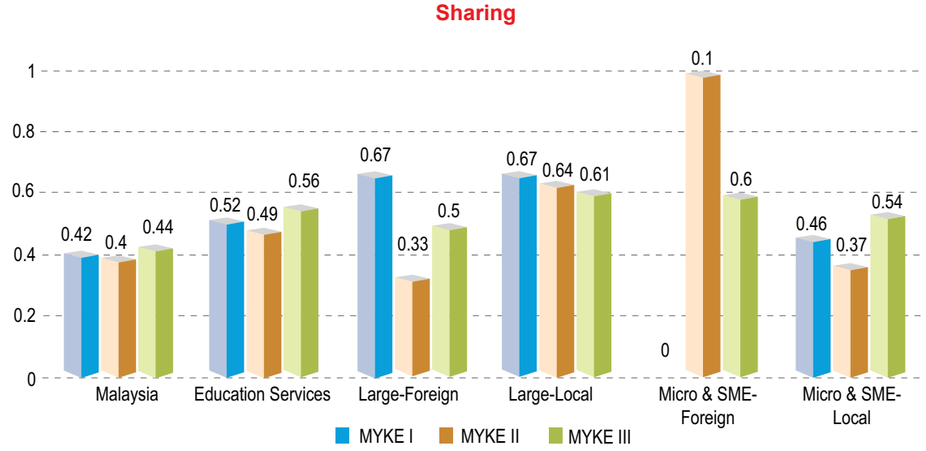


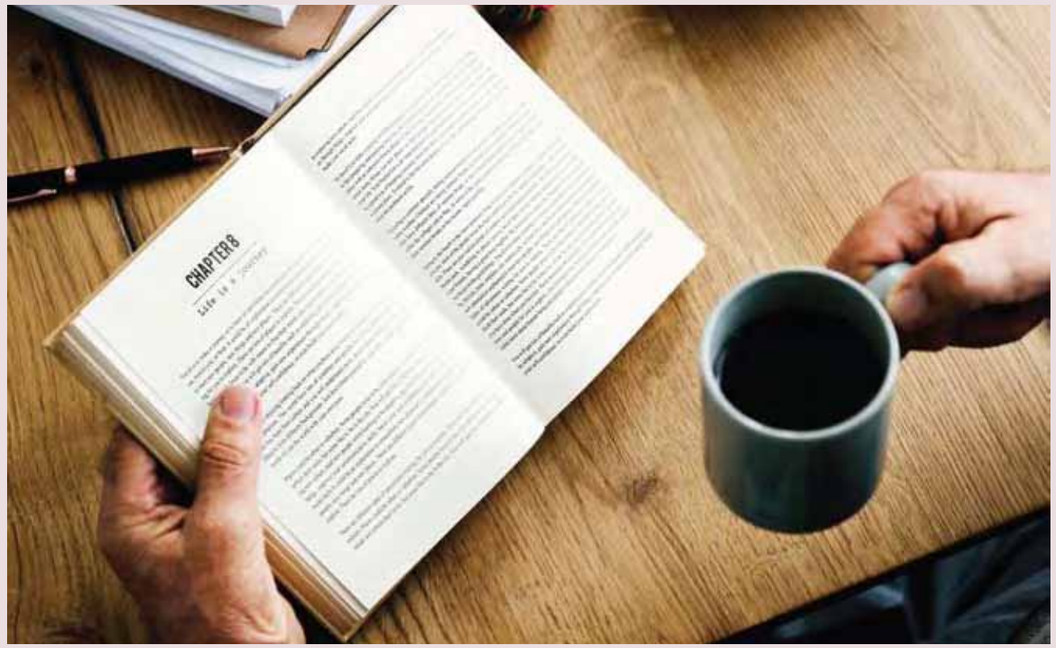
13.4.2 Knowledge Sharing

Overall, knowledge sharing in the education industry is slightly higher than the national aggregate, and follows a similar trend with a dip in knowledge sharing in 2007. However, the amount of knowledge sharing differs between the types of institutions. Large local institutions are more consistent in their knowledge sharing from 2003 to 2014 and had the highest knowledge sharing index (0.61) in 2014. The large foreign institutions are least likely to engage in knowledge sharing activities. It is interesting to note that small foreign institutions plunged from a perfect index of 1 in 2007 to 0.6 in 2014. This is still high in comparison to other institutions, and the perceived 'decline' may just be due to the unusually high index from the previous period.

Of all industries, the education industry should be keenest to share knowledge with other institutions and organisations, and allow public access to its research output. However, the lack of trust and the increasing competitiveness in the education industry in terms of research and education quality rankings may have created an unwillingness to share knowledge.

Figure 13.7: Knowledge Sharing Activity of the Education Industry



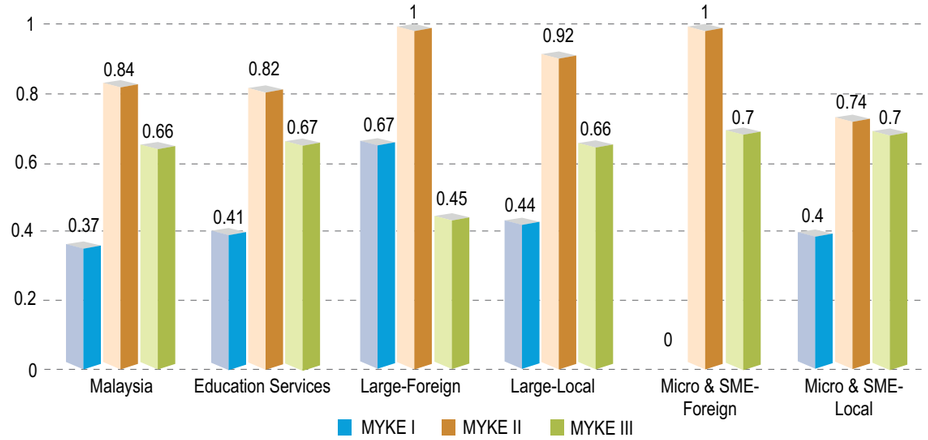


13.4.3 Knowledge Utilisation

Knowledge utilisation in the education industry followed a similar trend to the Malaysian aggregate – starting from a low base in 2003, all firms in the education industry made a strong leap in 2007 in utilising its knowledge, but experienced a decline in 2014, with the large local and foreign firms experiencing a larger decline than the smaller local and foreign firms. It is the SMEs, both local and foreign, which have managed to keep up with knowledge utilisation, albeit at a lower level than during the previous MYKE period.

A likely explanation could be that smaller institutions have more flexibility and face fewer institutional barriers to using experiential knowledge than their larger counterparts which are usually encumbered by institutional policies and rules which act as barriers to knowledge utilisation.

Figure 13.8: Knowledge Utilisation Activity of the Education Industry



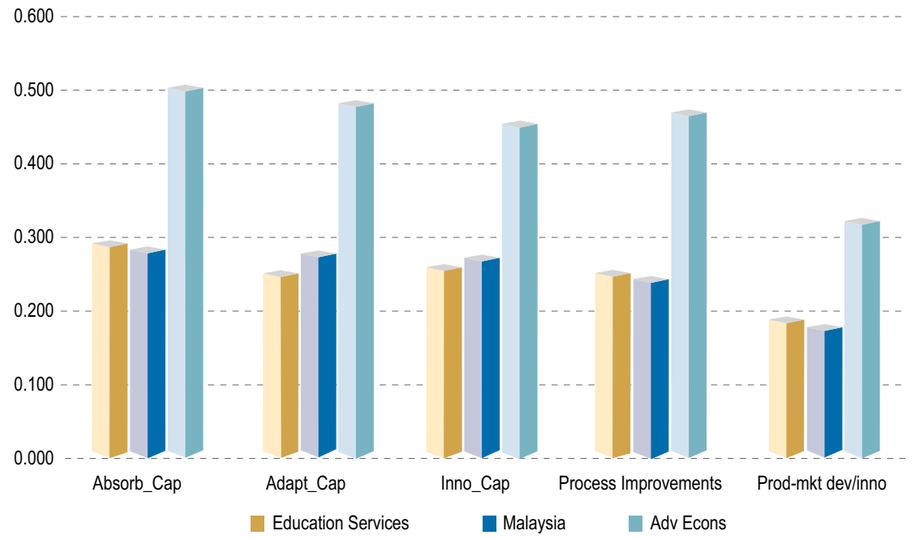
13.5 Dynamic Capabilities Profile for Education Industry

Dynamic capabilities represent the firms' arsenal in the face of competition. These are skills, processes and structures that enable firms to adapt and manoeuvre its organisational course to meet the changing needs of customers and ward off competition, and to gain positions of power within the business ecosystem. The three components which constitute dynamic capabilities include absorptive capability, adaptive capability and innovative capability.

The education industry's dynamic capabilities profile provides insights into the current state of our education industry and its potential to significantly contribute to the Malaysian knowledge economy. **Figure 13.9** reveals an interesting feature - the industry's absorptive capability is the only component which is higher than the Malaysia industry aggregate. It appears that its solid performance in building its absorptive capabilities and moderate performance in building its adaptive and innovative capabilities have produced higher than the national aggregate outcomes for its process improvement and new product-market innovation.

Next, we examine each of the components of dynamic capabilities for the education industry to understand how the elements within each component affect the industry's dynamic capabilities profile.

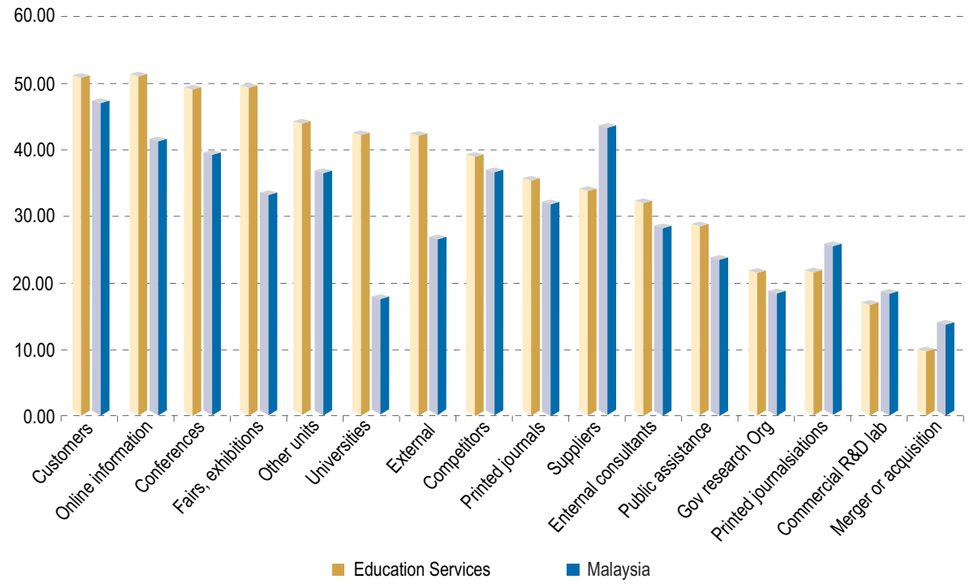
Figure 13.9: Dynamic Capabilities Profile of the Education Industry



13.5.1 Absorptive Capability

A closer look at the absorptive capability profile in **Figure 13.9** provides further insights. The education industry is positively endowed with the ability to scan the environment for information, and learn and transfer new knowledge. Knowledge is gained from numerous sources and is performed at a higher level than the national aggregate for a majority of the sources (**Figure 13.10**). Understandably, the education industry relies less on suppliers, commercial R&D labs and mergers and acquisitions, but more on customers, online information, conferences, fairs and exhibitions, other units, universities, printed journals and government research organisations. The education industry is doing what it does best – using a wide range of sources, both private and public, international and local, to learn and transfer knowledge.

Figure 13.10 Sources of Knowledge in the Education Industry



13.5.2 Adaptive Capability

Adaptive capability provides firms with the ability to align their people, resources and structures to effectively use external knowledge to create new knowledge which is useful for the firm. Thus a high level of adaptive capability is necessary if firms are to push through the frontiers of a knowledge economy. **Figure 13.9** shows that the education industry is slightly below the national aggregate, but is still performing moderately well, suggesting that it is still able to respond to changes in the educational space.

The skills profile of the education industry depicted in **Figure 13.11** suggests that the industry has significant human capability to meet the challenges of a fast changing environment, in particular in the area of science and technology. Business administration represents the largest group in the industry, followed by computer science, social sciences, E&E engineering, natural science, biotechnology, medical sciences, and agricultural science. All these are higher than the national aggregate. General engineering falls below the national aggregate, which may be due to the nation's focus on E&E engineering instead of general engineering.

The skills profile is reflective of Malaysia's national priorities in science and technology, that is, computer science, biotechnology and electrical and electronic engineering. There is a dominance of skills in computer science and software development which is aligned with the government's initiative to develop the Information Communications Technology (ICT) industry. The skills profile suggests that the education industry is on the right trajectory toward building its human capability to meet the needs of the Malaysian knowledge economy based on national priorities.

Institutional environment plays an important role in building capabilities. **Figure 13.12** shows the extent to which the education industry utilises the various institutions in building its capabilities. The industry is involved at a higher level than the national aggregate in all activities except for standards, technical requirements, and import or export regulations - which is not surprising, given the nature of the industry. Thus the industry is much attuned to seeking advice from the full range of services available in Malaysia.

Figure 13.11: Skills Profile of the Education Industry

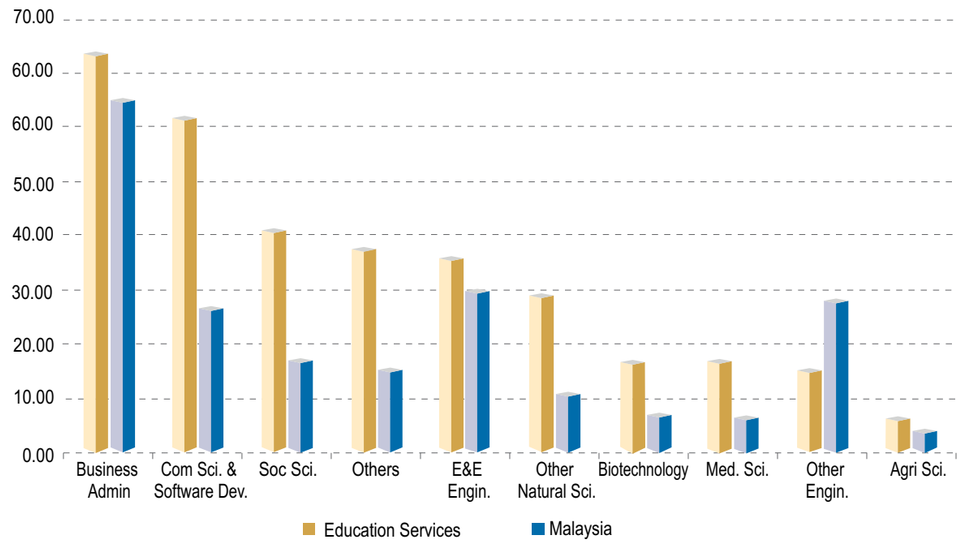
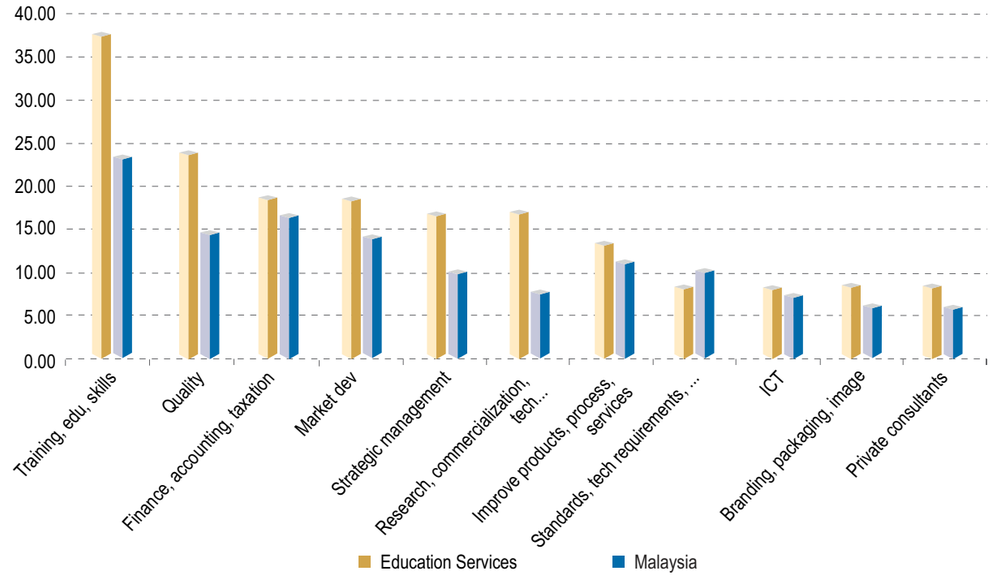


Figure 13.12: Role of Institutional Environment in Skills Building of the Education Industry



Not surprisingly, the education industry spends most of its resources in building human capability through training, education and skills upgrading. This is very positive given the importance of highly educated and well-trained educators in the development of future talent for the nation's knowledge economy. The next priority is seeking assistance in quality management – suggesting the industry is taking the government's prodding to improve both education and research rankings to meet international standards. It is heartening to note that the industry continues to seek advice on research commercialisation, which suggests that universities are beginning to include the commercialisation of its research as one of its priorities.

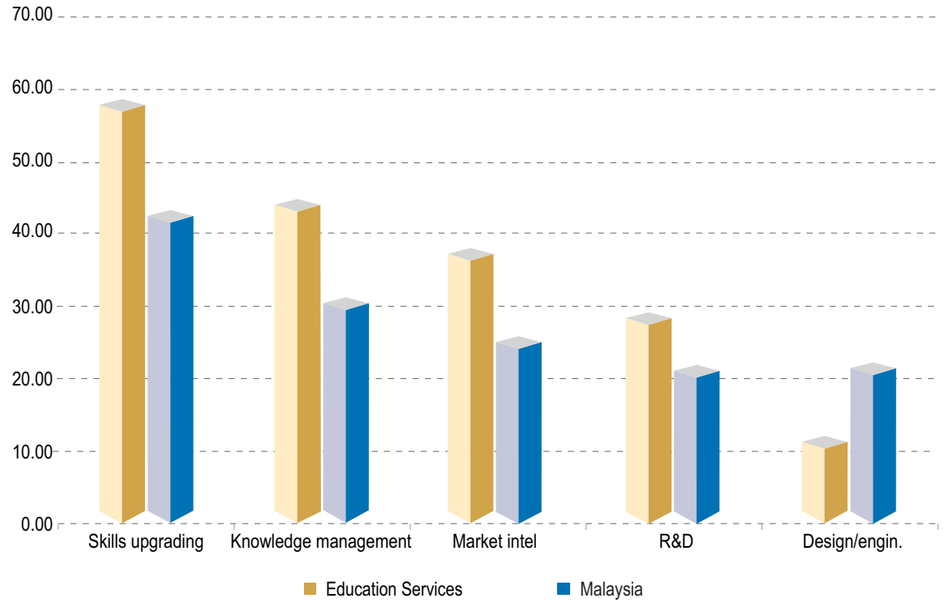
13.5.3 Innovative Capability

New product development and innovation requires more than market knowledge and resources – processes and systems are needed as well as, in addition to having the capability to integrate acquired knowledge with the firm's resources. Firms with a high level of innovative capability are better equipped to assimilate external knowledge with firm's resources to allow them to develop new products and innovations. Similar to its performance in building adaptive capability, the education industry is slightly below the national aggregate, but is still performing moderately well and is still able to adequately respond to changes in the education space.

The education industry is engaged at a higher level than the national aggregate in all the knowledge intensive activities (skills upgrading, knowledge management, market intelligence, R&D) except for design engineering. This level of engagement suggests that the education industry is on the right trajectory towards building its innovative capability. It is not surprising that the industry is heavily focused on upgrading skills which is essential since the industry is a conduit for Malaysia's human capital. Similarly, its emphasis on knowledge management, market

intelligence and R&D all point towards a push for innovation to meet the demands of a vibrant industry which is drawing international competition as the government opens the nation's doors to high ranked international universities to set up its campuses in Malaysia.

Figure 13.13: Knowledge Intensive Activities in the Education Industry



13.6 Outcomes of Dynamic Capabilities in the Education Industry

95% of the education industry's revenue originates from within Malaysia (77% within state and 18% national), with hardly any regional or international presence (**Figure 13.14**). As part of its education blueprint, the government is encouraging highly ranked international universities to establish themselves locally – results reveal most, if not all the revenue of foreign education institutions, both large (97.5%) and small (100%), are obtained domestically. It is the local firms (large and small) which have gained some, albeit minute, revenue from export sales.

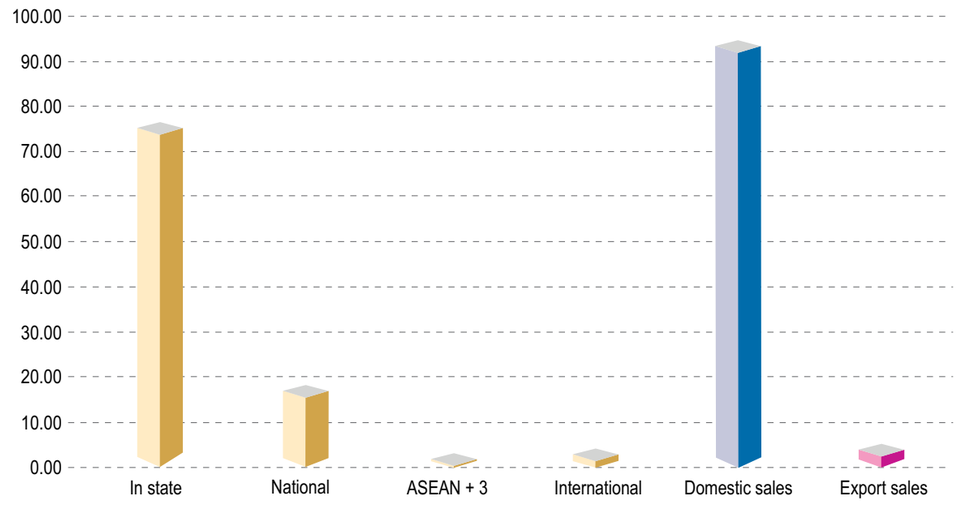
The predominantly local presence of the education industry is not surprising since Malaysia is a relatively recent player in education and is still developing its competencies in this industry. The current focus of the government is on building the industry's dynamic capabilities to enable it to provide a high quality education to build human capital for the nation.

The industry's strong store of absorptive capabilities and moderate endowment of adaptive capabilities and innovative capabilities have produced some positive outcomes. There are innovative improvements to management methods and marketing strategies. These process outcomes are imperative for the education industry as it prepares itself for more competition from foreign institutions, and as Malaysia opens its doors to international students.

Not surprisingly, its lack of focus on technological innovation – whether it is in the form of acquiring technology externally or leveraging its technological capability – resulted in its poor performance in the development of technologically new or improved processes.

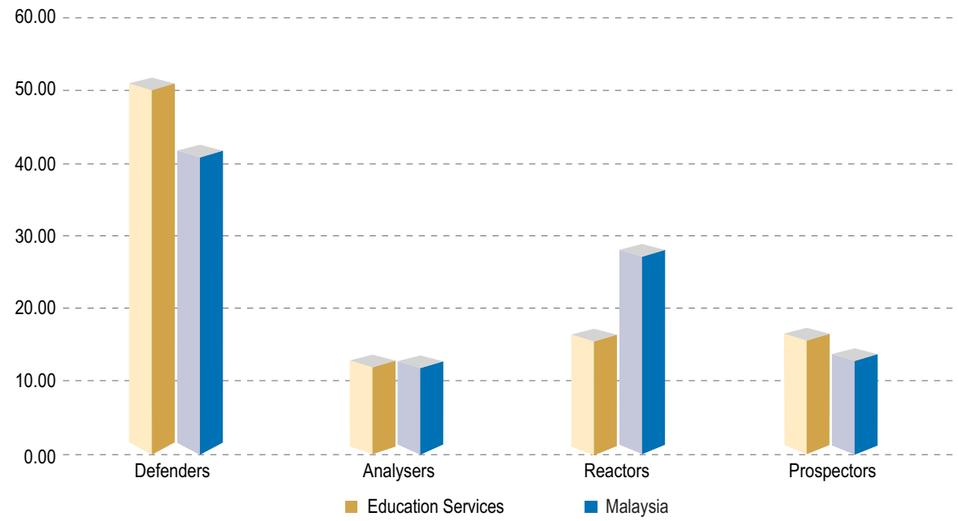
The strategic profile of firms in the education industry depicts an industry which is dominated by defender companies (51.7%). Defenders focus on a few areas, with the aim to ensure quality delivery, their focus is on operational efficiency instead of innovation. In contrast, Prospectors are highly innovative and are prepared to take risks in unchartered territories – 17.2% are Prospectors, this figure is higher than the national aggregate and it is local education providers who are taking the lead in risking their investments in potentially high pay-off products or services. 17.2% of the firms in the education industry are Reactors, which is much lower than the national aggregate. Reactor firms tend not to adapt to changes in the marketplace unless threatened.

Figure 13.14: Market Presence of the Education Industry



Note: The results are based on survey data.

Figure 13.15: Strategic Profile of Firms in the Education Industry



The smallest proportion of firms fall in the Analysers group, with 13.8%, which is at the same level as the national aggregate.

The large number of Defenders in the education industry concurs with the results discussed earlier regarding the industry's focus on operational and process improvements instead of product innovation, and its reliance on adapting programmes and courses from international partners to the Malaysian environment instead of developing home-grown programmes. Only a small number of institutions are Prospectors, pointing at a need to dissuade the industry from its Defender mind-set to become progressive educators for a nation on its path towards a knowledge economy.

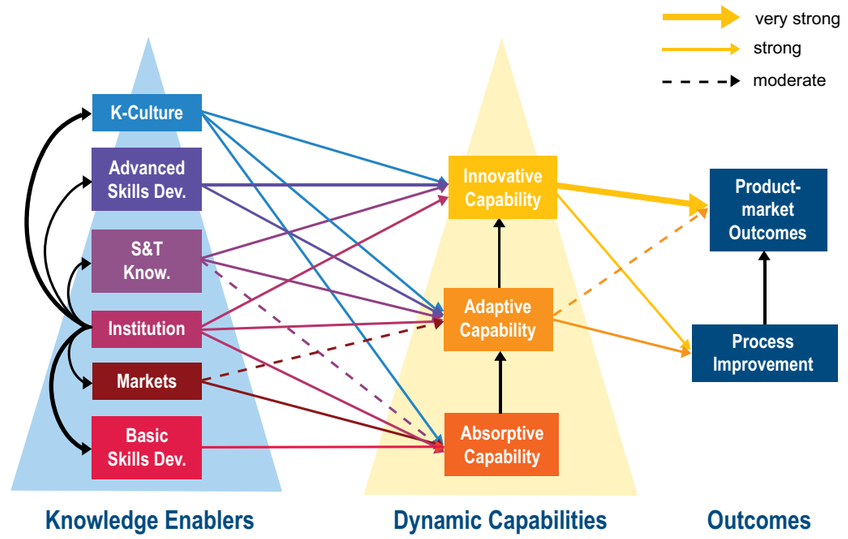
13.7 Relationships between the Key Blueprints of the Education Knowledge Ecosystem

In this section, we examine the impact of knowledge enablers on dynamic capabilities, and economic outcomes for the education industry. The knowledge ecosystem for the industry is benchmarked with that of advanced countries (USA, UK, Australia, Finland and Canada). Based on content analysis and the data obtained from DOS, the education industry in advanced countries and in Malaysia is classified as a pace-setter – an industry that has the highest level of knowledge content and innovations.

The knowledge ecosystem for the education industry in advanced countries is shown in **Figure 13.16**. In advanced countries, the knowledge ecosystem for institutions of learning (ILs) in the industry supports all three components of the dynamic capability, which enable them to drive both product and process innovations. In these countries, the ILs have very strong absorbability capability, which enable them to develop higher value-added innovation (adaptive capability). Strong absorptive and adaptive capabilities in these countries enable ILs in this industry to transcend the adaptive capability stage to build innovative capability. This enables the ILS in this industry to develop new process improvements and product outcomes that are globally competitive.

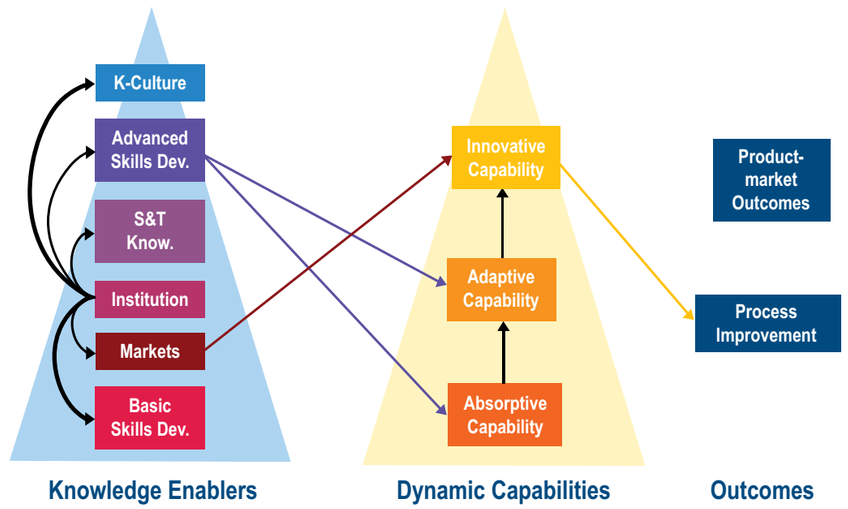
The knowledge ecosystem for the education industry in Malaysia based on the data obtained from DOS is shown in **Figure 13.17**. The knowledge ecosystem for ILs in this industry was found to be relatively weaker than that of more advanced countries. One of the key differences is that the absorptive and adaptive capabilities are supported by advanced skills only.

Figure 13.16: Knowledge Ecosystem of the Education Industry in an Advanced Country



Note: Very strong impacts are represented by the bolded line, strong impacts are represented by normal lines and moderate impacts are represented by dotted lines.

Figure 13.17: Knowledge Ecosystem of Education Industry in Malaysia



On the other hand, innovative capability is supported by market information. It is also shown the primary goal of ILs is to produce education programmes that are borrowed from more advanced countries, but delivered at a cheaper cost

A summary of the strength of the education ecosystems in advanced countries and in Malaysia are given in **Table 13.1**. The analysis in the table shows that the knowledge ecosystem for the industry in Malaysia was found to be relatively weaker than that of more advanced countries.

Table 13.1: Knowledge Enablers and Dynamic Capabilities for the Education Industry

Advanced Countries	Malaysia
Basic Skills have a **positive and strong impact** on absorptive capability. In most developed countries, the quality of the basic skills levels is very good and the quality of education is driven by government agencies, regulatory authorities, industry associations and institutions of learning.	Basic Skills have a **no impact** on absorptive capability. A majority of ILs would expect staff to have basic qualifications to teach. Due to the high cost of upgrading staff qualification, very few ILs invest in training programs for their staff to continuously upgrade their skills. Only universities tend to have training programmes to assist their staff keep up with new developments in the field.
Market Intelligence has a **positive and strong impact** on absorptive capability; and **positive and moderate impact** on adaptive capability. To ensure the training provided to students are relevant to the market needs, educationists in most of the ILs work closely with industry and other external stakeholders to upgrade their course curriculum. The close linkages with external stakeholders enable academics to understand changes taking place in industry and external environment and adapt these changes in their curriculum to ensure that they are relevant to the students they teach and to their own R&D activities.	Market Intelligence has a **positive and strong impact** on innovative capabilities. The ILs rely on their partner institutions, customers and competitors to undertake new innovations. Most of the innovations leverage of course design and curriculum from partner institutions or external providers of educational services. An example of such innovations is the offering of local institutions the "twinning-programs" from foreign partner universities.
Institutions are **strong enablers** of the knowledge ecosystem and have direct strong and positive impact on all three dynamic capability components. The institutions such as regulatory authorities (Education quality agencies, industry associations, government research institutions and universities tend to not only play a key role in creating a vibrant education ecosystem, many of them are at the forefront for driving the dynamic capabilities components directly, either upholding the quality and standard of education by ensuring there is adequate resources are channelled for skills development, upgrading of talent, undertaking R&D development that will not only contribute to enhancing service quality of existing educational produces, but be at the forefront to generate the next generation educational programmes, R&D and innovations for the industry.	Institutions are **strong enablers** for all the other knowledge enablers, but **does not impact** the three dynamic capability components directly. The institutions such education quality agencies, industry associations (National Association of Private Educational Institutions – NAPEI and Malaysian Association of Private Universities and Colleges – MAPCU), government research institutions and universities play key roles in regulating the industry and ensuring IHLs provide competitive educational services. However, these institutions were found to not directly influence the dynamic capability components of the ILs. In Malaysia, the Department of Private Education, MOE has played a key role in promoting Malaysian education in China, Indonesia, Vietnam and United Arab Emirates. The Ministry of Education in

Table 13.1: Knowledge Enablers and Dynamic Capabilities for the Education Industry (cont'd)

Advanced Countries	Malaysia
In some of the selected developed countries key agencies were established to promote these countries to international students - Australia Education International (AEI); IDP Education Australia; Canadian Bureau for International Education; Canadian Foreign Affairs Canada; Canadian Education Centre (CEC) Network; The British Council; American International Education Foundation (AIEF), Institute of International Education (IIE) and International Education Services (IES)	partnership with NAPEI and MAPCU have created the "Study Malaysia" website to highlight the value proposition and quality of courses offered by Malaysian institutions.
Science and technology knowledge has a **positive and moderate impact** on absorptive capability; but, **positive and strong impact** on adaptive and innovative capability. In most advanced countries, the educational institutions invest significant resources to send their staff for conferences, seminars, technical meetings and professional society meetings. These institutions provide staff access to research facilities, journal and other publications. Staff members (academic and professional) are also encouraged to contribute to knowledge dissemination by undertaking R&D activities, publishing and presenting in leading forums across the globe. These forums provide staff an opportunity to learn new teaching and research approaches and these new innovations are incorporated in staff teaching, research and other development activities. This enables staff to improve all the dynamic capability components.	Science and technology knowledge has no **impact on** absorptive, adaptive or innovative capabilities. A majority of the educational institutions, especially the small and medium operator do not send their staff for conferences, meetings and workshops and trainings. Staff members are expected to have the necessary skills to be employed in the education sector. A majority of the institutions do not undertake high quality R&D with the exception of the research universities and international foreign branch campuses. Lack of opportunities to learn new developments among lecturers and professional staff hinder their ability to achieve absorptive, adaptive and innovative capabilities.
Advanced Skills have **a positive and strong impact** on both innovative capability and adaptive capability. In many of the advanced countries significant resources in nurturing higher order thinking, including training in higher degree so as to ensure they have sound theoretical and analytical skills. These include ensuring the employees are able to foster experiential learning with multiple stakeholders and translational outcomes.	Advanced Skills have a **positive and significant impact** on absorptive and adaptive capabilities only. There is considerable on-the job training in many of the institutions, where curriculum is borrowed or adopted from ILs from more advanced countries. Some institutions over years have learnt to adapt the foreign-based curriculum and teaching pedagogies to suit the local and regional markets. Among the key adaptation in the industry is the "twinning programs' with foreign educational providers.

Table 13.1: Knowledge Enablers and Dynamic Capabilities for the Education Industry (cont'd)

Advanced Countries	Malaysia
Knowledge culture has a **positive and strong impact** on all three dynamic capabilities. A culture of innovation is fostered at all levels. Teachers and lecturers are required to have advanced qualifications in teaching and learning to be able to be teacher or lecturer. Both academic and professional staff members are empowered and encouraged to foster independent learning, creativity and innovative approaches to enrich teaching and learning. Improvement in student learning and experience takes the centre stage of all employed in this sector. The leadership team take a TQM-type of approach to innovation, where innovation is not the responsibility of the R&D team, but every employee. Leadership team continuously encourages staff to use the best technology, teaching approaches and curriculum to enrich student learning. Promotions are tied to performance. Qualification Agency play a key role in ensuring continuous improvement and innovation are key drivers of quality in the education industry.	Knowledge culture has **no significant impact** on the dynamic capability components. Most of the ILs, with the exception of international branch campuses organisation culture is still hierarchical. Many of the ILs does not invest resources for R&D activities; hence tend to rely on ILs from more advanced countries to lead the R&D innovations and technology development. The culture in the industry is to comply with local regulatory authorities, who shape the underlying structure of the industry.
The continuum from absorptive capability to adaptive capability to innovative capability is **present and strong.** There is significant support provided to develop the basic skills and adoptive capabilities of workers in this industry. Strong foundational knowledge help workers adapt the external knowledge and reconfigure it into new innovations that improve processes and enhance quality of existing educational products and services. Over time, as the workers gain more experience, they tend to be more innovative in using the acquired knowledge to create new education products and services that meet both the local and global markets. In many of ILs, the diffusion of technology and new innovations are high and these enable them to successfully produce innovative educational products, but also new ways of delivering courses in more efficient ways.	The continuum from absorptive capability to adaptive capability to innovative capability **is present.** The talent in the industry have the capacity to adopt new knowledge generated from ILs from more advanced countries. Most of the local institutions refine and modify foreign knowledge or innovations to meet the local and global market demand. These incremental innovations enable ILs to cater to the domestic and regional markets. An area the Malaysian education industry has demonstrated regional leadership is in providing affordable tertiary education via the "twinning-programs" with all local and foreign universities.

Next, we compare the flows from dynamic capabilities to economic outcomes for the education industry for both advanced countries and Malaysia, which are summarised in **Table 13.2.** The study also found significant differences in the impact of dynamic capabilities components on economic outcomes for advanced countries and Malaysia. In the sample advanced countries, adaptive capability in the education industry was found to have a positive and strong impact on process improvements. It also has a positive and moderate impact on product market outcomes. Furthermore, innovative capability was found to have a positive and strong impact on process improvement and a very strong to product market outcomes.

For Malaysian education industry, adaptive capability was found to not have any impact on process improvement and product market development. However, innovative capability only contributes to process improvements. This results implies that much of the innovation undertaken by ILs in this industry is marginal to ensure the education services are cost efficient by new improved processes, improved internal management and organisational methods and improved marketing approaches. Among the key innovations of the education industry is the "twinning programmes" from more established universities that are made more cost-effective for students from Malaysia and the developing world where income levels are low.

Table 13.2: Dynamic Capabilities and Economic Outcomes for the Education Industry

Advanced Countries	Malaysia
Adaptive capability has a **positive and strong impact** on process improvement and a **positive and moderate impact** on product market development. ILs in these countries are at the forefront of adopting new educational innovations and technologies to not only continuously improve existing products and services to enrich student learning experience and value.	Adaptive capability has **no impact** on process improvement and product market development. Most of ILs tends to use curriculum and programs from more established universities or foreign ILs, with the exception of foreign university branch campuses. Hence, most them are franchise programs, which require very little innovation and delivered with varying quality of staff and resources.
Innovative capability has a **positive and strong impact** on process improvement and a **positive and very strong impact** on product market outcomes. Significant resources are channelled to improve the curriculum, teaching and learning experience, use of technology and research-led learning in many of these ILs. The sound education ecosystem enhance innovative capability of ILs that lead to continuous improvement of existing educational products, but also creation of new products that meet the needs of various stakeholders across the globe.	Innovative capability has a **strong impact** on process improvement only. Innovative **does not impact** product market outcomes. Much of the domestic adopts new technology, systems, processes and management tools and course curriculum from advanced countries. Most domestic ILs undertake marginal innovations to improve cost-efficiency, service quality and meet domestic and regional market demand, where income levels are low. Hence, the domestic education market is attractive to students from less developed as well as developing countries in the region.

Table 13.2: Dynamic Capabilities and Eonomic Outcomes for the Education Industry (cont'd)

Advanced Countries	Malaysia
Process improvement **positive and moderate impact** on product market outcomes. Most ILs use technology, in particular ICT to deliver education products. Among them include the use of MOOCS and other technologies to increase the reach of the educational program to students across the globe. The use of advanced technology also provides the global community access to information and knowledge with a click of a button, provide good quality service and are cost effective. The marginal cost of the delivery is very low. This facilitates its accessibility to students in developing and less developed countries, making them extremely popular. These platforms also open new channels of education delivery and have the potential to enhance continuous learning.	Process improvement **does not impact** product market outcomes. Most of the process improvements in the education industry are based on intellectual property developed and designed in ILs and research institute in more advanced countries. As such, the potential for creating new market outcomes and intellectual property remains limited.

13.8 Summary: Key Trends, Challenges, Way Forward and Best Practices

13.8.1 Industry Trends

The Malaysian education industry has transformed rapidly over the last two decades with more new private operators entering into the education market, providing pre-school to tertiary education. Increasing income levels in Malaysia and other regional economies have increased the demand for private education. To reduce the burden of government providing educational services and to create new foreign revenue stream for the country, the education industry was privatised in the middle of 1980s. This led to an explosion of new operators and in the early days, the development of the industry was chaotic and quality of the operators varied. To improve the quality of education, the Lembaga Akreditasi, now known as Malaysian Qualification Agency, was established to provide direction to operators to move up the value chain.

Earlier, it was noted that the industry's strength in terms of its knowledge enablers are its human capabilities and its infostructure, and that the industry was beginning to understand the importance of R&D and knowledge sharing. These knowledge resource foundations are reflected in the dynamic capabilities profile of the industry. What the education industry does particularly well is its ability to quickly set-up product development teams once a good business opportunity is identified, and this capability, together with its strong absorptive capabilities, have assisted the industry in improving processes and producing new to the firm products (see **Figure 13.9**). However, these products (courses and programmes) are not new to the market innovations, but are foreign programmes already extant on the market adapted to the local environment.

Gradual strengthening of the industry's dynamic capabilities through the government-driven initiatives have produced positive results in terms of both product-market development innovation, process development outcomes among operators and overall improvement in quality of tertiary education. These initiatives include the establishment of the Malaysian Qualification Agency (MQA) under the Ministry of Education, which is the national accreditation and quality assurance body to monitor quality of programs. The introduction of the Malaysian Qualification Framework, which set the program standards; and the establishment of The Higher Education Leadership Academy or Akademi Kepimpinan Pengajian Tinggi (AKEPT) in 2008 to professionalise the education industry. This drive for innovation is also attributed to the pressure to improve institutional rankings through research and teaching.

Other factors that have motivated some firms in the education industry to push the boundaries of their operations include: MOE's directive for Malaysian HEIs to meet quality international standards, international competition for the Malaysian education market, and the potential of a lucrative international student market. Those who do not improve their offerings or provide innovative products and services will not survive in such a demanding market in constant flux. Positive innovation and economic outcomes with its current moderate endowment of dynamic capabilities suggest that the education industry is capable of transforming into a regional centre of education excellence if it continues along this path of exponential improvement.

13.8.2 Challenges

The demand for education in Malaysia and the region over the last two decades has been on an upward trend due to a number of factors discussed in the earlier sections. To meet the demand, the number of institutions catering for the wide segment of the market also increased rapidly. While the opportunities for local institutions have been very good, intensive competition from other countries in the region and structural weaknesses in the local ecosystem pose a number of challenges for the local operators in Malaysia. The challenges encountered by education institutions are discussed below.

Institutions:

- The industry developed in an ad-hoc way. At present, there are more than 600 providers of higher education offering varying qualities of education. This has adversely impacted the image of Malaysia as a leading centre for education excellence.
- The industry is highly competitive regionally and globally and the local education industry is not keeping pace with the talent needs of the Malaysian economy. There is a lack of fore-sighting, prioritisation, planning and implementation strategy on how the education system will nurture the next generation global innovators and leaders.
- The level of cooperation and collaboration between all stakeholders (government, industry, trade associations and educational institutions) are weak – resulting in a mismatch between the supply and demand for talent to power Malaysia's knowledge economy.

Basic Skills Development:

- The education industry, especially smaller educational institutions are unable to attract the best talent due to lower remuneration, poor working environment as compared to other professions. The problem is further exacerbated by talent poaching by foreign institutions.
- The cost of training is high for many smaller and medium institutions. Hence many do not invest in continuous improvement programmes.

Advanced Skills Development:

- Smaller and medium size institutions do not invest in advanced capability development programs due to the high cost of training programs – levels of staff with doctoral qualification or advanced training are low.
- Many educational institutions do not provide academic staff access to leadership and entrepreneurial training, R&D or support educational innovation.
- Over reliance on foreign partners for innovations and course curriculum – hence, very little local innovations are developed.

S&T Knowledge:

- Lack of experts and mentors in leading S&T areas. This constrains indigenous and contextualised innovations in the region.

- ow levels of ICT use among educators hinders the development of creative learning environments to enrich the learning experience.

- Lack of strategically focused R&D investment in key priority areas. High dependency on foreign firms and universities for technology and innovations. This perpetuates the 'lock-in' effect that crowds out local innovations.

Market Intelligence:

- Many educational institutions do not have the expertise to understand the changing dynamics of the education industry and the types of skillset needed for Industrial Revolution 4.0. Knowledge intensive industries require graduates to be analytical, creative, good command of global languages, inter-cultural competence and possess the ability to work in an inter-disciplinary setting using advanced technologies.

- Lack of coordination and knowledge sharing among key institutions. Most institutions work in 'silos' and are highly secretive/competitive.

- Sharing among educational institutions is limited due to lack of understanding and adherence to formal and ethical business practices (NDA's and IPs).

Knowledge Culture:

- Local educational institutions are highly dependent on foreign counterparts for knowledge and innovations.

- Low levels of knowledge transfer take place between larger and smaller firms; and between local and foreign firms.

- A majority of Institutions are risk averse towards investing in R&D activities and generating IPs/ innovations. Many are not savvy in working with industry, leading to educational curriculum that do not meet the needs of industry.

13.8.3 Way Forward

A sound education industry can play a dual role of producing high quality talent for the domestic economy and generating wealth for the country. To achieve this objective, education institutions should endeavour to enhance their dynamic capability and market reach through innovative technology, governance systems and business models. Three major transformations should take place to enable education institutions and complementing industries to improve their knowledge intensity.

Recommendation 13.1: Improve Quality Assurance and Governance

Quality assurance agencies such as Malaysian Qualifications Agency (MQA) and Ministry of Education (MOE) should continue to strive toward transforming Malaysian Education to adhere to global best practices and standards.

- All institutions (government, industry associations and institutions of learning) should work towards ensuring high quality education; and map the talent requirements for the various industries, economic corridors and industrial parks in Malaysia and the region. This will help these institutions to meet the talent needs of industries and nurture next generation pace-setter industries.

- Universities and educational institutions in the different industrial clusters should be made champions for driving change and innovation – refer to the national maps of the leading institutions in Malaysia (Figure 13.18) and key areas of focus of these institutions (Figure 13.19). These institutions can be an important source for the following: talent and capability development for the industry; jointly undertaking R&D with industry and the local community; providing expert advice to the various stakeholders in the clusters; and providing industry and the community access to research infrastructure and support systems.

Figure 13.18: National Map of Key Educational Focus Areas of the Institutions

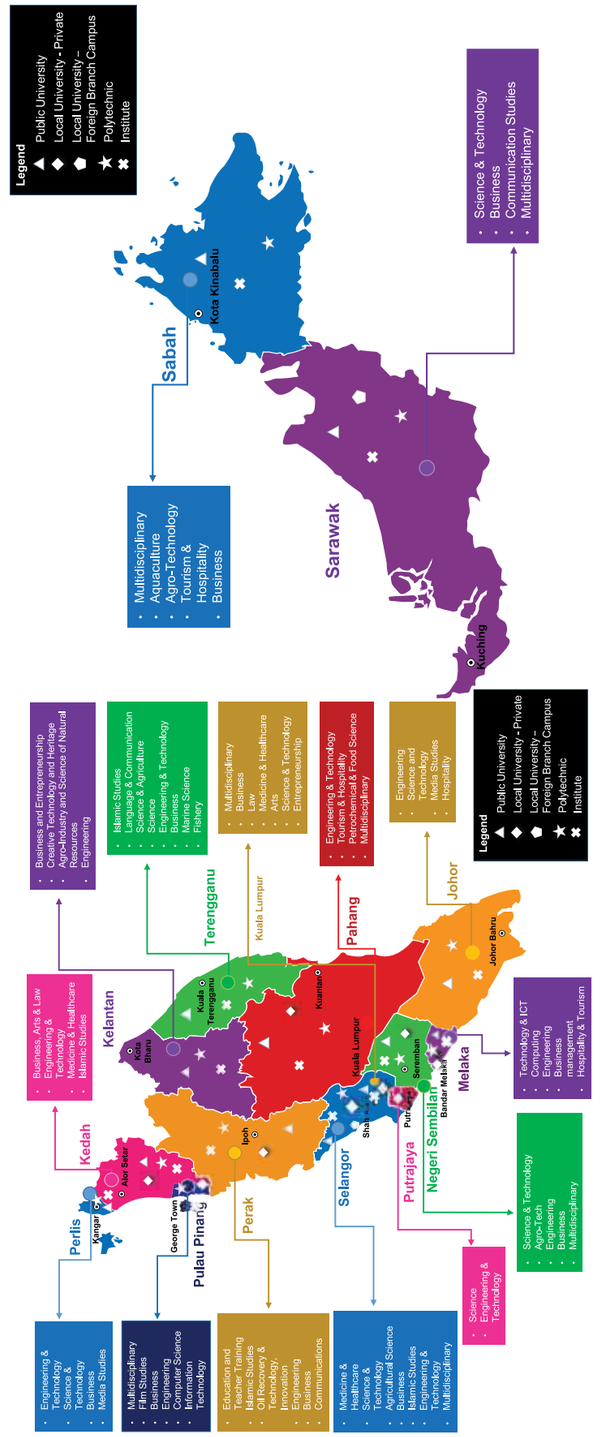
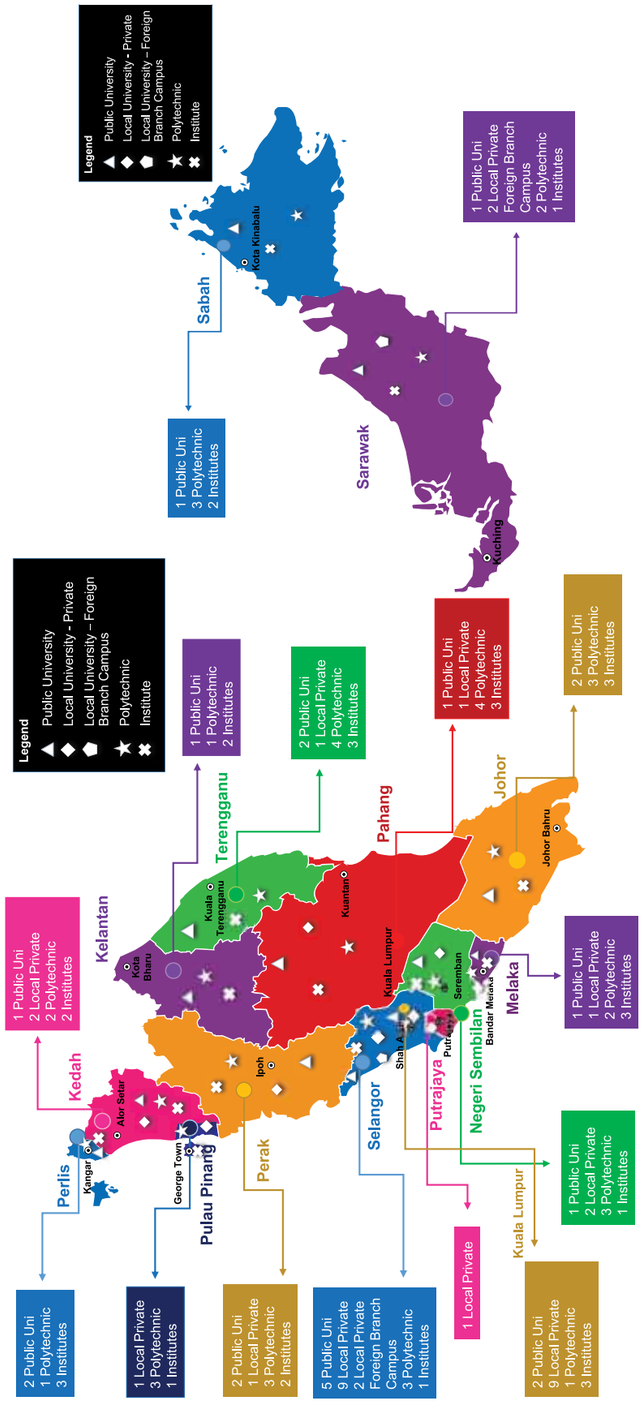


Figure 13.19: National Map of Key Institutions Across the Country



- Institutions such as AKEPT-MOHE should develop leadership programs for senior leaders of educational institutions to achieve the following:
  - Be more strategic in understanding future trends in the industrial landscape and align courses and programs to not only meet future industry needs, but also spawn next generation industries that will enhance Malaysia's global innovation footprints and wealth creation opportunities.
  - Be ambidextrous to prioritise short-term goals and the development of long-term sustainability trajectory for the institution.

Recommendation 13.2: Invest in the Right Talent to Power Malaysia's 4th Industrial Revolution

- Continue to increase qualification of academics (doctoral and other higher qualifications) and professional certifications in Malaysian institutions, especially in the STEM and TEVT related areas – increase support for programs such as MyBrain and MyMaster.
- Continue to provide a clear pathway for career development for academics in institutions that provide TEVT qualifications.
- Annual funds to support student scholarships to overseas universities should be channelled to develop local institutions to be global players. This will help attract leading Malaysian scholars residing in leading universities and research institutes to use the local institutions as the preferred place to undertake their leading edge R&D activities.
- High performing Malaysian undergraduate and postgraduate students are given full scholarships to study in local institutions with a SETARA rating of 5 and MYRA rating of 4 and above. High quality students will result in high quality outcomes in teaching and R&D activities. This will raise the standards and global ranking of Malaysian institutions of learning.

Recommendation 13.3: Enhance the Education Ecosystem

- MOE and MOHE to continue to rate institutions using the rating systems such as SETARA/D-SETARA and MYRA. This is to ensure the educational institutions provide high quality programs that meet future manpower needs of Malaysia and the region. Institutions that fall short of the standards should be given assistance to improve; failing which, mechanisms to deregister them should be in place.
- MOE and MOHE work with agencies, trade associations and industry to continuously provide state of the art training and up-skilling for academics and researchers in academic institutions. An example is the program offered by MDEC on data scientists needed to meet the needs of key government agencies, industry and other organisations.
- Establish One-stop portal (eAcademic/eResearch) that identify facilities, expertise and other support systems available to industry, government and community groups.
- Educational institutions should have a greater understanding of IP generation, patent registration, new start-ups and commercialisation activities. There is a need to work closely with key agencies such as Steinbeis and Platcom that help professionalise translational research activities.
- Increasing international reach of local institutions – establish a dedicated agency to work with the Malaysian embassies and trade missions to brand, position and promote Education Malaysia in the 21st century (EM21) in other countries.

13.8.4 Best Practices

The education industry is not only a source for supplying talent for an economy, it is increasingly becoming an important source of income generation for many countries. A sound education industry will save developing countries, such as Malaysia from losing foreign exchange due to outflow of Malaysian students to foreign institutions of learning. A high quality education system will attract international students to a country and will result in an inflow of foreign exchange into the country. For Malaysia to compete with more developed countries in retaining domestic students and attracting international students; efforts should be intensified to ensure the quality of education provided is comparable to that of other leading countries such as US, Canada, UK, Australia and New Zealand. The Malaysian education industry should consider strengthening the ecosystem by implementing best practices adopted in pace-setter countries.

Best Practice 13.1: Improve Quality Assurance and Governance

Malaysian Qualification Agency (MQA)

The MQA is a lead agency that has played a pivotal role in transforming the tertiary education industry into a regional centre of education excellence. MQA has played a key role in achieving the following:

- Improving quality assurance mechanisms for programs offered by local educational institutions. This has had a significant impact on increasing the quality of private tertiary education in the region over the last 5 years.
- Established a systematic framework providing a reference point and standards for all academic programs offered by institutions in Malaysia.
- Articulated and facilitated recognition of qualifications to ensure all courses offered fulfil the established performance standards and have in place continuous improvement mechanisms.

Tertiary Education Quality and Standards Agency (TEQSA) - Australia

- An independent agency that was established to be a regulatory and quality assurance agency for higher education (university and non-university higher education providers, which includes TEVT education) to meet the Higher Education Standards and Australian Qualification Framework (AQF).
- TEQSA's role is to ensure that the educational programs meet the needs of the various stakeholders in the country and the programs adhere to the global best practices, including incorporating innovative teaching approaches to nurture creative talent.

Best Practice 13.2: Invest in the Right Talent to Power 4th Industrial Revolution

University of California Industry-University Cooperative Research Program, USA

- A key role of a university is to ensure that students trained by the institution meet the needs of the economy. This program is strongly supported by the government and significant resources are channelled to establish a strong industry-university collaboration to achieve the following:
- Provide industry access to university facilities and expertise – industry labs located in universities. This is to assist firms, especially SMEs, to obtain the necessary capability development programs, technology, testing and other support to improve their productivity and competitiveness.
- Under this program, both government and industry invest significant resources in discovery research that underpins the foundation of new technologies and products. These discoveries are informed to industry through a well-structured 'technology-transfer' and 'knowledge-transfer' programs.
- The program also fosters inter-disciplinary research and S&T development initiatives that are aligned to national research priority areas. The projects developed under this program helps solve industry problems and encourage start-ups companies that will power next generation innovations for the economy.
- The cooperative program also promotes high-risk and high impact R&D initiatives via multi-stakeholder partnership models with rigorous quality control and assurance mechanisms.
- The strong collaboration between academia and industry will also acculturate academics and students to undertaking translational R&D activities and encouraging research-enriched teaching outcomes; all of which are important for nurturing next-generation innovators that will lead economic development for the country.

Best Practice 13.3: Enhancing the Education Ecosystem

IDP Education - World Leader in Student Placement in Australia, UK, USA, Canada and New Zealand (50% owned by 32 Australian universities)

- A key role of IDP is to position, brand and market education from Australia, UK, USA, Canada and New Zealand globally.
- IDP has a network of 89 student placement centres in 32 countries and have been in operation for more than 46 years. The strong track record and experience has helped IDP develop excellent market intelligence and social capital in the communities. All of these have resulted in significant student inflow into the above countries. These countries are popular destination for students from Malaysia and Asia.

  IDP has the largest English language proficiency centre (IELTS) across the globe. Close to 2.5 million tests have been taken globally at these IDP centres. IDP also has English language schools in Thailand, Vietnam and Cambodia. The English proficiency tests and education open new opportunities for students from non-English speaking countries to gain entry into tertiary institutions in Australia, UK, US, Canada and New Zealand.

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CHAPTER 14

KNOWLEDGE CONTENT OF THE TRANSPORTATION SERVICE INDUSTRY

CHAPTER 14
Knowledge Content of the Transportation Service Industry

14.0 Introduction

Malaysia is located at the centre of a globally interconnected land, sea and air transportation network. The logistics industry in Malaysia is made up of four modes of transportation: (1) transport via railways; (2) other land transport; (3) sea and coastal water transport; inland water transport; and (4) air transport. The Malaysian Government recognises the logistics industry as one of their key pillars for nation development. It is one of the development priorities in the Third Industrial Master Plan (2006-2020) (IMP3) and the Eleventh Malaysian Plan (2016-2020), as it is critical in supporting global supply chains, as well as Malaysia's international trade and industrialisation.

Logistics performance is positively associated with the availability of infrastructure, reliability of supply chains and the service provisions. In the aggregated 2010–2016 Logistics Performance Index (LPI) survey of 160 countries, Germany was ranked at the top (4.17/5), followed by the Netherlands (4.12/5) and Singapore (4.10/5). Hong Kong was ranked at 8th, United Arab Emirates at 19th, Taiwan at 23rd, China at 26th, Qatar at 29th, and Malaysia at 30th. Most notably, in 2016, Malaysia was among the two upper-middle-income countries of the top 30 performers on LPI. Comparing the 2016 LPI in Asia region, Malaysia is relatively better than Thailand (3.26) and Indonesia (2.98), India (3.42), but behind Singapore (4.14), Hong Kong (4.07) and Taiwan (3.70).

Table 14.1: Logistics Performance Index in Asia, 2016

Country	LPI Rank	LPI Score	Customs	Infra-structure	Inter-national shipments	Logistics competence	Tracking & tracing	Timeli-ness
Singapore	5	4.14	4.18	4.20	3.96	4.09	4.05	4.40
Hong Kong	9	4.07	3.94	4.10	4.05	4.00	4.03	4.29
Taiwan	25	3.70	3.23	3.57	3.57	3.95	3.59	4.25
Malaysia	32	3.43	3.17	3.45	3.48	3.34	3.46	3.65
Thailand	45	3.26	3.11	3.12	3.37	3.14	3.20	3.56
Indonesia	63	2.98	2.69	2.65	2.90	3.00	3.19	3.46
India	35	3.42	3.17	3.34	3.36	3.39	3.52	3.74

Source: The World Bank (2016)

Agencies involved in developing the logistic industry include Ministry of Transport (MOT), Ministry of Works (MOW), Royal Malaysian Customs Department (JKDRM) and the Land Public Transport Commission (SPAD), Pusat Pemeriksaan Kenderaan Berkomputer (PUSPAKOM), Road Transport Department (JPJ), Economic Planning Unit (EPU), Ministry of International Trade and Industry (MITI). To strengthen and promote the local logistics industry, Malaysia Logistics Council (MLC) was set up in partnership with the private industry to address the ongoing challenges within the sector. Partner members include industry players, academics, and associations such as Association of Malaysia Hauliers (AMH), Airfreight Forwarders Association of Malaysia (AFAM), Malaysian Shipowners Association (MASA), Federation of Malaysian Port Operating Companies (FMPOC), Malaysian International Chamber of Commerce and Industry (MICCI), Malaysian National Shippers Council (MNSC), Federation of Malaysian Freight Forwarders (FMFF), Federation of Malaysian Manufacturers (FMM), and the Logistics and Supply Chain Association of Malaysia (LSCoM).

Rail and Road Transport

The Malaysian logistics industry is not a well-integrated industry, with many small and medium-sized companies. There are over 22,000 companies in the Malaysian logistics industry (Department of Skills Development Ministry of Human Resources, 2008). These companies are mainly freight forwarders, transport companies and warehousing companies. In Malaysia, 60% of the logistics market share is taken by MNCs (e.g., DHL, Schenker Logistics etc), 26% by Malaysian companies (e.g., Tiong Nam Logistics Holdings Berhad, Freight Management Holdings Bhd etc), and 14% in-house logistics by manufacturers and distributors (e.g., AEON). An increasing number of Malaysian logistics companies (e.g., Freight Management Holdings Bhd, Century Logistics Holdings Bhd, Tiong Nam Logistics Holdings Bhd and Freight Mark (M) Sdn Bhd.) offer services on an international basis.

During the period of 2005-2014, the transport and storage sub-industry was stagnant between 3.6% and 3.7% to GDP (Malaysia Productivity Corporation [MPC], 2015). The share of transport and storage sub-industry to GDP in 2014 was recorded at 3.6% (RM30 billion), and 6.5% to the services industry value-added. The Malaysian logistics industry is estimated to increase at a double digit compound annual growth rate (CAGR) of 10.2% to RM207.4 billion in 2017 (Malaysia Logistics Directory, 2013/2014).

The global Third Party Logistics (3PL) market is projected to achieve US$1.35 trillion by 2018 (Malaysia Logistics Directory, 2013/2014). 3PL logistic players are classified into four types: (1) Standard 3PL provider (basic services such as packing, warehousing and distribution); (2) Service developer (value-added services such as

tracking and tracing, cross-docking and customised packaging); (3) Customer adapter (customer-oriented services based on markets, demands and delivery requirements.); (4) Customer developer (full-blown customer-oriented services). In Malaysia, there is a lack of consumer awareness on 3PL services and market penetration of 3PL is low.

The land freight movement includes rail and road transport. During the period of 2005 to 2014, rail freight achieved a steady growth with an annual growth rate of 7.3%. In 2014, rail freight recorded 7.8 million tonnes. The main commodities transported by rail freight are namely containerised cargo, cement and clinker. Road transport also plays an important role to domestic distribution, by linking the transportation to and from entry and exit points.

Port

Malaysia's strategic position between the Indian Ocean and the South China Sea places the country in the middle of the sea route linking major Asian economies such as India, China, Japan and South Korea. Resident companies operating in shipping or air transport are taxable on their worldwide income, instead of income generated from Malaysia. Moreover, foreign tax relief is applied to these companies.

In 2014, total trade was recorded at RM1.45 trillion. The total freight volume transported by sea, rail and air reached 548 million tonnes. Sea freight is the most popular low-cost transportation mode in Malaysia. During the period of 2005 to 2014, the annual growth rate for freight volume transported by sea was 5.4%. The total sea freight volume in 2014 was valued at 539.2 million tonnes. Ports that contributed significantly to shipment of goods were Port Klang, Port of Tanjung Pelepas, Penang Port, Kuantan Port, Johor Port and Bintulu Port.

Table 14.2: Key Developments under the 10th Malaysian Plan

No	Port	Development and Upgrading
1	Port Klang	• Construction of 900m additional container wharf and reclamation of land for future expansion at Westports. • Construction of 300m of container wharf at Northport, enabling container handling capacity of 17 million twenty-footer equivalent units (TEUS). • The Port Klang Authority deepened the south channel to 18m to cater for vessel of 18,000 TEUS.
2	Port of Tanjung Pelepas	• Construction of 700m container wharf, enabling container handling capacity of 10.5 million TEUS.
3	Kuantan Port	• Construction of 600m cargo wharf, enabling cargo handling capacity of 21 million tonnes.
4	Johor Port	• Upgrade break bulk jetties and break bulk wharf.
5	Penang Port	• Construction of 600m container wharf and related equipment, reclamation of 25 hectares for container yard, enabling container handling capacity of 2 million TEUS.
6	Tanjung Manis Port	• Upgrading of facilities which increased the capacity to 2.5 million tonnes for bulk cargo and 180,000 TEUs for container cargo.
7	Sepanggar Bay Container Port	• Procurement of two units of ship-to-shore cranes for container handling.

Source: Ministry of Transport (2015)

Port Klang, comprising Northport and Westports, is the largest and busiest container port in Malaysia, followed by the Port of Tanjung Pelepas. Port Klang was ranked at 13 and Port of Tanjung Pelepas was ranked at 19 in the International Association of Ports and Harbours World's Top 20 Container Port report. In 2014, the total cargo throughput was reported at RM461,815,000 freight weight tonnes, including dry bulk (RM36,160,000), liquid bulk (RM68,848,000), general cargo (RM21,389,000) and Containerised Cargo (RM335,418,000) (Economic Planning Unit, 2015). The total cargo throughput achieved an average annual growth rate of 2.21% between 2010 and 2014.

Airport

Air transport in Malaysia is regulated by Department of Civil Aviation (DCA) in terms of safety and security. There are seven international airports in Malaysia, namely Kuala Lumpur International Airport (KLIA), KLIA 2, Penang International Airport, Langkawi International Airport, Kota Kinabalu International Airport, Kuching International Airport and Senai International Airport.

In 2014, the total air freight volume was captured at 987,362 tonnes, of which 91.2% was handled by the KLIA, Penang Airport, and Subang Airport. However, the annual growth rate (2005 and 2014) reduced by 0.8%. The problems in air transport include limited connectivity and number of air cargo flights, limited cargo volume, and strong degree of competition from neighbouring countries such as Singapore.

The Kuala Lumpur International Airport (KLIA) is ranked the tenth best airport in Asia (Skytrax World Airport Awards, 2016). KLIA 2 was launched in 2014, is the largest low-cost airport in the region. As the domestic industry rapidly grows, Malaysia has built a total of 16 domestic airports and 18 Short Take-Off and Landing (STOL) ports across the 13 states and 3 federal territories. Given the huge investments in airport infrastructure and subsequent high maintenance, the institutional and regulatory frameworks are often revised to address the problems of over-investment in airport facilities, inefficient operations, connectivity to the rural areas and facility management.

The global air transport network is able to operate close to 100,000 daily flights in each region of the world. In Malaysia, there are 64 airlines (e.g., Malindo Air, Air France, Turkish Airlines etc.) operating at Kuala Lumpur International Airport (KLIA). In 2014, the traffic handled at all airports includes 85 million passengers for international and domestic travels, 987,420 metric tonnes of cargo handled, and 834,000 registered aircraft movements (EPU, 2015; Ministry of Transport, 2015). The total traffic handled at all airports recorded an average annual growth rate of 9.04% between 2010 and 2014.

The Malaysian airline industry is dominated by Malaysia Airline (MAS) and AirAsia. Based on the Malaysian Airports and company figures in 2013, AirAsia had a 17.5% share of the passenger market; AirAsia X has 4.7%; and MAS, 30.8%. MAS is the first national carrier and has received several awards including the World's Best Cabin Crew and the World's 5-Star Airline Award. On the other hand, AirAsia is the leading budget airline in Asia, operating on a low-cost airline business model with its touted slogan. "Now Everyone Can Fly".

The air transport industry is highly regulated. Malaysia is signatory to a number of international treaties and developed a number of legislations for the aviation industry to ensure safety and sustained development of the industry. A number of institutions have been established to provide oversight to the overall governance and development of the industry. Some of the key initiatives are discussed below.

- **Legislations:** The Malaysian aviation legislations include Civil Aviation Act (CAA) 1969, Civil Aviation Regulations (CAR) 1996, Carriage by Air Act 1974, Aviation Offences Act 1984, Airport and Aviation Services (Operating Company) Act 1991.

- **The International Civil Aviation Organisation (ICAO):** Malaysia is one of the signatory countries of the Convention on International Civil Aviation (Chicago Convention 1944). The International Civil Aviation Organisation (ICAO) was set-up in 1944 upon the signing of the Chicago Convention 1944. Malaysia became a member of ICAO in

1958. Malaysia is one of the elected Council Member of the ICAO since 2007, and has been working with the Convention's 191 Member States and global aviation organisations to develop international Standards and Recommended Practices (SARPs).

- **Malaysia Aviation Academy:** The Malaysia Aviation Academy (MAvA) is the training arm of Department of Civil Aviation (DCA) Malaysia, has been awarded the certification of Air Traffic Control - Aviation Training Organisation (ATC-ATO). The ATC-ATO certification is an important milestone for MAvA in its goal towards becoming a member of the ICAO TRAINAIR PLUS Programme (TPP), accessing to the ICAO's network of training centres.

- **Approved Flying Training Organisations (AFTOs):** Department of Civil Aviation (DCA) plays an important role in developing the Malaysian aviation industry. To address the problem of pilot shortage in Malaysia, DCA has been promoting the Approved Flying Training Organisations (AFTOs) since 2005. AFTOs is tasked to provide training for Private Pilot Licence (PPL), Commercial Pilot License (CPL), Instrument Rating (Aeroplane/ Helicopter), Flying Instructor Rating, Assistant Flying Instructor Rating and Night VPR Rating. The growth of Malaysian aviation industry is attributed to five AFTOs (i.e., Asia Pacific Flight Training, HM Aerospace, International Aero Training Academy, KIST Aviation Academy and Malaysian Flying Academy) and 12 flying clubs.

14.1 Key Developments and Initiatives

Rapid economic and industrial development in Malaysia and the region of over the last two decades have increased the demand for all forms of transportation systems. Under the previous five-year Malaysia plans, the transportation industry in the country experienced rapid development and has become increasingly technology-driven. Key developments include the following:

- Rapid economic developments across the country, especially within the economic corridor have seen major increase in roads and other transportation facilities coming online - a total of 4554 km of new rural roads were constructed under the National Key Result Area (NKRA) programme (EPU, 2015).

- Road development is expected to increase road length from 137,000 km in 2010 to 230,300 km in 2015 with close to RM4.3 billion was allocated for maintenance of the federal roads under the 10th Malaysian Plan.

- Increasing use of Electronic Data Interchange (EDI) services, Radio Frequency Identification (RFID) technology to improve the productivity of logistics industry (MITI, 2015).

- Increasing use of e-Commerce in Malaysia has generated demands for an integrated logistics services to facilitate efficient delivery and distribution.

- Greater awareness of 'carbon-footprint', environmental consciousness among consumers, government environmental regulations and cost of petroleum over the last few years have had increased the cost and adverse impact on the transport industry.

- New technology such as 3D Printing is seen as a 'disruptive technology' for the global logistics industry, as manufacturing can re-bundle products within a single facility and location. This changing trend will lead to a new type of logistics model, 4PL that focuses on an integration of software development, distribution, partner relationship management, and contract management.

- The ASEAN Open Skies Agreement in 2013 and the ASEAN Single Aviation Market (ASEAN-SAM) in 2015 have enabled opened new opportunities for Malaysian transport providers, but also intensified competition within domestic market.

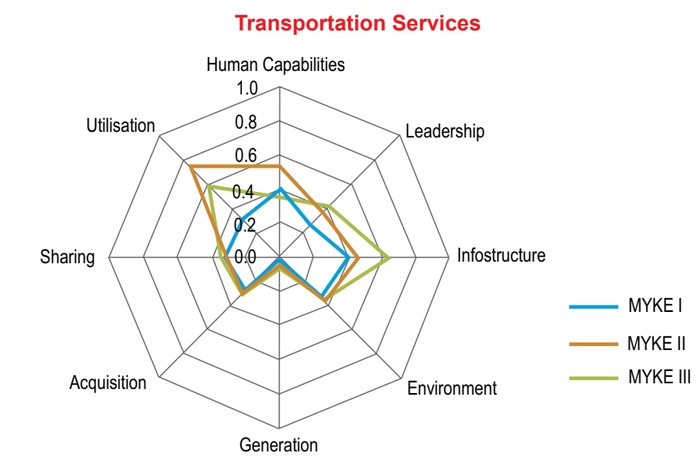
- Promotion of Malaysia as an ideal Asian tourist destination and increasing wealth in the region have increased air travel market in region and this has contributed to the development of budget airlines.

14.2 Knowledge Content

In this study, the sample used to map the knowledge ecosystem for the Malaysian transportation service industry sector was based on the following samples for MYKE-I, MYKE-II and MYKE-III studies, respectively: 123, 202 and 192, as shown in **Table 1.1.** The number of SMEs and large players for the two sample periods were as follows: (SME, Large) are (58, 65), (149, 53) and (152, 40), respectively.

Figure 14.1 shows the trajectory of development in knowledge resource foundations of transport services industry over the period 2003 to 2014. The Malaysia's transport services industry did not seem to perform well over the three MYKE periods with an index below the Malaysian aggregate level for all knowledge enablers and actions dimensions. There was a slight improvement in knowledge-leadership, infostructure and knowledge sharing between 2007 (MYKE II) and 2014 (MYKE III). Knowledge generation index remained unchanged at 0.05 in 2014. There was a reduction in human capabilities, knowledge environment and knowledge utilisation enablers from 2007 to 2014. A detailed analysis of each of the knowledge enablers are given below.

Figure 14.1 Overview of Knowledge Enablers and Knowledge Actions for MYKE I, MYKE II and MYKE III



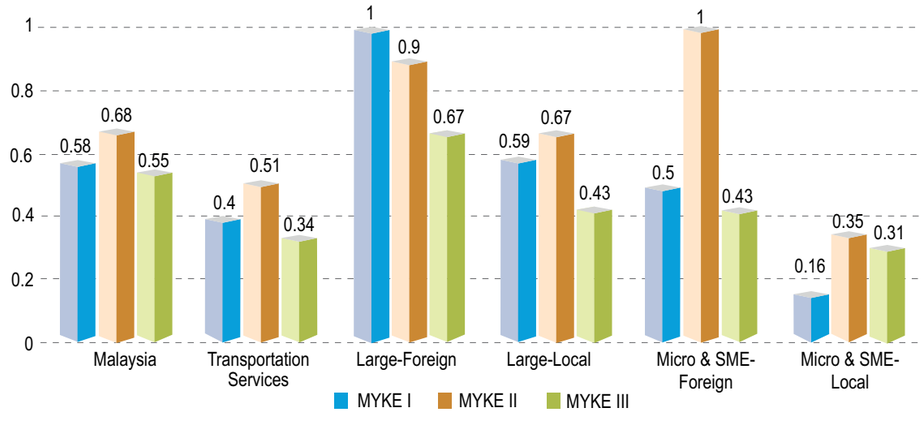
14.3 Knowledge Enablers

14.3.1 Human Capabilities

As shown in **Figure 14.2**, MYKE III (2014) assessment shows a downward trend in human capabilities in the transportation industry. Large foreign firms achieved a perfect score of 1 in 2003, reduced to 0.9 in 2007, and slipped significantly to 0.67 in 2014. Large local firms increased from 0.59 (2003) to 0.67 (2007), but regressed to 0.43 in 2014. Foreign SMEs started at 0.5 (2003), accelerated to 1 (2007) but dropped rapidly to 0.43 (2014). Micro and SMEs Malaysian-based firms started from a low base of 0.16 (2003), progressed to 0.35 (2007) but declined slightly to 0.31 (2014).

This decline can be attributed to heightened competition for skilled workers in the area of supply chain management, warehouse management, crane operations, shipping and air transport services. Additionally, Malaysia has a major brain drain problem as the local highly trained staff tended to migrate to other countries such as Singapore for higher salaries.

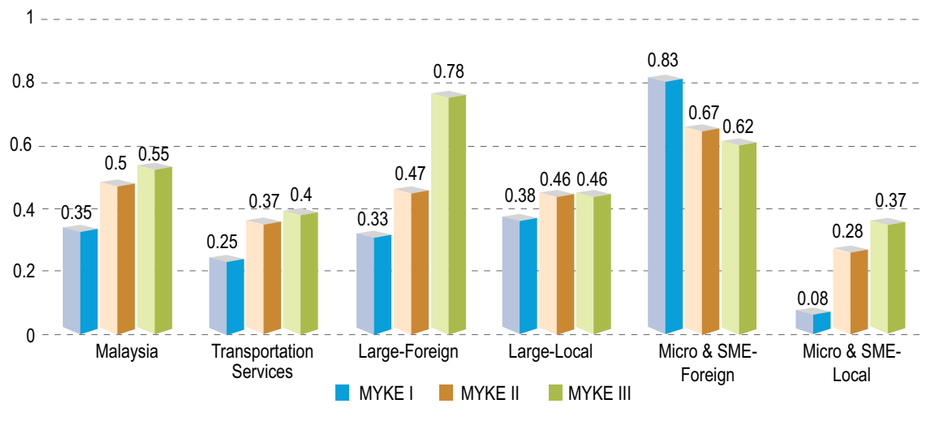
Figure 14.2: Human Capability of the Transportation Service Industry



14.3.2 Knowledge Systems and Leadership

The Malaysia's transport services industry made an incremental improvement in knowledge-leadership, with an index of 0.25 (2003) to 0.37 (2007) to 0.4 (2014) (see **Figure 14.3**). However, the overall performance of transport services firms is below the national aggregate index. A more detailed analysis show that large foreign firms progressed positively from 0.33 (2003) to 0.47 (2007), and registered the highest index (0.78) among all types of firms in 2014. However, one observes a mixed trend in small foreign firms where they posted a high index of 0.83 (2003), dropped to 0.67 (2007), and declined further to 0.62 (2014). Large local firms started from 0.38 (MYKE I) and stayed at 0.46 over the periods of MYKE II and MYKE III. Interestingly, micro and SMEs local firms made a strong jump to 0.37 (2014) from 0.08 (2003).

Figure 14.3: Knowledge Leadership in the Transportation Service Industry



14.3.3 Technology and Infostructure

The transport services industry shows year on year improvement in infostructure, with an index of 0.41 (2003) to 0.49 (2007) to 0.65 (2014) (see **Figure 14.4**). Large foreign firms started from 0.5 (MYKE I), and advanced to 0.74 (MYKE II) and scored the highest index (0.84) among all categories of transport services firms in MYKE III. Small foreign firms demonstrated similar performance, except that they fell to 0.76 (MYKE III) from 0.98 (MYKE II). Although the local firms were below the industry and national average, they were making steady progress in technology adoption (e.g., computer and e-commerce) to provide the capability in achieving higher levels of efficiency and productivity in business operations. This is evident with large local firms recorded 0.48 (2003), 0.56 (2007) and 0.58 (2014), whereas small local firms improved from 0.31 (2003) to 0.41 (2007) to 0.64 (2014).

14.3.4 Knowledge Environment

Over the three MYKE periods, the transport services industry shows a low level of industrial engagement with other stakeholders, stagnant between 0.31 and 0.36, below the Malaysian aggregate index (see **Figure 14.5**). In 2014, foreign small firms scored 0.43, the highest index across all types of firms, over taking the large firm that recorded 0.39. In contrast, large local firms fell to 0.24 (2014) from 0.38 (2007), and small local firms also dropped to 0.31 (2014) from 0.35 (2007). It is interesting to note that foreign firms, regardless of size, made more efforts to know about the national plans, engage in government's projects and initiatives, work closely with the industry associations, and establish collaborative projects with the academia. The analysis shows that local firms are not capitalising on Malaysia's institutional knowledge environment as much as their foreign counterparts are.

Figure 14.4: Technology and Infostructure in the Transportation Service Industry

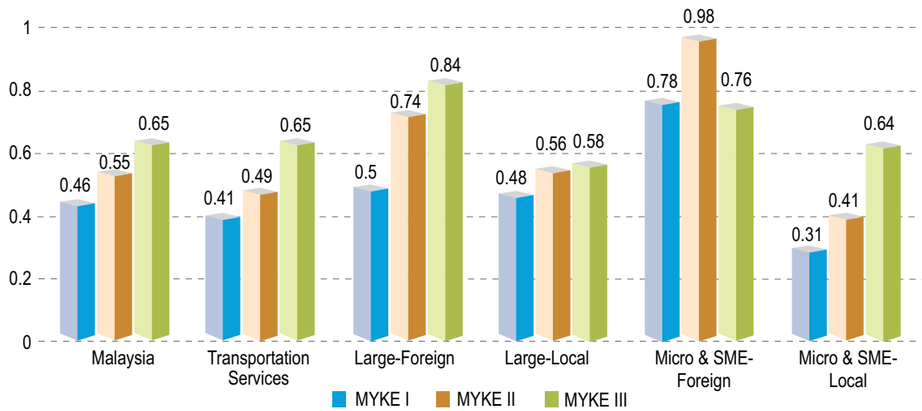
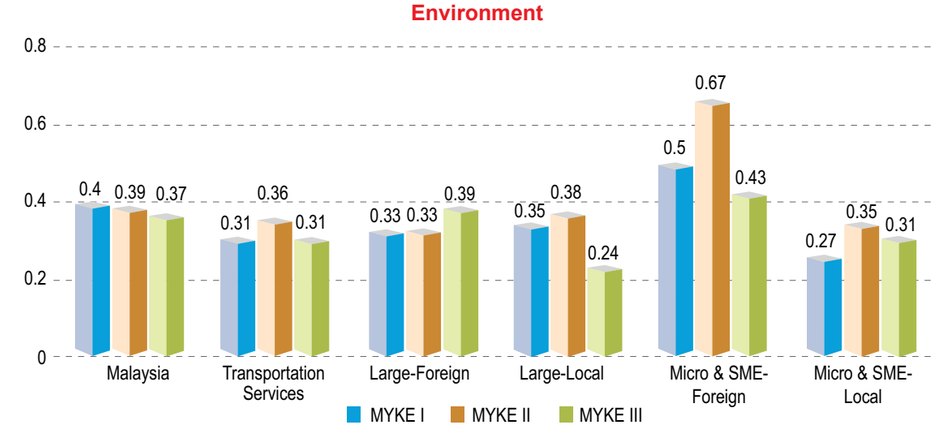


Figure 14.5: General Environment Awareness of Transportation Service Industry

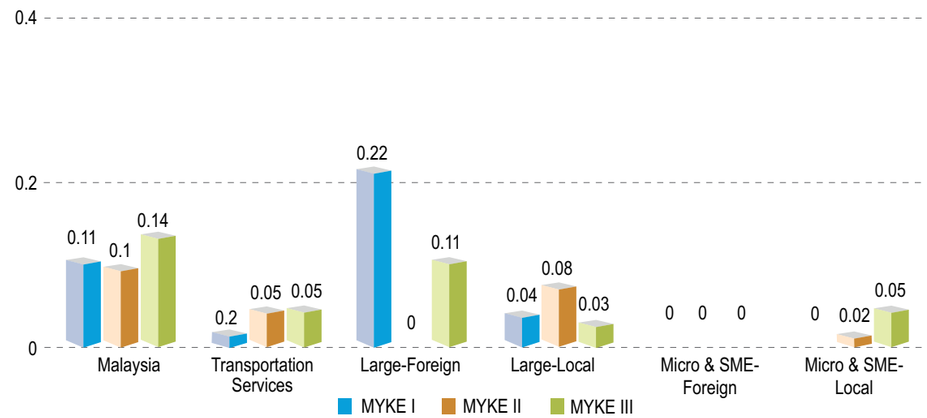


14.4 Knowledge Actions

14.4.1 Knowledge Generation

The knowledge generation in the transport service industry was found to be very low compared to the national aggregate average. The knowledge generation for the transport industry was 0.02 in 2003, and plateaued at 0.05 in 2007 and 2014 (see **Figure 14.6**). Assessment of MYKE reports revealed that large foreign firms achieved a relatively higher score than domestic firms. The outcomes of knowledge generation of local transport services firms were low and inconsistent over the three MYKE studies. Many of the local firms spend very little resources for R&D activities and the generation of intellectual property. This result is not surprising as the local transport services industry is highly fragmented and the logistics activities are often outsourced to third party service providers.

Figure 14.6: Knowledge Generation Activities in the Transportation Service Industry

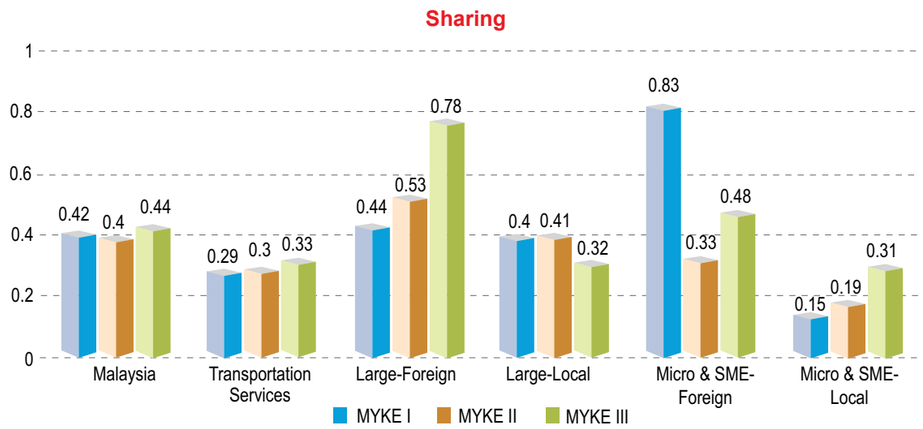


14.4.2 Knowledge Sharing

Over the periods of 2003 to 2014, the transport services industry scored lower than the national aggregate with regard to knowledge sharing. However, there is some improvement shown in knowledge sharing activities among the transport services firms, as evidenced by 0.29 (2003) to 0.3 (2007) to 0.33 (2014) (see **Figure 14.7**). All types of firms, except the large local firms, have made positive progress in MYKE III.

The knowledge sharing measure for large foreign firms was 0.44 in 2003 and this increased to 0.53 in 2007. In 2014, the knowledge sharing index was 0.78 (2014). One of the factors contributing to the continuous improvement in knowledge sharing among large foreign firms is the adoption of advanced information systems that enable them to enhance their market reach and improve the richness of the services provided to their clients. Examples of information systems include high-end collaboration tools such as Electronic Data Interchange (EDI) and Enterprise Resource Planning (ERP). Note that all other firms also experienced an increase in knowledge sharing from 2007 to 2014.

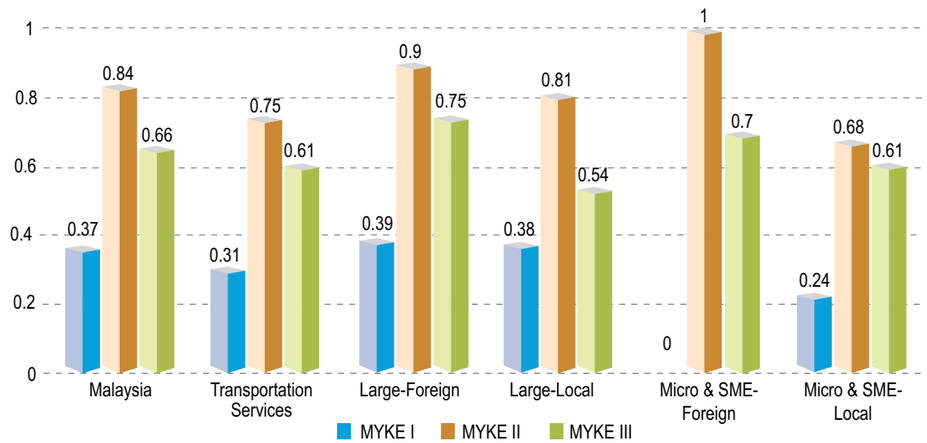
Figure 14.7: Knowledge Sharing Activity of the Transportation Service Industry



14.4.3 Knowledge Utilisation

As shown in **Figure 14.8**, knowledge utilisation in the transport services industry is consistent with that of the national aggregate index, starting from 0.31 in 2003, increased to 0.75 in 2007, but declined to 0.61 in 2014. Large foreign firms are the major users of knowledge. Nevertheless, the utilisation of knowledge among local firms is moderately high. This is not surprising as the adoption of new technology and knowledge is an important source of competitiveness for firms. The industry as a whole invests significant resources to acquire new knowledge to make transport firms more productive and efficient to meet the needs of a booming region.

Figure 14.8: Knowledge Utilisation Activity of the Transportation Service Industry

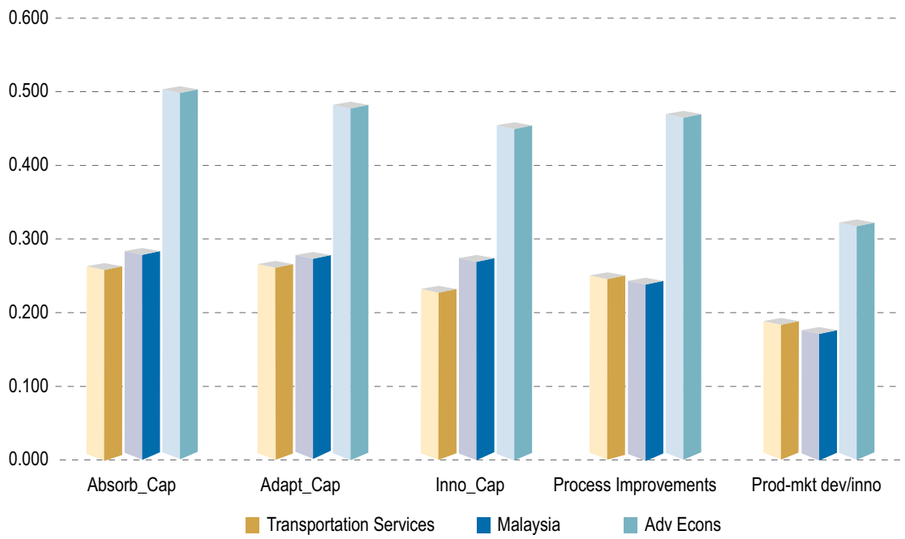


14.5 Dynamic Capabilities Profile for Transportation Industry

Dynamic capabilities refer to a range of firm-specific resources, processes and capabilities, encapsulating the absorptive capability, adaptive capability and innovative capability to enable them to learn and integrate resources and reconfigure operational capabilities to respond to the environmental changes.

Figure 14.9 shows that the transport services firms have attained a lower level of all three elements of dynamic capability when compared against the Malaysian industry aggregate. However, the firms' dynamic capabilities have produced greater outcomes compared to the national aggregate, in terms of process improvement and product-market development/innovation. Detailed analyses of all the components of dynamic capabilities are provided below.

Figure 14.9: Dynamic Capability Profile of the Transportation Service Industry



14.5.1 Absorptive Capability

Figure 14.10 shows that customers, suppliers, competitors, online information and other units are the top five knowledge sources that the transport services industry acquire and utilise to enhance their innovative activities. Firms with higher absorptive capability have greater learning ability to acquire, assimilate and apply knowledge. The transport services providers seem to have a moderate absorptive capability in which they source knowledge from different channels. However, it is important to note that the average of all forms of knowledge sources in this industry is below the Malaysian industry average

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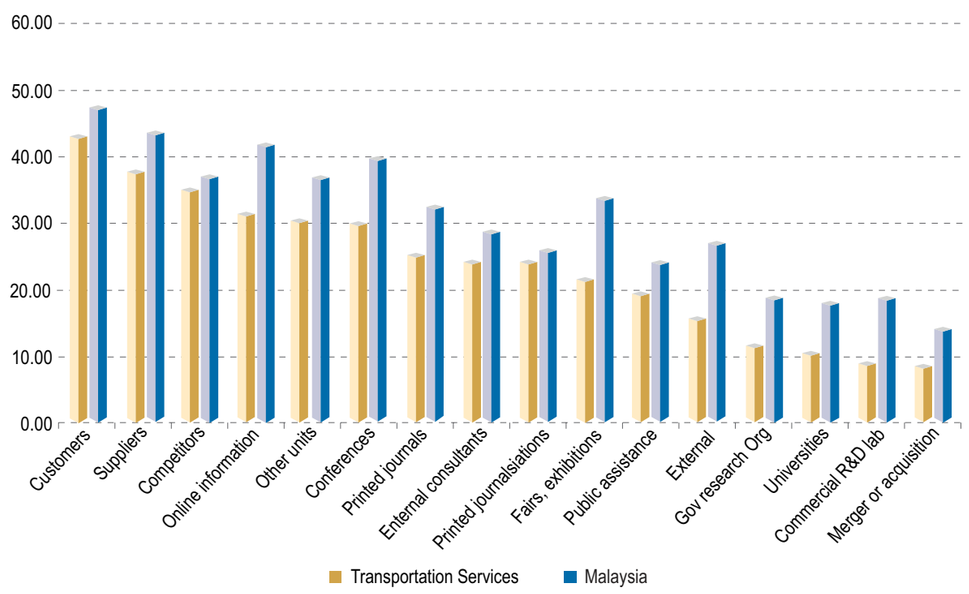
Note that the three dynamic capability components for Malaysia was significantly lower than that of more advanced countries. This corresponds to the lower process improvements and product market development in Malaysia as compared to the dynamic capabilities in advanced countries.

Figure 14.10: Sources of Knowledge in the Transportation Service Industry



14.5.2 Adaptive Capability

The development of adaptive capability is achieved through strategic flexibility of resources and capabilities reconfiguration in line with external changes and market demand. This would require a workforce with higher order skills, underpinned by both technical proficiencies and abilities that allow them to contextualise knowledge to the business and the broader community. As shown in **Figure 14.11**, the transport services industry appears to be dominated by employees with business and administration disciplines. The percentage of graduates with computer, engineering and technology related areas is at a much lower level than the Malaysian industry aggregate. This is indicative of the industry's weakness in which it is more a user of new technology as opposed to a creator of new knowledge that can be widely used within the industry and across other industries.

There are many facilitative programs and assistances given by the Malaysian Government to support the growth of the transport services industry. This is because the transport services industry is important for sustained economic and social development, as it is heavily built into the movement of people, product and services. Institutional support for continuous training and skills development for the Transport industry is shown in **Figure 14.12.** Here, the level of training support and skills development in the transport services industry is demonstrably much lower than the national average. The industry does not seem to utilise the services offered to them in building human capability. This is evident by each type of assistance scoring below the Malaysian industry aggregate. Other than training, education and skills development, financial and tax advice, the industry scores lower than 10% in all instances including quality management, market development and product and process improvement, which are critical for the success of the industry, which is experiencing extreme competition from larger and more technology savvy foreign players in the domestic market.

Figure 14.11: Skills Profile of the Transportation Service Industry

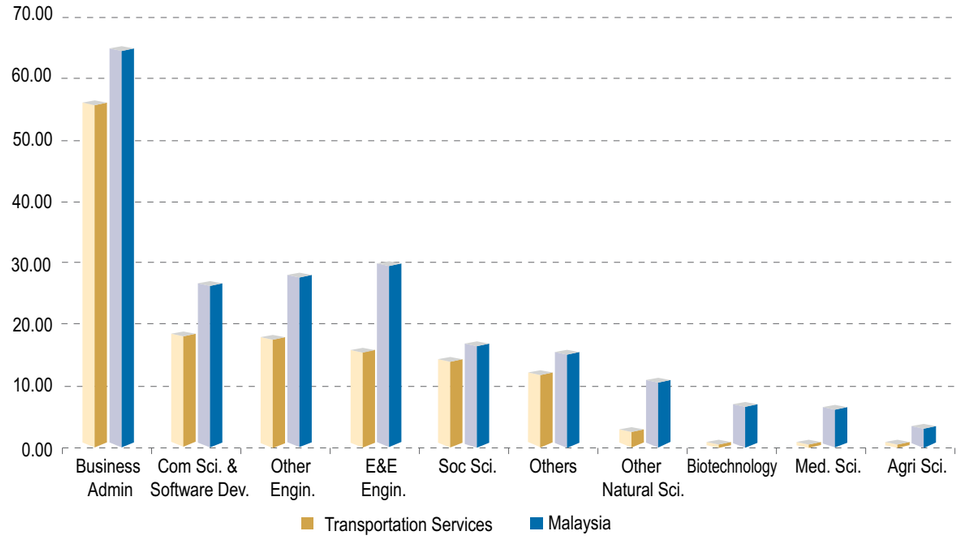


Figure 14.12: Role of Institutional Environment in Skill Building of the Transportation Service Industry

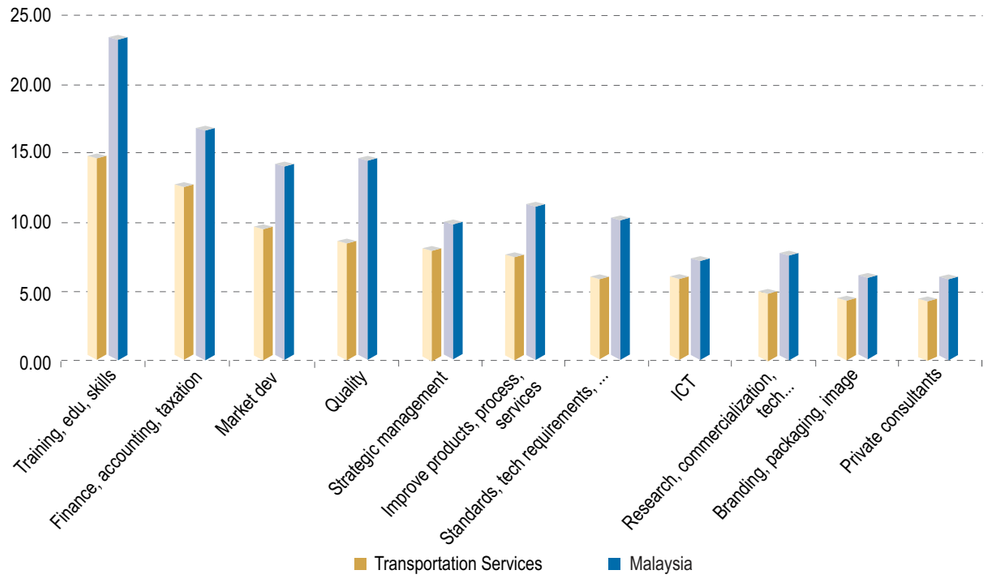
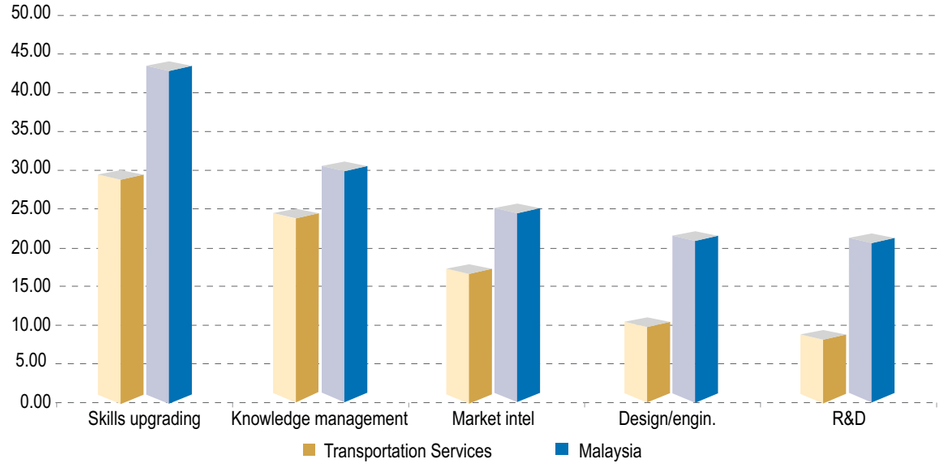


Figure 14.13: Knowledge Intensive Activities in the Transportation Service Industry



14.5.3 Innovative Capability

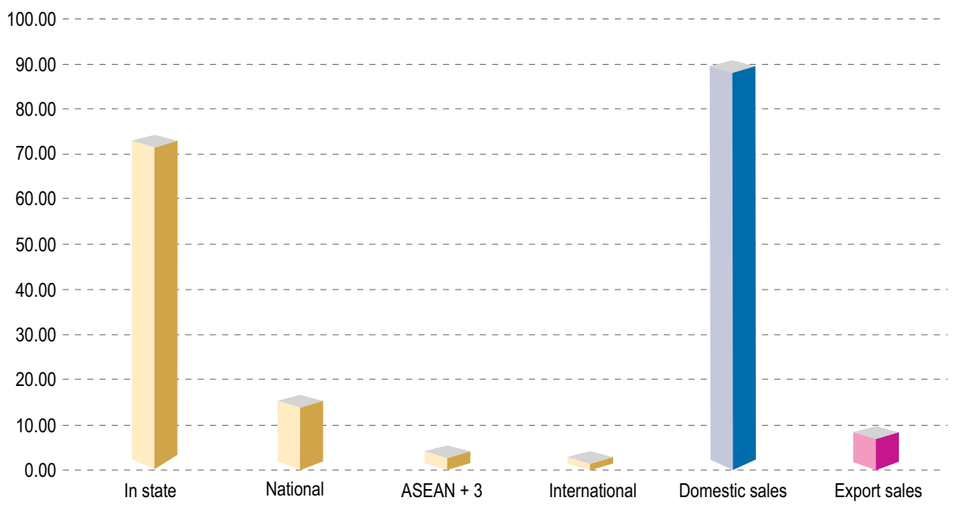
Coupled with its lower levels of absorptive and adaptive capabilities, the transport services industry falls short in terms of innovative capability compared to the Malaysian industry average. **Figure 14.13** shows that the firms invest less in innovative capability building activities than the overall national industry average. Only 30% of the firms in the industry invest in skills development, compared to 43% at the national level. The industry investment for the other activities are as follows: industry investment in knowledge management systems is 25%, while national level is 31%; investment in market intelligence is 18%.

The trends of innovative capability of the local transport service industry is concerning as it is increasingly coming under intense competition from other regional hubs such as Singapore, Indonesia and Thailand, who are investing significant resource to transform their countries to become regional transportation hub. Many of them are not only investing significant resource upgrading the infrastructure, human capital development, technology, R&D, but also attracting the best talent across the region to help develop these countries in regional transport, trans-shipment and logistic hubs.

14.6 Outcomes of Dynamic Capabilities in the Transportation Industry

Figure 14.14 show that almost all of the sales of transport services industry are generated from the domestic market (90.92%) with most of its revenue drawn from within the state (74.19%), and 16.72% from national. This result is expected because the Malaysian transport services industry is relatively fragmented, with many small/medium-sized and family owned companies. These companies often target the domestic market and lack the drive to strengthen their dynamic capabilities to compete in the global market. The 9.08% revenue generated from the export markets is equally contributed by ASEAN plus China, Japan and Korea (4.83%), and other countries (4.26%).

Figure 14.14: Market Presence of the Transportation Service Industry

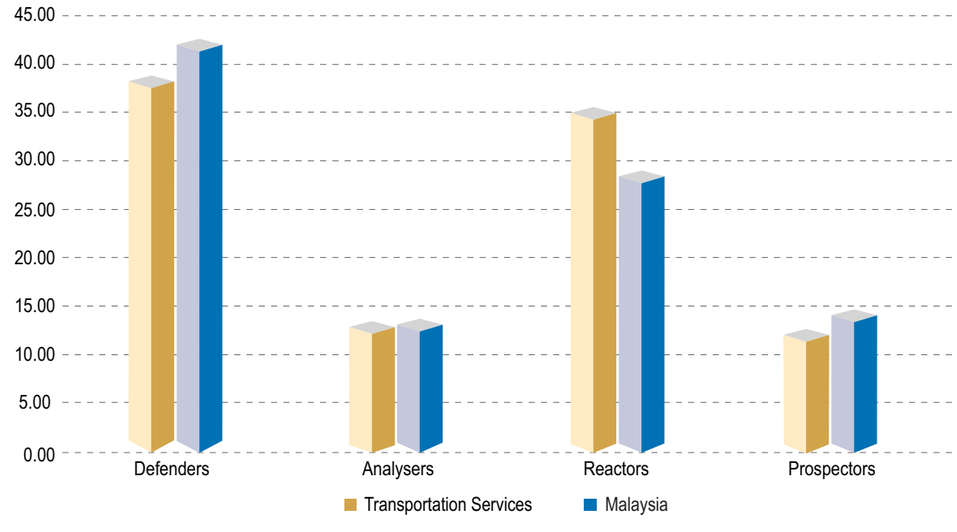


Note: The results are based on survey data.

Figure 14.15 shows the strategic profile of the transport services industry. There seems to be a strong presence of Defenders (38.54%) and Reactors (35.42%) companies in the industry. Notably, the industry has more Reactors than the Malaysian industry aggregate of 29%. The two smaller groups are Analysers (13.54%) and Prospectors (12.5%), which are below the Malaysian industry average.

The above result is of concern because the transport services industry seems to be dominated by Defenders and Reactors firms, who are characterised by lower adaptive capability and are only suited to service a stable and narrowly defined home market. These firms have very low adaptive capability and often remain at their organisational status quo despite market change. This may hinder their long-term sustainability in the domestic market.

Figure 14.15: Strategic Profile of Firms in the Transportation Service Industry

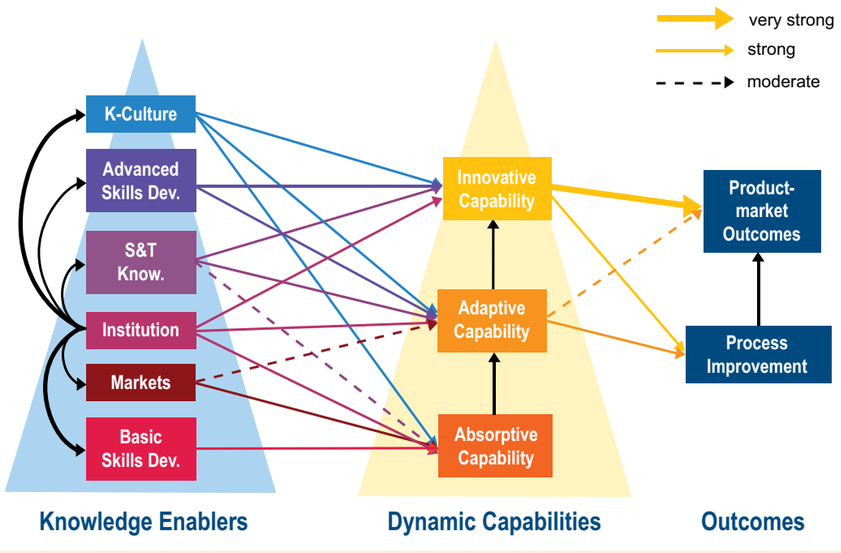


14.7 Relationships between the Key Blueprints of the Transportation Service Knowledge Ecosystem

In this section, the dynamics between the knowledge enablers, dynamic capabilities and economic outcomes for the transportation service industry. The Malaysian transportation service industry knowledge ecosystem is benchmarked against their counterparts in advanced countries (UAE, France, Germany, Japan, Singapore, South Korea and USA). Based on content analysis and the data obtained from DOS, this industry in advanced countries and in Malaysia is classified as an imitator, key industry that has relatively low knowledge content.

In **Figure 14.16** and **Figure 14.17** show the knowledge ecosystems for advanced countries and Malaysia, respectively. Detail analysis of the blueprints of the ecosystem for the advanced countries and Malaysia are discussed in **Table 14.3**.

Figure 14.16: Knowledge Ecosystem of the Transportation Service Industry in an Advanced Country



Note: Very strong impacts are represented by the bolded line, strong impacts are represented by normal lines and moderate impacts are represented by dotted lines.

Figure 14.17: Knowledge Ecosystem Transportation Service Industry in Malaysia

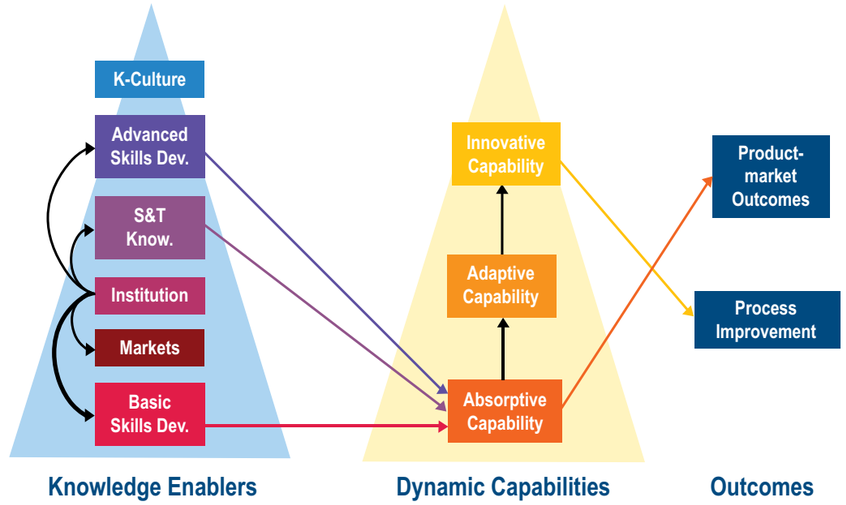


Table 14.3: Knowledge Enablers and Dynamic Capabilities for the Transportation Service Industry

Advanced Countries	Malaysia
Basic Skills have a **positive and strong impact** on absorptive capability. In most developed countries, continuous training is provided for workers in the transportation service industry on good driving and safety skills, customer service quality, use of transportation management systems to ensure the industry provide high quality service to all stakeholders. Most of the workers take pride in their jobs and take a professional view of the jobs.	Basic Skills have a **positive and strong impact** on absorptive capability. Training is provided to operate the vehicles, good driving and safety skills. However, the use of satellite and other advanced communication technology is gaining traction in the transportation system and the service quality has improved significantly.
Market Intelligence has a **positive and strong impact** on absorptive capability; and **positive and moderate impact** on adaptive capability. Many of these countries are transportation hubs and they rely on suppliers, customers, competitors, external consultants and commercial R&D centres other key network partners to provide information on new knowledge, technology, systems and processes that will enhance their quality of transportation services. In many of these countries, transportation regulations are sound and set the tone for continuous quality improvement.	Market Intelligence has **no impact** on innovative capabilities. Majority local firms do not invest in sophisticated mechanisms and tools to obtain market intelligence to enhance their dynamic capabilities. There is a tendency to rely on the foreign suppliers of technology for product information and knowledge – hence, the firms do not move up the knowledge and innovation value chain. Further, the regulations across the different transportation modes vary. Different institutions provide oversights for the different modes of transportation. At times, development of the transportation services seems to be fragmented and uncoordinated.

Table 14.3: Knowledge Enablers and Dynamic Capabilities for the Transportation Service Industry (cont'd)

Advanced Countries	Malaysia
Institutions are **strong enablers** of the knowledge ecosystem and have **direct strong and positive impact** on all three dynamic capability components. Government research institutions (GRI), universities, regulators and trade associations play a key role in shaping the transportation ecosystem and influencing the dynamic capabilities components directly. For example, universities, industry and government agencies work closely to support the transportation clusters with training, networking, and international market penetration. For example, The Korea National University of Transportation is a dedicated university for developing the transportation service industry. The trade associations and government agencies also play key roles in disseminating and increasing knowledge and understanding of innovative solutions for transportation systems (e.g. The Advanced Transit Association – ATRA in the UK plays a pro-active role in the dissemination of knowledge).	Institutions **strong enablers** for all the other knowledge enablers, but **does not impact** the k-culture and three dynamic capability components directly. The Ministry of Transport provides oversight of the transportation industry. Key institutions such as trade association and university also support the development of the transportation ecosystems. The institutions do not foster a culture of innovation and creativity. There is some resistance to acknowledge that the industry is respectable. There are 24 higher learning institutions providing training in the logistics and transport area. The supply of experts in the field is still low. These institutions do not impact the three dynamic capability components directly.
Science and technology knowledge has a **positive and moderate impact** on absorptive capability; but, **positive and strong impact** on adaptive and innovative capability. In advanced countries, significant resources are channelled into education and R&D activities to improve the transportation services and new technology related to the logistics and supply chain. Significant resources are also invested to build and sustain strong partnerships with key players in the transportation network and supply chain.	Science and technology knowledge has a **positive and strong impact** on to absorptive capability only. Most of the R&D and innovations used in the industry are from more advanced countries. – Local R&D tends to lag behind more developed countries. Lack of talented staff in key research priority areas and weak industry-university partnership has led to a majority of the firms in the industry being dependent on foreign technology and know-how to create value for their operations. This suggests that most S&T knowledge is to improve the absorptive capacity of a majority of the industry players in Malaysia.

Table 14.3: Knowledge Enablers and Dynamic Capabilities for the Transportation Service Industry (cont'd)

Advanced Countries	Malaysia
Advanced Skills have **a positive and strong impact** on both innovative capability and adaptive capability. In the advanced countries, strength in the fields of STEM, computer science, data analytics and ICT have led to new applications in the transportation and logistics industry. Many of these countries invest in research programs that have very strong basic research, but high translational research outcomes. Strong partnerships between industry and universities intensify knowledge transfer and develop advanced skills that help close the 'knowledge-commercialisation chasm', improving the adaptive and innovative capability of firms.	Advanced Skills have a **positive and significant impact** on absorptive capabilities only. A majority of the firms use high technology developed in more advanced countries. Hence, most of the advanced skills provided to workers are to use high technology to improve productivity and efficiency. As such, most of the advanced skills set acquired is to improve absorptive capability only.
Knowledge culture has a **positive and strong impact** on all three dynamic capabilities. Most of the firms from advanced countries run flat and lean organisations with very highly skilled workforce using high technology to undertake most of the operations. As such, these firms provide support and training to all workers to ensure they have the required skill set to enhance their efficiency and productivity.	Knowledge culture has **no impact** on the three dynamic capability components. The local transportation firms tend to be relatively more labour intensive. Only the larger firms tend to use more sophisticated technology and systems. Very little resources are invested to increase the knowledge level and in many firms the knowledge culture is not present.
The continuum from absorptive capability to adaptive capability to innovative capability is **present and strong.** In the advanced countries, there is coherence in the technology development initiative, business development plan and talent management strategy at all levels of the organisation. As such, the industry has very strong support to develop the absorptive, adaptive, and innovative capability of workers.	The continuum from absorptive capability to adaptive capability to innovative capability **is present.** The transportation industry is relatively labour intensive and much of the absorptive, adaptive and innovative capability operates at lower levels of knowledge intensity due to the level of capability of the talent pool. There are segments of the local firms that part of the foreign firms supply network in providing services and support to foreign firms. These local firms adopt more innovative and creative solutions to extend their market reach. The local transportation and logistics cluster network is fragmented - as such, it operates at a much lower level of operational efficiency than the industry in more advanced countries.

The impact of dynamic capabilities on economic outcomes in the transportation service industry are summarised in **Table 14.4.**

Table 14.4: Dynamic Capabilities and Economic Outcomes for the Transportation Service Industry

Advanced Countries	Malaysia
Adaptive capability has a **positive and strong impact** on process improvement and a **positive and moderate impact** on product market development. The firms in the industry continuously adapt new technology and knowledge to improve the quality of services. As they derive improvements in their service, the information is then transformed into knowledge to improve their technology and systems. The knowledge is then codified and productised for others to improve their production processes.	Absorptive capability has a **positive and strong impact** on product market development. The local firms tend to use technology and transport management systems developed by foreign firms. The knowledge obtained from the foreign firms is then used to develop products and services that cater to the domestic market. Some of the local firms also are efficient and are able to become local service providers for foreign global players. The quality of service and innovations by local firms are linked to their quality of talent pool and resources they invest to acquire the best technology. Most of the larger local players are in a better position to create new markets for themselves both locally and in partnership with foreign players.
Innovative capability has a **positive and strong impact** on process improvement and a **positive and very strong** impact on product market outcomes. High investments in R&D and talent development in the advanced countries in the transportation industry enhance both product and process improvement. Basic research in other discipline areas such as ICT, engineering, urban planning are translated to applications for the transport and services industry. Research centres tend to foster multi-disciplinary and inter-disciplinary R&D activities that are relevant to the local industry.	Innovative capability has a **strong impact** on process improvement only. Innovative capability **does not impact** product market outcomes. The local firms tend to use new transportation technology and innovations from more advanced countries to improve cost-efficiency, service quality and meet domestic market demand. However, lacking ownership of know-how, IPs and patents, many of the firms are unable to create new products. Firms who are able to create IPs do not have the resources to file and maintain their patents. Hence, tend to sell of their innovations to larger firms with greater commercialisation potential.
Process improvement **positive and moderate impact** on product market outcomes. Very sound S&T base in these countries have had a positive spill-over benefits to the transportation industry in the form of development of new innovations for the transportation industry. These innovations have several spill-over benefits in the form of development of more cost transportation and creation of new IPs that have high commercial value.	Process improvement **does not impact** product market outcomes. Firms in the transportation industry are users of advanced technology from foreign firms. Lack of ownership of IPs or lack of resources to maintain patents and commercialisation opportunities both hinder local firms from creating new products from home-grown innovations.

14.8 Summary: Key Trends, Challenges, Way Forward and Best Practices

14.8.1 Industry Trends

The transport services industry has undergone major transformation on both the demand- and supply-side. On the demand-side, opening up the marketing to international trade, foreign direct investment and robust economic growth in the region has increased the demand for transportation for goods, services and people. On the supply-side, incorporation of new innovations and technology in the transportation services has enabled firms to increase their productivity, efficiency and global foot-print.

The transportation services industry is a key enabler for economic development. Under the previous five-year economic plans, the Malaysian Government has invested significant resources to improve the transportation system in the country. This was done by the provision of support to local players to drive the domestic logistic and supply chain networks and opening up the domestic industry to foreign players.

The MYKE III analysis show that while there has been significant improvement in the knowledge content of domestic firms, the level of knowledge generation among domestic firms was relatively lower than the foreign players. This is a major concern for several reasons; including the ability of local firms in meeting the aspirational needs of transforming the industry into a knowledge-driven industry and creating an efficient and competitive regional logistic hub. The development of the logistic and supply chain networks has an important impact on the competitiveness of other industries and also the ability to attract foreign direct investment that will transform Malaysia into a high-income economy.

14.8.2 Challenges

The transportation services industry is central to the Malaysia's economic development. An efficient transportation services industry is critical to the competitiveness of various industries. While there have been significant improvements in the transportation services ecosystem over the last two decades, the industry continues to face a number of challenges in enhancing its knowledge content. These challenges are discussed below.

Institutions:

- Lack of integration and coordination between the key stakeholders in the transportation services industry hinders systematic development of the local transportation industry (ports, rail and roads are not integrated sufficiently).

- The development of this industry has been ad hoc. Many of the initiatives in the industry have not incorporated best practices and sophisticated technology. The result of these weaknesses can be observed in major traffic congestion, bottlenecks and inefficiencies.

Basic Skills Development:

- The workforce in the transportation industry (in particular road transportation) is largely constituted by unskilled workers.

- Cost of training staff to use more sophisticated technology is high, hence a majority of the transportation services industry has low utilisation of advanced technology.

- Shortage of manpower due to the unattractive outlook of the industry – low paying salary, non-conducive working environment, long and odd hours.

Advanced Skills Development:

- There is a mismatch in the supply and demand of workers in this industry. Higher value-add jobs in this industry will require advanced skills in S&T, logistic supply chain management and management of complex transportation systems and technology.

- Cost of training is very high. Hence, employers do not invest in training due to 'talent poaching' in the industry.

- Senior management places little emphasis on training and development of skilled workforce which is essential to drive the industry to the next level of productivity and innovation.

S&T Knowledge:

- There is a high reliance on technology and innovations developed in more advanced countries.

- Lack the quantum and quality of R&D personnel and mentor in the industry, leading to low levels of local S&T development.

- Low utilisation of modern logistic systems and integrated solutions by the local industry – hence the industry remain labour intensive.

- Larger firms within the industry spend extensively in training held abroad as we lack training facilities and the industry/technology "know how" locally. SMEs are unable to access these training programs due to the costs involved.

Market Intelligence:

- Lack of investment in talent and technology hinders firms from gaining access to valuable market intelligence.

- Firms, especially SMEs also are not well networked with the global players; hence, do not gain access to vital market information.

- Many of the firms do not attend key local and international industry forums, conferences and seminars to learn about market trends and changes taking place in the transportation services industry.

- Knowledge transfer and information flow about the state of the local and regional market environment from trade associations to firms is weak.

Knowledge Culture:

- Labour intensive industry with low reliance on technology and sophisticated transportation models and systems.

- Very few resources are invested into knowledge development or promotion of knowledge culture within firms and industry.

- The industry is plagued by market failures such as rent-seeking behaviour that diminishes the efficiency and competitiveness of the industry. Varying governance of firms within the industry leads to constant confusion of practices, procedures and policies. Some sectors in the industry are led by the government, some by corporations whilst some are privately owned.

14.8.3 Way Forward

A sound transport service industry is a key catalyst for the competitiveness of other industries, especially export-oriented industry. To ensure the transportation service industry plays a key enabling role of transforming Malaysia into a regionally competitive economy, major institutional and structural changes need to be undertaken. These are outlined below.

Recommendation 14.1: Improve Governance for a Smart Intelligent Transportation Ecosystem (SITE)

- Establish a clear governance structure that unifies the management of multiple modes of transportation services.

- Develop a clear 5-year transportation strategic plan that will ensure seamless integration of all modes of transportation using advanced technology.

- Effective coordination and communication between all government agencies and relevant enforcement bodies to ensure greater harmonisation, transparency, efficiency, and simplification of regulations that govern the transportation services industry.

- Closer cooperation and collaboration with regional economies to harmonise transportation policies and regulations so as to ensure Malaysia is part of the global regional and global transportation network.

- Trade associations in partnership with other key stakeholders provide a "One-Stop Centre" to provide smaller firms support to internationalise their operations in the ASEAN region, especially providing guidance on the different regulations, rules and custom requirements.

- Key government agencies and industry associations should work closely to brand, promote and position Malaysia (especially KLIA 1 & 2, Subang and Port Klang,) as the preferred aerospace corridors and logistic hub in the ASEAN region.

Recommendation 14.2: Nurturing Creative Talent for a SITE

- Increase the number of training programmes and courses that will increase the quantum and quality of talent in a wide spectrum of areas that will enhance the competitiveness of the industry. This includes the use of advanced logistic systems, smart transportation systems, entrepreneurship, marketing, branding and use of e-platforms to improve firm level efficiencies and market reach.

- Courses offered by the transportation industry should internationally accredited programs with leading global institutes so as to ensure local talent have the knowledge and expertise to assist local firms to meet international standards and best practices.

- Regular dialogues and discussions should be organised by MOT between all stakeholders to ensure the quality of human capital development not only meets the needs of the current industry requirements, but also assists to transform the industry to leap-frog to a more advanced and sophisticated industry, as in some of the pace-setter countries such as Singapore, Hong Kong and Korea.

- Establish a university or a faculty within a public university in Malaysia to focus on training the next generation leaders for the industry, covering undergraduate, postgraduate and doctoral courses.

Recommendation 14.3: Intensify R&D to Nurture the Development of a SITE

- Establish a Centre of Excellence (CoE) in a local university jointly with industry to develop next generation transportation models and systems using advanced communication technology, big data analytics, new apps and halal supply chain management system.

- The CoE should be a key centre for training the next generation researchers; and be an incubator for testing new logistic models, apps and knowledge management systems & tools.

- The CoE should also be part of the global network of centres of excellence in the transportation services industry to be able to gain access to frontier knowledge in the field. It should be an important knowledge resource and market intelligence for the local transportation industry.

14.8.4 Best Practises

The Malaysian Government Transformation Program has outlined six National Key Result Areas and one of them specifically focuses on the upgrading of transportation services to be more knowledge intensive. To achieve this objective, the industry should adopt some of the best practices implemented in some of leading transportation hubs. Some of the best practices are discussed in this section.

Best Practice 14.1: Improve Governance for a Smart Intelligent Transportation Ecosystem (SITE)

Singapore's Seamless Integrated Transport and Logistics Network

- Transformed a backwater nation into a strategic location for commerce and trade by a focused plan to develop its ports and airport as one of the most sophisticated, efficient, transparent and busiest in the world.
- Strong supply chain manufacturing network is supported by 20 of the 25 leading Third Party Logistics firms.
- The network is also supported by 9000 logistics and supply chain management companies located in Singapore.
- The transportation services industry is supported by one of the most advanced telecommunication network, consumer information systems, e-Government, enterprise technology and interactive digital media.

Best Practice 14.2: Nurturing Creative Talent for a SITE

Korea National University of Transportation

- This institution has been in existences since 1905 and played a key role in transforming the railroad, shipping, road systems, air travel, ports and airports as one of the most advanced and competitive in the world.
- Provides undergraduate, postgraduate and doctoral training in transportation planning and engineering systems, including covering areas, such as improvement of traffic congestion, safety, eco-friendly and high speed transportation.

Best Practice 14.3: Intensify R&D to Nurture the Development of a SITE

Institute of Transportation Studies – University Berkeley, USA

The Institute hosts leading research centres that works closely with industry to power the next generation innovations in the transportation service industry:

- *California Partners for Advanced Technology (PATH)* – world's leading intelligent transportation system since 1986. Key focus areas include: transportation safety, efficient & integrated traffic operations, environmental friendly vehicles and improving traffic congestion.
- *National Centre of Excellence for Aviation Operations Research (NEXTOR)* – lead aviation research, covering air safety, aviation economics and air traffic management & control.
- *Safe Transport Research and Education Centre* – focus on research related to transportation safety issues.
- *Centre for Future Urban Transport* – developing innovative & sustainable urban transportation models, policies and technologies.

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CHAPTER 15

KNOWLEDGE CONTENT OF THE FINANCE INDUSTRY

CHAPTER 15
Knowledge Content of the Finance Industry

15.0 Introduction

The finance industry is an important industry for sustained economic development of Malaysia, both as a sector on its own and as an enabler of other industries in the country. The financial services industry shares a long development history and has been critical to the transformation of the Malaysian economy. From around the early 1900s, excess profits from the prospering rubber plantations and tin industry led foreign banks to open branch operations locally. By 1913 the first Malaysian bank Kwong Yik (Selangor) Banking Corporation, now known as Malayan Banking Berhad, was set up to meet the growing needs of emerging enterprises.

Over the last two decades, the finance industry in Malaysia has intensified its development to cater for a more open, competitive and knowledge intensive economy. The Malaysian financial services today have become more integrated with international financial systems and global markets, enabling the Malaysia economy to transform into a higher value-added high-income economy. At present, the financial services industry is constituted of banking intermediaries, insurance companies and capital market intermediaries. Oversight and regulation of the industry is provided by Bank Negara and the Securities and Exchange Commission.

The Malaysian financial services industry is well balanced; significant credit intermediation by the banking industry has been complemented by capital market development through provident and pension funds. Combined with a mix of positive macroeconomic conditions, strong regulatory guidance, legal provisions and carefully developed government initiatives, the industry has witnessed rapid growth. Guiding these developments are a number of blueprints, central among them being the Financial Industry Master Plan (FMSP) and the Capital Market Master Plan (CMP) created following the aftermath of the Asian Financial Crisis of 1997. More recently, the Financial Sector Blueprint 2011-2020 set the directions for the Malaysian financial industry.

The financial industry consists of banking services, capital markets and the insurance industry. The Malaysian banking industry services has sound fundamentals. Its relative insularity in specific submarkets has allowed the country to weather the 2008 global financial crisis relatively well. Stability is underpinned by healthy capital and liquidity positions. In 2014, Bank Negara stress-tested Malaysian banks and concluded that the current financial health of Malaysian banks would allow them to handle shocks of a level greater than those arising of the 2008 financial crisis. Reports by the International Monetary Fund [IMF] (2014) (Financial Industry Assessment), Bloomberg (2014) (World's Strongest Banks) and Moody's (2014) (Banking System in Malaysia Outlook) affirmed the soundness of the Malaysian financial system.

Malaysia also is one of the very few countries in the world that has a dual banking system - the conventional and Islamic banking systems. The latter system has enabled the nation to further internationalise the financial industry. Malaysia is regarded as an international Islamic finance centre. Malaysia has the second highest global Islamic fund assets of 25%, only behind Saudi Arabia, which accounts for 40% of the global Islamic financial assets (Islamic Financial Services Board [IFSB], 2015). In terms of banking asset, Islamic banking system accounts for 21.9% of the domestic banking asset and 9.6% of the global Islamic banking asset (Islamic Financial Services Board [IFSB], 2015).

Currently Malaysia has 27 licensed commercial banks, eight of which are locally owned. There are also 16 Islamic banks operating in the country, and five of these are international Islamic banks. Foreign banking franchises originate largely from the UK (e.g. HSBC), Singapore (UOB, OCBC) and the Middle East. Despite the presence of a number of banks, the industry remained relatively concentrated due to limits (number of branches, location, etc.) imposed by the Islamic Banking Act of 1983 and Financial Institutions Act, 1989.

Malaysia's capital markets have exhibited strong growth over the last decade, registering double-digit figures. According to Bursa Malaysia, market capitalisation hovered around RM1.8 trillion between July 2013 and June 2014. Quantitative easing in the developed Western countries raised some concern in Malaysia and the region over potential outflows. The impact however was not as pronounced as initially feared, with demand for Malaysian equities remaining robust.

There have been 74 new listings on the Bursa Malaysia since 2011 (ETP Annual Report, 2014). Bursa Malaysia noted 17 IPOs in 2012 and 2013 with the exchange raising RM22.9bn (US$ 7.15bn) and RM8.2bn (US$ 2.56bn) respectively, and 14 IPOs in 2014 raising RM5.87 billion. The year 2012 was exceptional as a number of very large listings emerged, such as the sale of the palm oil producer Felda Global Ventures with the value of RM9.93 billion, or US$3.1 billion, making it the second largest global offering since Facebook in 2012. There have been other large IPOs too, such as IHH Healthcare at RM6.3 billion (US$1.97 billion).

Despite these positive developments, there remains considerable room for improvement. One of the main issues faced by the Malaysian markets is the lack of internationalisation. Foreign institutions accounted for 26.32% of Bursa Malaysia shares trade in 2014. However, most listings made on the exchange are by local enterprises. According to World Federation of

Exchanges, a decade ago Bursa Malaysia had four foreign listings but only managed to reach ten foreign listings by 2014.

The insurance industry, like banking, has long history in Malaysia. Historical records suggest that the Union Insurance Society of Canton was probably the first to be set up, around the mid-1800s, offering fire insurance as a primary service in Penang. British and US companies were the major players in the early 20th century, and foreign entities accounted for more than 95% of the market share in the mid-50s and early-60s. The introduction of the New Economic Policy (NEP) in 1971 changed this landscape by encouraging local ownership. By 1987, 41 foreign insurers had been transformed into 31 Malaysian companies. Regulation was loose and capitalisation weak until Bank Negara took over the supervision of the industry from the Ministry of Finance in 1987. With the introduction of the new Financial Services Act (FSA) in 2013, which replaced the Insurance Act 1996, the industry is now tightly regulated, stable and well-capitalised.

The insurance industry, despite its long history, comprises only around 6% of the country's financial assets based on IMF estimates and 0.9% of the nation's GDP. The insurance industry remains fragmented and requires considerable product enhancement to align with more topical market needs. Car insurance is the largest segment, followed by fire insurance, with personal insurance still registering low activity. In 1991, there were 91 direct insurers and by 2014 this had fallen to 33. From these, 19 provide general insurance, nine for life insurance and five providing a combination of both. Further shake-up and consolidation of the industry is likely to occur as FSA controls begin to exert pressure on non-compliant or uncompetitive entities.

Besides insurance agencies, the Central Bank approved banks as an alternative channel for such services since 1993. Bancassurance has been gaining popularity and Bank Negara estimated it to account for about 16% of new premiums in 2013.

The government is taking strong positive steps to foster growth of the insurance industry, through an ETP initiative to have 75% of the population insured by 2020. Both expansion and inclusion are stressed as part of this initiative, under programs such as the Financial Services Entry Point Project 5 and 1Malaysia Micro Protection Plan, which permits low-income individuals access to insurance plans at as low as RM20 per month.

In summary, the financial industry has undergone major transformation over the last two decades. In this chapter, the state of knowledge content of the industry is assessed and knowledge ecosystem of the financial industry is measured. The financial ecosystem of Malaysia and other developed countries are benchmarked in this chapter. Key success factors and gaps in the Malaysian financial industry are identified. Strategies to strengthen the financial ecosystem are discussed in this chapter.

This chapter is structured as outlined below. In Section 15.1 key developments in the Malaysian financial sector are discussed. In Section 15.2, the key blueprints of the knowledge ecosystem for the finance industry are benchmarked for the three MYKE periods. In Section 15.3, detail patterns in the knowledge enablers for the three MYKE periods are discussed. This is followed by detailed discussion on the knowledge enablers, knowledge actions, dynamic capabilities and the outcome of the dynamic capabilities for the three MYKE periods in Section 15.3, 15.4, 15.5 and 15.6, respectively. The complex relationships between the knowledge enablers, knowledge actions, dynamic capabilities and economic outcomes for the finance industry in Malaysia are discussed in Section 15.7. In this section, the finance knowledge ecosystem for Malaysia is benchmarked against those in more advanced countries. Finally, in Section 15.8, a summary of the findings, key success factors, challenges and way forward to move the Malaysian finance industry up the knowledge global value chain are discussed.

15.1 Key Developments and Initiatives

In this section, key developments and initiatives to strengthen the resilience of the financial industry are discussed. These include regulatory reforms undertaken, measures to reduced household debt, development of the bond, equity markets and venture capital industry, better management of pension funds, creating an environment for a globally competitive Islamic banking industry and nurturing the next generating talent that will move the Malaysian finance industry up the global innovation value chain.

Regulatory Reform:

The Financial Service Act (FSA) enacted in June 2013 consolidates and supersedes all previous associated regulations (the Banking and Financial Institutions Act 1989, the Insurance Act 1996, the Payment Systems Act 1989 and the Exchange Control Act 1953). It has increased the capacity of the central bank to shape the industry through greater scrutiny and good governance. The aim of the FSA is to ensure that the operating strength of financial institutions, transparency of management and accountability of staff are altogether at acceptable levels. Under the act, Bank Negara can influence and intervene in matters relating to staffing, operations, and mergers and acquisitions within the industry.

Reducing High Rate of Household Debt:

Whilst the underlying financial system is sound, Malaysian debt to GDP ratio hit a record high of 86.8% in 2013, making it the highest in South East Asia. According to Bank Negara, GDP grew at 10.4% whilst household debt grew by 12.7%. Household debt is estimated to be seven times annual income, making it a cause for concern, especially if interest rates rise. This prompted Bank Negara to institute a range of macro-prudential measures to get the spiralling growth in consumer lending under control. Among the initiatives include establishing a comprehensive consumer education and assistance system such as the Credit Counselling and Debt Management Agency (AKPK), Financial Mediation Bureau and the Bank's Integrated Contact Centre. These facilities provided advisory services for consumers and firms on responsible financial planning and decision-making. By 2014, these measures had yielded some results, and curbed household debt growth to 11.7%.

Bonds and Equities:

In order to build and strengthen its existing capabilities and position itself globally and within ASEAN, Bursa Malaysia initiated a number of programs for product development and enhanced service delivery. Among them include the following:

- to improve clearing and settlement of outbound trades, Bursa Malaysia introduced a single contact point ASEAN Post Trade Services facility in August 2014.

- to improve the product and service range, 2014 saw the launch of MyETF Malaysia Islamic dividend, RDB Palm Olein Futures Contract (FPOL) and a 5-Year Government Securities Futures (FMG 5).

- to improve governance and social responsible behaviour, the Bursa Malaysia introduced the Environmental, Social and Governance Index (ESG) in December 2014. This will help promote to the growing body of socially responsible investors and funds.

Equity, Venture Capital and SME Financial Support:

The reforms undertaken in Malaysian financial over the last decade also provided a varied of financial support for increasingly diversified economy. A number of initiatives have been set in motion to provide financial support to strategic industries, and targeted especially at SME firms developing capabilities to move up the value chain and venture capital to enhance innovative capacity of Malaysian firms. Development Financial Institutions (DFI) are at the forefront of this initiative. DFIs work under the Development Financial Institution Act (2002), which is presently being amended to ensure that DFIs are focused on promoting a sound, progressive and inclusive financial ecosystem that supports the government's strategic industrial development to transform Malaysia into a high income economy.

Private Pension Funds:

The Malaysians pension system is administered by the EPF, founded in 1951, covering all private and public industry employees without civil servant pensions. The mandatory contribution rate is 11% with no maximum, of which 0.5% goes to social insurance. About 52% of the labour force is covered by EPF. Even though it provides a good base, the EPF is unable to adequately make provisions for the nation's aged population and higher cost of living. To address the issue, encouragement has been provided to Private Retirement Schemes (PRS) as a supplement to EPF. As a voluntary scheme PRS gives control to individuals to make adequate provision for retirement at their own discretion. Currently, there are eight providers running a total of 44 retirement funds. These funds boost the nation's capital market liquidity. The Securities Commission working with Private Pensions Administrator have been actively promoting PRS through roadshows and exhibitions. Younger people are particularly encouraged to become aware of the issue and take early steps to avoid any problem as they reach retirement age.

Islamic Finance:

Malaysia is the undisputed leader of Islamic finance. Though there were earlier initiatives such as the Pilgrims Management and Fund Board, the blueprint of Islamic banking in Malaysia was marked by the enactment of Islamic Banking Act and Government Investment Act in 1983. In July 1983, Bank Islam Malaysia Berhad came into being offering financial services based on Shariah principles.

Malaysia operates a dual system, in which Islamic banks operate and compete directly for loans and deposits with conventional banks. The government played a key role in nurturing the industry through the previous *Financial Services Industry Master Plan (FSMP) 2001-2010*, and presently the *Financial Industry Blueprint (FSB) 2011-2020*. Before 2001, Malaysia had only two Islamic banks but the number grew significantly under the FSMP and FSB. The industry now has 16 Islamic banks, among them the largest in the world in terms of assets. RHB Islamic, Maybank Islamic and Kuwait Finance House (Malaysia) are three of the biggest. From these, six are considered to be international (not locally integrated) and have their operations restricted to non-ringgit businesses for non-residents. Additionally, Malaysia has 12 registered Takaful insurance operators.

Over time, the country has developed a sophisticated Islamic ecosystem comprising of financial institutions, universities specialising in Islamic finance, as well as accreditation and standards bodies overseeing development of Shariah-compliant financial products and services. In 2013, the Islamic Financial Services Act was passed in order to prevent a range of malpractices, such as arbitrage in the Takaful industry. Accompanied by heightened punitive measures for non-compliance, the Act will tighten the level of supervision and control of the industry.

By 2014, Malaysian Islamic Banking has reached significant performance milestones. Islamic finance assets account for 25% of the financial market. Malaysia presently services 56.9% of the global sukuk outstanding. In the first half of 2016 Malaysia's sukuk volume was registered at US$40 billion (New Straits Times Online, 2016). On the insurance side, the penetration level for family insurance sits at around 54% according to Bank Negara estimates, suggesting considerable opportunity within the domestic market for takaful operators. To provide insurance to low income groups, personal cover and property cover are provided through micro-insurance and micro-takaful initiatives.

While Malaysia enjoys a strong position, it is being challenged by a number of global incumbents. The Dubai International Financial Centre, set up in 2004, has set its sights on becoming the capital of Islamic finance. Others, such as the city of London, are also looking to assume this mantle given their strong financial credentials and representation of global brands in their jurisdiction.

Talent Development:

Human capital and talent development are critical to move the finance industry up the knowledge and innovation value chain. One of the earliest training centres established to cater for the industry was the Malaysian Insurance Institute (MII) in 1968, which provided training programmes for professionals that were employed in the insurance and related industries. In 1977, the Institute of Bankers Malaysia (IBBM) was established to ensure that manpower for the industry had the relevant skills set that were required by the industry. Trainings were introduced to ensure that manpower for the industry kept pace with the rapidly changing industry. As more resources and support was provided to transform Malaysia into a global hub for Islamic banking and finance, the government established the Islamic Banking and Finance Institute Malaysia (IBFIM) with the objective of establishing a reference centre for practitioners, researchers and academia.

From 2003 onwards, a series of talent management strategies were introduced to ensure that the finance industry not only produce adequate number of workers for the industry, but also the talent that will power the next generation innovations, products and services that are globally competitive. In 2003, the International Centre for Leadership in Finance (ICLIF) was established to train senior managers in strategic and leadership management areas. In 2006, the International Centre for Education in Islamic Finance (INCIEF) was formed to ensure the industry had adequate talent and skilled workers for a dynamic and robust Islamic finance industry. In 2007, to ensure that the top local graduates have adequate foundational knowledge for the rapidly changing financial sector, the Financial Sector Talent Enrichment Programme (FSTEP) was introduced.

To further enhance innovation and new product development in the Islamic finance area, the International Shariah Research Academy for Islamic Finance (ISRA) was established in 2008 to promote and enhance research in Shariah and Islamic finance areas. The Malaysian government also recognised the importance of corporate boards in creating a knowledge culture in an organisation; the Financial Institutions Directors' Education Programme (FIDE) was introduced in 2008 to expose corporate boards in financial institutions to global best practices in corporate governance, risk management and other strategic development of the financial institutions.

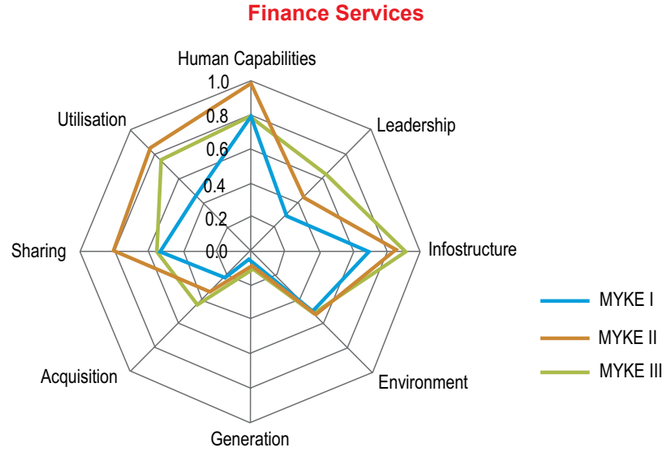
In 2009, the Asian Institute of Finance (AIF) was established to develop a talent pool in a wide range of financial services, encourage thought leadership, produce high quality applied research and play an advocacy role in enhancing professional standards and ethics in the industry. To raise the standards of human capital development for the finance industry, AIF in partnership with Asian Institute of Chartered Bankers, Islamic Banking and Finance Institute Malaysia, the Insurance Institute and Security Industry Development Corporation jointly develop content and delivery of professional qualifications for the industry. In 2010, ICLIF was assigned to oversee all FIDE programmes, from designing, managing and delivering the programmes for the various stakeholders in the finance industry.

15.2 Knowledge Content

The mapping of the knowledge ecosystem for the finance industry was based on the following samples for the three MYKE studies, respectively: 59, 15 and 23 as shown in **Table 1.1.** The number of SMEs and large players for the three sample periods were as follows: (SME, Large) are (8, 51); (3, 12); and, (14, 9), respectively.

The finance industry's knowledge resource foundations have demonstrated measurable improvements over time the three MYKE periods. A number of observations can be made from Figure 15.1 concerning Knowledge Enablers and Knowledge Actions. Generally, there have been improvements in Leadership, Infostructure and Knowledge Acquisition from the MYKE-II to MYKE-III periods. The knowledge environment and knowledge generation have changed very little during the two periods. However, for Knowledge Sharing, Human Capabilities and Knowledge Utilisation have declined from the MYKE-II to MYKE-III periods. Detailed discussion for each of the blueprint of the finance knowledge ecosystem is provided in the following section.

Figure 15.1: Knowledge Enablers and Knowledge Actions for MYKE I, II and III



15.3 Knowledge Enablers

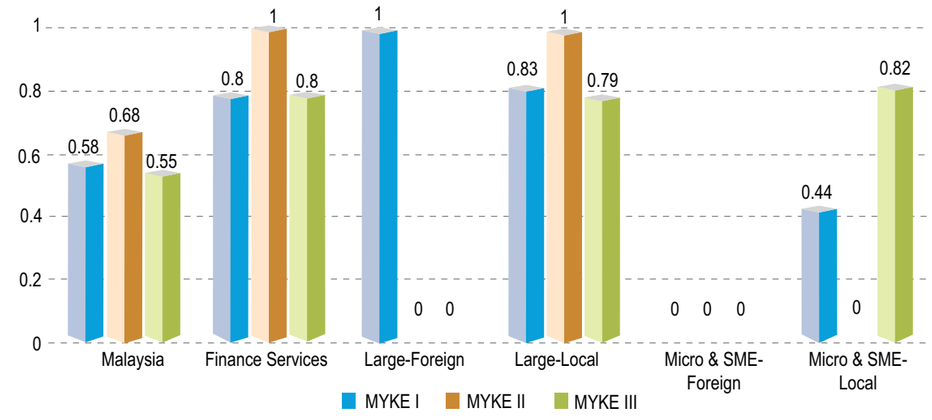
15.3.1 Human Capabilities

On the whole, human capabilities in the financial industry are higher than the Malaysian aggregate. They increased from 2003 to 2007 then fell subsequently. The driving force behind high human capabilities in Malaysia is the high skill requirement set by Bank Negara Malaysia for workforce participation. This has led banking and financial institutions of all types to invest heavily in procuring and developing their human resource assets.

Over the period 2003 to 2007 the large financial firms made the major move to improve upon their talent base, since the smaller institutions faced lower regulatory demands. However, as regulatory demands tightened in response to the global crisis, smaller players too were mandated to improve their skill base. **Figure 15.2** shows that in 2003, small financial service firms were lower than the Malaysian industry aggregate in their training and skill levels. By 2014 the small firms have developed their human capabilities through recruitment and training such that they now stand slightly above large firms with a performance index of 0.82.

In addition to regulatory pressures, a number of shifts are contributing to the change in human capability within and across the different strata/categories of firms. First, there is an increased level of competition for talent between firms culminating in talent poaching; second, changes in technology create a demand for improved and/or different skillsets within the enterprise, and; thirdly, ongoing talent drain from the country has seen the departure of highly qualified individuals to countries with better wage levels.

Figure 15.2: Human Capability of the Finance Industry

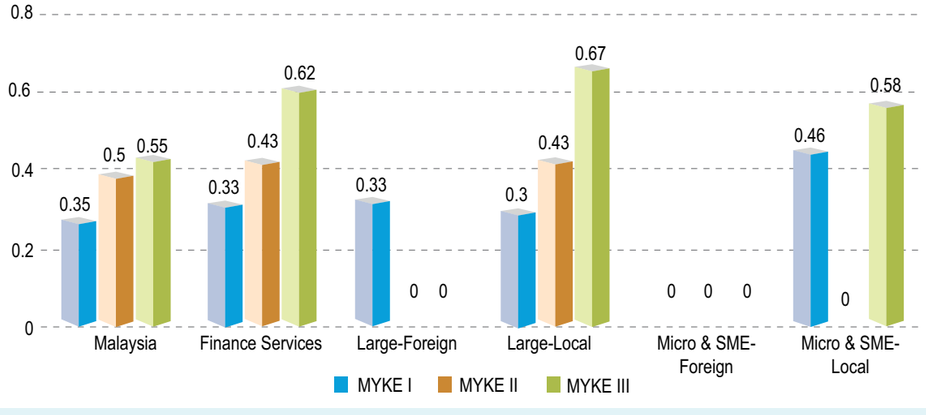


15.3.2 Knowledge Systems and Leadership

The performance of knowledge management and knowledge systems in the financial industry in Malaysia was low in 2003, but gradually increased to 0.43 in 2007. In both assessment periods, the sector was lower than the aggregate of Malaysian industry, suggesting the financial industry to be a laggard in introducing formal approaches to the management of knowledge. The industry was not focused on this issue, since its primary concern was legislative and operational matters. There was marked improvement between 2007 and 2014. Nonetheless; the industry improved at a faster rate than the Malaysian industry as a whole overtaking the latter with a performance index of 0.62 versus the 0.55 nationwide aggregate. Once again the main impetus driving the improvement was government initiatives to improve knowledge capabilities and improve competitiveness of local institutions.

Driven by regulatory pressure, both large and small local firms have made strides in implementing knowledge systems and approaches to improve internal operations and customer services.

Figure 15.3: Knowledge Leadership in the Finance Industry



15.3.3 Technology and Infostructure

Even in as early as 2003 the financial industry was well-equipped with technology-based infostructure. Over the period 2003 to 2014 all financial institutions have further improved upon this high baseline. The most striking gains have been made by the smaller organisations which managed to perform on par with their larger counterparts by 2014. The shift towards improved technology and infostructure is in response to the changes in the external environment, in particular the consumers' shift to a digital lifestyle, and the lower cost structure through enabling technologies.

15.3.4 Knowledge Environment

The financial industry as a whole is highly engaged with the broader institutional knowledge environment. Firms operating in the industry must by default be aware of and follow the initiatives being taken by regulatory bodies. All institutions, irrespective of size or ownership show such awareness actively participate in the various directives and initiatives by government agencies. Oversight bodies such as the SEC and Bank Negara Malaysia work closely with associations to ensure sound progress and stability of the financial system. Specialist niche developments such as Islamic finance additionally rely on close collaboration with Islamic universities and institutes such as INCIEF. Once again the positive development is across the board for all organisation categories.

Figure 15.4: Technology and Infostructure of the Finance Industry

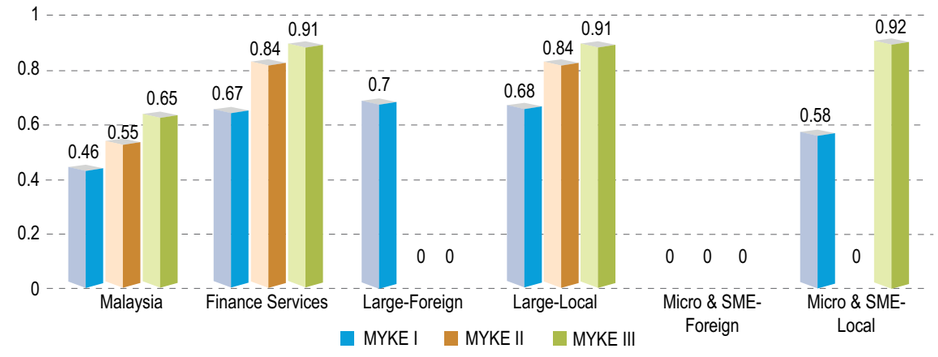
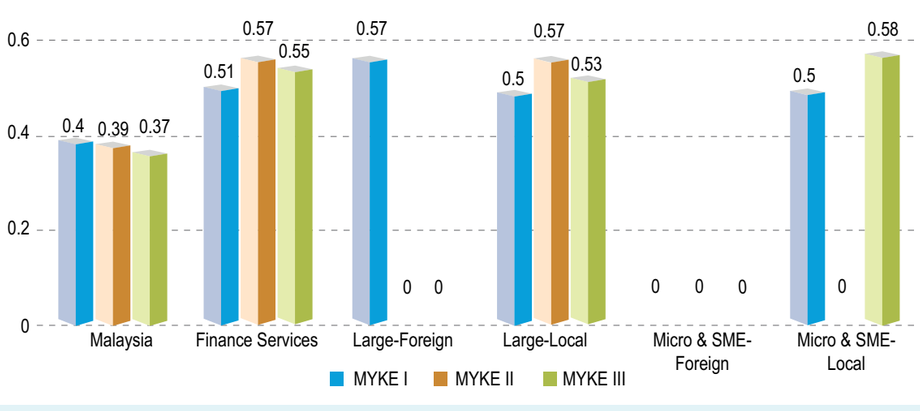


Figure 15.5: General Environment Awareness of the Finance Industry



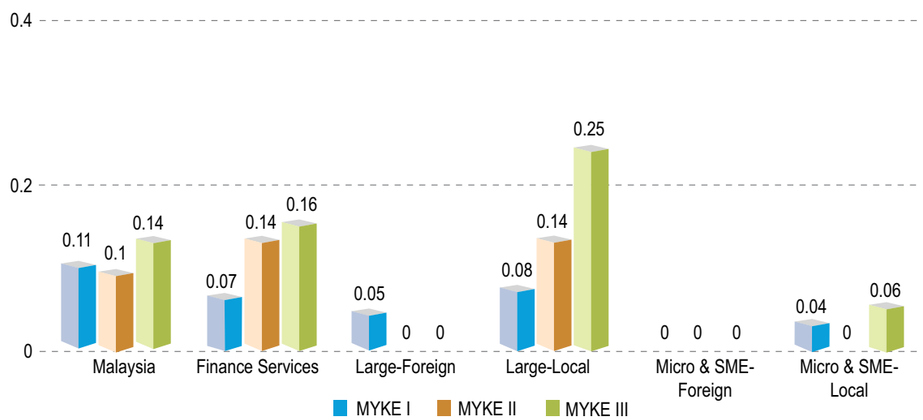
15.4 Knowledge Actions

15.4.1 Knowledge Generation

Comparison between the financial industry and the Malaysian aggregate in terms of knowledge generation reveals a lower initial emphasis on R&D related activities. By 2007 the focus on R&D had improved, exceeding the Malaysian industry average. Change was brought about by a stronger emphasis on developing new service products, and the competitive drive from strategic sub-industries like Islamic finance. Further improvement is observed in 2014, albeit at a smaller degree.

The drive to boost knowledge outputs and R&D was championed by large local financial institutions. Large institutions generally ran operations based on R&D in parent locations and locally-based ones have made major headway by nearly doubling their performance index to 0.25 in 2014 from 0.14 in 2007. Unfortunately, smaller local financial institutions did not make significant progress in this direction and remained at an unimpressive 0.06, a figure far below the Malaysian industry average.

Figure 15.6: Knowledge Generation Activity in the Finance Industry

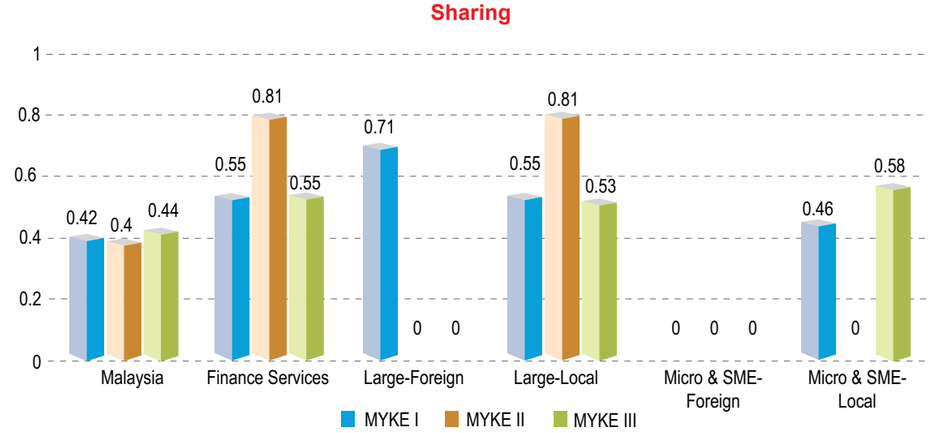


15.4.2 Knowledge Sharing

Knowledge sharing in the financial industry is considerably stronger than the Malaysian aggregate. There was a large positive improvement from 2003 to 2007, but the performance reverted to initial levels in 2014. A similar pattern of rise-and-decline by 2014 is observed in the large local institutions. Over the same period, local SMEs exhibited incremental improvement.

Large institutions were quick to implement knowledge sharing procedures and structures, in line with incentives and driving force of regulatory bodies. The fall in emphasis is likely due to the institutions shifting their focus to other challenges and also lower sharing between firms as competitive pressures became more evident from 2007 to 2014. Sharing continues, and is particularly visible in Islamic finance, where different competitors come together to present a united front in driving regulations and initiatives in collaboration with universities and other stakeholders. In contrast, competition within conventional product/services is intense and imitation was all too common. External sharing is therefore limited and internal sharing also protected, especially with high personnel turnover being a characteristic of the industry.

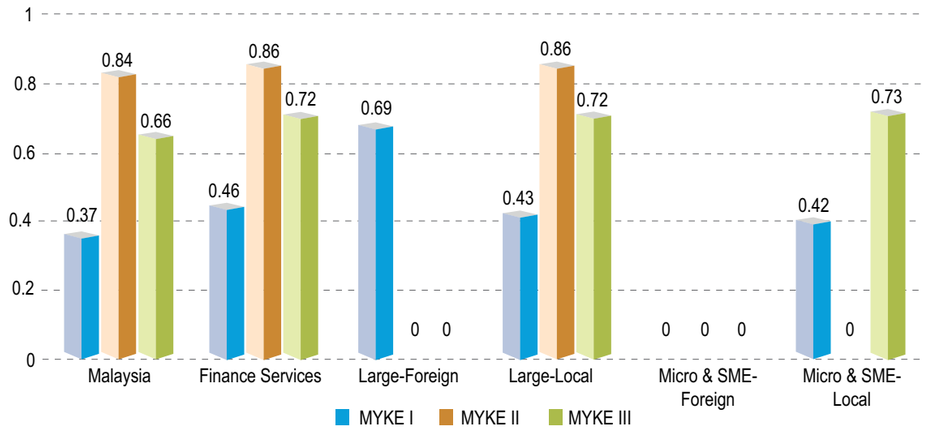
Figure 15.7: Knowledge Sharing Activity of the Financial Services industry



15.4.3 Knowledge Utilisation

All financial industry firms over the period of 2003 to 2014 have performed better in terms of knowledge utilisation, irrespective of the size or local or foreign origins. Between 2003 and 2007 large local institutions moved from 0.43 to 0.86, doubling their knowledge utilisation. By 2014 this figure had declined to 0.72. Small local institutions have shown significant improvement by 2014 with a score value of 0.73. Small institutions have made strong efforts to leverage upon whatever knowledge they possess to become more competitive in niche markets. This is indicative of a growing capability within the SME industry.

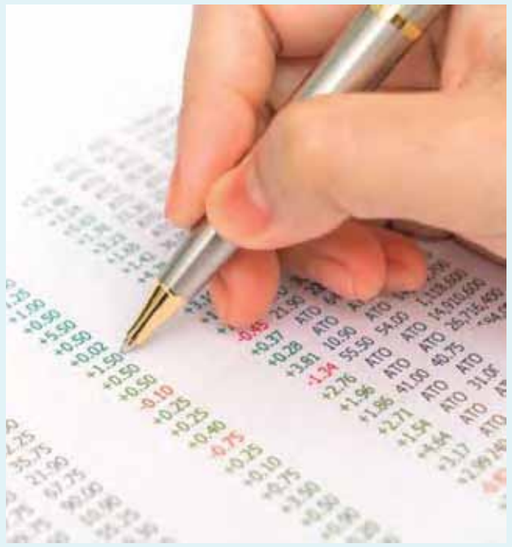
Figure 15.8: Knowledge Utilisation Activity of the Finance Industry



15.5 Dynamic Capabilities Profile for Finance Industry

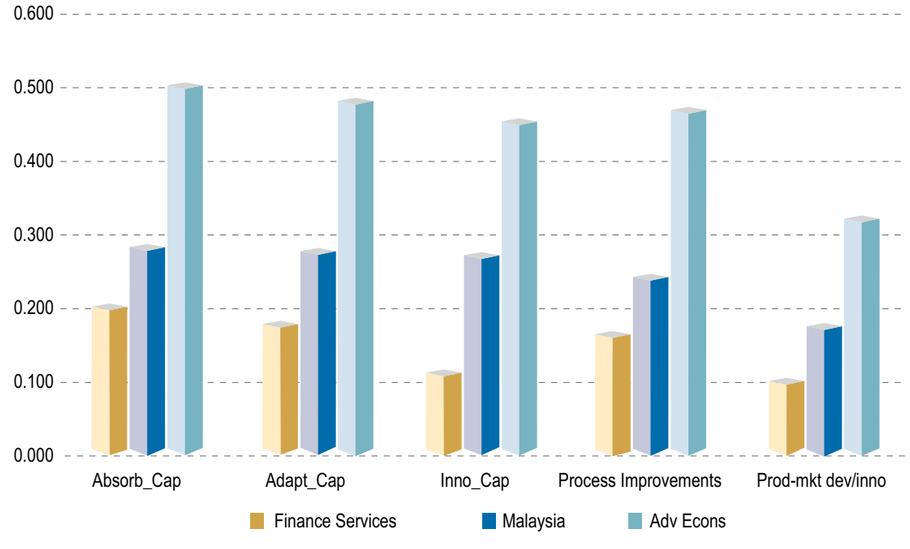
Dynamic capabilities underpin the ability of firms to succeed over time, especially within turbulent environments. Dynamic capabilities are particularly pertinent for granting the capacity for business renewal and regeneration under unstable markets, and are assessed through three measures: absorptive capability, adaptive capability and innovative capability. High level of possession of dynamic capabilities enables firm to adjust to the changing landscape of the market and competition.

Characteristically, the financial industry is heavily regulated by oversight bodies to ensure the stability of the system. In this respect, the Malaysian finance industry is robust and resilient against most economic volatilities. This soundness and stability has been built on a prudent approach to underlying financial fundamentals, with risk taking kept to minimum levels. A strict level of regulations creates a boundary around the level of innovation that is allowed within the system, in that innovations inherently carry elements of risk.



The finance industries dynamic capability profile and innovation outcomes are shown in **Figure 15.9.** Across all three dynamic capabilities, the finance industry's performance is lower than that of the Malaysian industry aggregate. This is reflected by weak improvements in operational processes and low product-service innovations.

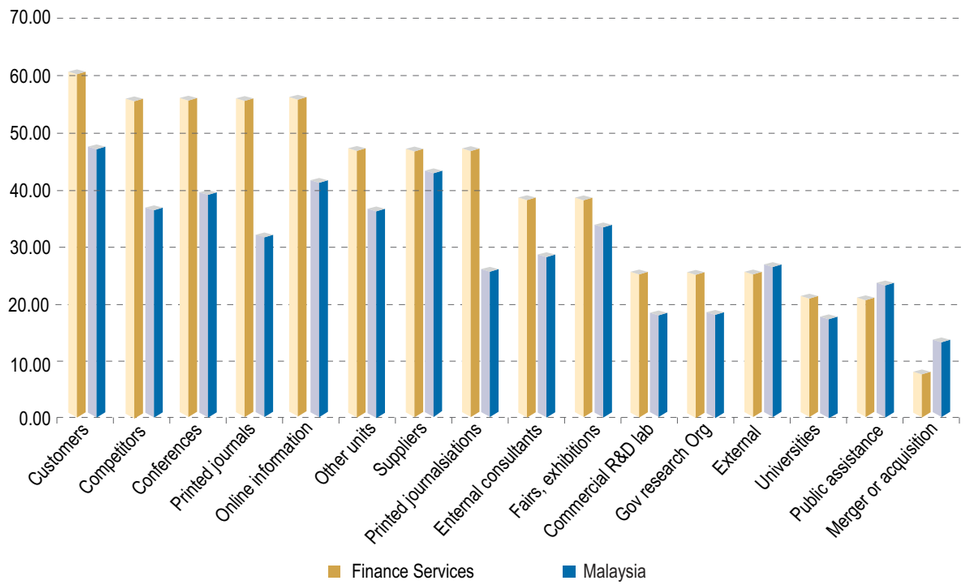
Figure 15.9: Dynamic Capability Profile of the Finance Industry



15.5.1 Absorptive Capability

Customers, competitors, conference, journals and online information are the top five sources of information for the finance industry (**Figure 15.10**). Generally, the industry performs well in sourcing information and knowledge from a range of external sources, and does so more actively than other firms in the Malaysian industry. Interestingly, however, the absorptive capability of the finance industry is lower than the average of other industries. This anomaly is indicative that although a high level of sourcing of information takes place, this is knowledge not well assimilated and disseminated within organisations.

Figure 15.10: Sources of Knowledge in the Finance Industry



15.5.2 Adaptive Capability

The skills profile employed by the finance industry shows a preponderance of individuals with business administration, computer science and software programming and general social science degree. This profile aligns with the general trends taking place within the financial industry. First, regulations necessitate individuals to have high level of expertise and qualifications in finance and its related fields, hence, the strong presence of business degree graduates. Second, there is a rapid movement to online banking, and this technological shift has led to increased demand for individuals with computing and associated technical skills. Additionally, the front-line nature of the service industry also creates higher than Malaysian industry aggregate demand for social science skills. Engineering and natural science degree-holders are also present but at much lower levels. The general skills base of the finance industry is comprised of highly qualified professionals, and this theoretically leads to strong adaptive capabilities. However, once again, as in the case for absorptive capability, poor utilisation of knowledge within the organisation impairs the adaptive capability of the financial industry, keeping it below the Malaysian industry average.

The finance industry is strongly supported by a variety of capability building initiatives arising out of government and associated institutional bodies (**Figure 15.12**). The majority of efforts in human capability building through these initiatives is around skills upgrading, especially in the areas of accounting, finance and taxation. Advice and help in strategic planning as well as support in market development are also key areas in which the government and related bodies play a role. A much lower focus is placed on operational and related matters.

Figure 15.11: Skills Profile of the Finance Industry

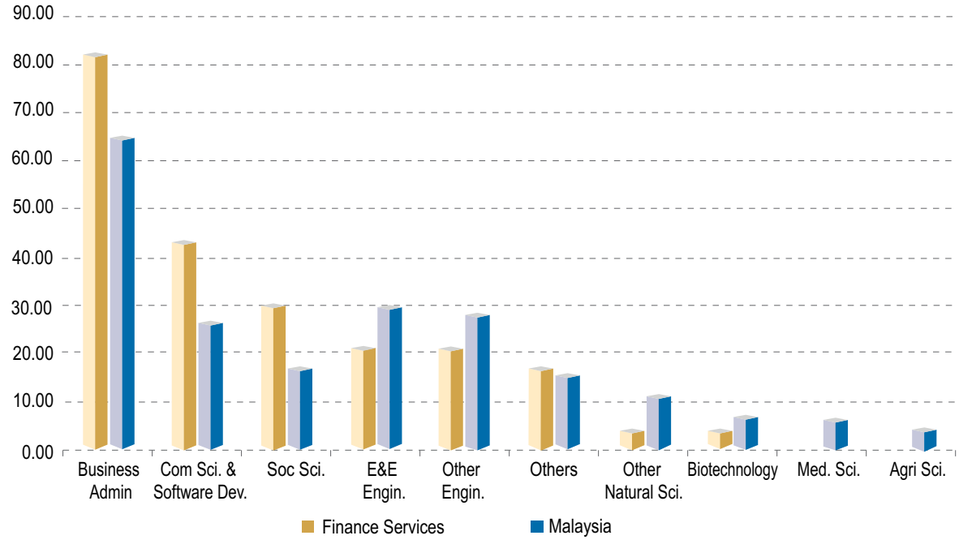
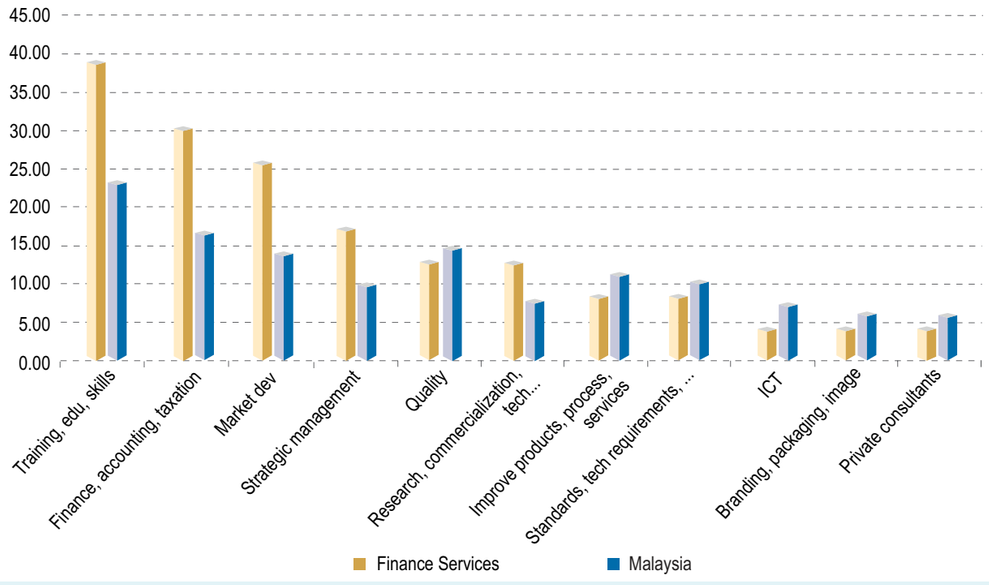


Figure 15.12: Role of Institutional Environment in Skill Building of the Finance Industry

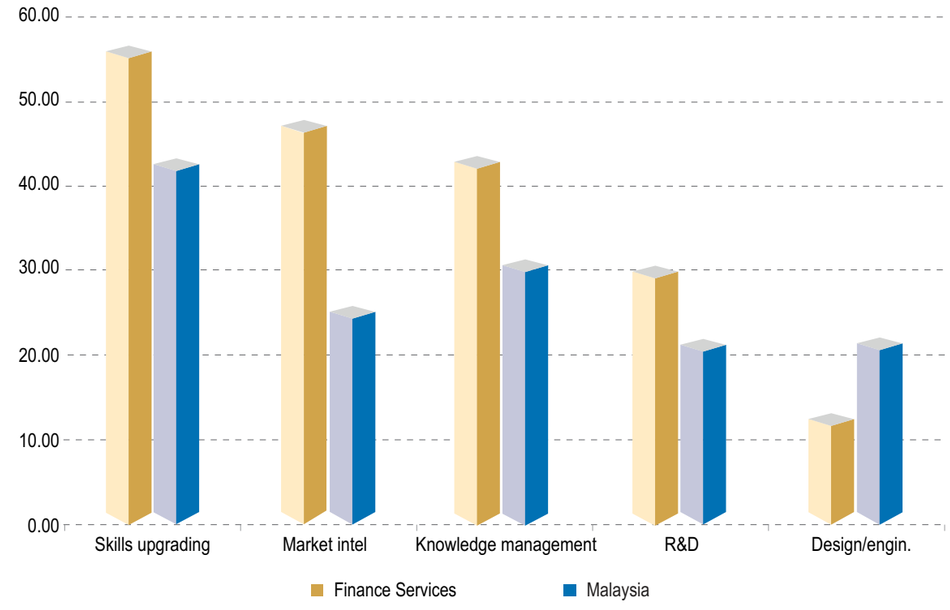


Despite having considerable support from government and related institutions, and possessing a highly qualified workforce, the Malaysian financial industry's adaptive capability is relatively low. One of the underlying factors for this is that within a highly regulated environment, fluctuations and change are minimised. This leads to lower emphasis placed on and lower commitment to change, with greater emphasis placed on stability, rules and tradition. Given the prevalence of these attitudes, it is unsurprising that despite considerable outlay in market intelligence as well as skills upgrading coupled with investment in knowledge management and R&D, little in the way of new product/services and market expansion is achieved.

15.5.3 Innovative Capability

From prior discussions, it is clear that investment in resources alone is insufficient for building competitive advantage. It is necessary to create processes that link information about market customer needs to internal processes to enable tangible innovation. Without a strong external drive or internal impulse to act on and monetise market intelligence, the creativity of human talent largely remains an untapped resource. Thus, it is unsurprising that organisations in the finance industry are unable to translate the high level of investment in their human and non-human resources into absorptive, adaptive or innovative capabilities, and hence fail to create higher operational efficiencies and market expansion.

Figure 15.13: Knowledge Intensive Activities in the Finance Industry



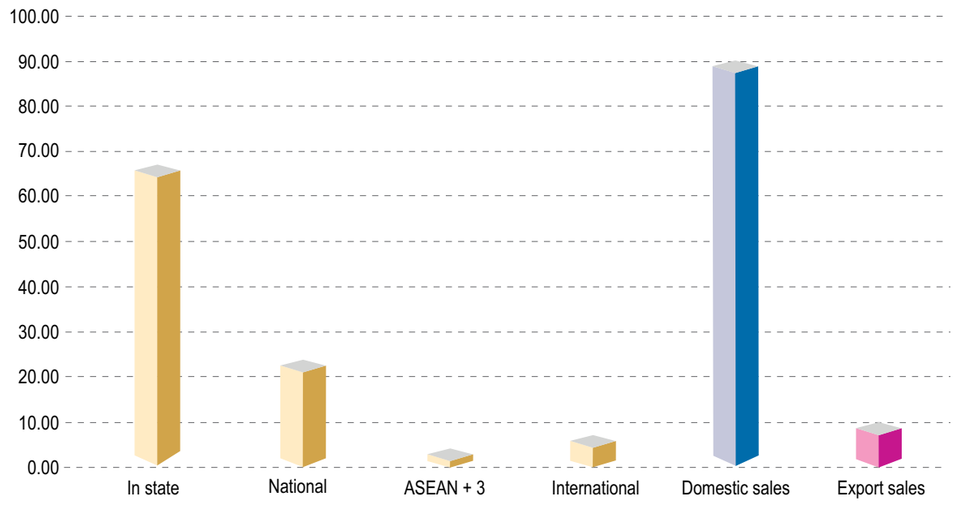
15.6 Outcomes of Dynamic Capabilities in the Finance Industry

Market presence of the Malaysian finance industry shows it to be strongly domestic market based with only a small footprint in the global and regional arena. The industry has been attempting to penetrate the ASEAN and international arena but the process has been slow due to differences in the regulatory environments of nation states. Despite the strong presence in the home market, Malaysian financial institutions are unable to compete effectively with the global financial players and the domestic incumbents of overseas markets, who leverage their size and/or local entrenchment to reap better returns and increase market presence.

The finance industry's strategic profile shows a high presence of Reactor (39.1%) firms. Analysers is the next largest group with 30.4% presence, followed by Defenders (17.4). Prospectors constitute the smallest group at 13.0%. The large presence of Reactor firms is worrying, since these organisations are deeply rooted in the past and tend not to provision for changes in their environment. With market liberalisation and technological shifts already on the horizon, these firms will be greatly challenged to overhaul their strategic mind sets. The number of Reactors is also much higher than Malaysian industry aggregate. The next largest group, Analysers are cautious and risk averse firms, who make transitions to new ways of doing things only after the flux in the environment has faded. In some sense, Analysers embody the characteristics of financial industry in their approach to risk and change. Defender firms are those that attempt for high quality provision in their selected market but disregard potential change. The main focus of these companies is not to innovate but control operations for effective high quality service delivery. Unfortunately their presence here is much lower than observed on the Malaysian industry average. The number of pace-setting Prospector firms that drive change is slightly lower than the Malaysian industry average, but their existence suggests potential for the future.

The Malaysian financial industry exhibits a number of strengths, particularly resilience to market volatility due to strong systemic fundamentals. The industry does nevertheless have weakness in its current dynamic capability profile. In part, the low level of dynamic capability possession arises from the proclivity to value stability over innovation. This feature has certainly helped in the building of a strong foundation. However, into the future, as advances in technology heralds in new forms of doing business,

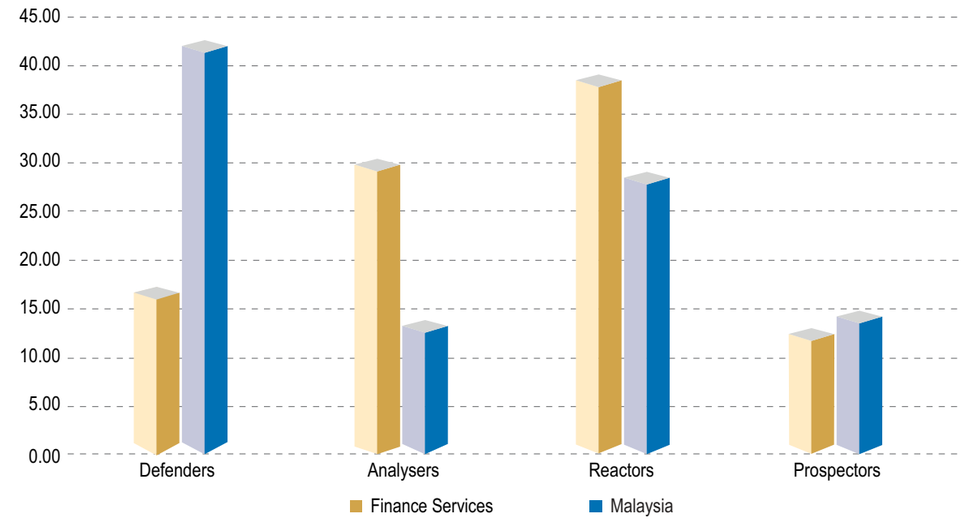
Figure 15.14: Market Presence of the Finance Industry



Note: The results are based on survey data.

the financial industry will need to adjust accordingly. In addition, the opening of the regional market through the Asia-Pacific Economic Cooperation (APEC), the ASEAN Economic Community (AEC), the Trans-Pacific Partnership (TPP) and other market liberalisations will also significantly increase the competitive exposures of the Malaysian financial industry. These factors present very significant pressures for change and innovation. Although dynamic capabilities were not a strong feature of the financial industry in the past, organisations must endeavour to remediate this gap and be able to face changes of the structural environment in which they operate lest they fall to irrelevance.

Figure 15.15: Strategic Profile of Firms in the Finance Industry



15.7 Relationships between the Key Blueprints of the Finance Knowledge Ecosystem

In this section, we examine the impact of knowledge enablers on dynamic capabilities, and economic outcomes for the finance industry. The knowledge ecosystem for the finance industry is benchmarked with that of advanced countries. Based on content analysis and the data obtained from DOS, the finance industry in advanced countries and in Malaysia are classified as pace-setter – an industry that has the highest level of knowledge content and innovations. The knowledge ecosystem for the finance industry in advanced countries is shown in Figure 15.16. In advanced countries, the knowledge ecosystem for firms in the finance industry supports all three components of the dynamic capability, which enable them to drive both product and process innovations.

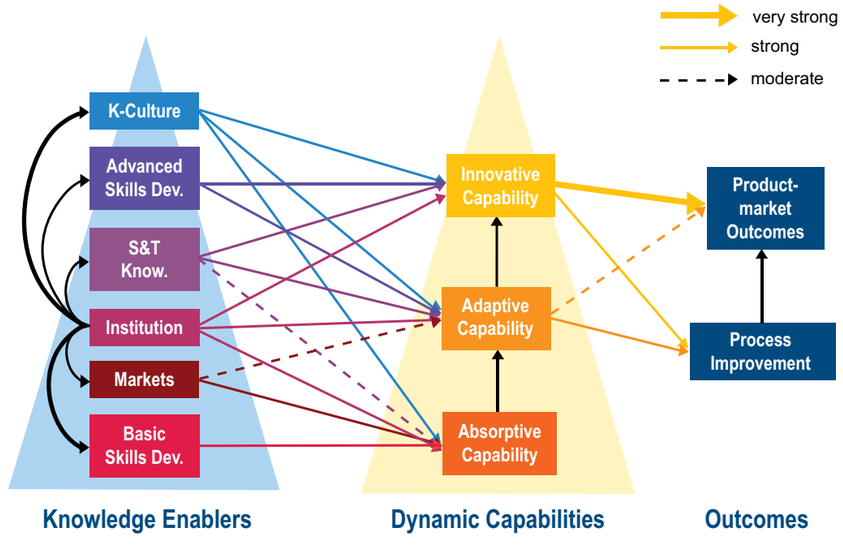
In these countries, the firms have very strong absorbability capability, which enable them to develop higher value-added innovation (adaptive capability). Strong absorptive and adaptive capabilities in these countries enable firms in this industry to transcend the adaptive capability stage to build innovative capability. This enable firms in this industry to develop new process improvements and product outcomes that are globally competitive.

The knowledge ecosystem for the finance industry in Malaysia based on the data obtained from DOS is shown in **Figure 15.17**. The knowledge ecosystem for firms in this finance industry was found to be relatively weaker than that of more advanced countries. One of the key differences found between the ecosystem in advanced countries and in Malaysia is the direction of S&T knowledge on innovative capability. In advanced countries, S&T knowledge has a positive and significant impact on innovative capability, while in Malaysia it was found to have a negative impact on innovative capability. The results suggest that, while Malaysia has a strong skills development programme in the finance industry; however, weakness in S&T areas result in significant opportunity cost for the industry if investment are channelled to build S&T technical skills without taking into consideration access to high quality and quantum of R&D activities, expertise, research personnel and S&T infrastructure to support innovative capability development in the industry. Lack of strong S&T expertise and weak cross-disciplinary research environment in the finance related areas in the country may result in high opportunity cost of investing in S&T research.

Figure 15.17 show that while the ecosystem supports all three dynamic capability components, they primarily enhance process improvement. There are instances, where there is a flow from adaptive capability to product market outcomes and this is primarily driven by institutions that provide niche product such as Islamic banking and finance products.

A summary of the strength of the finance ecosystems in advanced countries and in Malaysia are given in **Table 15.1**. The analysis in the table shows that the knowledge ecosystem for the finance industry in Malaysia was found to be relatively weaker than that of more advanced countries.

Figure 15.16: Knowledge Ecosystem of the Finance Industry in an Advanced Country



Note: Very strong impacts are represented by the bolded line, strong impacts are represented by normal lines and moderate impacts are represented by dotted lines.

Figure 15.17: Knowledge Ecosystem of the Finance Industry in Malaysia

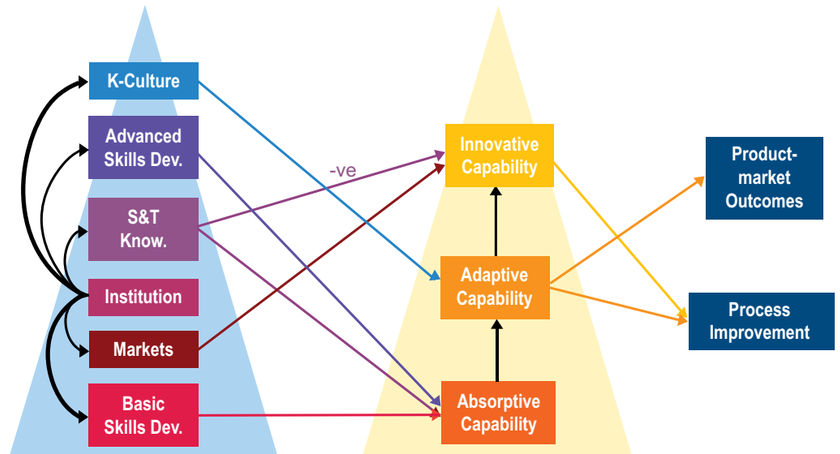


Table 15.1: Knowledge Enablers and Dynamic Capabilities for the Finance Industry

Advanced Countries	Malaysia
Basic Skills have a **positive and strong impact** on absorptive capability. In most developed countries, the basic skills levels are high and this primarily driven by government agencies, regulatory authorities, industry associations and institutions of learning.	Basic Skills have a **positive and strong impact** on absorptive capability. In the Malaysian finance industry, the role of ICLIF, INCIEF, FSTEP, FIDE and ISRA are critical in ensuring continuous upgrading of skills is taking place in the industry.
Market Intelligence has a **positive and strong impact** on absorptive capability; and positive and moderate impact on adaptive capability. The role of suppliers, customers, competitors, external consultants and commercial R&D centres in many of the countries is to contribute strongly to absorption of new knowledge, in particular the	Market Intelligence has a **positive and strong impact** on innovative capabilities. The finance industry relies on suppliers, customers, competitors, external consultants and commercial R&D centres to undertake new innovations. In most instances the innovations are incremental innovations, where local talent is used to develop

Table 15.1: Knowledge Enablers and Dynamic Capabilities for the Finance Industry (cont'd)

Advanced Countries	Malaysia
use of new technology, systems and processes to develop new, efficient and cost-efficient product and services for the local financial industry.	more cost-efficient products and service. This includes the development of niche products in the Islamic banking and finance space.
Institutions are **strong enablers** of the knowledge ecosystem and have **direct strong and positive impact** on all three dynamic capability components. The institutions such as regulatory authorities (central banks and agencies the provide oversight to the capital markets). Trade associations, government research institutions and universities tend to not only play a key role in creating a vibrant financial ecosystem, many of them are at the forefront for driving the dynamic capabilities components directly, either through skills development or fostering upgrading of talent or undertaking R&D development that will generate the next generation products and services for the industry.	Institutions **strong enablers** for all the other knowledge enablers, but **does not impact** the three dynamic capability components directly. The institutions such Bank Negara or the Security Commission play key roles in regulating the industry and to ensure enabling environments of the financial and capital markets are conducive to enhance their competitiveness. On the other hand, industry associations and universities provide manpower training for the industry. However, these institutions were found to not directly influence the dynamic capability components of the firms in the finance industry.
Science and technology knowledge has a **positive and moderate impact** on absorptive capability; but, positive and strong impact on adaptive and innovative capability. In most advanced countries, new innovations scientific development, especially in the ICT related areas and applications are at the forefront of development of new systems, products and services in the finance industry. In many of the developed countries, the foundation of basic and applied research in the Science, Technology, Engineering and Mathematics (STEM), computer science, Machine Learning, Pattern Recognition and other related areas are sound. This is further strengthened with significant investment to nurture and develop translational research that transcend to social sciences and business related areas. An	Science and technology knowledge has a **positive and strong impact** on to absorptive capability. On the other hand, Science and technology has a **negative and strong impact** on innovative capability. The latter results show that **S&T knowledge has an opportunity cost** to the innovative capability of the industry. Most of the players in the industry are users of new technology or innovations. This suggests that most of the S&T knowledge is to improve the absorptive capacity of a majority of the industry players in Malaysia. Given that the S&T research within the industry is at a relatively infant stage, investing in high-end S&T knowledge may lead to high opportunity cost for the industry. Further, fragmentation of STEM and social science/ business related areas further hinder the translation of local technology into new product design and development in the finance industry.

Table 15.1: Knowledge Enablers and Dynamic Capabilities for the Finance Industry (cont'd)

Advanced Countries	Malaysia
integrated multi-disciplinary research and a sound industrial cluster development framework not only strengthens the existing financial product line, but also spawn new products and services that cater for the domestic and global markets.	
Advanced Skills have **a positive and strong impact** on both innovative capability and adaptive capability. In many of these countries significant resources are channelled to increase the quantum and quality of manpower with higher degrees and advance knowledge that are relevant for the industry. A strong 'quadruple-helix' enables many of them with sound theoretical knowledge to reconfigure and apply their knowledge for developing the finance industry. New financial models, instruments, software, tools, technology and applications are designed and developed in many of the advance financial centres.	Advanced Skills have **a positive and significant impact** on absorptive capabilities only. While the level of quantum and quality of knowledge within the financial industry are on an upward trend; lack of integration of knowledge from more diverse areas such as STEM related areas and weak 'quadruple-helix' hinder the flow of advanced skills to adaptive and innovative capabilities within the Malaysian finance industry. Hence, a majority of the talented workforce are users of new technology and innovations; but are not producers of the cutting-edge innovations for the industry.
Knowledge culture has a **positive and strong impact** on all three dynamic capabilities. In many of the firms, the organisational culture is rather flat and they tend to focus on outcome based key performance indicators. The leadership team take a TQM-type of approach to innovation, where innovation is not the responsibility of the R&D team, but every employee. Further, diversity in disciplines areas and expertise is valued – there is a push for multidisciplinary R&D endeavours. Leadership team and the organisations are kept up to date on current trends using various approaches such as brain storming session, fore-sighting and visioning. The vision of the firm is effectively communicated to all stakeholders and there is constant mentorship and nurturing of talent in the different employment levels. Clear career paths for all employees are also mapped out with good support for professional development. This measure has helped reduce the problem of 'brain-drain'. Due to competitive nature of the employment	Knowledge culture has a **positive and strong impact** on adaptive capability. In many of the firms, the organisation culture is still hierarchical and R&D is primarily undertaken by a few people or a department within a firm. Many of the firms do not invest resources in R&D activities; they tend to rely on firms from more advanced countries for new knowledge, innovations or technology. Much of the knowledge culture is to encourage firms to modify existing products and services for the local market. The culture in the industry is to comply with local regulatory authorities, who are at the fore-front of developing the industry – it is still 'top-down' in terms driving change in the industry.

Table 15.1: Knowledge Enablers and Dynamic Capabilities for the Finance Industry (cont'd)

Advanced Countries	Malaysia
conditions, the finance industry is able to attract high quality talent from other countries. Further, these organisations find ways to reduce the cost of experimentation using simulation tools, prototypes and pilot studies. Many of the firms have tools to identify risk profile and put in place 'Green-Alert Risks' (risks that can be taken) and ensure "Guard-Rails' are put around the Green-Alert Risks so as to ensure that these initiatives do not jeopardise the firm's core operations. Opportunities to enhance their creative skills and innovative capabilities are another reason the finance industry in advanced countries is able to attract talent from across the globe. While the regulatory authorities play a key role in setting the tone for development, their role is primarily to enable the firms to develop new innovations, products and services. The enabling role of the regulatory authorities and organic innovative culture at the firm level prove to be the optimal recipe for sustaining knowledge creation in this industry.	
The continuum from absorptive capability to adaptive capability to innovative capability is **present and strong.** Sound R&D coupled with strong personnel with basic, technical and R&D experience help the industry to be resilient in absorbing new knowledge. Strong foundational knowledge help firms adapt the external knowledge and reconfigure it into new innovations that improve processes and enhance quality of existing products and services. As the workers gain more experience, they are able to translate this knowledge into new products and services that meet both the local and global markets. As firms intensify their technology and knowledge capabilities, some firms will be successfully produce new process improvements that translate into new line of products and services.	The continuum from absorptive capability to adaptive capability to innovative capability **is present.** The skilled workforce in the industry has the capacity to adopt new knowledge generated from more advanced countries. There is some level of refining and modifying some of the foreign knowledge or innovations to meet the local and global market demand. These incremental innovations enable firms to cater for niche markets. An area the Malaysian finance industry has demonstrated global leadership is in Islamic banking and finance areas. Malaysia is seen as important player in the global Sukuk industry.

A comparison between the flows from dynamic capabilities to economic outcomes in the finance industry for both advanced countries and Malaysia are summarised in Table 15.2. The study also found that the impact of dynamic capabilities components on economic outcomes for the finance industry in advanced countries and Malaysia vary significantly. In advanced countries, adaptive capability in the finance industry was found to have a positive and strong impact on process improvements; and a positive and moderate impact on product market outcomes. Further, innovative capability was found to have a positive and strong impact on process improvement and a very strong to product market outcomes.

In the case of Malaysian finance industry, adaptive capability was found to have a strong and positive impact on both process improvement and product market development. However, innovative capability only contributes to process improvements. This suggests that much of the innovation adopted by firms in the domestic finance industry is to ensure the products and services are globally competitive by adopting new improved processes, improved internal management and organisational methods and improved marketing approaches. The empirical analysis also confirms that the Malaysian finance industry has also been successful in adapting advanced methods to create niche products that have global market demand such as Islamic finance and banking products and services.

Table 15.2: Dynamic Capabilities and Economic Outcomes for the Finance Industry

Advanced Countries	Malaysia
Adaptive capability has a **positive and strong impact** on process improvement and a **positive and moderate impact** on product market development.	Adaptive capability has a **positive and strong impact** on process improvement and a **positive and strong impact** on product market development.
There is a segment of firms that is strong in adapting new technology and innovations to not only continuously improve existing products and services; but also create new applications for the global finance industry.	Much of the capability leverages on existing knowledge from more advanced countries. However, the domestic finance industry is able to create niche products and services that meet the local market. In some of the niche markets such as in the Islamic banking and finance areas, Malaysian firms are regionally and globally competitive.
Innovative capability has a **positive and strong impact** on process improvement and a **positive and very strong** impact on product market outcomes. Strong innovative capability powered by sound S&T base, high R&D investment and strong quadruple-helix among all stakeholders contribute to the emergence of new financial instruments, applications, products and services that not only meet the needs of the domestic finance market, but also the global finance industry.	Innovative capability has a **strong impact** on process improvement only. Innovative **does not impact** product market outcomes. Much of the industry adopts new technology, systems, processes and management tools from more advanced countries to improve cost-efficiency, service quality and meet domestic market demand.

Table 15.2: Dynamic Capabilities and Economic Outcomes for the Finance Industry (cont'd)

Advanced Countries	Malaysia
Process improvement positive and **moderate impact** on product market outcomes. Sound S&T base and effective translational research has powered process improvements in the finance industry – these products and services underpinned by strong S&T platforms are able to create new financial products and services that enhance the reach and richness of a broader segment economy. These new applications play a key enabling role in enhancing the competitiveness of the other industries. Hence, the demand for these financial products and services both in the domestic and global markets are high.	Process improvement **does not impact** product market outcomes. Most of the process improvements are based on the use of foreign technology, knowledge and intellectual property; hence, potential for creating new market outcomes and intellectual property for the domestic finance industry is limited.

15.8 Summary: Key Trends, Challenges, Way Forward and Best Practices

15.8.1 Industry Trends

The integrity of the Malaysian financial system bodes well for the foreseeable future. Much of the soundness has been predicated on tight regulatory control, which is a double-edged quality for the industry. On the one hand, financial regulators have been the major drivers of change and most financial industry firms have managed to align themselves to these requirements through appropriate skill building actions. On the other side, strict regulation has heavily reined in competitive, self-driven innovation, with most players being content in their regulatory compliance as modus for existence. This will not prove a problem provided that the regulators themselves constantly keep abreast of the latest innovations and balance regulation with sufficient liberalisation.

In the past, low levels of dynamic capability allowed for comfortable returns as long as minimum adherence to standards was achieved. However, with the advances in technology and greater coalescing of markets, the financial industry faces a sustained period of upheaval and change. In this environment, all financial institutions will have to strengthen their dynamic capabilities in order to survive.

Fortunately, the Malaysian financial industry is well-positioned in a number of niche areas within the Islamic banking and finance. This endowment has been built over a period of time, through the development of an intricate Islamic financial ecosystem. This can be leveraged to significant effect but the window of opportunity is closing fast in light of numerous other Muslim and non-Muslim countries vying for the same competitive position. To capitalise on this position of strength Malaysian financial industries firms will have to build stronger dynamic outlook and respond through a stronger base in absorptive, adaptive and innovative capability. Simple imitative innovations based on conventional instruments in Islamic area will no longer be sufficient. New product service offerings that closely match customer financial transaction behaviour to create significant value and functionally rich products and services at lowest cost will be the order of the future. This will be true of Islamic as well as conventional financial products and services.

15.8.2 Challenges

The financial industry has moved with international trends in terms of sophistication and in meeting the needs of local and global industries operating in Malaysia and the ASEAN region. In spite of the positive outlook for the finance industry, there are number of challenges faced by the industry that may erode the dynamic capability, knowledge intensity and competitiveness of the industry. These challenges are discussed below.

Institutions:

- Reforms and development programs to make Malaysia a 'cashless' society has yielded poor results compared to more advanced countries. The adoption rate has been slow due to lack of coordination among all institutions (industry association, education institutions, government agencies and community organisations) in implementing the plans and programs.

- Although Industry associations and universities provide manpower training for financial services, these institutions do not directly influence the dynamic capabilities of the firms. Industry and universities are not at the forefront of developing new innovations and technology that are widely used by the local and global industry.

Basic Skills Development:

- There are a number of challenges encountered by the industry and among them include:

- Lack of proficiency in English especially within the lower tiers of the organisational hierarchy.

- SMEs in the industry have limited training budget. Hence, they provide very little support for continuous training of their employees.

- There is a lack of trainers to conduct internal trainings. Some of the trainers are expensive. The cost factor prevents many SMEs from sending staff for training and capability development.

- Lack of external training programs and the expense of some external training programs imposes high barriers that deter the participation.

Advanced Skills Development:

- Low retention of highly trained and qualified professionals, particularly among SMEs due to limited career options and lack of competitive remuneration.

- SMEs struggle to keep pace with training needs of a rapidly changing industry due to limited training budget, especially in highly specialised training programmes.

- Tight labour market for highly skilled work force causes "talent poaching" and discourages human capital investments by firms.

- Lack of integration of knowledge from more diverse areas such as STEM related areas and weak 'quadruple-helix' hinder the flow of advanced skills to adaptive and innovative capabilities within the Malaysian finance industry. A majority of the talented workforce are users of new innovations and technology. They are not producers of cutting-edge innovations.

- Limited stock of creative talent and innovators limits the number of available mentors in the industry – this has an adverse impact on knowledge transfer to younger generation workers in the field.

S&T Knowledge:

- The industry is faced by a major brain-drain problem to other regional financial hubs. These regional financial hubs provide relatively better remuneration, working environment and career prospects.

- Slow development toward a cashless financial system not only impacts the competitiveness of the financial industry, but also other sectors that depend on the financial industry for financial services.

- As S&T research within the local industry is at a relative infant stage, investing in high-end S&T knowledge may lead to high opportunity costs if the industry continues to suffer from a lack of creative talent, innovators and workforce with highly specialised skills.

- Fragmentation of STEM and social science/ business research activities in local institutions and research centres of excellence hinder the translation of local technology into new product design and innovation. An example is the slow development of the Finance Technology (known as FinTech) industry in Malaysia. The FinTech are generally start-up firms that are providing financial services using technology platforms to provide financial services in a quicker, more cost-effective, and flexible way compared to traditional service providers.

Market Intelligence:

- The financial industry is changing at a rapid pace due to technology and opening up of regional markets. This provides firms in the financial industry opportunity to expand their market reach. The FinTech revolution is intensifying across the globe. This has the potential of eroding the local finance industry's competitiveness and revenue. Slow adoption of advanced technology may limit local firms' ability to respond to market needs.

Knowledge Culture:

- This is a highly regulated industry. Firms tend to adopt a culture of strict compliance to regulations and this at times stifles creativity, especially in the absence of a sophisticated back-office mechanism for many of these firms. Firms face a challenge in striking a balance between compliance to regulations and undertaking innovations. The latter is seen as risky since they do not have mechanisms in place to undertake "Green-alert risks". The "Green-alert risks" are untested strategies and innovations that undergo intense experimentation and testing before rolling out to the market. Experimentation, piloting and undertaking simulations on new initiatives are not a common practice among firms, especially the SMEs in the industry. Firms are not savvy in designing 'guard rails' and support systems to help employees undertake innovative endeavours that do not pose a risk to the institution or the financial system.

- Most of the local institutions do not invest in R&D activities. They tend to be users of technology and knowledge from more advanced countries.

- Organisation culture is hierarchical among a majority of firms in the industry. R&D is primarily undertaken by selected few local firms. The problem is further compounded by a lack of a sharing culture among firms in the industry. An innovative culture is not pervasive across the firms. A culture of compliance is more dominant in the Finance industry.

15.8.3 Way Forward

The finance industry is a key enabler for the remaining 20 industries and for the Malaysian economy. It is widely accepted that a well-developed financial industry is an important catalyst for moving the economy up the knowledge and innovation value chain. Since the 1997 Asian financial crisis, reforms undertaken by the Malaysian government have enhanced the soundness of the financial system. This has enabled the industry to expand into new niche areas where Malaysia is seen as a global player. However, opening up of the markets to global players has intensified competition for talent, markets and resource. To ensure the long-term sustainability and competitiveness of the Malaysian finance industry, the financial ecosystem needs to be further strengthened. The following are proposed to address a number of gaps in the finance ecosystem.

Recommendation 15.1: Nurture Creative Talent to Power Next Generation Innovations

- Establish a National Financial Services Talent Council, which consists of all stakeholders (government, regulatory authorities, industry, universities and thought leaders) to foresight and sign-post the changes that will take place in the industry and the types of creative talent required to power the next-generation financial sector.

- Invest in establishing strong multidisciplinary and inter-disciplinary education and research programs that will draw upon strengths in the STEM, behavioural, social sciences, business and finance research areas.

- Ensure education provided in colleges and universities is industry relevant by strengthening the internship program and by incorporating elements of the Financial Sector Talent Enrichment Programme (FSTEP) in the curriculum from tertiary institutions.

- Continue to intensify skills development programmes by providing a clear pathway for employees to pursue certificate, diploma, undergraduate, online courses, higher degree studies or a professional certification.

- Effectively promote employment opportunities to attract talent from regional and other international talent pool(s).

Recommendation 15.2: Nurture Next Generation Leaders to Transform the Finance Industry to be a Regional Leader and Enable a High Income Economy

- The ICLIF Leadership and Governance Centre should nurture next generation leaders who have multidisciplinary skills for the industry with the following leadership qualities:
  - Ability to be leaders who are ambidextrous to meet the short-term needs and long-term sustainability of their firm and industry.
  - Ability to communicate well at all levels of the organisation and across to other industries.
  - Possess high degree of emotional intelligence and have the cross-cultural skills. The latter is important if financial institutions are to expand their operations to markets in the region and globally.

- Universities working closely with the industry should invest in R&D to enrich learning environment for the financial sector. There is a need to establish research centres that explore next generation technology trends, reforms and systems that will transform local financial services to be a regional hub and test-bed new innovation, products and services.

Recommendation 15.3: Establish a Business Friendly Ecosystem with a Regional Focus

- Firms in the financial industry (especially Banks) need to take concerted steps to change perceptions that they are bureaucratic and inflexible.

- The industry needs to develop its structure, culture and strategies to be aligned with consumers' lifestyle changes. The changes need also to accommodate younger generation employee needs through greater drive towards employer-centricity.

- Provide R&D incentives for firms to develop new products and services in high growth areas such as: (i) new technology and applications for the finance industry; (ii) financial products and services; or (iii) FinTech startup acceleration through a deregulated sandbox environment.

- Other support includes introduction of appropriate fiscal incentives (scholarships and grants) for industry to gain access to the research ecosystem in universities and research centres. These strategic engagements will have significant spill-over benefits to the industry, especially SMEs in the form of having access to leading experts and mentors to help them increase their knowledge content and competitiveness.

- Provide greater support for financial institutions to expand their reach across the ASEAN and the Asia-Pacific region. This includes mobilising trade offices, economic attachés and embassies overseas to play a more pro-active role in providing market intelligence and networking opportunities in the region.

- Opportunities for domestic financial institutions to penetrate the ASEAN and other regional markets can be further enhanced with strong push for government-to-government (G2G) arrangements that provide mutual access to and support for domestic financial institutions.

- Establishment of a "one-stop portal" providing information on rules, regulations and other information and also establishment of offices in the ASEAN and the Asia-Pacific region will go a long way in assisting local firms, especially SMEs in extending their market reach in the region.

Recommendation 15.4: Global Leadership in Niche Areas (Islamic Banking and Finance).

- Substantial resources and R&D support should be provided to research Islamic finance, innovation and products.

- New products must be more aligned to genuine Islamic principles than simple mimicry of conventional products.

- Islamic products and innovations must deliver better if not the same functional benefits as conventional instruments, especially if the industry wishes to widen its market scope beyond the Muslim-driven market.

Recommendation 15.5: Technology-Led Transformation in the Finance Industry

- The financial industry needs to make greater effort to take advantage of technological advances that are opening up new possibilities and opportunities for firms to extend their market reach and improve the richness of their products and services.

- Moving in line with the wave of technological shifts taking place globally, firms in the industry to establish close collaborations with leading research centres in the country and globally to enhance product innovation and development.

- Regulators and government agencies can play a lead role in increasing online financial transactions among firms and consumers by promoting paperless offices as means to improve operational efficiencies. This will also require increasing awareness campaigns and capability development programs to acculturate firms and the general population on the benefits of cashless transactions.

Recommendation 15.6: Enhance Financial Literacy among All Segments of the Population

- Raising financial sophistication among Malaysians will widen the scope for product innovation and differentiation among local providers of financial services.

- Initiatives to broaden the understanding of insurance, savings and credit soundness reinforced by the development of distribution channels that are able to reach out to the mass population are going to be essential in creating a financially literate population. The education effort must be embarked upon across all age groups, but is particularly pertinent for the younger demographics that need to be encouraged to save more, and plan for their future, and their retirement.

- The above will give impetus for greater knowledge creation as well as space in which marketing branding and positioning can take place.

15.8.4 Best Practices

The finance industry is in a good position to become regional financial hub for a number of reasons: increasing sophistication in physical and technological infrastructure; increasing quantum and quality of talent in the industry; sound regulatory ecosystem; strong dual finance and banking system – both conventional and Islamic finance and banking; strategic location in the ASEAN region and the Islamic World; vibrant, diversified and internationalised economy; and increasing income levels and sophistication among consumers. While the finance industry has made significant progress over the last two decades, competition from regional financial hubs continues to intensify. To keep pace with competition, the local industry should continue to intensify areas they are strong and emulate best practices from other pace-setter countries. Below are a number of best practices which can help the Malaysian financial industry strengthen its knowledge content and enhance its regional competitiveness.

Best Practice 15.1: Nurture Creative Talent to Power Next Generation Innovations

Financial Sector Talent Enrichment Programme in Malaysia

- Concise (3 months) but comprehensive program (8 key features) to prepare talent for the financial services industry (conventional banking, Islamic banking, insurance, and Takaful).

- Key features to empower industry relevant creative talent include foundation in financial services, English for business and finance (communication), career enhancing skills, technical training, field visits, sharing sessions by industry champions, business simulation (creative and critical thinking skills), and future leaders' and managers' enrichment programme (management).

- This an excellent program to provide students the necessary experiential learning experience that not only enriches their career prospects, but also provides the talent to propel the industry to a higher level of knowledge intensity and innovative capability.

Best Practice 15.2: Nurture Next Generation Leaders to Transform the Finance Industry to be a Regional Leader and Enable a High Income Economy

ICLIF Leadership and Governance Centre in Malaysia

- ICLIF offers various leadership programmes relevant to the finance industry. For example, the leadership programme helps people to leverage on their personal leadership purpose and values to become more credible and capable leaders.

- The programme seeks to create individuals that understand and influence stakeholders to execute departmental strategies, lead initiatives and attain results in an emotionally intelligent way.

- There is also significant emphasis placed on communication, allowing leaders to facilitate exchange of ideas, and create a group-wide culture of high-performance by developing and empowering teams.

- The training programmes include nurturing the next-generation leadership for a fast changing environment, instilling good corporate governance among the leadership and ensuring a robust succession plan is in place.

Best Practice 15.3: Establish a Business Friendly Ecosystem with a Regional Focus

Singapore as a Leading Financial Hub in Asia

- Singapore has proactively capitalised on emerging opportunities in the financial services industry by creating an attractive business environment for investors, both domestically and globally. This has resulted in the country being consistently rated as having world-class infrastructure and high service quality ratings by major international bodies (World Economic Forum, United Nations).

- Recent initiatives to further enhance such a perception include the Friends of Singapore Network, regular high profile conferences and forums on financial services, improved foreign tax credit mechanism, raised the international profile of the nation's education and training environment for financial services.

- Monetary Authority of Singapore (MAS) put in place strategies to promote Singapore as the leading Asia's (Renminbi) RMB Internationalisation centre. This has the potential to be a world's largest off shore wealth hub.

- Strong RMB ecosystem in Singapore increased RMB trade financing activities, enhanced capital markets and asset management; and also increased RMB product offerings for industries, governments and investors in regional and international markets.

- The Singaporean financial ecosystem consists of 5 local banks (two are subsidiaries of three of the local banks), 122 foreign banks (28 foreign full banks, 57 wholesale banks and 37 offshore banks). On the whole, the Singapore banking sector has very good asset quality and good liquidity.

Best Practice 15.4: Global Leadership in Niche Areas (Islamic Banking and Finance)

Islamic Finance in Malaysia

- Malaysia is one of the five global Islamic finance hubs due to the following:

- Very strong regulatory architecture that was firmly established by the Central Bank of Malaysia. The level of transparency and protection of investors and other stakeholders is on par with that of leading conventional financial systems.

- Increased competitiveness of Islamic finance instruments by granting tax neutrality to Islamic finance instruments and transactions.

- Strong support for product innovation, which has led to the development of global corporate and sovereign Sukuk, Islamic exchangeable bonds and the Islamic and Islamic REIT.

- Among the top players, Malaysia is regarded a leader in Sukuk markets, equity market, fund management and placed second after Iran for Takaful and 3rd for Islamic banking.

Best Practice 15.5: Technology-Led Transformation in the Finance Industry

Cashless Society in Sweden

- The central bank of Sweden, Riksbank, notes that cash transactions made up barely 2% of the value of all payments made in Sweden in 2015.

- Only 20% of retailers accept cash today, which is half the number 5 years ago, and falls below the present global average of 75%.

- Cards, debit and credit, have been the main form of payment.

- Mobile phone apps have also taken off in spectacular fashion. Swish, a hugely popular app, has been jointly developed by the major banks in Sweden; it uses phone numbers to allow anyone with a smartphone to transfer money from one bank to another in real time.


Development of FinTech Industry in Australia and Singapore

FinTech is a new trend in the finance industry arising out of asymmetric information in the financial markets. FinTech solutions enable the financial industry allocate resources more efficiently to productive endeavours. The entry of FinTech into the financial industry has increased competition in the industry – it has a wider reach to customers, not just within the country, but also across the globe.

To capitalise on the FinTech, both these countries have put in place to undertake the following:

- **Australia**
  - The government established a FinTech Advisory Group to spearhead the Australian FinTech industry. A series of initiatives have been proposed to develop the industry, which include the following:
    - Financial support is provided to promote the Australian FinTech industry globally;
    - Review the financial technology infrastructure (Blockchain) to ensure it meet the needs of the industry;
    - Pilot to be undertaken in suitable localities of the country, where information registry and sound supply chain networks can be rolled out smoothly;
    - Venture capital tax concession have been extended for FinTech businesses that provide banking, financial and insurance services.
    - FinTech companies are also permitted to bid for government information and communication projects;

- **Singapore**
  - The FinTech initiative is spearheaded by the Monetary Authority of Singapore (MAS), where a Chief FinTech Officer was appointed to provide oversight to the development of the industry. Among the key initiatives undertaken to develop the FinTech industry include the following:
    - The MAS led the industry by making its data available through the Open Application Programming Interface (API), a public interface that software developer can access to develop software applications. The open API enables various financial applications and tools to communicate with one another.
    - Established a 'Regulatory Sandbox' that enables companies to place their innovations for a team of experts to test and trial them for 6 months. The sandbox is a "Green-Alert Risk" that enables the firms to release new innovations to the market without posting any risk to the financial system and the public.
    - Singapore has also signed bilateral agreements with Australia and South Korea to harmonise licensing and regulatory requirements so that firms in all three countries can tap into a wider pool of the regional market much quicker.

Best Practice 15.6: Enhance Financial Literacy among All Segments of the Population

National Financial Literacy Strategy in Australia

- The Australian Securities and Investments Commission have introduced the National Financial Literacy Strategy to set out a national direction for improving financial literacy in the country.
- The strategy provides a practical framework to guide the action of stakeholders from the government, business, community, and education sectors with an interest in improving the financial literacy of Australians.
- Among the areas that are focused upon the action plan are educating the next generation, particularly through the formal education system; increase the use of free, impartial information, tools and resources; provide quality targeted guidance and support; strengthen coordination and effective partnerships; and improve research, measurement, and evaluation.

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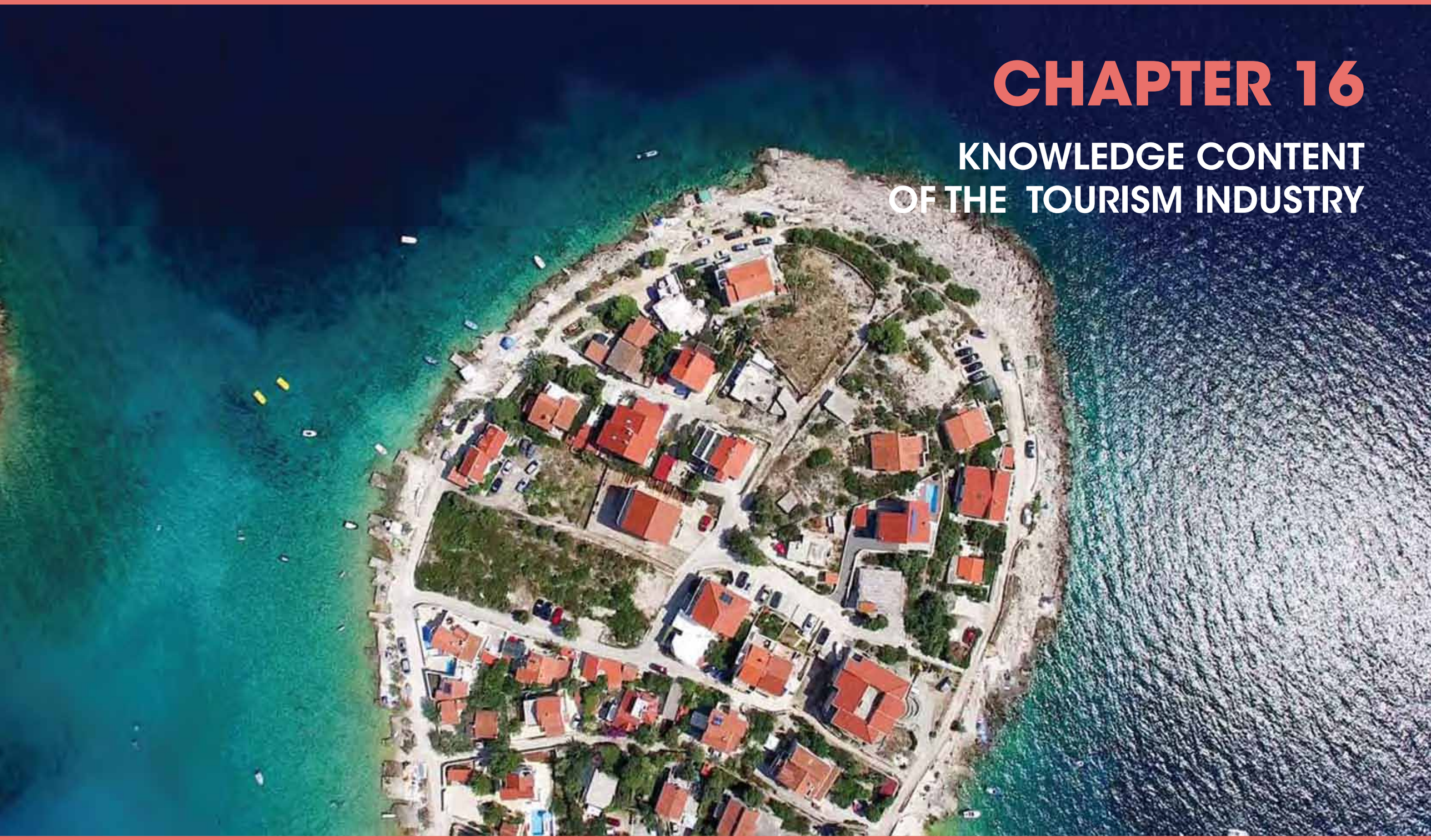
CHAPTER 16

KNOWLEDGE CONTENT OF THE TOURISM INDUSTRY



CHAPTER 16
Knowledge Content of the Tourism Industry

16.0 Introduction

The Ministry of Tourism and Culture has invested heavily in promoting Malaysia as a diverse and culturally rich travel destination. The tourism industry witnessed remarkable growth in the past decade, becoming one of the fastest-growing industries in Malaysia, and maintaining an average growth rate of 12% per annum since 2004 (Performance Management & Delivery Unit [PEMANDU], 2015).

The tourism industry is also the sixth largest contributor to Malaysia's GDP, having generated 5.3% of the total GDP in 2014 (ETP Annual Report, 2014). The industry brought in RM65.4 billon in tourist receipts, with tourist arrivals recording 25.72 million in 2013 (ETP Annual Report, 2014). **Table 16.1** shows the steady growth in tourist arrivals and in travel receipts between 2010 and 2015. Revenue generated by the tourism industry in 2015 reached RM69.1 billion with 25.7 million arrivals (Tourism Malaysia, 2016).

Table 16.1: Number of arrivals and receipts (RM)

Year	2010	2011	2012	2013	2014	2015
Arrivals	24.58 mil	24.71 mil	25.03 mil	25.72 mil	27.44 mil	25.70 mil
Receipts (RM)	56.5 bil	58.3 bil	60.6 bil	65.44 bil	72.0 bil	69.10 bil

Source: Tourism Malaysia (2016)

The tourism industry is made up of a number of important co-dependent stakeholders. These are airlines, hotels, tour agencies, and attraction and service operators. Hotels would not be able to thrive without airlines to connect Malaysia to the rest of the world and bring tourists to the country. Similarly, tour agents would have trouble promoting Malaysia as a tourist destination if services and attractions are weak, thus making the tourism ecosystem a complex one with numerous co-dependent sub-industries.

16.0.1 Airlines

Malaysia is easily accessible through the many international airlines which use the Kuala Lumpur International Airport (KLIA) as a major hub in South-East Asia. According to the Airports Council International statistics, KLIA currently stands as the 13th busiest airport by international passenger traffic. Furthermore, the presence of low budget carriers such as AirAsia play a strong role in making Malaysia more accessible to budget-constrained tourists and attracts more visitors from neighbouring countries such as Singapore, Thailand and Indonesia. In addition to AirAsia, other low cost carriers such as Firefly and Malindo Air help to increase travel between the east and west coast, and the northern and southern parts of Malaysia, thus encouraging domestic tourism within the country.

16.0.2 Hotels

The past decade marked a phase of rapid development with more hotels, resorts and business centres sprouting across the country in tandem with the growth in the number of tourists. Highly rated hotels are concentrated in Kuala Lumpur and few other high-profile tourist destinations, such as Langkawi and Penang. A majority of these are foreign hotels, including Shangri La, Marriott and Starwood Alliance hotels. The number of Malaysian-owned four- and five- star hotels has increased recently, though foreign hotels remain dominant in the high-end market, leaving local hotels to operate primarily in the middle- and low-end segment.

The hospitality industry is a high-investment-low-yield industry, where competition is tough especially among the small players. There is also growing competition from alternative providers such as Couchsurfing, Airbnb and homestay programs that give consumers wide range of accommodation options and even an authentic cultural experience. Recognising that improving service quality and hotel rating is important to attract high-yielding tourists, the government has put in place programs to improve hotel ratings and the quality and range of hotels. As part of the ETP, a number of investment initiatives were started to help boost the hospitality industry such as tax allowance and industry liberalisation policies. Such incentives resulted in 4,039 new four and five-star hotel rooms being made available by the end of 2014. These new hotels are well-distributed among the key cities of Alor Setar, Ulu Kinta, Kuching, Johor Bahru, Penang, Pulau Carey, Melaka and Miri.

16.0.3 Travel and Tour Operators

The travel and tour operation sub-industries also registered growth as well in recent years. In 2014, the Ministry of Tourism and Culture issued 4,984 business licences for Tour Operating Business and Travel Agency, compared to 4,563 licences in 2013 (ETP Annual Report, 2014). There was also an increase in the number of tour guides from 11,018 to 12,144 tour guides, marking a 10.2% increase between 2013 and 2014.

16.0.4 Attractions

Malaysia is blessed with serene islands, old forests, mountains and richness in bio-diversity that make it a top destination for nature travellers. At the same time, it has well-developed infrastructure, modern establishments, and some of the largest retail and shopping outlets in South-East Asia. This makes the city attractive for shopping and business travel. Families also find Malaysia an exciting country with adventure theme parks as well as heritage and cultural festivals.

One of the main tensions for this sub-industry is keeping the delicate balance between development projects and the preservation of nature. In addition, there is the need to be continuously innovative in product offerings to ensure repeat tourists, especially with strong competition from neighbouring countries such as Thailand, Singapore and Indonesia.

16.1 Key Developments and Initiatives

In recent years, Malaysia invested in developing new market segments by focusing on golf tourism as well as medical tourism. Meanwhile, culture and heritage remains an important area but is where development lags behind – the heritage industry is gradually growing, but is impeded by its small number of participants. Nonetheless, a revival of old traders and heritage sites is taking place especially in the states of Melaka and Penang.

Under the Economic Transformation Programme (ETP), tourism is identified as one of the 12 National Key Economic Areas (NKEAs). This means various dedicated plans will be initiated to boost the industry and encourage private investment. The target was set at 36 million tourists and RM168 billion in receipts by 2020. To help Malaysia reach this goal, twelve Entry Point Projects (EPPs) have been planned and clustered under five themes, namely affordable luxury, nature adventure, family fun, events, and entertainment and business tourism.

16.1.1 Developing Shopping and Retail Industry

The shopping and retail industry is one of the key growth drivers in the tourism industry. It accounts for 30.7% of tourist expenditure, second only to accommodation (Tourism Malaysia, 2015). A number of initiatives were taken to facilitate better shopping experience, such as making Malaysia a duty-free hub in the region, bringing premium outlet stores to Johor, building the Mitsui Outlet Park in KLIA Sepang, and creating better pedestrian connection across the main shopping locales of Kuala Lumpur City Centre and Bukit Bintang. These efforts have resulted in an increase in tourist shopping spending from RM769 million in 2013 to RM787 million in 2014 (ETP Annual Report, 2014).

16.1.2 Establishing Dedicated Entertainment Zones (DEZ)

In order to provide truly exciting night entertainment, the government initiated Dedicated Entertainment Zones (DEZ) to add vibrancy and liveliness to the city nightlife. Zouk KL, four entertainment outlets in Genting Highlands, and three new outlets in Penang were designated as DEZs.

16.1.3 Homestay Program

The homestay program is one of the high-impact tourism programs conducted by the Ministry of Tourism and Culture. It offers travellers a Malaysian lifestyle experience by staying with selected Malaysian families. Tourists can experience the daily local life, through the culture, food, and economic activities in rural Malaysia. The program attracted 325,258 participants in 2012, with 20.4% being foreign tourists. It also benefited the rural community and generated an income of RM18.55 million, which is an increase of 17.9% from 2011 (Aruna, 2013).

16.1.4 Business Tourism

In further support of the tourism industry and local economy, the government aims to make Malaysia a centre for business events in the region. The year 2014 concluded with 47 international events and 152 business events that generated 362,280 total delegate days (ETP Annual Report Review, 2014). These events were arranged and supported by the Malaysia Convention & Exhibition Bureau (MyCEB).

16.1.5 Creating Biodiversity Hub

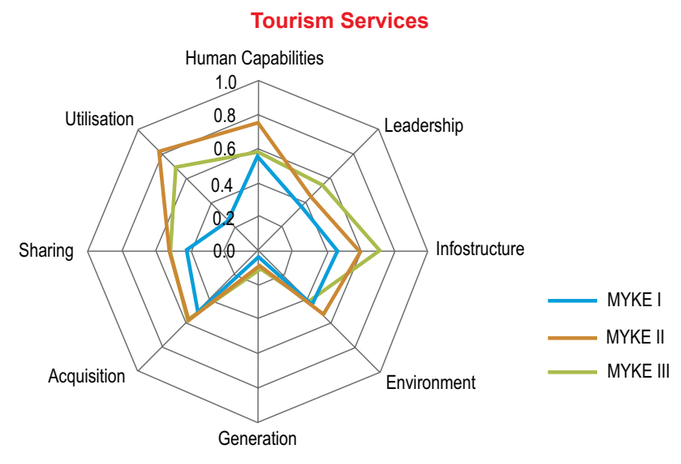
Playing to its core strength, the Malaysian Government has recognized the potential Malaysia has in its natural biodiversity. To maintain its nature reserve and to strengthen its reputation as a biodiversity hub, Malaysia realises the need to have a comprehensive system of monitoring, feedback, and supervision. This led to the development of a set of guidelines and a criteria and indicators program (C&I) for rating and certifying Malaysia's eco-sites. The C&I program has been put in place to help Malaysia's sites reach global standards for nature tourism by overseeing environment preservation and site upgrades. The program has been piloted in few locations and will be merged with MOTAC's Tourism Quality Assurance Standard (MyTQA) to be later implemented across the nation.

Another initiative under the ETP is to create the first Rainforest Discovery Centre at the Sepang Kecil mangrove forest which is being developed by Sepang GoldCoast Sdn Bhd. The purpose of the centre is to be an accessible visitor hub to promote Malaysia's biodiversity network and educate tourists about nature and rainforest. The Economic Transformation Program also plans to invest in developing Eco-Nature Integrated Resorts city in Karambunai, Sabah.

16.2 Knowledge Content

The tourism industry exhibits mixed trends in its knowledge content foundations. **Figure 16.1** indicates improvement in knowledge infostructure and leadership. This is unsurprising given continuous government efforts to encourage integration and utilisation of technology and documentation of knowledge and business processes. There is also a slight improvement in knowledge generation and sharing. The most noticeable changes are the increased human capabilities, improvement in environment and higher knowledge utilisation from the period of MYKE I to MYKE II, followed by a decline in MYKE III.

Figure 16.1: Overview of Knowledge Enablers and Knowledge Actions in Tourism Industry for MYKE I, II and III



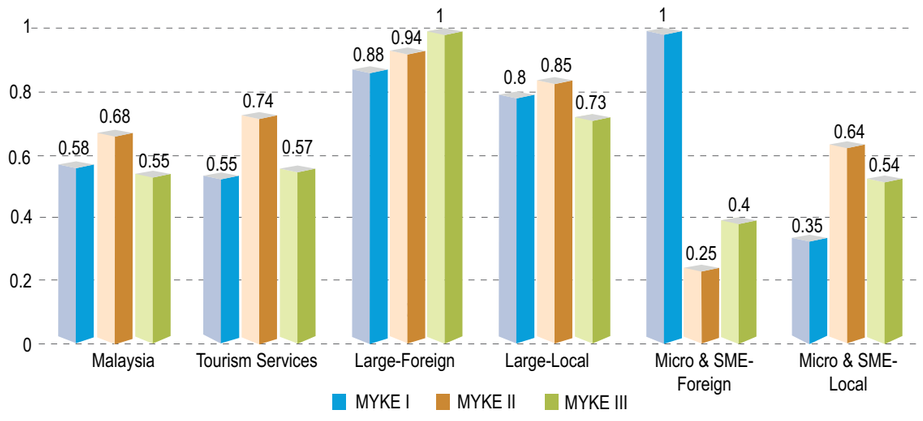
16.3 Knowledge Enablers

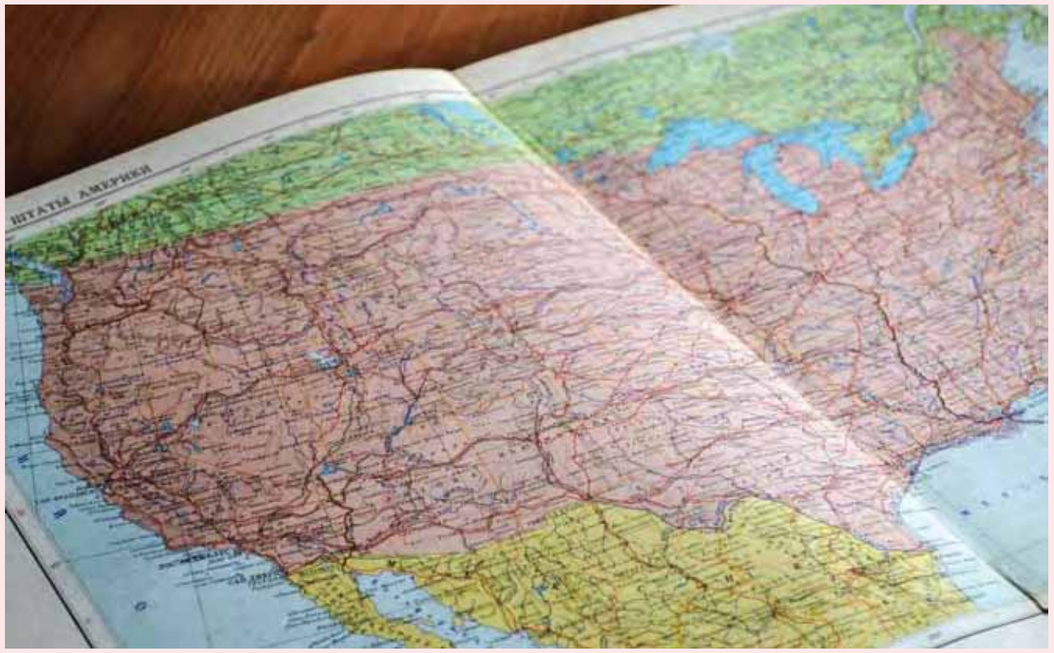
16.3.1 Human Capabilities

Figure 16.2 shows that the trend in the tourism industry mirrors that of Malaysia's aggregate, in particular a decline in human capabilities in the period of 2014. This may be the result of stiff competition over qualified employees – the shifting industry landscape creates unprecedented demand for soft skills and managerial skills, but has not been met by equal improvement in human capability. This trend does not apply to foreign firms (large, micro and SME) where human capabilities improved at a greater pace than local firms. This could be attributed to the higher attractiveness of foreign firms to a qualified workforce.

The data also registered improvement in the performance of micro and SME local firms over time. In MYKE II they scored below industry aggregates, but for MYKE III they had almost caught up with the national average.

Figure 16.2: Human Capability of the Tourism Industry



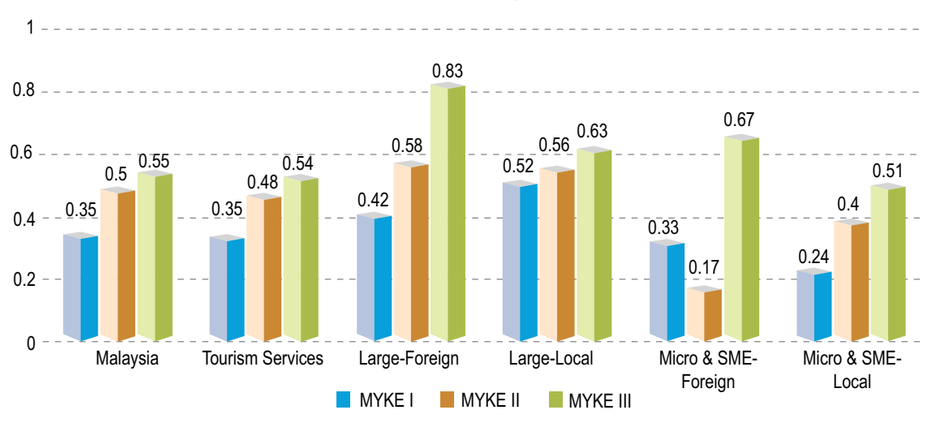


16.3.2 Knowledge Systems and Leadership

The tourism industry shows positive improvement on the knowledge leadership indicator, reflecting more formalised approaches to knowledge. The positive year-on-year trend is consistent across foreign and local firms, and large and small firms. This shows the growing realisation of the importance of documenting knowledge and instituting formal structures and processes, even among Micro and SME firms.

Examining the degree of knowledge formalisation across different firm types reveals a noticeable gap between large foreign firms and other firm categories. Foreign Micro and SME firms took a dip in MYKE II but rose strongly in MYKE III. Although local micro and SME firms come in below the industry and national average, the gap is shrinking over time as they play catch up.

Figure 16.3: Knowledge Systems and Leadership in the Tourism Industry



16.3.3 Technology and Infostructure

With regard to technology-based knowledge infostructure, the tourism industry shows year on year improvement in the use of e-commerce and the use of personal computers in the conduct of business. Positive strides can be observed across the different firm categories where they all score higher than national average, except for foreign Micro and SME firms which registered a decline in their knowledge infostructure.

16.3.4 Knowledge Environment

The tourism industry shows a slight decline in the level of companies' engagement with institutional knowledge environment. This follows the pattern of decline in the nation's aggregate score in knowledge environment. This reflects an overall decline in the broader engagement between tourism operators and institutions such as associations, government agencies and universities.

Looking beneath the aggregate level, the charts show that foreign firms score higher in knowledge environment in the 2014 period compared to the 2007 period. Both large and small foreign firms increased their awareness of government plans and programs. This suggests that foreign tourism companies are taking greater advantage of the support provided by the various institutions. In contrast, engagement by local firms declined, with the biggest dip seen among large local firms.

Figure 16.4: Technology and Infostructure of the Tourism Industry

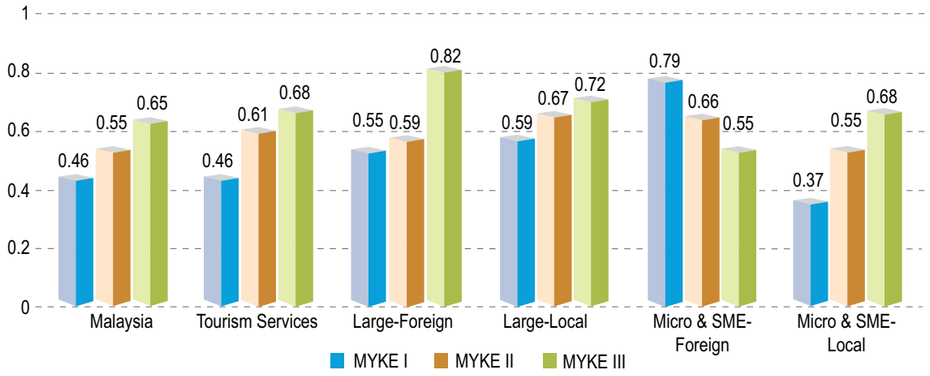
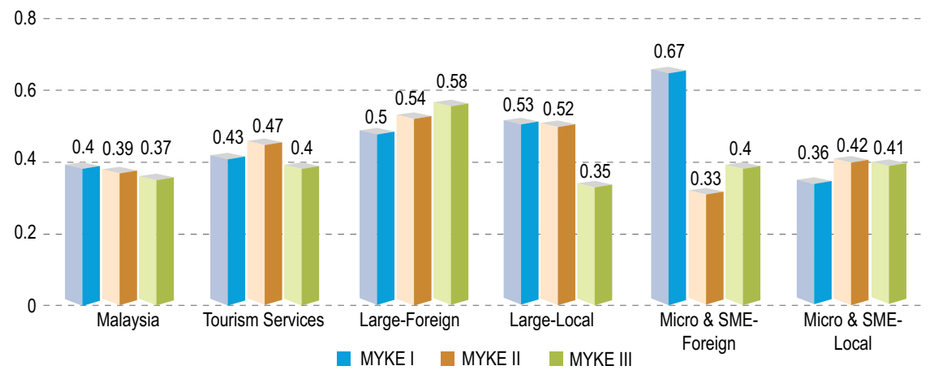


Figure 16.5: General Environment Awareness of the Tourism Industry

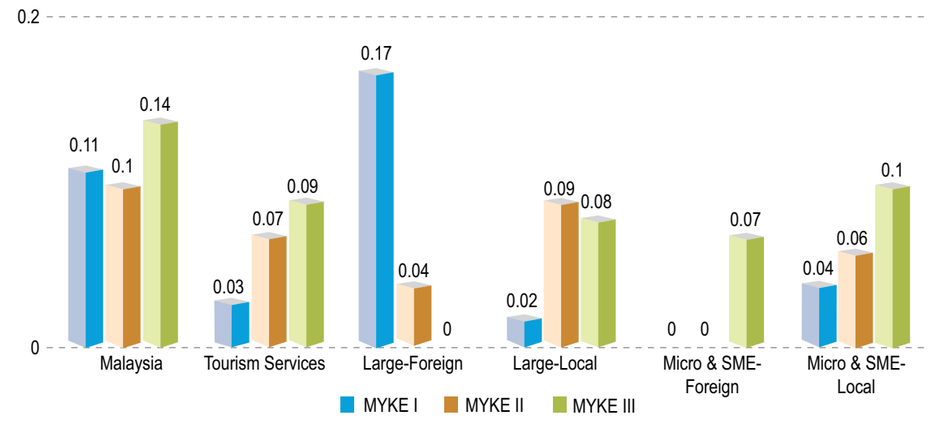


16.4 Knowledge Actions

16.4.1 Knowledge Generation

The tourism industry performs below the Malaysian industry aggregate in terms of R&D engagement, and filing of patents and copyright. The national aggregate for knowledge generation has remained low with scores between 0.11 and 0.14 over the period of 2003 to 2014. Given the nature of the services offered, the tourism industry is not characterised by ground-breaking R&D and hence patent filing is not common. The focus is mainly directed to market research and customer feedback.

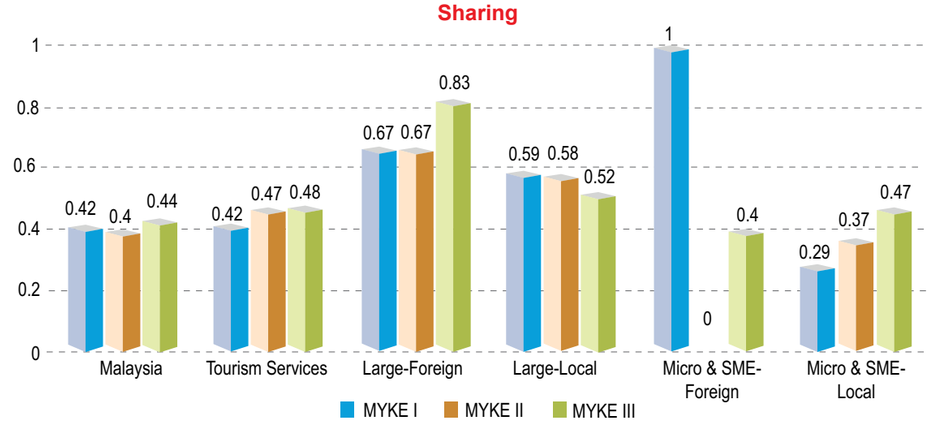
Figure 16.6: Knowledge Generation Activity in the Tourism Industry



16.4.2 Knowledge Sharing

Knowledge sharing in the tourism industry is only marginally higher than the national aggregate. There is a positive trend among large foreign firms and small local firms. With large foreign firms exhibiting the highest knowledge sharing in 2014. Meanwhile, large local firms and small foreign firms show a decline in knowledge sharing. In general, large firms continue to perform better than small firms across the period of 2007 to 2014.

Figure 16.7: Knowledge Sharing Activity of the Tourism Industry



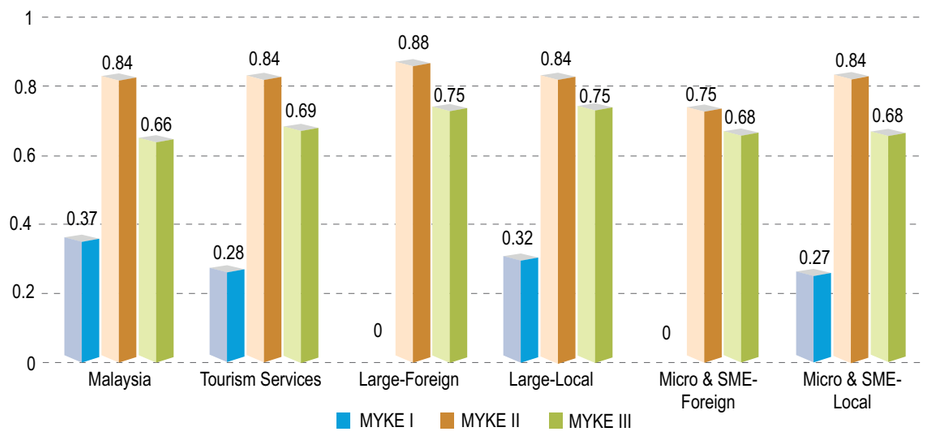
Note: The sample for foreign firms was small, especially for micro and SMEs. There were no micro & SMEs for the MYKE II study.

16.4.3 Knowledge Utilisation

All tourism firms made significant improvement in knowledge utilisation in the period between 2003 and 2007. Starting from very low base with scores below the national average of firms leveraged the knowledge they have and improved their scores to above national average by 2014. Although foreign large firms exhibit the highest level of knowledge utilisation, the scores are very close between different firm categories. Despite the tremendous progress in knowledge utilisation from the MYKE I to MYKE II assessment periods, 2014 marked a slight decline for all companies in their knowledge utilisation.

Overall, firms in the tourism industry generally show positive development and progress in leadership and infostructure but a decline in human capability, knowledge environment, and knowledge sharing over the period covered by MYKE I, II and III. In 2003, Malaysian firms had low knowledge infostructure and a low level of knowledge management formalisation. By 2007 they had made noticeable improvement in providing employee training and attracting employees with degrees. Firms also enhanced their knowledge management by adopting formal processes and strategies. They also took advantage of a range of government initiatives and programs to promote better infostructure and industry engagement with government and other institutes.

Figure 16.8: Knowledge Utilisation Activity of the Tourism Industry



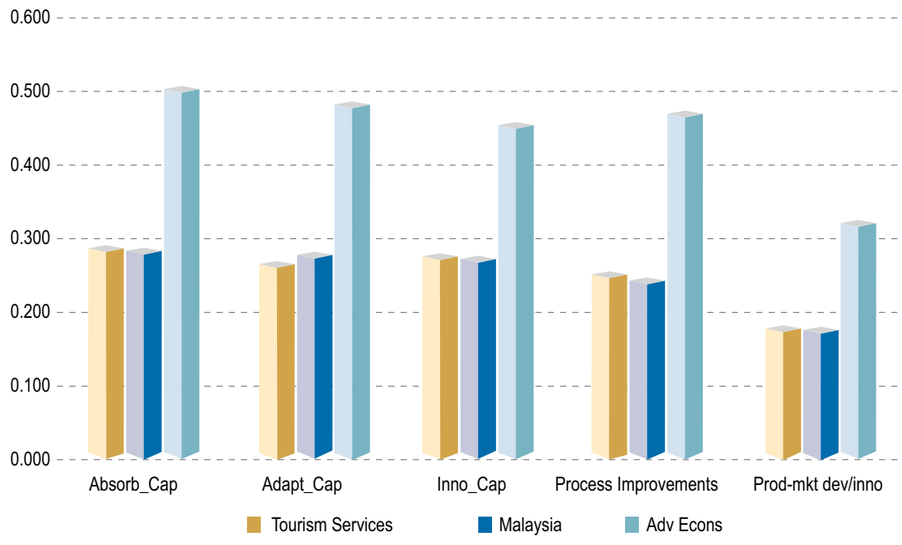
16.5 Dynamic Capabilities Profile for Tourism Industry

Dynamic capabilities play a fundamental role in enabling firms to change and adapt to their environment and its associated challenges and competitions, and are categorised into three key measures: absorptive capability, adaptive capability and innovative capability. Firms that manage to develop high levels of dynamic capabilities are better equipped to face their industry changes and to create a position of strength. Meanwhile those with low dynamic capabilities struggle to adjust to and survive the intensifying domestic and global competition.

The performance of the tourism industry is rather weak with regard to knowledge sources foundations. The industry failed to show significant improvement in knowledge generation or sharing, while its knowledge utilisation is on a decline. This weakness in knowledge actions underscores the failure in firms' abilities to handle knowledge.

Weakness in knowledge foundations has obstructed the process of dynamic capabilities building. **Figure 16.9** shows the outcomes of the tourism industry's dynamic capability profile and innovation associated with these knowledge-based capabilities. **Figure 16.9** shows that the tourism industry is on par with the national aggregate level with regard to absorptive capabilities and innovative capabilities but has lower adaptive capabilities.

Figure 16.9: Dynamic Capability Profile of the Tourism Industry

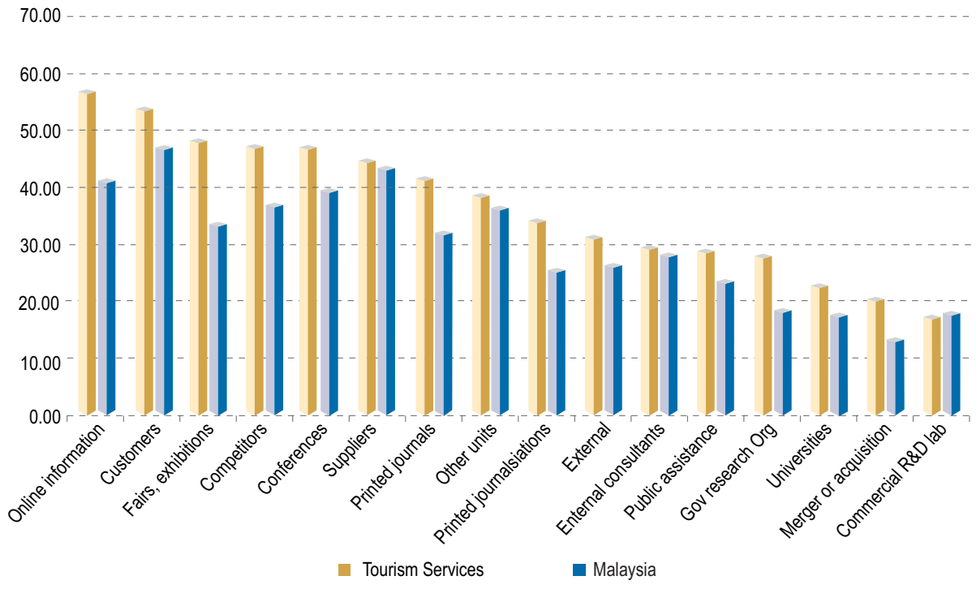


16.5.1 Absorptive Capability

The tourism industry is consumer focused and places considerable emphasis on collecting information from customers and other external sources. However, only the larger firms approach the task systematically. Many small and micro players have an ad hoc approach and hence have limited absorptive capabilities.

As noted, the industry is consumer-oriented and hence consumers, online information, and trade fairs constitute its top source of knowledge (**Figure 16.10**). Tourism operators also engage in a considerable level of benchmarking with competitors, and use conferences and suppliers as knowledge sources. Learning from government organisations, universities and R&D is minimal. Despite receiving a higher than average level of information, the industry's absorptive capability remains only average because the focus and type of knowledge acquired is confined to basic market research and customer feedback.

Figure 16.10: Sources of Knowledge in the Tourism Industry

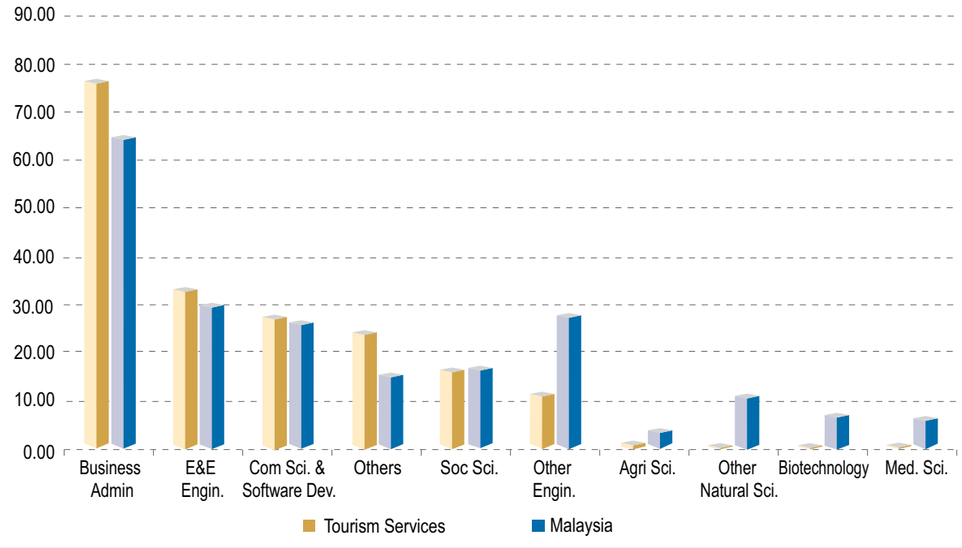


16.5.2 Adaptive Capability

Adaptive capabilities enable firms to make use of the knowledge collected from external sources. High adaptive capabilities suggest firms in the industry are able to reconfigure and reallocate the needed resources and structures to facilitate creative use of knowledge. The tourism industry shows lower than national aggregate score in adaptive capabilities, suggestive of weakness in the industry's ability to commit resources to highly innovative projects.

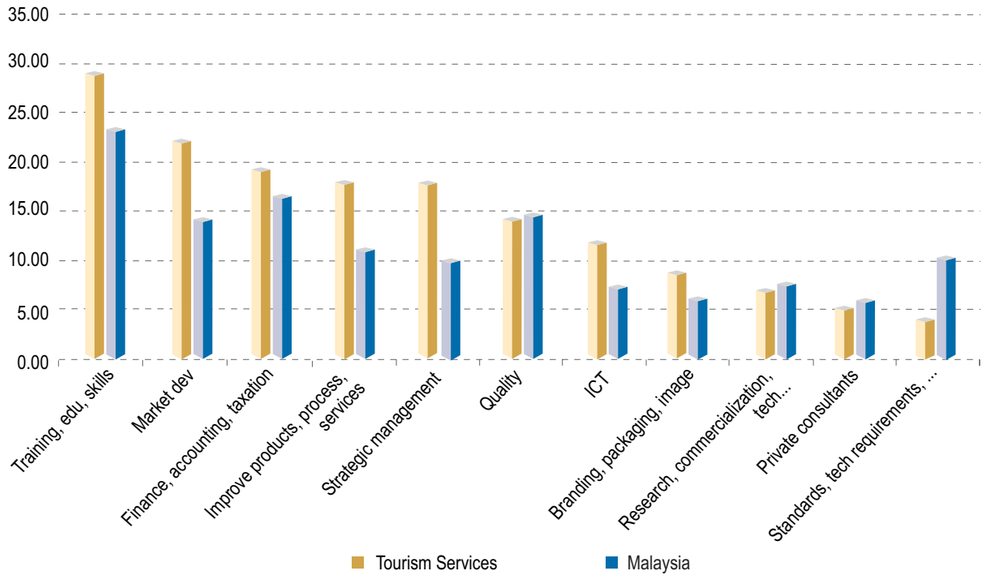
Human capability is a critical resource that firms can leverage to develop adaptive capability. The skills profile of firms in the tourism industry shown in **Figure 16.11** shows a high concentration of business administrative graduates. This is expected given the general nature of the tourism industry. The tourism industry also has above average level of E&E and engineering, and computer science graduates, and slightly below average level of social science graduates, and very small level of agriculture science graduates. With the development of new types of tourism such as ecotourism and agriculture tourism the industry will need to further develop its human capital capability, especially recruitment of graduates from the science disciplines such as botany, marine biology, and zoology. The growing interest in restoring history and heritage will also require people with specific skills in architecture and conservation, as well as knowledge of history and culture. The tourism industry is yet to build human capability strength in these areas.

Figure 16.11: Skills Profile of the Tourism Industry



The broader institutional environment in Malaysia provides help to firms which seek to develop their capabilities. Institutions such as government agencies, industry associations and universities provide a range of assistance and support in numerous areas. **Figure 16.12** shows that most firms gain external help in training, education and skills upgrading. The tourism industry also receives above average help in market development, finance and accounting, product and process improvement, and enhancement of strategic management. Greater emphasis and effort is required in quality assurance, standards and technology requirements, with these areas standing below the national average.

Figure 16.12: Role of Institutional Environment in Skill Building of the Tourism Industry



16.5.3 Innovative Capability

Innovative capability enables firms to use the collected knowledge and allocated resources to create new or improved products and/or services. Innovative capability is based on excellence in the execution of developed processes and structures to integrate knowledge and resources to produce outcomes. The tourism industry shows innovative capability on par with the national aggregate.

Firms in the tourism industry show mixed performance in their engagement with activities to improve innovative capability. For instance, the tourism industry has higher level of skills upgrading and development of market intelligence compared to Malaysian average. However, the firms in the industry show lower knowledge management, as well as low investment in R&D and weaker design and engineering improvements. To reach the aspiration of becoming a tourism hub of the region, the industry will have to make a much stronger effort to innovate and transform their propositions into world-leading offering.

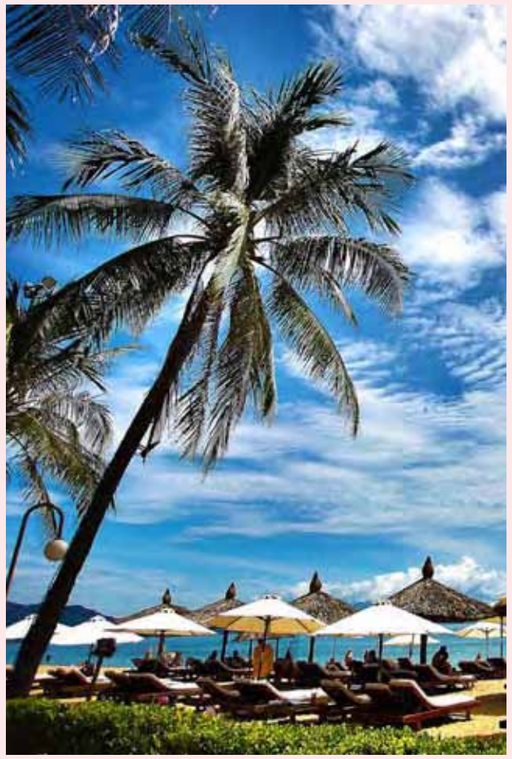
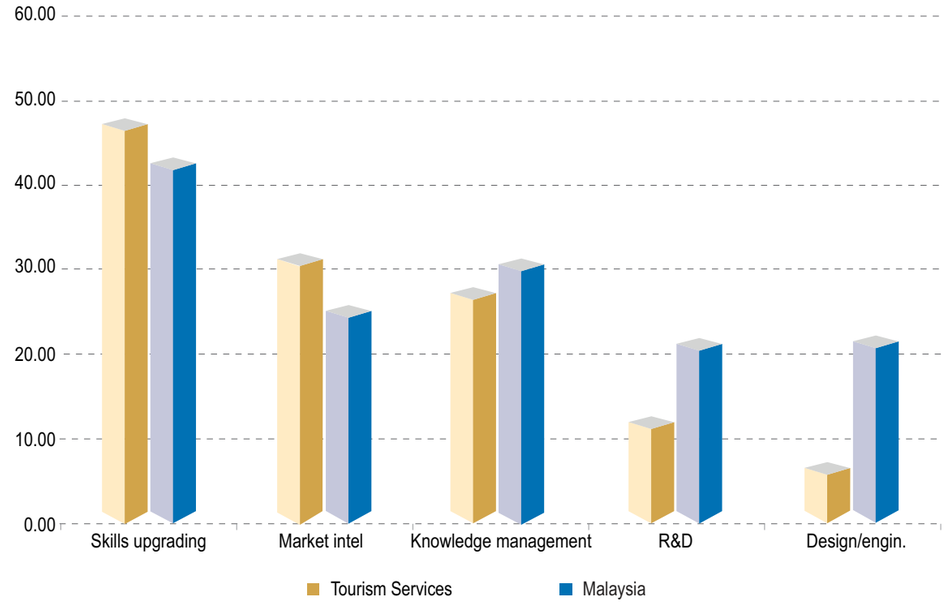


Figure 16.13: Knowledge Intensive Activities in the Tourism Industry



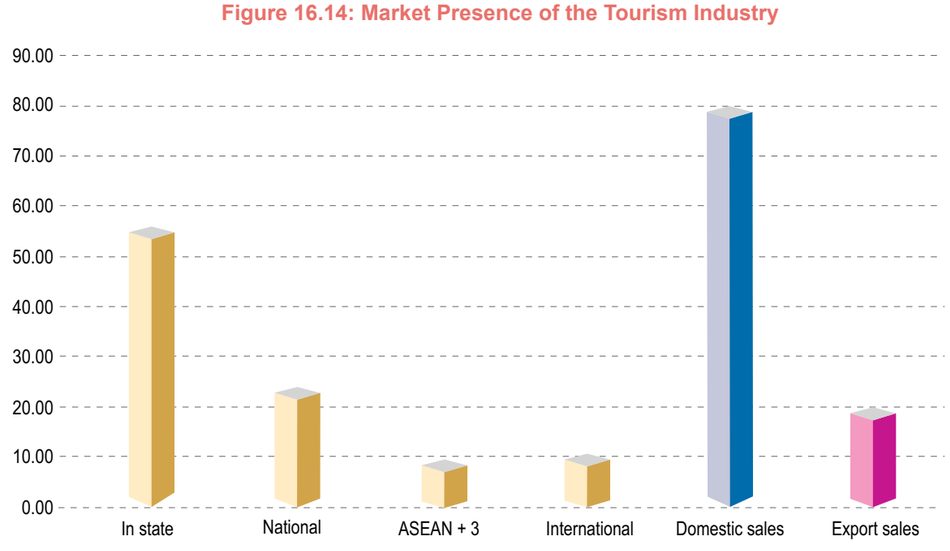
16.6 Outcomes of Dynamic Capabilities in the Tourism Industry

In keeping with the basic characteristics of the industry, the tourism industry is heavily focused on domestic operations. Only 20.10% of revenue is generated from international markets, with the remaining 79.89% originating from the home market. The majority of domestic activity is geographically bounded, with within-state activity accounting for 55.85%. Export sales suggest that the regional (ASEAN plus Japan, China and South Korea) and worldwide sales contributions are approximately equal at around 10% each. Although the Malaysian tourism industry is gradually expanding its operations outside Malaysia, it remains focused on inbound tourism.

Over time the tourism industry has made progress in upgrading its knowledge capabilities by laying the groundwork processes and through ICT investments. However, the industry shows variable performance in knowledge generation, sharing and utilisation. This subsequently translates into weak development of dynamic capabilities within the industry.

Weak dynamic capabilities of the industry are suggestive of the inability of firms to optimally translate knowledge and resources into marketplace innovations. **Figure 16.14** shows that performance of firms in the tourism industry is just slightly above national aggregate for process improvement. For an industry in which demand is not based on R&D but on service provision, high service delivery processes are essential. Service processes must be underpinned by excellent execution to ensure global market attractiveness. Unfortunately, Malaysian operators introduce imitative products/services rather than unique experiences for tourists. If continued in this manner, it will be difficult for local players to retain patronage and covert clients into strong advocates.

Figure 16.14: Market Presence of the Tourism Industry



Note: The results are based on survey data.

Figure 16.15: Strategic Profile of Firms in the Tourism Industry

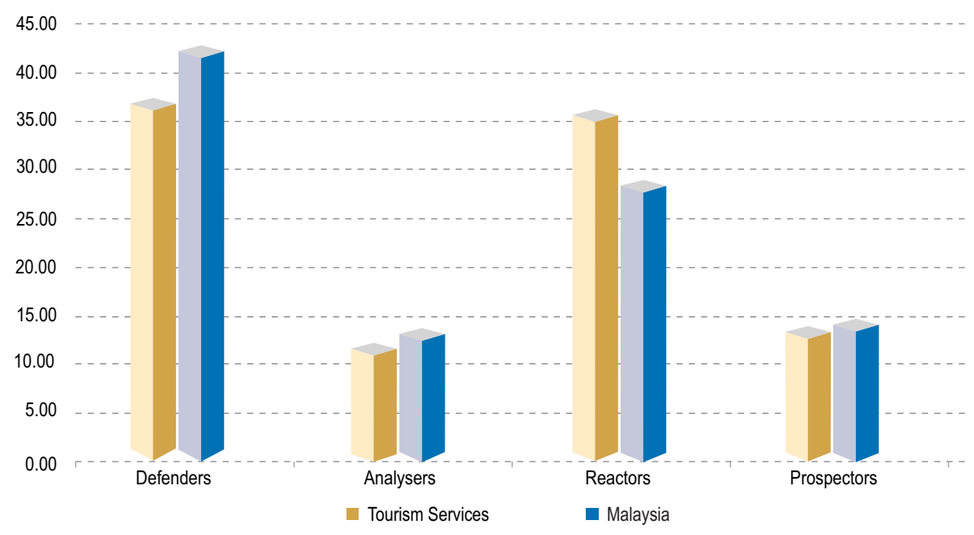


Figure 16.15 shows firms strategic profile in the tourism industry. The figure suggests strong presence of companies that are Defenders (37.58%) and Reactors (36.36%). Defenders and Reactors are not creative type of firms. Defender companies take a narrow focus on improvements, while Reactors change only when they can no longer survive by maintaining their conventional ways of doing business. These two types of companies form a 73.94% majority in the tourism industry. Forward-thinking companies, comprising of innovation-orientated Prospectors (13.94%) and Analysers (12.2%) feature at a lower level than the national aggregate.

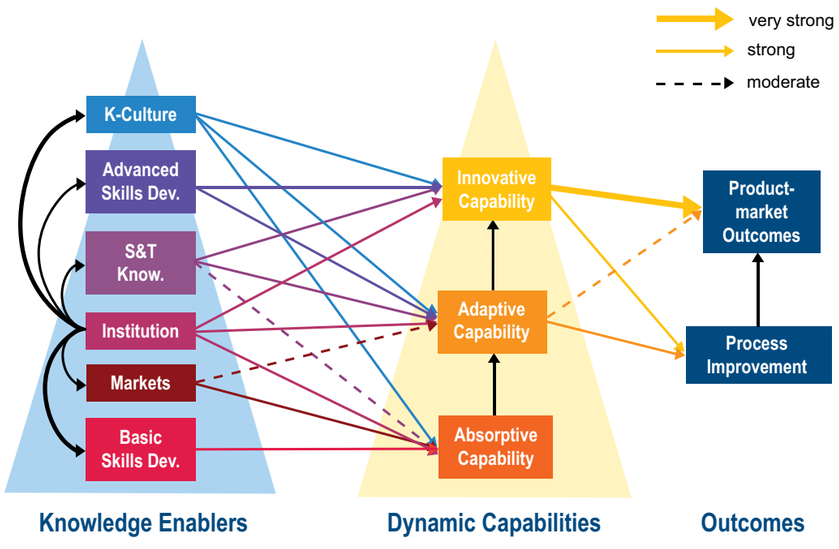
16.7 Relationships between the Key Blueprints of the Tourism Knowledge Ecosystem

In this section, the knowledge ecosystem, specifically the impact of knowledge enablers on dynamic capabilities and the subsequent impact on economic outcomes, for the tourism industry in advanced sector countries (e.g. France, Germany, Spain) and in Malaysia is compared and evaluated. From the content analysis of in-depth interviews and the data obtained from DOS, the tourism industry in Malaysia is identified as an Adapter. Strong tourisms firms in the industry exhibit a sufficiency in knowledge that enables them to rapidly adjust to external changes and create memorable experiences through the embodiment of culture, heritage and technology.

The knowledge ecosystem for the tourism industry in advanced sector countries (see Figure 16.16) facilitates the development of dynamic capability in the form of absorptive, adaptive and innovative capabilities, which in turn, drives process and product innovations. Firms in the tourism industry are strongly attuned to the external marketplace and exhibit strong absorbability capability. Market and customer knowledge is used to good effect via a process of internal adaptation in response to external opportunities, which is captured in the form of adaptive capability in this study. Strong absorptive and adaptive capabilities of these firms enable them to leverage upon these capabilities in the attempt to construct and develop innovative capability. Ownership of high levels of dynamic capabilities allows firms in the industry to make significant strides and improvements in their processes as well as introduce novel and new tourism experiences locals and foreign visitors.

The knowledge ecosystem for the tourism industry in Malaysia (see Figure 16.17) is significantly weaker than that of advanced sector countries across a number of areas. When the tourism industry is considered from the advanced sector countries' perspective, tourism firms appear to possess a strong overall dynamic capability position. A rich tapestry of enablers plays a role in the nurturance of the different dynamic capabilities in the tourism industry. In contrast, the tourism industry in Malaysia displays dynamic capabilities that have been weakly nurtured, particularly in innovative capability ability to produce significantly novel tourism product and service experiences.

Figure 16.16: Knowledge Ecosystem of the Tourism Industry in an Advanced Country



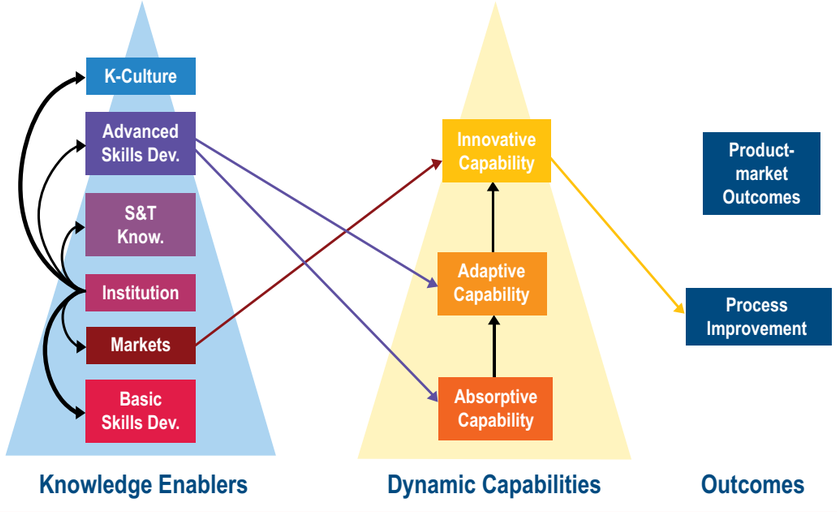
Note: Very strong impacts are represented by the bolded line, strong impacts are represented by normal lines and moderate impacts are represented by dotted lines.

In advanced sector countries, the absorptive capability of firms in the tourism industry is developed through market sensing, which in turn, transposes into innovative capabilities to create process efficiencies and produce tourism products that closely match market needs and demand through internal adaptation and readiness of firms to take advantage of absorptive intelligence. However, tourism firms in Malaysia, lack strength in adaptive capability, and face great challenges in creating truly unique tourism products and experiences. Most often, efforts are focused on understanding others tourism products and services (absorptive effort), instead of focusing on creating experiences that are unique, distinct and ahead of other competitor destinations. Innovative capability of tourism firms in Malaysia is such that it essentially is able to create imitative experiences in a cost conscious manner. There is little development of new tourism products and experiences that are truly distinctive.

Besides the above, in advanced sector countries, significant collaborations between universities, colleges of arts, history and culture and technical institutes contribute in the creation of all three components of dynamic capability (i.e., absorptive, adaptive, and innovative capabilities). This appears to be weak within the Malaysian tourism industry, due to lack of emphasis on culture, history and heritage as well as the use of technology to bring out such aspects in the modern creation of experiences for modern day technically demanding consumers. Institutional enablement of the variety of these enablers leads to weaknesses in the industry dynamic capability set and undermines its long term competitive position.

The weaknesses in the knowledge ecosystem in developing the necessary strength across all three components of dynamic capability for the tourism in Malaysia is apparent. Due to these deficiencies, tourism firms in Malaysia primarily compete on a cost through process efficiencies with little product innovation. Price becomes the key focus rather than high value-added tourism products and experiences.

Figure 16.17: Knowledge Ecosystem of Tourism Industry in Malaysia



A summary of the comparative standing of the tourism industry and its knowledge ecosystem in advanced sector countries and in Malaysia is provided (see **Table 16.2**). Key areas of comparative deficiency of the knowledge ecosystem of the tourism industry in Malaysia relative to the strengths found in advanced sector countries are also highlighted.

Table 16.2: Knowledge Enablers and Dynamic Capabilities for the Tourism Industry

Advanced Countries	Malaysia
Basic skills have a **positive impact** on absorptive capability. In advanced sector countries, the level of basic skills required for top notch tourism products and experiences is high. Besides having a long history and accumulated knowledge, it is important to note that the development, nurturance and dissemination of knowledge in these countries is co-ordinated and carefully integrated though collaboration between government agencies, regulatory authorities, industry associations and institutions of learning.	Basic skills **fail to show significant impact** on absorptive capability. In Malaysia, the tourism industry is highly dependent on a labour force comprised by a significant number of low skill foreign workers. The transitory nature of employment of foreign workers creates problems in systematic development of absorptive capability. Inadequacy at this level weakens the absorptive capability foundation and the makes it challenging to feed into higher dynamic capability components.
Market intelligence has a **strong positive impact** on absorptive capability and moderate impact on adaptive capability. In advanced sector countries, suppliers, customers, competitors, external consultants and commercial R&D centres play a key role in the absorption of new knowledge, especially the use of new technology, in the tourism industry. This nexus of collaboration and intensive sharing facilitates the development of new technologies, systems, and processes for firms in the tourism industry. In turn, the combination of multiple knowledge sources contributes to developing high value-added tourism products and experiences.	Market intelligence has a **positive impact** on innovative capability. In Malaysia, the tourism industry relies on similar sources to the advanced sector countries the integration and collaboration aspects are much weaker. This hinders the enabling impact of these sources to drive service innovation. Particularly lack of sufficient market intelligence on other components of dynamic capability making it difficult to materialise innovation into new high value-added tourism products and experiences. Tourism firms in Malaysia are able only to use such knowledge to fashion improvements in tourism processes in the pursuit of becoming price competitive rather than create new uniquely Malaysian experiences.
Institutions are **strong enablers** of the knowledge ecosystem and have a **direct strong and positive impact** on absorptive, adaptive, and innovative capability. In advanced sector countries, institutions such as industry associations, government research institutions, and colleges of art, history and culture feature heavily in the development of a vibrant knowledge ecosystem for the tourism industry. These institutions are proactive and play significant roles nurturing absorptive, adaptive and innovative capabilities. Consequently, these institutions act as direct enablers of skills development and talent advancement, as well as being key drivers of leading-edge service development. With all the different pieces coming together, it becomes possible for tourism industry to create exciting, memorable and unique experiences by blending culture, art, history, infrastructure and technology for the next generation of tourism products and services.	Institutions are indirect **enablers** for all the different knowledge enablers, but they **do not produce any direct impact** on absorptive, adaptive, and innovative capability. In Malaysia, institutions, such as industry associations, colleges and universities play a peripheral role in the development of talent training for the tourism industry. As a consequence of this, institutions are unable to provide any direct improvements in the absorptive, adaptive and innovative capabilities of firms in the tourism industry.
S&T knowledge has a **positive and moderate impact** on absorptive capability, but a **positive and strong impact** on adaptive and innovative capabilities. In advanced sector countries, the tourism industry has a strong foundation in basic and applied research in science and technology. Firms in this industry tend to be highly focused on creating technical advances as part of offering tourism products and experiences that employ cutting edge technology and inputs, which in turn enables them to be at the forefront in developing new systems, products and experiences for the tourism market.	S&T knowledge has a **no direct impact** on absorptive, adaptive and innovative capabilities. Instead, S&T has **indirect effects** through its interaction with other knowledge enabling factors. In Malaysia, a majority of tourism providers are users of new technologies or formats developed elsewhere. The primary influence of S&T is on translating and adapting others' knowledge and formats that can be adapted for use in tourism markets. S&T knowledge that does takes place is marginal and tends not to be widespread within the tourism providers.
Advanced skills have a **positive and strong impact** on innovative and adaptive capabilities. In advanced sector countries, significant resources are dedicated to improve the quantum and quality of the workforce through the development of specialist areas of crafts, and professional practice of arts aligned with the current needs of the tourism industry, as well as its future needs. Advanced sector countries have a strong 'quadruple-helix' that helps in the co-ordination and integration of a seamless tourism experience. With diverse range of skills and creative arts environment that is highly valued it becomes possible to stretch the frontiers of tourism experience in novel directions, whilst at	Advanced skills have a **positive and significant impact** on absorptive and adaptive capabilities. In Malaysia, the impact of advanced skills in tourism industry is inclined toward the lower level simple experiences. Lower level dynamic capability (absorptive and adaptive capabilities) feature more prominently than higher levels of adaptive and innovative capabilities. Without cutting edge creative skills to develop new ways of experiencing tourism, the industry relies on basic approach to attract and service tourists. Strengthening the knowledge of culture, heritage, history as well as preserving the natural

Table 16.2: Knowledge Enablers and Dynamic Capabilities for the Tourism Industry (cont'd)

Advanced Countries	Malaysia
the same time restoring and maintaining cultural traditions and artefacts. New approaches and concepts opens up new frontiers in the applications of products and experiences for tourism purposes.	environment are both fundamental in raising the threshold of adaptive and innovative capability of firms in the tourism industry. This will require a majority of the skilled workforce in the tourism industry to move from mere interpretation of others' tourism formats and new technology to producers of cutting-edge development of tourism products and services.
Knowledge culture has a **positive and strong impact** on absorptive, adaptive and innovative capabilities. In advanced sector countries, the organisational culture among tourism providers are strongly geared toward deep knowledge acquisition of the creative arts, history, and cultural traditions. Deep understanding and knowledge of these skills combines with an understanding of the tourist segments to create finely-tuned service experiences. By having a culture that is trained or cultural excellence tourism providers can build unique aspects into their dynamic capability DNA. This in turn is key to the launch of high value added new tourism products and experiences.	Knowledge culture **does not feature as key driver** in the nurturance and development of absorptive, adaptive and innovative capabilities. In Malaysia, organisational culture is strongly hierarchical. Art and innovation are considered the domain of a few, and often corporate executives focussed on profit returns than the aesthetics of the art and innovative boundary extending experiences. Such internal reflexes diminish the creative impulse. Within a majority of firms in the industry there is negligible organisation wide dynamic capability to extend experiences in novel and untried directions. Safety in simple adoption of tried and tested tourism formulas is preferred to ground breaking approaches to art and service experience.
The continuum from absorptive capability to adaptive capability to innovative capability is **present and strong.** In advanced sector counties, sound R&D coupled with strong personnel with basic, technical, and advanced skills in the arts and crafts contribute to the industry's resilience. This takes place through a strong foundation of absorptive capability linked to firm adaptation and subsequent reconfiguration to create new service experiences that enhance quality of existing tourism products and experiences. As skilled artists and workers in the tourism industry gain more experience, they are able to translate internal and external knowledge into new tourism products and experiences suited for local and foreign tourists. Additionally, as tourism providers intensify their technology and knowledge capabilities, they are able to successfully produce new process improvements that often can translate into new lines of tourism products and experiences.	The continuum from absorptive capability to adaptive capability to innovative capability **is present.** In Malaysia, the skill composition of the tourism industry is predominated by many low skill workers and only a small composition of highly skilled creative artists and professionals. This suggests some degree of sufficiency to build dynamic capabilities but the quantum and quality of workers with specific skills that allow for higher order adaptive and innovative capabilities (leading to truly new and unique tourism products and experiences) continues to suffer from significant shortfalls.

The translation of dynamic capabilities to economic outcomes for the tourism industry in advanced sector countries and in Malaysia is provided (see **Table 16.3**) in which the study's evaluation shows that the impact of dynamic capabilities components on economic outcomes for the tourism industry between advanced sector countries and Malaysia differ significantly. More specifically, in advanced sector countries, adaptive and innovative capabilities were found to produce a positive impact on new product development and process improvement, and a notable very strong positive flow from process innovation to product innovation indicating that process innovation is a key enabler for tourism providers to not only complete on new features of tourism products and experiences but also its cost effectiveness.

In contrast, observations of the tourism industry in Malaysia suggest different flows as compared to that of advanced sector countries. Interestingly, only innovative capability was found to produce a significant impact on process improvement. This is demonstrative that the Malaysian tourism industry is geared primarily compete primarily on price rather than development of innovative tourism products and experiences. The result of the weakness in dynamic capability points to a lack of global competitiveness of tourism providers in Malaysia in the distinct and high value-added segments demanded by foreign tourists. Many of Malaysian tourism service providers respond to the highly cost conscious segments, epitomised by local tourists. These reflexes are captured by the weakness of innovative capability and the absence of adaptive capability effects that feature so prominently in the tourism industry of advanced sector countries.

Table 16.3: Dynamic Capabilities and Economic Outcomes for the Tourism Industry

Advanced Countries	Malaysia
Adaptive capability has a **positive impact** on process improvement and product-market innovation. In advanced sector counties, adaptive capability of tourism providers plays a key role in driving process-led efficiencies that help launch globally competitive, new and unique tourism products and experiences. Tourism providers in advanced countries are highly capable of adapting new technologies and scientific advances and meld them with the creative arts and history to create highly distinct and high value-added products and experiences for tourists.	Adaptive capability d**oes not have any impact** on process improvement or product market innovation. In Malaysia, insufficient strength and depth in dynamic capability can be observed in the tourism industry, which may be attributed to weaknesses in the enabling factors and poor adaptive capability that fails to deliver significant benefits. This reduces the potential of making advances in both process improvement and service experience enhancements.
Innovative capability has a **positive impact** on product market outcomes and a moderate impact on process improvement. In advanced sector countries, strong innovative capability powered by strength in their arts and S&T base, coupled with strong interaction and collaboration among stakeholders in the tourism industry contributes to creative and technical advances that can be used to create wider range of possibilities in distinct and high value-adding tourism products and experiences.	Innovative capability has an **impact** on process improvement, but **not on** product market outcomes. In Malaysia, the focus of tourism providers is strongly geared to provide tourism products and experiences that are often based on formats developed by others. The primary focus is on reducing cost of providing tourism products and experiences, and using price as competitive device to attract tourists.
Process improvement has a **very strong positive impact** on product market outcomes. In advanced sector countries, strong components of dynamic capability are supported by a rich string of enablers to enable tourism providers to not only create enhanced and novel tourism products and experiences, but also, provide these offerings very efficiently. In addition, strong institutional collaborations and high technical and creative skills in performance and crafts allow for translational impact across processes as well as products and experiences in the tourism industry. Moreover, the strong process capability possessed by tourism providers in advanced sector countries enable them to amplify the leverage and benefit of tourism-based product-market innovations.	Process improvement **does not impact** product market outcomes. In Malaysia, the non-contributory nature of process improvement to advancement in product innovations creates a situation in which tourism providers become limited in their focus to existing portfolio of tourism products and experiences, and thus become solely dependent on price competitiveness for market success.

16.8 Summary: Key Trends, Challenges, Way Forward and Best Practices

16.8.1 Industry Trends

Malaysia has the advantage of having a variety of natural attractions, history and culture, shopping facilities and infrastructure development. Furthermore, being a Muslim majority country translates into widespread availability of Muslim-friendly facilities which allows the industry to cater for a diverse market with large Muslim population. While opportunity exists for Malaysia to be the leading tourist destination in the region, this will require the strengthening of knowledge foundations and adopting well-thought strategies to allow better leverage of resources.

The tourism industry shows average knowledge performance. Its knowledge foundations are on par with Malaysian aggregate, except in knowledge generation where its performance is much lower. The trend in knowledge enablers and knowledge actions (except knowledge generation) mirrors that of industry aggregate over the period between 2003 and 2014. Knowledge generation is particularly low in the tourism industry, indicating firms' heavy reliance on knowledge created by others and the inability of local industry to generate new knowledge through truly innovative services.

Consequent to the Malaysian Government's push to grow the tourism industry, firms have taken advantage of a range of initiatives and programs especially in their use of ICT for business. Many have also taken advantage to improve their formal processes and create new strategies. Despite the improvements made over the years the industry remains average in its knowledge capability, and continues to face difficulty in developing its human capability level.

16.8.2 Challenges

The tourism industry is one of the largest contributor to the national economy. However, the tourism industry currently faces a number of challenges that may affect the competitiveness of the industry, which are discussed below.

Institutions:

- Poor communication between industry players, associations and government, leading to policies and regulations that affect the livelihood and operations of tourism players without full cognisance of feedback from the grassroots level.

- Lack of coordination between the tourism industry and related players in the supply chain network (e.g. transportation industry, hospitality services industry, etc.). These disjoints lead to poor travel experiences – unreliable public transport system, poor travel advice, lack of widely available trustworthy information, and so on.

- Lack of governance and policies involving environmental (flora & fauna) protection, historical & heritage preservation and a lack of clarity and integration in the overall direction of the different components making up the tourism industry.

Basic Skills Development:

- Talent mismatch in workforce. Most graduates are business administration, sales and marketing etc.). In particular, there is a lack of graduates with sufficient service skills, such as language proficiency, culture, heritage and destination knowledge, etc.

- Lack of soft skills and language competency of workforce in the industry.

- Limited investment in skills and training to upgrade the workforce.

- Weakness in the standard and quality of service skills that are essential for the industry. Individuals are content to provide average level of service.

Advanced Skills Development:

- Skills of graduates do not meet the needs of creative work in the industry. There is significant lack of employees with talent or specialist knowledge to develop novel travel experiences. Graduates are good users of foreign approaches and innovations but not designers of new experiences and innovations.

- Few firms have staff with the knowledge and skills to apply knowledge in a creative way (e.g. modernisation of the hotel industry with app check-ins, app-based ordering, etc.)

- SMEs have major challenges in recruiting high calibre workers. Most qualified local k-workers prefer working overseas or with MNCs in the industry (e.g. F&B managers, Hotel managers, Tour guides, chefs etc.)

S&T Knowledge:

- Industry offers imitative products and services to the market.

- The industry's usage of S&T knowledge remains basic. The industry lacks innovative approaches in the use of new technology to develop new or enhance existing experiences.

- The wave of new technology in the form of smart devices, applications and web-based tourism offerings (e.g. AirBnB, Agoda.com, GrabCar etc.) does not dovetail well with the existing industry infrastructure, especially in the case of micro firms and SMEs.

Market Intelligence:

- Extensive monitoring takes place but its focus is to simply imitate services provided by competitors.

- Lack of effort by firms to systematically understand customers' and weak understanding of the need to improve travel and service experiences.

- Over reliance on superficial knowledge and information derived from online sources.

- Inadequate mechanisms and systems to capture market intelligence to usefully help institutional agencies to steer the industry towards a positive and impactful growth.

Knowledge Culture:

- Strong "reliance" culture whereby many firms have over time become overly dependent on public funding, investment and incentives. This has led to a lack of "resilience" and an inhibited "innovative" drive.

- Firms in the industry are not sufficiently inclined to innovate or have the spirit to share knowledge to help steer the industry towards long term objective sustainable growth (e.g. eco-tourism, medical tourism and halal tourism). Efforts and actions are short-term and self-interest focused with little interest in developing a win-win collective outlook.

16.8.3 Way Forward

Over the years, several initiatives and programs have been undertaken by the Malaysian Government to promote the tourism industry in Malaysia, internally and externally. To maintain its competitive advantages, the tourism ecosystem should continuously improve to enable it to move up the knowledge value chain. The following are proposed recommendations to strengthen the tourism ecosystem.

Recommendation 16.1: Improve Infrastructure and Connectivity for Seamless Travel Experience

- Create connectivity between various modes of travel (rail, bus, plane, etc) for seamless travel experiences.

- Establish an advanced and integrated public transport network that provides greater coverage (current projects are on-going for Klang Valley only) and connectivity across land, air and sea network. It needs to be fully functional and integrated for the whole country.

- Improve management of existing and new transport infrastructures by the government and private sector – greater emphasis needs to be placed on safety, timeliness, reliability etc.

Recommendation 16.2: Upgrade and Maintenance of Public Facilities to Ensure Minimum Standards of Service Expectation are not Contravened

- Tourist service experiences can be easily compromised by a failure to reach minimum hygiene expectations. This can have long term impact on travellers, with few wishing to return back if minimum expectations are compromised.

- Constant and systematic upgrading and maintenance work is required as current facilities are generally neglected or poorly maintained. Long term neglect leads to higher maintenance and replacement costs. There is a need for strategic allocation of funds to upgrade and maintain public facilities and amenities to ensure highest levels of public facilities across the country, especially tourist destinations.

- Tenders for up-grading projects must involve transparent selection processes and appointments in order to increase public trust that public resources are not being wasted in the creation of inadequate public facilities and services.

Recommendation 16.3: Develop Quality Service-Oriented Human Capital Aligned with Specific Tourism Sectors of the Country

- Initiate partnerships between institutions and industry - to understand the needs of the industry and align institutions to provide human capital to match the needs.

- Universities, colleges and vocational schools to provide programs structured to cater for both the basic (e.g. Language, hospitality, mannerism etc.) and advanced skills (e.g. knowledge of Malaysia's marine life, forestry, animals, flora and fauna, culture, heritage) required to work in tourism.

- On the job training and mentorships to allow essential exposure through "real life" interaction with the tourism industry to enhance the skills of the workforce.

- Policies need to be put in place to ensure standardisation and consistency of service quality level is provided by firms in the industry.

- Mapping of current and future skill needs so that strategic decisions can be taken in the allocation of resources.

Recommendation 16.4: Technology Integration to Support Building of Customised Customer's Travel Experiences

- Leverage existing technologies to provide efficient and reliable service to the consumers.

- Partnerships with start-ups such as Agoda, AirBnB, Booking.com etc. to improve service, productivity and output for the tourism industry. Technology-based partnerships will open up a variety of choices and allow customer to customize their experience accordingly to specific needs.

- Utilise smart devices and apps (e.g. Grabcar, Uber, LRT App etc.) to positive effect. Initiatives needs to be taken to leverage such platforms to create an integrated technology driven future.

- Interactive and augmented reality tours are slowly gathering pace in the tourism industry. Steps should be taken to review and implement leading-edge transformative breakthroughs within Malaysia's tourism industry.

Recommendation 16.5: Raise Civic Mindedness and Awareness of the Malaysian Public to Create Sustainable Eco-Environments

- Country wide campaign and awareness to raise the level of civic mindedness in the public's general lifestyle.

- Institutions to conduct courses and integrated learning in Malaysian public schools to tackle civic norms at the grassroots level. Active participation of young children in civic projects to embed a mind-set of civic virtue and purpose. For example, one can emuate the civic education found in cultures such as the Japanese.

Recommendation 16.6: Develop Sustainable Environment to attract Tourism

- Environmental sustainability programmes funded and encouraged by the government to encourage greater responsibility for the natural flora and fauna of the country, as a key factor in the sustainable development of the tourism industry.

16.8.4 Best Practices

Under the Malaysian Government's ten-year Economic Transformation Programme (ETP), the tourism industry has been identified as an important sector to stimulate economic growth. It is therefore important for the Malaysian tourism industry to adopt the best practices to move up the knowledge and innovation value chain.

Best Practice 16.1: Develop Integrated Policy for the Promotion of Tourism

EU Tourism Policy: Promoting and Invigorating Tourism

- Promote and consolidate the image and profile of Europe as home to the development of sustainable, responsible and high quality tourism.

- Maximise the potential of EU policies and financial instruments to improve the flow of tourist into the country through a number of initiatives. They include the following: effective promotions overseas; branding of EU as the preferred place for tourist; ease of visa issuance in home countries; ensuring safety and security of tourists; improving the ambience and assistance in port of entry for tourist; ensuring adequate information in multiple languages are in place to cater for a wide segments of tourism from around the world; and improving intensifying the professional skills, multicultural competence and capability of personnel working in the industry

- Digital platforms, such as the Virtual Tourism Observatory (VTO), are used effectively to promote and provide information to tourists on important and historical sites. The VTO is also important for EU's tourism industry to acquire information, statistical indicators and the state of tourism in EU. The information obtained through the VTO provides policy-makers and industry associations' valuable information in developing policies and strategies that cater for interests and needs of tourists to EU.

- The tourism board also have incorporated niche market strategies to cater for a wider segment of the market and they include the following initiatives:
  - *The Calypso Initiative* – provides disadvantaged people an opportunity to go on holidays during the low season and provides opportunity for lesser known destinations the opportunity to promote their localities. This initiative encourages longer lasting employment in the industry.

  - *Senior Tourism Initiative* – promotes competitive tourism packages to senior citizens during off-season period.

  - *The Eden Initiative*–promotes sustainable tourism; enhance visibility of emerging tourism destinations; and create awareness of Europe's tourism diversity, cultural heritage, history and quality of tourist experience.

Best Practice 16.2: Understand Unique Characteristic of the Country to Build a Holistic Journey and Experience

Ireland – Create a "Journey" of Experiences of the Country

- *Wild Atlantic Way* – long distance touring route, stretching along the Atlantic coast from Donegal to West Cork – provision of new commercial opportunities for businesses along the route. These entice tourists to stay longer and spend more throughout their trip and explore the different cultures and experiences the route provides to the visitors.

- *Foreign Language in Education Strategy* – The Department of Education and Skills prepares a foreign language in education strategy, which provides framework for future development of language proficiency to boost the tourism industry.

Best Practice 16.3: Technology Integration to Support Building of Customised Customer's Travel Experiences

USA – Embedding the Frontiers of Technology for Service Delivery

- Visa waiver programmes for selected countries to ease the burden of travel coupled with popular trusted traveller programmes to entice travellers to a variety of tourist destinations and experiences available.

- Development of autonomous robot helpers in hotels to provide room services.

- Tech-savvy hotel innovations that include app check-ins, remote charging capabilities for devices, and remote control apps to control the various devices and appliances in the room.

United Kingdom – Building Experiences around Niche Segment Needs

- Travel Tech Incubator – Travel tech labs support the growth of the UK's tech industry by offering high-specification workspaces equipped with the necessary technology and applications for business to be carried out remotely (e.g. meetings with foreign partners, foreign interviews, business workspaces for business travels etc.).

Best Practice 16.4: Develop Sustainable Environment to Attract Tourism

A Whole-Of-New Zealand Approach

- There is a strong commitment from the government to take a 'holistic' approach to managing the tourism industry and to ensure the natural environment of New Zealand in an integral strategy to promoting this industry. This is evidenced by its commitment to sustainable tourism or "ecotourism". The government has gazetted over 30 percent of the land as national parks and these parks are managed in a sustainable way that appeals to nature lovers.

- The management of the tourism spans multiple ministries and agencies; hence, the Ministry of Tourism as the lead agency has established clear protocols and mechanism for multiple agencies and ministries to promote the tourism industry. For example, the government introduced the Environmentally Sustainable Tourism Project, which is jointly led by the Ministry of Tourism and the Ministry for the Environment. The sustainable tourism initiative is also strongly supported by strategies implemented by other ministries such as the New Zealand Transport Strategy and New Zealand Digital Strategy.

- A holistic approach to managing the tourism industry through a strong multi-stakeholder partnership model has enabled the tourism industry in New Zealand to be branded as one of the most popular tourism destinations in the world for lovers of nature.

Developing a Niche: Agro-Tourism in Taiwan

- Niche area of leisure agriculture in Taiwan has been developed very well in the past decade with the help of government policy and farmers' eagerness to transform their agricultural operations. This has also had a complementary effect of increasing the scale of leisure farm. From the agriculture leisure areas, guesthouses have grown steadily and their quality increasingly refined with special features. The growing tourism activity provides an additional source of income for the farming communities.

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CHAPTER 17

KNOWLEDGE CONTENT OF THE TELECOMMUNICATIONS AND COURIER SERVICES INDUSTRY

CHAPTER 17
Knowledge Content of the Telecommunications and Courier Services Industry

17.0 Introduction

In the 1990s, rapid innovations in telecommunication research and the spill-over benefits derived from these innovations have resulted in governments across the globe investing in the development of effective institutions, infrastructure and other supporting systems to migrate all economic agents to a more information and knowledge driven economy. Malaysia followed the global trend of the convergence of communications and multimedia in 1990s with the enactment of the 1998 Communications and Multimedia Commission Act and the creation of the Malaysian Communications and Multimedia Commission (MCMC). This regulatory licensing framework and regulatory body helped to consolidate the telecommunication services and paved the way for the rapid development of communications content (multimedia) and infrastructure (CCI) in Malaysia. The importance placed on the role of CCI to Malaysia's progress in evident, with the category being one the twelve NKEAs in the Malaysia's ETP.

The Malaysian Communications and Multimedia Commission [MCMC] (2016) showed that 77% of the communications and multimedia (C&M) industry revenue comes from telecommunications. The Malaysian telecommunication industry has come a long way since its first telephone exchange was established in 1891 with 400 miles of communications line and 20 telephones, to become one of the most connected countries in the region. In 2014, Malaysia's mobile cellular penetration exceeded 100%, with 44.9 million mobile phone subscriptions, putting Malaysia ahead of China, Vietnam and Thailand, though still behind India, Philippines and Singapore. In 2015, the penetration rate of mobile subscriptions achieved 143.8% (MCMC, 2016). Malaysia also ranks among the top ten countries in terms of internet usage in the Asia Pacific with 21 million internet users in 2016 and a household penetration rate of 68.1% (Internet World Stat, 2016), the latter being well above the target set by Broadband Commission for Digital Development (UNESCO). Internet penetration will continue to grow with the improvement in mobile broadband coverage, including transitioning from 2G and 3G to 4G long term evolution (LTE).

Postal and courier services came under the responsibility of the Malaysian Communications and Multimedia Commission in 2001 (MCMC, 2015a), underscoring the importance of the sub-sector as an e-commerce enabler and the role of postal services in the wider communication market. The Postal Services Act 2012 was purposefully enacted to ensure the modernisation of the postal services in a rapidly changing environment. The advent of the internet and email has led to a decline in the traditional postal model of mail delivery. However, strategic foresight through the National Postal Strategy (2011-2014) saw the reinvention of service offerings; therefore, although the number of post offices declined between 2012 and 2013 (from 1004 to 969 post offices respectively), the revenue from postal services (Pos Malaysia) increased by 8.3% from RM1.2 billion to RM1.3 billion, with 100% increase in operating profit from RM0.1 to RM0.2 billion (MCMC, 2009). While the number of courier licenses has declined slightly from 105 in 2012 to 93 in 2014, courier traffic has picked up quite significantly for both domestic and international documents and parcels due to the growth of e-commerce (delivery of merchandise purchased online) (MCMC 2009; 2015b). The total revenue of postal and courier services industry rose by 41% from RM3.2 billion in 2011 to RM4.5 billion in 2015 (MCMC, 2016). The upward trend in courier traffic over the years indicates that physical deliveries of official documents and parcels will continue to play an important role in servicing the Malaysian community.

17.1 Key Developments and Initiatives

Although the monopoly of fixed line and cellular services ended in 1994 with the award of several licences, Telekom Malaysia continues to dominate the fixed line industry with over 95% market share. It is also the major provider of fixed broadband and has a monopoly over the country high speed broadband (HSBB).

The mobile cellular market is dominated by three major players with almost equal market shares, Maxis (28.1%), Celcom (27.9%), DiGi (27.2%) and smaller players share the remaining 16.8 % (e.g. U Mobile and mobile virtual networks operators) (MCMC, 2016). The intensely competitive telecom market has put a squeeze on revenue, particularly from the traditional services, voice and SMS, which have been taken over by voice-over-internet-protocol (VOIP) and new messaging services, such as WhatsApp and WeChat. Unfortunately, the revenue from data is unable to cover the revenue loss from those traditional services.

Additional pressure on profits has been a hindrance to the progress of telecommunications in Malaysia, as the capital expenditure on infrastructure to improve or to install base stations and towers are very high. The high cost of developing LTE services and infrastructure led companies to collaborate to optimise their resources and reduce duplication. For example, network sharing agreement between Celcom and DiGi, as well as TM's backhaul agreement with DiGi and Celcom to provide wholesale bandwidth connectivity.

One of the roles of MCMC is also to establish links between communication providers and content creators to take advantage of the global trend towards the convergence of communication and creative content. The initiative led to Malaysians having access to internet protocol television (IPTV) services, such as Astro, HyppTV and 1MalaysiaIPTV. It has also opened Malaysia to the lucrative global creative content industry. Government incentives such as Intellectual Property Financing Scheme (Malaysian Debt Ventures) and Film in Malaysia Incentive have encouraged Malaysian animation and film production companies to export its creative content.

Connecting its citizens across the country and globally remains a key objective for the Malaysian Government even though broadband penetration has exceeded all expectations. A major goal is to ensure lower income Malaysians have access to affordable broadband. This is achieved through several initiatives:

- Securing more bandwidth and reducing the cost of internet bandwidth by 34%.
- HSBB 2 is the second phase of the high-speed broadband development initiative to extend connectivity in urban and suburban areas has commenced with targeted deliverables by the end of 2015.
- Regulators working with service providers to ensure LTE wireless broadband increases to 30% in 2015.
- Push for all developers to provide communication infrastructure for all new residential and commercial developments by the gazetting of the amended Uniform Building By-laws 1984 Act.
- Extend broadband to rural Malaysia by establishing internet centres and building rural communication towers.
- Improving connectivity within East Malaysia, and between East Malaysia and Peninsular Malaysia by adding a new cable system.

Moving forward, the finalisation of the ASEAN Economic Community (AEC) creates an opportunity for telecommunication operators to provide a seamless mobile service across the region.

In terms of the courier services and postal services, much of the early services provided by the postal operators include packages, parcels, document letters and printed materials. On the other hand, the course services include multi-modal courier services, which include the pick-up, transport and delivery services of the above, which are not delivered by the postal services. These services often are provided either by self-owned enterprises and using public transport system.

Pos Malaysia, corporatized in 1992 and listed in stock exchange in 2001, is the incumbent postal service provider in Malaysia. Over the years the industry has been liberalised and there are a total of 10 major players. The international courier services include DHL, FedEx, UPS and TNT. The domestic players include: PosLaju/Post Malaysia, Nationwide Express, GD Express, City-Link Express, ABX Express and Skynet Express. The first three domestic players are public listed companies.

The Malaysian Government recognised the importance of the courier services in enabling the smooth movement of goods and services for an international trading hub such as Malaysia. To ensure this industry become an enabler of a high income regionally competitive economy, the National Postal Strategy (NPS) 2010-2014 was launched. The strategy focused on three key strands of the industry to move up the knowledge value chain. The first is the physical dimension of the industry, which includes mails, parcels and courier services. The second is the electronic dimension, which includes e-commerce and services. The third is the financial services, which includes electronic money transfer and counter services.

In most recent five-year strategic plan (2011-2016), the government aims to transform the organisation's business model to ensure the sustainability of their postal and courier services in light of the various disruptions in the consumer market including technology and e-commerce. The key objective of the five-year plan is to become a one-stop solution centre in both physical and digital platforms – with the goal of expanding its reach regionally in 2017. As part of its transformation, Pos Malaysia works toward building efficiencies in its service offerings through the development of:

- an integrated parcel centre (IPC) to automate the parcel sorting process, expected to be operational in the second half of 2015; and,
- a single postal integrated track and trace system (1PITTIS) to improve the efficiency of the tracking and tracing of items, expected to be operational mid-2015.

17.2 Knowledge Content

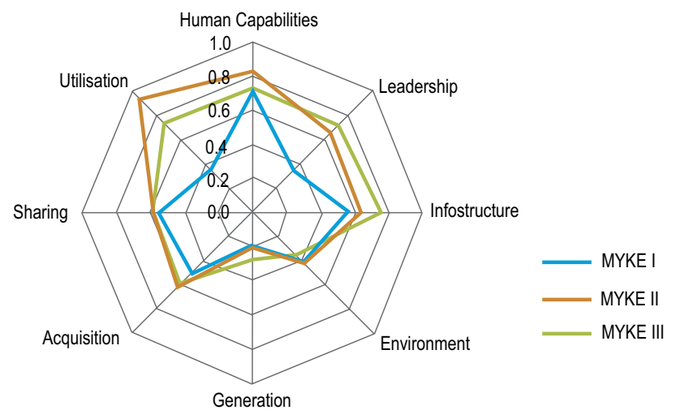
The sample used to map the knowledge ecosystem for the Malaysian Telco & Courier Service industry was based on the following samples for the three MYKE studies, respectively: 41, 40 and 30 as shown in Table 1.1. The number of SMEs and large players for the three sample periods were as follows: (SME, Large) are (11, 30); (11, 29); and (10, 20), respectively.

The telecommunication industry is performing better than the Malaysia aggregate across the three MYKE assessment periods in 2003, 2007 and 2014 for all dimensions of the knowledge resources, except for knowledge environment in 2014, where telecommunications industry was almost at par with the Malaysia aggregate with an index of 0.36 compared to 0.37 respectively. However, within the industry itself, the pattern of improvement varied – after experiencing a positive improvement in its knowledge resource foundations from 2003 to 2007, with sharp rise in knowledge utilisation, human capabilities and knowledge leadership, it lost its momentum in 2014 with little or no improvement in most of the knowledge resources, except for knowledge leadership and infostructure.

Next, we examine each of the knowledge resource dimensions to provide a clearer picture of how the telecommunications industry is performing across the three MYKE assessment periods.

Figure 17.1: Overview of Knowledge Enablers and Knowledge Actions for MYKE I, II & III

Telecommunications & Courier Services



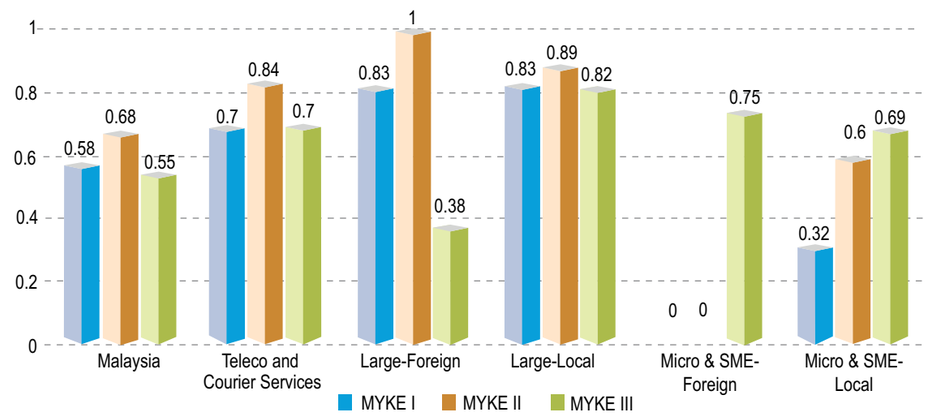
17.3 Knowledge Enablers

17.3.1 Human Capabilities

The results reveal that the telecommunications industry is better at attracting skilled talent than other industries in Malaysia, with an index of 0.7 in 2003, improving to 0.84 in 2007, but reverting back to 0.7 in 2014. These scores are well above that of the Malaysian aggregate of 0.58, 0.68 and 0.55 across the three MYKE assessment periods. This result is indicative of Malaysians having a preference for service industries, especially those located in city centres instead of the traditional manufacturing and agricultural industries.

The industry is performing reasonably well as a whole. The visible decline in human capability is in fact attributed mostly to large foreign companies within the sector. These companies have experienced extraordinary levels of deterioration (0.83 to 1 to 0.38 across the three periods) in the development of human capital. This may be caused by inability to attract new talent or that such firms may be fulfilling advanced and high-level openings offshore. Unfortunately, the large local firms, while still strong in its human capability did not progress. It is interesting to note that the small firms, both foreign and local, show a steady positive trajectory of human capability.

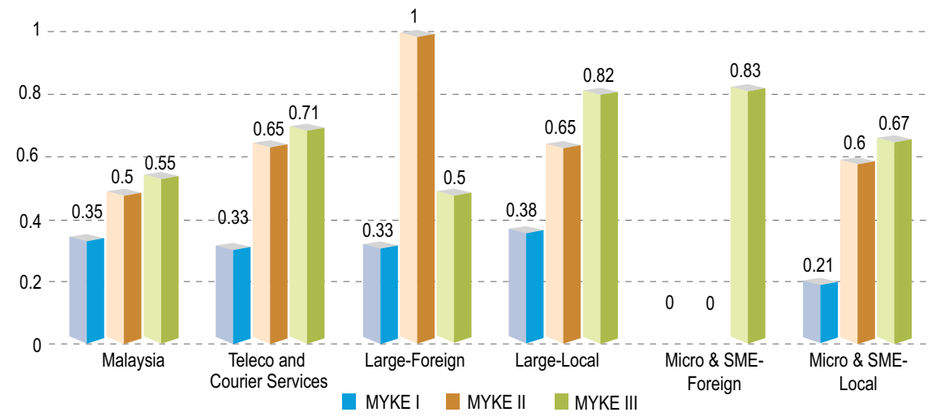
Figure 17.2: Human Capability of Telecommunications & Courier Services Industry



17.3.2 Knowledge Systems and Leadership

It is evident that the telecommunications industry has made significant strides in knowledge leadership – starting from a low base of 0.33 (lower than the Malaysian aggregate of 0.35) in 2003, it leapt to an index of 0.65 and exceeded the national average in 2007, before finally stabilising to an index of 0.71 in 2014. The telecommunications industry is intensely competitive. Business viability is dependent on each enterprise's responsiveness to technology and its capacity to constantly generate innovative product offerings. The local firms show evident positive improvement across the three assessments periods (0.38 to 0.65 to 0.82) outpacing large foreign firms which shrunk by half from MYKE II to MYKE III (from 1 to 0.5). The small firms (both foreign and local) are also taking charge and formulating strategic knowledge plans and systems.

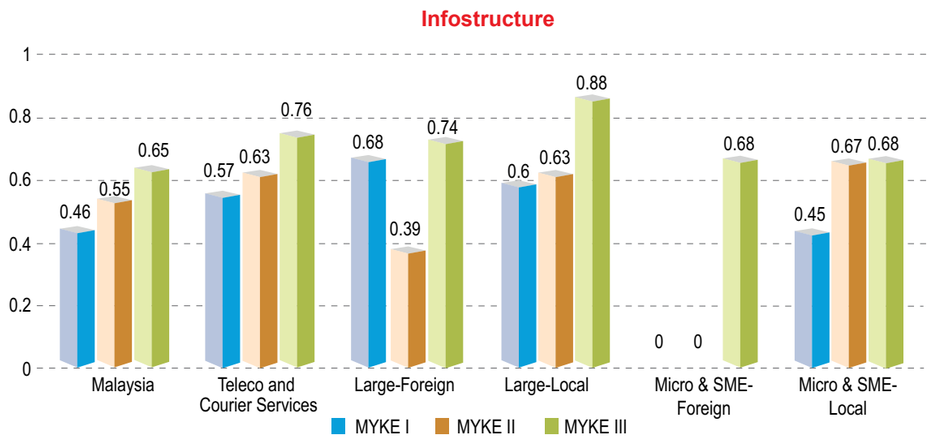
Figure 17.3: Knowledge Leadership in the Telecommunications & Courier Services Industry



17.3.3 Technology and Infostructure

The results displayed in **Figure 17.4** align with the nature of the telecommunications industry. There is a positive, incremental progress across the three MYKE assessment periods (0.57 in 2003 to 0.63 in 2007 and finally 0.76 in 2014), and at a higher level than the national aggregate. All firms, irrespective of size and whether foreign or local, show a high level of technology and infostructure during the MYKE III assessment period. The large local firms demonstrated the highest index of 0.88.

Figure 17.4: Technology and Infostructure of the Telecommunications & Courier Services Industry

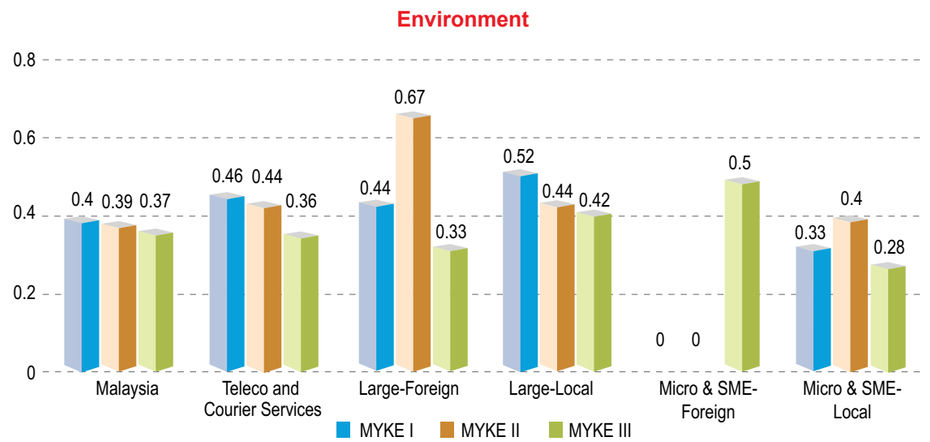


17.3.4 Knowledge Environment

The telecommunications industry's engagement with the government and universities to develop the knowledge environment has been declining over the three MYKE assessment periods (from 0.46 in 2003 to 0.44 in 2007 and 0.36 in 2014). While not performing as poorly as the rest of Malaysia, the trend presents a challenge for the government since telecommunication is a vital enabler in the development of a knowledge economy.

Large foreign firms are the ones which experienced the most significant decline after a short-lived improvement during the MYKE II assessment period. In the MYKE III assessment period, knowledge environment for large foreign firms registered the lowest index (0.33) which is below the national aggregate, while the small foreign firms lead the whole industry with an index of 0.5, which is significantly above the Malaysia and telecommunications industry aggregate.

Figure 17.5: General Environment Awareness of the Telecommunications & Courier Services Industry

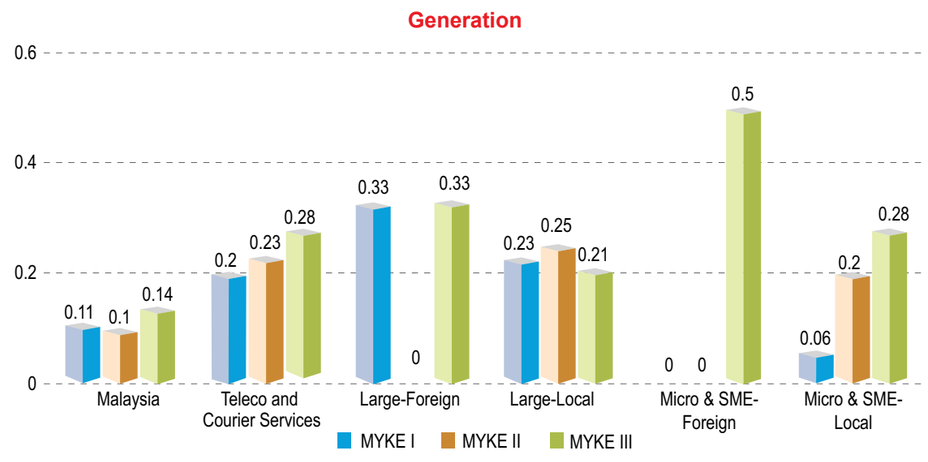


17.4 Knowledge Actions

17.4.1 Knowledge Generation

Knowledge generation is a key knowledge resource for the telecommunications industry because of its reliance on new technology and innovation to remain competitive and relevant in a modern economy. While the index for this industry is twice that of the Malaysian aggregate for all three MYKE assessment periods (0.20, 0.23, 0.28), the results are not particularly reflective of an industry which must keep abreast of innovation. Large and small local firms have underperformed in this regard having scored 0.21 and 0.28 respectively in the latest assessment period. The foreign firms are better at R&D, with the small foreign firms leading the pack in generating knowledge at an index of 0.5 which is far higher than the rest of the telecommunications firms and much higher than the national aggregate.

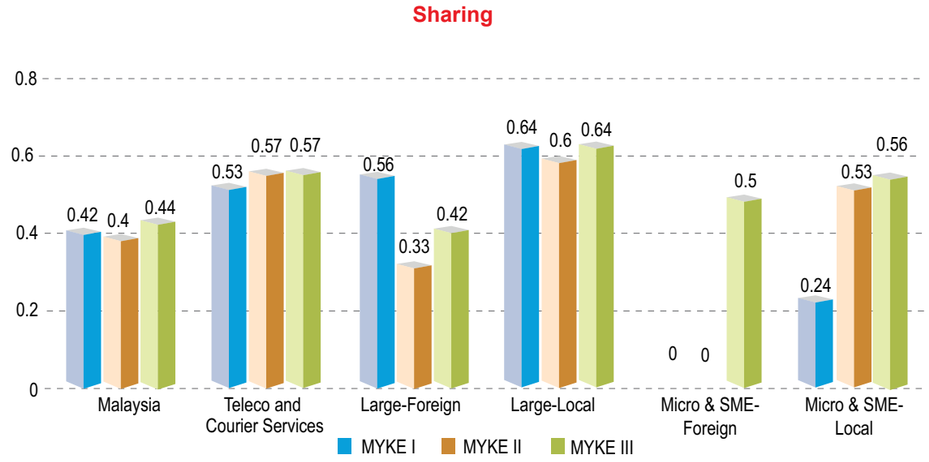
Figure 17.6: Knowledge Generation Activity in the Telecommunications & Courier Services Industry



17.4.2. Knowledge Sharing

After some improvement in knowledge sharing from MYKE I to MYKE II (0.53 to 0.57), the telecommunications industry stagnated at 0.57 in MYKE III assessment period. However, the telecommunications industry is much better at sharing than other Malaysian industries in general as depicted by the Malaysian average of 0.42. The local firms appear to be performing better at knowledge sharing than the foreign firms – large local firms are far ahead of the telecommunications industry at knowledge sharing with an index of 0.64. The small foreign firm's knowledge sharing of 0.5 in MYKE III is the same as the index displayed for knowledge generation, suggesting that small foreign firms are sharing the knowledge generated.

Figure 17.7: Knowledge Sharing Activity of the Telecommunications & Courier Services Industry

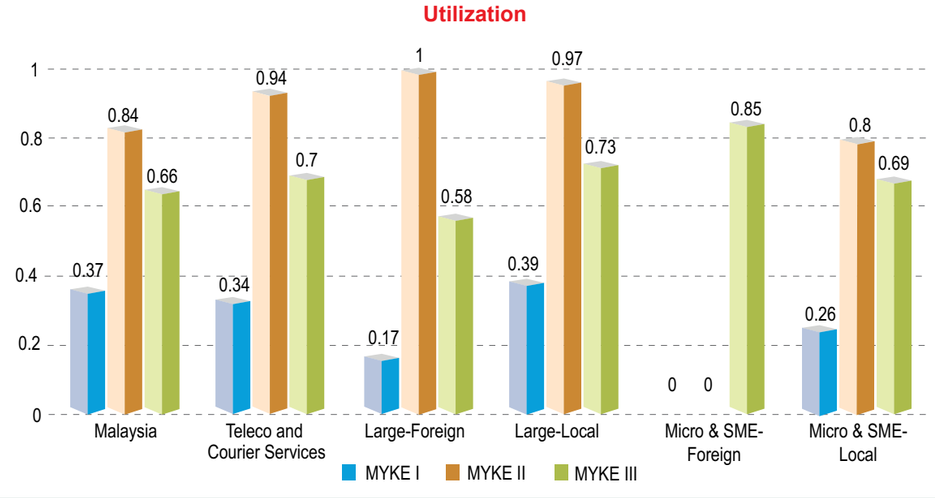


17.4.3 Knowledge Utilisation

Starting from a base lower than the national aggregate in 2003 (0.34 versus 0.37), the telecommunications industry made a leap in the MYKE II assessment period with an index of 0.94, surpassing the national aggregate of 0.84. However, similar to the rest of the country, it lost its momentum and fell to 0.7 in 2014.

An examination of the types of firms' contribution to knowledge utilisation, it is observed that the large foreign firms have lost most of its drive in utilising knowledge after pushing forward from 0.17 in MYKE I to a perfect score of 1 in MYKE II, it fell by almost half to 0.58. The firms which are performing exceptionally well are the small foreign firms with an index of 0.85 in 2014.

Figure 17.8: Knowledge Utilisation of the Telecommunications & Courier Services Industry

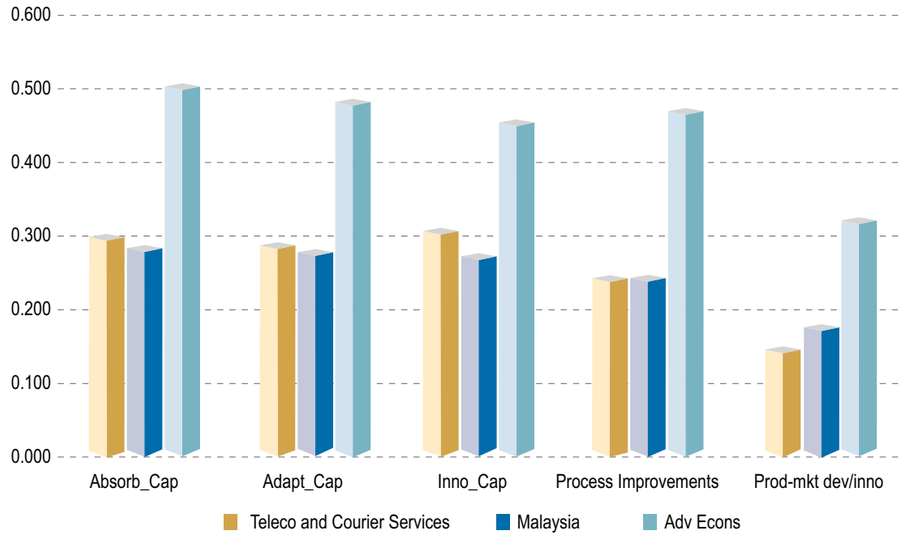


17.5 Dynamic Capabilities Profile for Telecommunications and Courier Services Industry

The firms' knowledge resources discussed are the foundations laid over time to build the dynamic capabilities essential for long term competitiveness. The three types of dynamic capabilities are absorptive capability, adaptive capability and innovative capability. Firms with higher levels of dynamic capability are able to respond to competitive pressure and market or environmental change, while firms with lower levels of dynamic capability have difficulty adapting or changing in response to competition.

Figure 17.9 reveals that firms in the telecommunications industry have a higher level of all three components of dynamic capabilities than the Malaysian aggregate; however, this has not resulted in equally strong innovation outcomes. The industry was on par with the national aggregate in its process improvements but performs below the national aggregate in new product-market development.

Figure 17.9: Dynamic Capabilities Profile of the Telecommunications & Courier Services Industry



17.5.1 Absorptive Capability

The telecommunications industry appears to be systematically handling and storing market and technology information gathered externally. It is also creating and transferring new knowledge and is particularly strong in acquiring technology. A combination of these positive elements contributes to the strong absorptive capability of the telecommunications industry.

Firms in the telecommunications industry acquire knowledge from a wide range of sources and at a very high level. As a result, they are above the Malaysian aggregate in accessing all forms of knowledge sources, with the main ones being suppliers, customers and competitors. Being a highly competitive industry, where technological shifts are rapid, the possession of knowledge is vital, so the industry appears to be well-positioned in sourcing market intelligence, building linkages with their

suppliers and benchmarking with their competitors. As a key enabler in Malaysia's knowledge economy, this result is very encouraging as it reflects a very progressive industry which engages in great levels of collaboration and sharing to build absorptive capability.

Figure 17.10: Sources of Knowledge in the Telecommunications & Courier Services Industry

17.5.2 Adaptive Capability

A high level of adaptive capability is also necessary to utilise the knowledge gained within the firm. Adaptive capability is necessary as it translates externally absorbed knowledge into useable knowledge to achieve business goals. The results in (**Figure 17.9**) show that the telecommunications industry is positively investing in innovation and marketing with an aim to respond quickly to new opportunities. This focus, however, is not carried through to the development of new structures and processes to align itself with external changes – which reduces its ability to respond quickly to environmental change.

The telecommunications industry appears to be well endowed with the skills and expertise necessary for the industry, these include business and administration, computer science and software development, E&E engineering and social sciences (**Figure 17.11**). These talents are well above the national aggregate and suggest that telecommunications

17.11: Skills Profile of the Telecommunications & Courier Services Industry

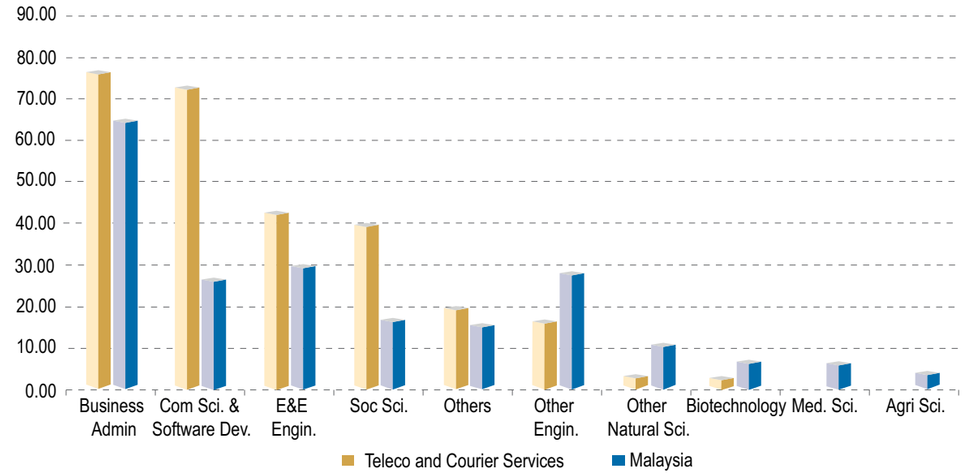
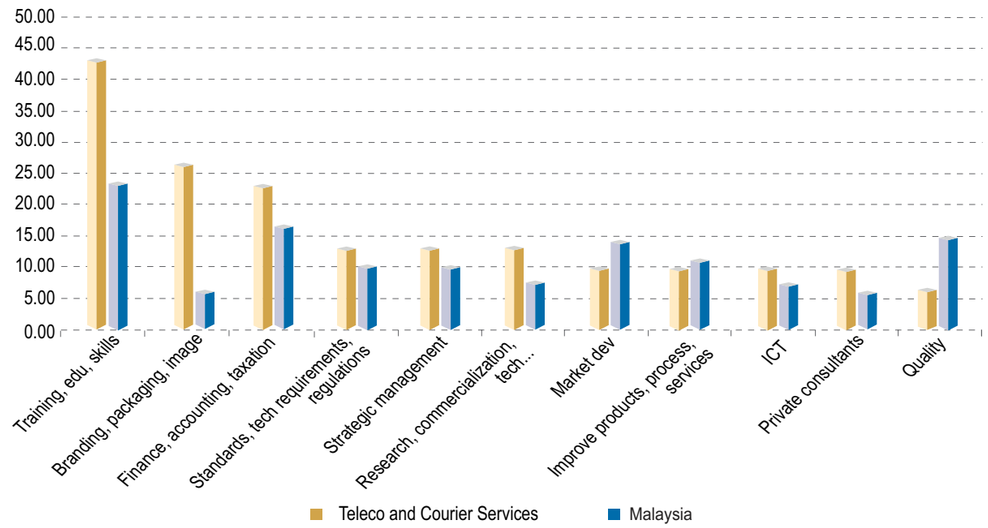


Figure 17.12: Role of Institutional Environment in the Skill Building of the Telecommunications & Courier Services Industry



firms understand the importance of human capital to remain competitive and vibrant in an industry which is constantly evolving.

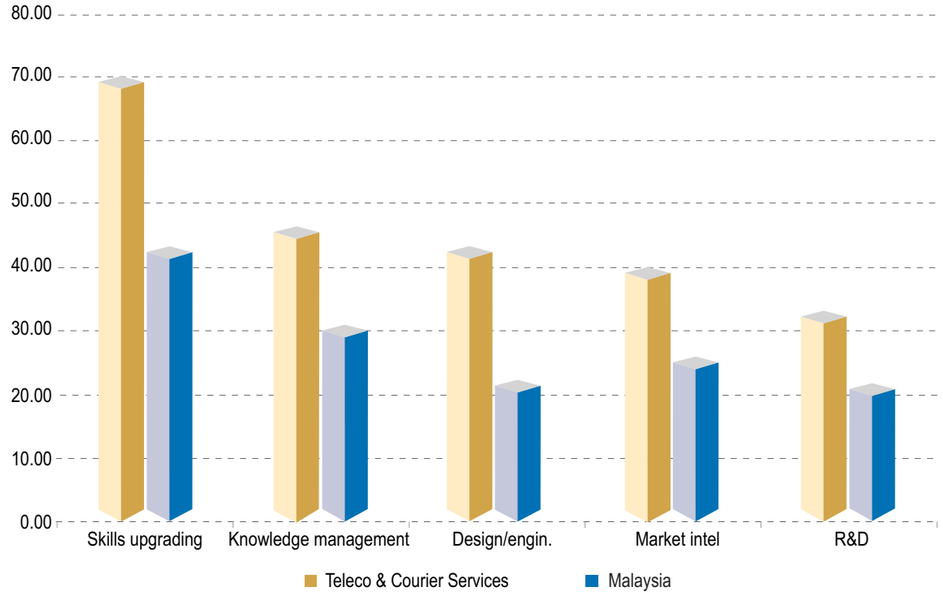
An industry's priorities in building human capability and knowledge are reflected by the extent to which firms seek assistance and support from the various institutions available. **Figure 17.12** shows that telecommunications firms have been committed to the enhancement of human capability, particularly through the training and education programmes. Additionally, the industry invests four times the national aggregate in branding, packaging and marketing. They also invest more than others in Malaysia in services relating to finance, accounting and taxation, standards and technical requirements, strategic management, research commercialisation, ICT and private consultants. This wide range of activities are characteristic of an industry which has a balanced approach in their business, and understands the need for marketing and strategic planning as much as the need to remain technologically relevant in a fast changing environment.

17.5.3 Innovative Capability

The third factor necessary to translate absorptive and adaptive capabilities into positive outcomes is innovative capabilities. Firms in the telecommunications industry are able to process and integrate their market and technological knowledge and are able to assimilate it with their internal resources (including people and processes). **Figure 17.9 shows** that its strong dynamic capabilities are translated into mediocre outcomes, having produced process improvements at the same level as the Malaysia industry aggregate and performing at a lower level than the Malaysia aggregate in terms of product-market development.

This less than positive dynamic capability outcome is surprising since telecommunications firms are investing significantly more in innovation capability activities than the Malaysian aggregate, spending twice as much on design and engineering, 60% more on market intelligence and 50% more on R&D, knowledge management and skills upgrading.

Figure 17.13: Knowledge Intensive Activities in the Telecommunications & Courier Services Industry



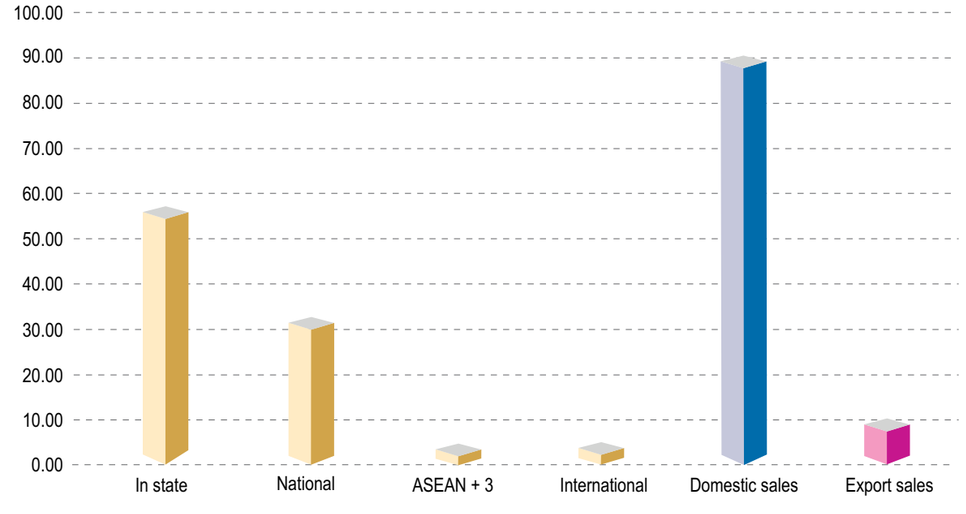
17.6 Outcomes of Dynamic Capabilities in the Telecommunication and Courier Services Industry

Telecommunications industry firms mostly operate within the home market, with 90% of its revenue originating from within Malaysia. 57% of the revenue comes from the state and 33% from the national market. The 10% export sales are equally divided between the regional and international markets (**Figure 17.14**). The result is as expected because the current focus is on building a strong telecommunication infrastructure and network to connect the country as part of the government's plan to stimulate economic growth by providing connectivity at an affordable price, to urban and rural areas alike across Peninsula and East Malaysia. The potential to expand into regional markets is immense given the positive attitude to build its knowledge resource foundations which can only lead to its continuous improvement in dynamic capabilities.

There is a strong presence of Reactor companies in the telecommunications industry (50%), significantly higher than the national aggregate of 29%. Defenders make up the next biggest group with only 20% and well below the national aggregate. The industry has a small group of Prospectors (16.7%) but this

is still higher than the national aggregate. The smallest remaining percentage (13.3%) comprises of Analysers, which is almost on par with the national aggregate. Although small in number, Prospectors should be encouraged in this industry to push through new product innovation because these firms are highly innovative, and are prepared to take risks in seeking out new markets and opportunities.

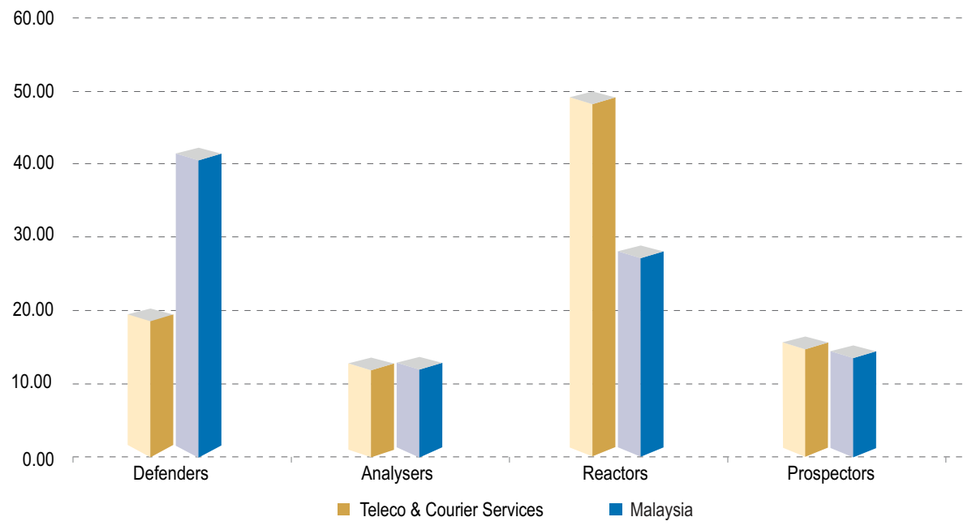
Figure 17.14: Market Presence of the Telecommunications & Courier Services Industry



Note: The results are based on survey data.

Together, the Reactor and Defender strategic profiles form the largest group in the industry which is indicative of the industry's weakness. Given the industry is fast-paced with constant technological shifts, this is of concern since Defenders are only interested on protecting their current markets and serving existing customers instead of exploring new business frontiers. Meanwhile, Reactors tend not to have clear strategies and would only adapt to changes in the marketplace or to technological shifts if their survival is threatened.

Figure 17.15 Strategic Profile of Firms in the Telecommunications and Courier Services Industry



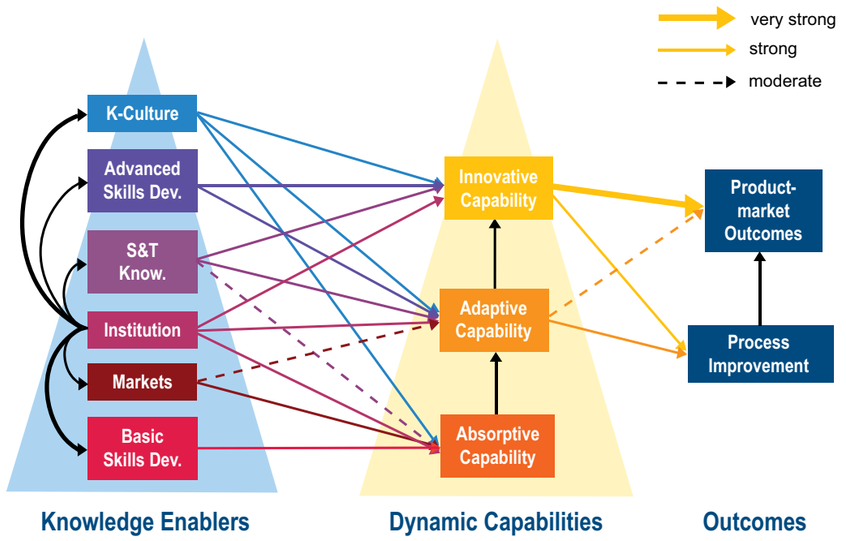
17.7 Relationships between the Key Blueprints of the Telecommunications & Courier Services Knowledge Ecosystem

In this section, we discuss the relationship between the knowledge enablers, dynamic capabilities and economic outcomes for the Telecommunication & Courier Services industry. The Malaysian Telecommunication & Courier Services industry knowledge ecosystem is benchmarked against their counterparts in advanced countries (USA, Japan and Korea). Based on content analysis and the data obtained from DOS, this industry in advanced countries and in Malaysia is classified as a key pace-setter industry that not only has the highest knowledge content, but also serves as a key enabler of knowledge intensity in other industries.

The Telecommunication & Courier Services industry industry's knowledge ecosystem for advanced countries is shown in **Figure 17.16.** In the selected advanced countries all three components of the dynamic capability are very strong. Strong

absorbability capability in this industry provides a good foundation for higher value-added services. Sound absorptive, adaptive and innovative capabilities have enabled the industry to develop new process improvements and generate new product outcomes that have global reach.

Figure 17.16: Knowledge Ecosystem of the Telecommunication & Courier Services Industry in an Advanced Country



Note: Very strong impacts are represented by the bolded line, strong impacts are represented by normal lines and moderate impacts are represented by dotted lines.

The knowledge ecosystem for the Malaysian Telecommunication & Courier Services industry is shown in **Figure 17.17.** While this is a pace-setter among the 21 industries in Malaysia, knowledge ecosystem was found to be relatively weaker than that of the advanced countries. **Figure 17.17** show that the three dynamic capability components primarily enhance supports process improvement. A summary of the strength of the Telecommunication & Courier Services ecosystems in advanced countries and in Malaysia are given in **Table 17.1.**

Figure 17.17: Knowledge Ecosystem of Telecommunication & Courier Services Industry in Malaysia

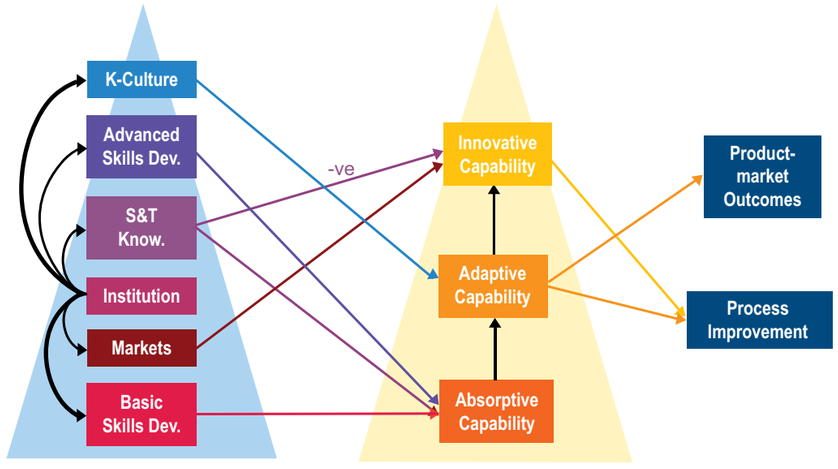


Table 17.1: Knowledge Enablers and Dynamic Capabilities for the Telecommunication & Courier Services Industry

Advanced Countries	Malaysia
Basic Skills have a **positive and strong impact** on absorptive capability. Technical and vocational education training (TVET) in schools, community and technical colleges (government and industry) and polytechnics are very strong and relevant for the telecommunications industry. Regular trainings and workshops are conducted to ensure the workers are able to use sophisticated and rapidly changing technologies in this industry. The courier service industry is the biggest beneficiary of an advanced telecommunication service industry. The logistic supply chain for the courier industry leverages on a sound telecommunication infrastructure – global positioning system is a major component of the courier service.	Basic Skills have a **positive and strong impact** on absorptive capability. The technical skills development programs for the telecommunication industry are primarily undertaken by polytechnics, colleges, and universities. Most of the medium and larger firms also have in-house program to up-skill their workforce. Most small firms find it hard to train workers due to a lack of resources and the high cost of training. Many are reluctant to train workers because of large staff turnover and talent poaching. Firms prefer hiring engineers and technicians from neighbouring countries that are willing to work as technicians in the telecommunications areas.

Table 17.1: Knowledge Enablers and Dynamic Capabilities for the Telecommunication & Courier Services Industry (cont'd)

Advanced Countries	Malaysia
The last mile delivery is still labour intensive; however, the remuneration for many of the positions is competitive for the skill set required for the position.	While the courier industry uses advanced telecommunication services, the final delivery is labour intensive and supplies only low paying jobs. As such, staff turnover is high.
Market Intelligence has a **positive and strong impact** on absorptive capability; and positive and moderate impact on adaptive capability. This industry depends on networks of suppliers, customers, competitors, external consultants and commercial R&D centres are key network partners that enhance absorption and adaptation of new knowledge, technology, systems and processes to create user-friendly and cost-efficient Telco and courier services. Further, regulations are clear and transparent and rights of all are protected. These countries also have a sound IP ecosystem that enables firms to protect their IP and commercialise it. Good and effective regulatory architecture has helped increase the diffusion of information and knowledge across all segments of the industry. Sound telecommunication infrastructure and advanced communication technology have also enabled firm in this industry to acquire the relevant market intelligence to enhance their absorptive, adaptive and innovative capability.	Market Intelligence has a **positive and strong impact** on innovative capabilities. The Prospector and Analyser firms in the domestic market use the information to upgrade their knowledge and technological base to improve their innovative capabilities. Local firms, especially SMEs depend on suppliers, customers, competitors, external consultants and commercial R&D centres to conduct R&D and innovations in the field. Most of the local firms, especially SMEs are dependent on foreign technology partners for market information to undertake modifications of the technology or business model to the local and regional market. The incremental innovations undertaken by local firms are to keep the telco and courier service cost competitive.
Institutions are **strong enablers** of the knowledge ecosystem and have direct strong and positive impact on all three dynamic capability components. MNCs, Government research institutions (GRI), universities and regulators play a key role in shaping the Telco & Courier Services ecosystem. They also influence the dynamic capabilities components directly. For example, universities, industry associations and government agencies work closely to establish strong Telco & courier services clusters that are able to translate basic research into new applied and commercial services. These Telco & Courier Services clusters also work closely with clusters in other industries – they play enabling roles for the other industries.	Institutions **strong enablers** for all the other knowledge enablers, but **does not impact** the three dynamic capability components directly. Key institutions such as the Government Linked Companies (GLCs), regulators and government agencies play key roles in shaping the Telco & Courier Services ecosystem. The Telco services industry is dominated by Telekom Malaysia and few other local and foreign players. On the other hand, the courier services industry is led by POS Malaysia and major global operators. The role of the institutions in directly impacting the dynamic capability components was found not to have a significant impact on the dynamic capability components.

Table 17.1: Knowledge Enablers and Dynamic Capabilities for the Telecommunication & Courier Services Industry (cont'd)

Advanced Countries	Malaysia
Science and technology knowledge has a **positive and moderate impact** on absorptive capability; but, **positive and strong impact** on adaptive and innovative capability. In most advanced countries, both basic and applied in STEM related R&D activities are strong. Industries in these countries work closely with leading research centres across the globe to push the boundary of knowledge in the field. Significant resources are also invested to ensure that there are strong partnerships between all stakeholders in the Telco and Courier ecosystems. Universities and research centres conduct major research programs and share some of the findings to the industry via developing the supply networks, extension programs and SBIR type research programs. Universities also work closely with industry to spawn new spin-off companies or start-up firms that are built around a technology or intellectual property that have commercial value.	Science and technology knowledge has **a positive and strong impact** on to absorptive capability. On the other hand, Science and technology has a **negative and strong impact** on innovative capability. The latter results show that **S&T knowledge has an opportunity** cost to the innovative capability of the industry. Local R&D tends to lag behind more developed countries. Shortage of talented staff in key research priority areas and weak industry-university partnership have led to a majority of the firms in the industry being dependent on foreign technology and know-how to create value for their operations. This suggests that most of the S&T knowledge is to improve the absorptive capacity of the industry players in Malaysia. Lack of high-end research personnel in Malaysia and low commercial value for local research result in high opportunity cost of investing in expensive R&D in the local market. There is also high reliance on foreign workforce for innovative endeavours in both Telco and courier services.
Advanced Skills have **a positive and strong impact** on both innovative capability and adaptive capability. In many of advanced countries, significant resources are invested to strengthen the STEM, computer science, data analytics and Telco related areas. Many of these countries invest in developing the research manpower in telco and other related areas. Where there is a lack of talent, these countries use liberal immigration policies to attract talent from across the world. In these countries, strong partnerships between industry and universities are established to ensure R&D activities undertaken have commercial value and can close the 'knowledge-commercialisation chasm', which implies that firms are able to enhance	Advanced Skills have **a positive and significant impact** on absorptive capabilities only. While there have been significant resources channelled to train workforce in the telco and courier services areas, the training provided generates workforce that are able to use leading-edge technology. However, many of the graduates are not independent to create their own innovations or IPs. The local industry is still dependent on foreign technology and experts. A majority of the local talented workforce are users of new technology and innovations from foreign firms with advanced R&D capabilities. Further, talent with highly specialised skills tend to be foreign skilled worker.

Table 17.1: Knowledge Enablers and Dynamic Capabilities for the Telecommunication & Courier Services Industry (cont'd)

Advanced Countries	Malaysia
their adaptive and innovative capability. Significant resources are spent on developing effective and efficient business models that increase the reach and richness of the services provided. Significant resources are also channelled to develop global brands and trademarks.	Many of the leading Malaysian talent work for foreign multinational companies or migrate to more advanced countries where the opportunities to undertake cutting-edge R&D and career prospects are much better. The 'brain-drain' is major problem for Malaysian talent working in this industry, as global talent for staff in the Telco and Courier Services industry are high. Most foreign firms undertake knowledge intensive tasks in Singapore and use Malaysia as a service station. There is also very little technological and knowledge transfer that takes place between foreign and local firms.
Knowledge culture has a **positive and strong impact** on all three dynamic capabilities. The firms in many of the developed countries are rather flat and innovation is everyone's responsibility. The firms' values diversity in skills and multidisciplinary R&D endeavours. The firms constantly undertake fore-sighting and competitor analysis to ensure they are at the fore-front of development. Many of them work with leading teams from around the globe and expose their staff to leading-edge research and scientific endeavours. These firms also scout for the best talent from around the world, providing the best environment for career development. Risk-taking behaviour are encouraged and employees are given supportive environment to undertake experimentation and simulations, what is known as 'Green-Alert Risks'. In some firms, the best failures are also rewarded. Success and failures are shared among employees and in some instances innovations are shared with the market. The lead firms tend to share best practices to other firms in the industry and transfer technology to other SMEs in the industry. Some of the larger corporations work closely with universities and research centres to spawn new start-up companies that develop new innovations that benefits firms in the industry and across other industries. Information session and trainings are regularly organised to upgrade skills, capabilities and continuously inspire staff to excel.	Knowledge culture has a **positive and strong impact** on adaptive capability. A small segment of the Prospector and Analyser firms, primarily larger firms invest in attracting talent. Some of the large and foreign firms also invest significant resources for nurturing creativity talent that will lead the development of new innovations. Many of the local firms undertake incremental innovations to meet the local and regional demand. Some try to develop home-grown services, but have to compete with bigger players with international networks and better economies and scale and scope. A majority of local firms, especially SMEs are dependent on foreign technology and expertise to meet their market demand. Since local talent in this industry is scarce; training cost is high and hiring from developed countries is expensive; many source talents from regional economies such as India and other regional economies. However, local firms do not invest in cutting-edge R&D, training or workshops. Most of the talent hired are to learn foreign technology and at best modify them to meet local market demand. Risk-taking culture is not encouraged and most local firms take a 'top-down' management approach. Sharing of best practices or ideas among industry players is not common due to the competitive nature of the telco & courier services industry.

Table 17.1: Knowledge Enablers and Dynamic Capabilities for the Telecommunication & Courier Services Industry (cont'd)

Advanced Countries	Malaysia
The continuum from absorptive capability to adaptive capability to innovative capability is **present and strong.** In the sample advanced countries, talent management plan is comprehensive and STEM education and training are strong at all levels of schooling system. Technical colleges and polytechnics are key sources for supplying technically competent staff to the industry. University and Government Research Institutes work closely with industry to develop skill set that enable the workforce to undertake adaptive and innovative capabilities. In countries such as Germany and Japan, concerted efforts by Government to use products developed by local industry; and there is In countries such as Japan and Germany priority is given to support local industries – "use local service first". As such, the industries in these advanced countries have very strong absorptive, adaptive and innovative capability; continuously enabling firms to move up the innovation value chain.	The continuum from absorptive capability to adaptive capability to innovative capability i**s present.** The local telecommunication cluster is dominated by Telekom Malaysia and several foreign players. On the other hand, the courier services are dominated by POS Malaysia and foreign courier companies. Many of them provide in-house training for staff. As such, are able to build, over the years, absorptive capability. These large firms also outsource work to local SMEs to adapt existing technology to the local market. A majority of the local firms are part of foreign firms' supply network. Most of the innovations undertaken by local firms are incremental innovation. There is very little technology transfer that takes place between local and foreign firms. Most foreign firms do their design and development in their home countries or in Singapore. Only service stations are maintained in the Malaysian operations.

Table 17.2 summarise the impact of dynamic capabilities on economic outcomes in the telecommunication and courier industry for both advanced countries and Malaysia are summarised in **Table 17.2.** In the sample advanced countries, adaptive capability for the telecommunication and courier industry was found to have a positive and strong impact on process improvements; and, positive and moderate impact on product market outcomes. Innovative capability was found to have strong and positive impact on process improvement and very strong to-product-market outcomes. This suggests that telecommunication and courier services industry in the advanced countries are competitive due to their ability to continually produce process improvement and generate new market outcomes.

Empirical results from the Malaysian telecommunication and courier industry suggest that adaptive capability was found to have a strong and positive impact on both process improvement and product market development. On the other hand, innovative capability only contributes to process improvements. This suggests that innovative endeavours undertaken by Malaysian firms lead to improvement in processes, improvement of service quality and keep the cost of the service low.

Table 17.2: Dynamic Capabilities and Economic Outcomes for the Telecommunication & Courier Services Industry

Advanced Countries	Malaysia
Adaptive capability has a **positive and strong impact** on process improvement and a **positive and moderate impact** on product market development. Firms in this industry continuously monitor the market and have very good market intelligence. The firms in this ecosystem are flexible in adapting new technology and innovations to improve existing products and services.	Adaptive capability has a **positive and strong impact** on process improvement and a p**ositive and strong impact** on product market development. Local firms are dependent on foreign technology partners who closely monitor changes in the technological landscape and are quick to adapt the new technology to avoid falling behind the race to keep their markets. The competitive advantage comes from continuously improving service quality and keeping the cost low. This would require firms to continuously enhance their processes and business models.
Innovative capability has a **positive and strong impact** on process improvement and a **positive and very strong impact** on product market outcomes. The telecommunication & courier industry in these advanced countries invests in technological infrastructure, R&D, skilled workforce, building global network and improving the entrepreneurial acumen of its workers. These initiatives enable the firms to improve their processes and product market outcomes. The strong process improvement and product development enable firms to expand their market reach and cater for clients with diverse needs across the globe.	Innovative capability has **a strong impact** on process improvement only. Innovative d**oes not impact** product market outcomes. Local firms irrespective of size tend to adopt new technology and innovations from more advanced countries. Many of them undertake incremental innovation that improve cost-efficiency, service quality and meet domestic market demand.
Process improvement positive and **moderate impact** on product market outcomes. The telecommunication and courier services clusters in these countries are sound and well integrated with all other clusters in the economy. Continuous process improvements lead to more the development of more cost-efficient services that open up new market opportunities, especially in diverse industries and markets.	Process improvement **does not impact** product market outcomes. Most of the process improvements generated by local firms are based on the use of advanced foreign technology and intellectual property. Cost efficiency is further obtained through the use of relatively cheaper labour. Hence, the potential of creating new products and services from the borrowed IPs are limited for the local firms.

17.8 Summary: Key Trends, Challenges, Way Forward and Best Practices

17.8.1 Industry Trends

The telecommunication and courier industry is performing better in most of knowledge resource foundations than the Malaysia aggregate across the three MYKE assessment periods in 2003, 2007 and 2014. However, the results show some variability relating to the different dimensions of both knowledge enablers and knowledge actions. Overall, there is very little albeit positive improvement across the three MYKE periods for knowledge action – of most concern is knowledge generation which reveals a progressive decline across the three MYKE assessment periods, there is also limited progress in knowledge sharing and a sharp retraction in knowledge utilisation.

Similarly, for knowledge enablers, a progressive decline is noted over the three MYKE periods for knowledge environment and human capabilities have also regressed in 2014, which is surprising given the preference for service industry by skilled jobseekers. Only knowledge leadership and infostructure show significant positive incremental progress across the three (3) MYKE periods. Of interest is the declining role of large foreign firms in building the knowledge economy within the telecommunications industry, this is in contrast to the high level of participation by the small foreign firms in Malaysia's knowledge economy. The local firms, both large and small, are also building their knowledge resource foundations.
The telecommunications and courier industry's strong performance in knowledge foundations over time has contributed to the dynamic capabilities position that surpasses the Malaysian industry aggregate. As a key enabler to Malaysia's knowledge economy, the government has paid close attention to the development of technology and infrastructure as well as to liberalise the industry to promote competition. The government's initiatives, plus the investment of firms into building knowledge foundations have resulted in the industry's strong dynamic capabilities for all three dynamic capabilities components.

Theoretically, firms which are able to innovatively integrate and assimilate external knowledge to create new knowledge to respond to new opportunities and market changes should lead to positive outcomes for themselves, in terms of process improvements and/or new product-market developments. Although the firms in the telecommunications industry possess a high level of absorptive, adaptive and innovative capabilities, they are unable to substantially convert these capabilities into significant new or improved innovations in terms of technologically new or improved processes or new products. It is only able to create internal organisational improvements (e.g. operational efficiencies and controls).

Two possible explanations may account for the lack of innovation outcomes in the telecommunications industry despite the possession of an abundance of dynamic capabilities. First, although firms have the dynamic capabilities and are probably ready to adapt to market changes and competitive manoeuvres, a majority of the firms, being Defenders and Reactors, are not growth oriented and do not search for new markets and opportunities to grow. Firms with these strategic profiles are not pro-active in disrupting the market through innovation and new product development, preferring instead to focus on operational efficiency or just trying to survive or exist in the marketplace. The second possible reason is the lack of investment in market development and product and process improvements as shown in **Figure 17.12.**

17.8.2 Challenges

The telecommunications, postal and courier industry is well on its way to facilitate the growth of other industries. This industry is a key enabler of Malaysia's knowledge economy. However, the industry faces several challenges that prevent it from realising its full potential. These challenges are discussed below:

Institutions:

- The role of the GLCs such as Telekom and POS Malaysia in directly impacting the dynamic capability components was found to have no significant impact on the dynamic capability components.
- Local universities are not training adequate number of engineers and scientists that are able to develop new 'blue-ocean' innovations.
- Patchy collaboration between industry and universities result in mismatch between the supply of graduates and the needs of the industry.
- Local regulators have been slow in allowing latest developments into the local markets – the rollout of high-speed broadband and other technologies has been relatively slow compared to other regional economies.

Basic Skills Development:

- Most small firms find it hard to train workers due to lack of resources, cost of training, large staff turnover, talent poaching, lack of trainers, lack of English proficiency and uncertainty about future growth.
- Firms prefer hiring engineers and technicians from neighbouring countries that are willing to work as technicians in the telecommunications areas for much cheaper remuneration packages. Most of the foreign workers are willing to work for longer hours and show high levels of dedication to their work.

Advanced Skills Development:

- Many graduates are not free to create their local innovations or IPs; hence the local industry is still dependent on foreign technology and experts.
- There is a shortage of workers with advanced skills; hence, areas that require highly specialised skills tend to be dominated by foreign skilled workers.
- 'Brain-drain' is major problem for Malaysia, where highly skilled workers get better remuneration packages, opportunities to undertake cutting-edge R&D and good career prospects in more advanced countries.
- Most foreign firms undertake knowledge intensive tasks in Singapore and use Malaysia as a service station; hence, very little knowledge transfer takes place between foreign and local firms.

S&T Knowledge:

- Local R&D tends to lag behind developed countries and local firms are failing to invest adequate amounts in R&D.
- Shortage of talented staff in key research priority areas and weak industry-university partnership has led to a majority of the firms in the industry becoming dependent on foreign technology and expertise. Further, short-term contracts for foreign skilled workers tend to impede transfer of technology to local workers.
- Lack of high-end research personnel in Malaysia and low commercial value for local research result in high opportunity cost of investing in expensive R&D in the local market.
- Malaysia was slow in the region of deploying high-speed broadband. The costs of internet and telecommunication infrastructure are significantly higher and the average speed of the internet is lower in Malaysia compared to other regional economies. These factors hinder the development and spill-over benefits to other industries, such as the creative content industry.

Market Intelligence:

- SMEs are dependent on foreign technology partners for market information and modifications of the technology or business model to the local and regional market.

- Structural issues with the market structure. For instance, GLCs play a dominant role, they tend to crowd-out market opportunities and development of other local firms.

- Opening up of the domestic market to new telecommunication, shipping, flights and courier service providers with better technology, global network and cost advantage will put intensive pressure on domestic service providers who have been primarily focussed on domestic market. Most local providers, especially SMEs do not have good market information on opportunities in the region. Hence many do not have economies of scale or scope. With a more open market, many of them are actually in danger of losing market share.

Knowledge Culture:

- Since local talent in this industry is scarce; training costs are high and hiring from developed countries is expensive; many companies source talent from regional economies such as India and other ASEAN countries.

- Local firms especially SMEs do not invest in cutting-edge R&D. Most of the talented employees learn how to use foreign technology. At best they modify it to meet local market demand. Risk-taking is not encouraged, especially undertaking "blue-ocean" R&D activities that are often times highly uncertain and risky.

- Sharing of best practices or ideas among industry players is not common due to competitive nature of the Telco & courier services industry. Knowledge transfer from leading foreign players to local firms has also been extremely slow.

17.8.3 Way Forward

On a positive note, despite the lack of strong innovations, the telecommunications and courier firms possess fairly strong dynamic capabilities and high knowledge content; thus the industry has a huge potential for innovative breakthroughs. The empirical analysis also suggests that the Malaysian telecommunications industry is well-equipped with the resources to swiftly adapt to technological shifts, marketplace changes and competitive challenges. Significant dynamic capabilities, combined with the prevalence of Prospectors and Analysers (making up 30% of the industry) places the telecommunications industry as an enabler for Malaysia's knowledge economy. To ensure the telecommunications industry moves up the knowledge value chain, the following recommendations are made.

Recommendation 17.1: Focus Development in Frontier Telecommunication Technology

- The telecommunication industry is envisaged to undergo rapid changes in several areas in the coming years, as technology platforms continue to converge. For telcos to stay competitive, firms in the sector will be required to enhance their quality, reach and richness of services. This requires telcos to intensify incentives (research, development and commercialisation funds and support) to develop emerging and disruptive telecommunication and courier service technologies, as well as the relevant content and applications. In this context, a new infrastructure plan needs to be put in place with a more holistic approach on fibre-optics, 4G and machine to machine (M2M) ecosystems.

- Key focus should be in a few of the areas that have the potential of exponentially increasing revenue for telecom providers. Areas for consideration include: fibre-optics; 4G & 5G network; M2M services; cloud services; Innovative Designer Devices; and smart and advanced logistics systems.

Recommendation 17.2: Embrace New Business and Leadership Style

- For local Telcos and courier industry to be competitive, they will need to reinvent their business models and cater for several changes taking place in the domestic market, such as increasing sophistication in the services required by consumers, new entrants in the market with better economies of scale and scope, a more open market environment and demands made by shareholders for higher dividend payouts.

- New business models will have to cater for both upstream and downstream customers, such as web players, media, government, retailers, devices manufacturers, consumers, SMEs, enterprises and devices manufacturers.

- The new business model for telcos, will require them to expand the spectrum of products from traditional core services, vertical industry solutions and infrastructure service to embedded communications (including IoTs), third-party business enablers and own-brand over-the-top (OTT) services.

- In the context of courier services, the new business model must provide a more holistic courier service, i.e., the full spectrum of services from transportation to warehousing.

- Speed, predictability of delivery, last-mile touch points (parcel locker, 24/7 centres and 2- hour delivery services) and quality of service. Fulfilling these parameters are key to ensuring the freshness of perishable products, and is critical for courier service providers to remain globally competitive.

- For new business model innovation to gain traction and be effective in enhancing the market reach and richness, three key factors are important:
  - A talent development strategy that nurtures the next generation workforce for the industry. Workers should be innovative and have the necessary skills to work in a multidisciplinary setting, understand technological requirements to meet the diverse interests and needs of consumers and businesses (a more comprehensive discussion is given in Recommendation 17.3).
  - Development of new innovative tools, knowledge management systems and business models to enhance reach and richness of the services provided.
  - Nurture leadership within firms to have shared wisdom and inspiration to encourage staff at all levels to be creative and innovative. One way is to establish a Leadership Academy, as in the Finance industry (refer to Best Practice 15.2).

Recommendation 17.3: A Holistic Talent Development Strategy

- Nurturing the next generation of creative talent will be critical to transforming the industrial landscape into a changing land that contains opportunities for local firms. To ensure that both the telecommunications and courier industries keep pace with the rapid changes taking place in technology, changing population dynamics and greater liberalisation of the markets.

- A number of initiatives are required to develop the talent needed to raise the knowledge content and innovative capacity of both industries:
  - Strengthen technical and engineering education in schools, colleges, polytechnics and universities. Ensure that training meets global benchmark standards for both industries.

- Research programs in Malaysian IHLs should not just focus on current technology, but also establish research programs that are multidisciplinary and interdisciplinary, bringing expertise from a wide range of disciplines to develop the next generation telecommunication technology, applications and sustainable business models.

- To ensure that graduates have the skills that meet the needs of the industry at all levels of employment, IHLs must be proactive in improving the employability of graduates by undertaking research and educational collaboration through mechanisms such as introduction of structured apprenticeship program and increasing scholarship programmes in telecommunication area.

- A good case study that assists in fostering strong engagement between IHLs and industry is the Steinbeis network (Steinbeis Malaysia Foundation, 2016), which exemplifies a systematic way to foster strong Triple-Helix.

Recommendation 17.4: Enhance the Telecommunication and Courier Business Ecosystem

- A key feature of enhancing the competitiveness of the industry is to ensure that business friendly policies and strategies are in place to nurture the creation of a vibrant and efficient telecommunication and courier business ecosystem.

- Key policies and strategies include the following:
  - Industry associations and key government agencies to be 'One-Stop-Shop' to assist micro and SMEs firms adopt new business models using advanced telecommunication technology. This will help them move up the knowledge and innovation value chain.
  - Foster stronger command of the English language for SMEs while conducting more technical training in vernacular languages.
  - Enhance the Global Business Services (GBS) initiative to help SMEs to brand and internationalise their business models.
  - Increase financial incentives for start-ups to adopt new technology and undertake R&D activities.
  - Improve technology adoption and R&D via Extension Program for SMEs via Small Business Innovation Research (SBIR) initiative and Research Intensive Scheme for Enterprise (RISE) with GLCs and universities.
  - Establish Industrial Research Centres in universities to support R&D initiatives of firms in the industry, adhering with the Quadruple Helix model for open innovation.
  - Establish a vendor development program that enables SMEs to be a part of the value chain for the more established and larger players, giving small and mobile firms capital to work with without eroding the market share of bigger companies that operate along economies of scale.
  - Telecommunication and courier service providers should provide full "quad play" (broadband internet access, digital television, home phone and mobile phone) and a wide range of innovative services via Internet Protocol (IP) that meet the demands of all segments of the population.

17.8.4 Best Practices

The telecommunication and courier services industry is an important part of the Malaysian economy. A sound and efficient telecommunication and courier industry will have significant spill-over benefits to the other industries. As mentioned in the previous sections, the industry is undergoing rapid transformation due to a number of factors. For the local industry to enhance its competitiveness, it will need to emulate best practices undertaken by the industry in other pace-setter countries. Below are a number of best practices that can help the Malaysian telecommunications industry move up the knowledge value chain.

Best Practice 17.1: Focus Development in Frontier Telecommunication Technology

Cloud-based Services in Australia

- The Australian Government Information Management Office developed a risk-managed approach to an organisational cloud strategy and an effective implementation plan for the roll-out of cloud-based services.

- The Australian Government's policy on cloud computing was also introduced where agencies may choose to use cloud-based services when they provide value for money and adequate security – as stated in the Australian Government Cloud Computing Strategic Direction Paper in 2011. Among the aspects covered in the guide are ways to identify cloud opportunities (such as assessing suitability against business needs, consideration of timing, triggers, financial impacts, organisational capabilities, change management, and governance review), implementing a cloud solution (such as building a business model, assessing risks, capture requirements, building a business case, preparing an exit strategy, determine contractual terms, approaching the market, selecting a provider, planning for implementation and on-going operations), and continuously reviewing the implementation strategy.

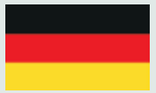
Best Practice 17.2: Embrace New Business and Leadership Style

Refining Organisational Structure around Core Business Areas by Maxis in Malaysia

- Maxis Berhad is Malaysia's only integrated communications service provider that took a radical approach to refine its organisational structure to strengthen its core business areas for future growth by placing the traditional finance, human resources, corporate affairs, information services, network, regulatory and government affairs, and legal divisions at the back end (supporting role) and contemporary business structures based on core business areas in the form of enterprise solutions, consumer business, sales and service, and digital services at the front end.

- The new structure streamlines its operations, improves processes, and improves agility and cohesiveness in delivering its integrated propositions across its wide range of products and services as well as supporting its growth strategies.

Best Practice 17.3: A Holistic Talent Development Strategy



The Steinbeis Model in Germany

- A system and organisation developed in Germany to bridge the gap between academia and industry in the pursuit of promoting effective and efficient cooperation that will lead to productive outcomes for all stakeholders.

- This unique model has been widely recognised across the globe for its success as a catalyst for knowledge and technology transfer from universities and research institutions to industries and firms.

- A similar concept has been modelled in Malaysia – the Steinbeis Malaysia Foundation.

Best Practice 17.4: Enhance the Telecommunication and Courier Business Ecosystem

FedEx US - Global Reach and Richness in technology powered courier system

- FedEx is one of the world's largest computer and telecommunication courier service providers.

- COSMOS (Customer Operations Service Master On-line System) enables clients to track the packages in real-time and designed to give 100% customer satisfaction.

- Command and control is in Memphis, Tennessee. It connects 750 customer service workstations, with more than 750 customer service workstations, over 500 aircrafts, 46 call centres across the world, who handle over half a million telephone calls daily.

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CHAPTER 18

KNOWLEDGE CONTENT OF THE HEALTHCARE INDUSTRY

CHAPTER 18
Knowledge Content of the Healthcare Industry

18.0 Introduction

The healthcare industry is not only important for ensuring the social wellbeing of its citizen; it also generates important revenue for the country. The Malaysian healthcare industry is a two-tier system comprising public and private healthcare providers. The public industry provides around 70% of healthcare services and is heavily subsidised by the government. The Ministry of Health provides oversight to 138 government hospitals, more than 2,880 clinics and 184 mobile health clinics that operate in remote and rural areas.

The private industry caters to the remaining 30% of healthcare services. Despite dominance of the public industry, the private industry has registered significant growth over the last three decades. More private hospitals were built in the last decade compared to public hospitals. As of 2012 there were 217 private hospitals, 34 maternity and nursing homes, 36 ambulatory care centres, and 6,442 medical clinics (Inside Investor, 2012). The most recent health fact statistics by Ministry of Health Malaysia (2015) reports that there were 184 licensed private hospitals, 35 maternity and nursing homes, 66 ambulatory care centres and 6978 medical clinics. Due to government subsidies, the public healthcare industry offers affordable care. However, patients show a preference to go to private hospitals where the patient-to-doctor ratio is lower and service is better, although treatment quality is similar.

Recent statistics by the World Health Organisation (WHO) show that Malaysia's performance continues to improve on a number of health indicators, such as infant mortality rate and life expectancy, indicating tangible improvements to healthcare services and quality of life in Malaysia. According to WHO (2016), Malaysia's total expenditure on health per capita reached USD$1040 in 2014. Additionally, the total healthcare expenditure in the country is approximately 4.2% of GDP (WHO, 2016).

The healthcare industry has witnessed continuous growth in recent years and is expected to continue on this positive trend. In South-East Asia, the standard of healthcare in Malaysia is considered the second highest after Singapore. Malaysia's healthcare expenditure is expected to reach up to RM68.4 billion in 2018 with an annual growth rate of 6.5% over the six-year period between 2012 and 2018 (Frost and Sullivan, 2012).

A number of important trends have emerged in the past few years in the healthcare industry. For example, as the country developed and peoples' lifestyle changed, different diseases became more prevalent in Malaysian society. According to 2012 statistics by the World Health Organisation (WHO), the top leading causes of death in Malaysia are ischaemic heart disease (20.1%), stroke (10.6%), and lower respiratory infections (8%). Other causes include pulmonary disease, diabetes, kidney diseases, and cancer. With rising income levels, cardiovascular diseases and diabetes, conditions typically associated with higher income societies, are becoming major health concerns in Malaysia. The shift in disease patterns has given rise to the government's reassessment of its healthcare strategy. More programmes that focus on educating the public about healthier lifestyles and the management of chronic diseases were conceived as a result. Nonetheless, programs for traditional health and basic hygiene remain relevant for rural communities.

Another trend impacting the healthcare industry is the aging population. This is attributed to increased life expectancy, improved standards of living and advances in healthcare and preventive practices. It is expected that by the year 2020, 10% of the country's population will be above the age of 60, and by 2030 this will rise to 15%, making Malaysia an aged nation. Thus there is greater pressure on the country to prepare adequate care for its elderly. At the moment, the country is not adequately equipped to provide for the long-term care needs for the elderly – nursing homes and mobile healthcare services remain fragmented and underdeveloped, and present a new avenue of growth in the healthcare industry.

18.1 Key Developments and Initiatives

As part of the Economic Development Program, the Malaysian Government has launched a number of Entry Point Projects (EPP) to encourage both foreign and domestic investment in different areas of the healthcare industry, such as manufacturing of pharmaceutical products and medical devices. Attention is also being paid to the importance of creating the needed infrastructure and support to enable clinical research and aged-care services. A total of 40 healthcare projects were announced under Healthcare NKEA. According to government estimates these projects are expected to create 26,966 jobs, RM6.59 billion in income, and RM4.96 billion in new investments by 2020 (ETP Annual Report, 2014).

The government has focused its attention on a few key areas to drive development and growth in the healthcare industry: manufacturing of pharmaceuticals and medical devices, seniors' healthcare services, and medical tourism.

Manufacturing of Pharmaceuticals and Medical Devices

The Malaysian Government recognises the multiplier effect of encouraging manufacture of pharmaceuticals and medical devices in the country. A number of projects have been established under the umbrella of Medical Devices Entry Point Projects (EPP 7-EPP 14). INTELLIS is one of the EPP projects developed by Lucenxia to provide Home Dialysis System for patients with chronic kidney disease. Malaysia is in a good position to leverage on its cost advantage and capabilities in manufacture of electronics and electrical equipment. The growing healthcare spending in the South-East Asian region provides a great opportunity for Malaysia to become a centre for high-value medical devices export to the region. Another example is Project Cheetah which aims to set up manufacturing facility for South-East Asia's first Metered Dose Inhaler (MDI) with projected investment value of 76.38 million by 2020.

Senior Living and Elderly Care Services

To assist with building better infrastructure and support services for elderly care, the Economic Transformation Program introduces three EPPs that are designed to drive the creation of seniors' living facilities. These are Mobile Healthcare Services (EPP 15), Institutionalised Aged Care (EPP 16) and Retirement Villages (EPP 17).

Medical Tourism

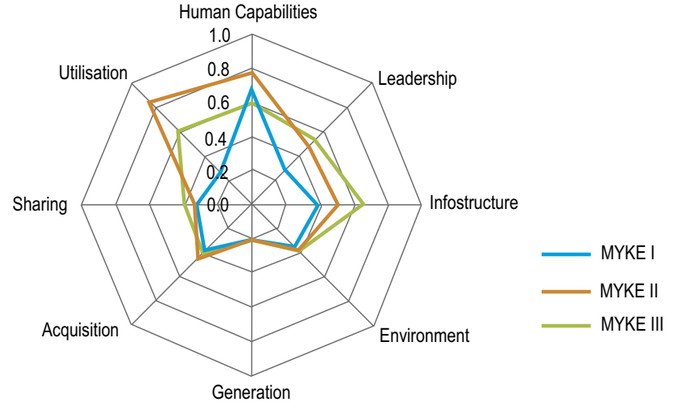
According to 'Patients Beyond Borders', the global medical tourism market is growing at a rate of 15% to 25%, with the Asian market having the highest growth rate. The Malaysia Healthcare Travel Council (MHTC) has been actively promoting Malaysia as a medical tourism destination. Malaysia's healthcare industry has the competitive advantage of quality service at an affordable price, making it an attractive destination for its south-East Asian neighbours. As a Muslim country that has Halal facilities it is particularly attractive to patients from Indonesia and the Middle-East. Although Thailand remains the leader in medical tourism with around 40% of the market share, the Malaysian medical tourism market grew more than eightfold between 2003 and 2011 (Medical Tourism Association, 2016). Malaysia has been listed as one of the top 10 preferred medication destinations by Patients Beyond Borders. The number of travellers doing so for healthcare increased significantly from 641,000 in 2011 to 850,000 in 2015 (Malaysia Healthcare Travel Council, 2016).

18.2 Knowledge Content

In this study, the sample used to map the knowledge ecosystem for the Malaysian health industry sector was based on the following samples for MYKE-I, MYKE-II and MYKE-III studies, respectively: 91, 96 and 122, as shown in Table 1.1. The number of SMEs and large players for the two sample periods were as follows: (SME, Large) are (59, 32), (62, 34) and (89, 33), respectively.

This section provides a discussion of the development in knowledge content in the healthcare industry between 2003 to 2014. Changes in knowledge enablers and knowledge actions are shown in **Figure 18.1.** In general, the healthcare industry shows progress along most enablers, though there is a fall in knowledge utilisation and human capabilities during the MYKE II and MYKE III period. A detailed discussion of each of the knowledge pillars is provided next.

Figure 18.1: Overview of Knowledge Enablers and Knowledge Actions for MYKE I, II & III Healthcare Services



18.3 Knowledge Enablers

18.3.1 Human Capabilities

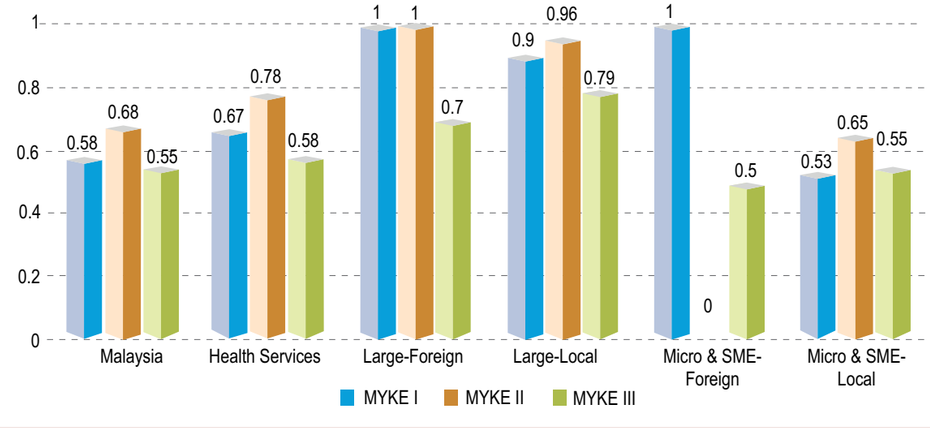
The Healthcare industry showed reasonable growth in recent years motivated by investments from the private industry. However, it still only contributes about 0.9% of GDP. The industry is identified as a key area of interest leading the government to push development in the industry though a number of EPP projects. By 2020 the healthcare industry is expected to generate 181,000 new jobs and contribute about RM35.3 billion to GDP (ETP Annual Report, 2014).

One of the most critical issues for the healthcare industry is the shortage in highly qualified and experienced employees, including doctors, nurses and other care providers. **Figure 18.2** shows a decline in 2014 after an improvement in 2007 period. In the period of MYKE III, human capability in the tourism sector fell to a level below that in the period of MYKE I. The pattern is consistent across firms of different types where there is a decline in employee training and employees with degrees. The rapid growth in the number of private healthcare providers in recent years has led to competition over a limited pool of qualified employees, marking a shortage in human capital. Decline in human capability is also attributed to the strong demand for Malaysian nurses in other regions such as the Middle-East, where they are offered higher salary and more comprehensive benefits.

Expansion of clinics and hospitals outside the major cities in the country also demonstrated the reluctance of doctors and nurses to work in certain locations that are too remote. This is particularly an issue in East Malaysia (Sabah and Sarawak) where there is a shortage of specialist doctors and experienced nurses. Healthcare providers in East Malaysia also face problems of access to training programs for their employees. Most healthcare training programs are conducted in West Malaysia, which results in higher costs for human capital development among healthcare providers in Sabah and Sarawak. Additionally, they would also have to factor in the inconvenience to employees who have to leave their family behind and stay in West Malaysia for the duration of the training programmes.

Despite the challenges faced by the industry, local large firms have surprisingly outperformed foreign large firms in the latest assessment period. Similarly, local micro and SME firms are better than their foreign counterparts, albeit by a small margin. This is a good indicator of the attractiveness of local healthcare firms to human capital and their ability to compete with their foreign counterparts over qualified employees.

Figure 18.2: Human Capability of the Healthcare Industry

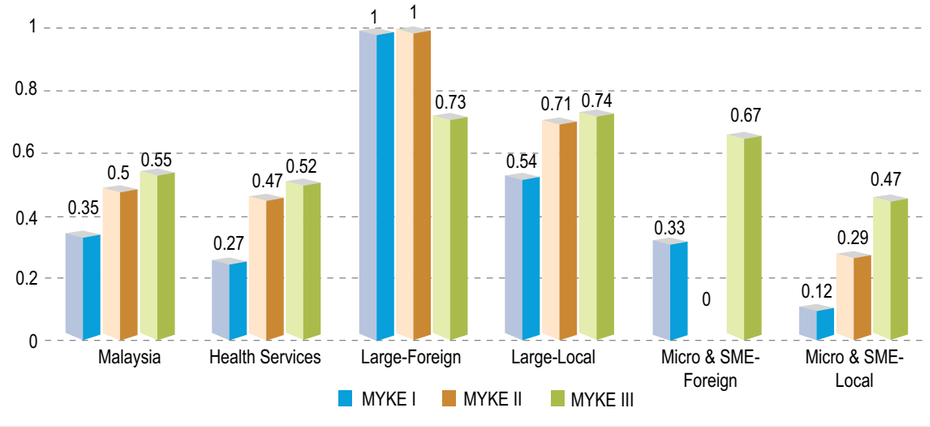


18.3.2 Knowledge Systems and Leadership

Assessment of the healthcare industry advancement in instilling formal knowledge processes and strategies shows the industry performing at a level lower than the Malaysian aggregate in all the periods of MYKE I, MYKE II, and MYKE III. Nonetheless, the healthcare industry shows a positive year-on-year improvement. With the launch of National Standards Compliance program in June 2014 which aims to enhance national adoption of better standards in the delivery of products and services, the healthcare industry could further improve its management of knowledge through better formalised processes.

Comparison at firm level reveals that large local firms and large foreign firms are almost on par with regard to instituting formal approaches to the management of knowledge. The gap between large and small firms is more evident in the case of local firms, which shows the limited capability of local micro and SME firms to formally capture and document knowledge.

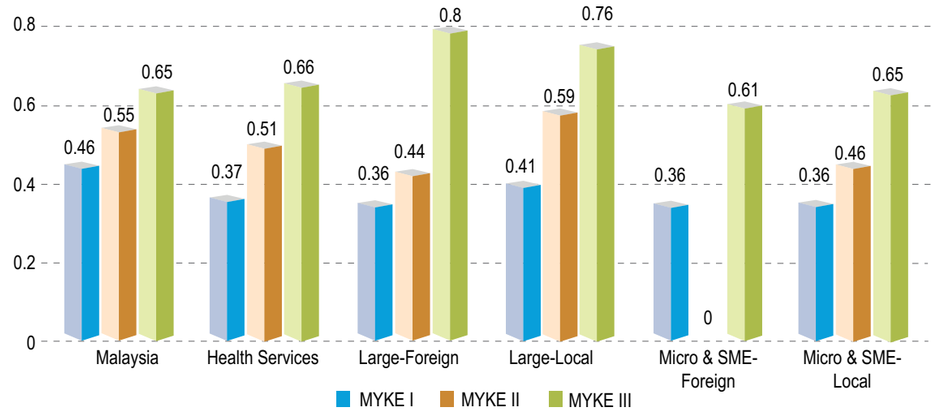
Figure 18.3: Knowledge Leadership in the Healthcare Industry



18.3.3 Technology and Infostructure

Technology based infostructure of Malaysian healthcare providers improved over the period of 2003 to 2014. The industry was behind national aggregate in 2003 but managed to successfully catch up by 2014. Local large firms began in 2003 at a slightly better position than others in terms of computer availability and access. There was no difference between the remaining firm types. By 2014, a gap between large and small firms emerged. Foreign large firms scored the highest in technology infostructure. Large local firms come in at a close second. Meanwhile, small local firms fared better than their foreign counterparts.

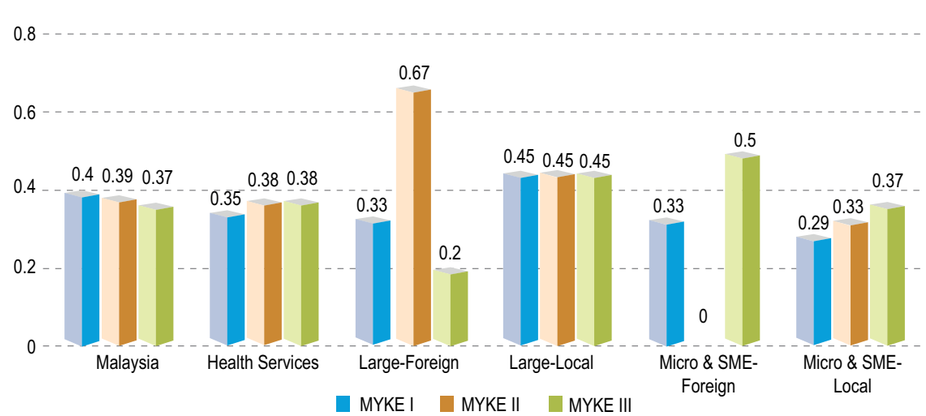
Figure 18.4: Technology and Infostructure of the Healthcare Industry



18.3.4 Knowledge Environment

At the aggregate level, the healthcare industry shows a low level of engagement with the broader institutional knowledge environment. There was no significant change over the period of 2003 to 2014. At the firm level, there is higher variability across different firm categories over time. The level of engagement with the knowledge environment by large foreign firms increased tremendously from 0.33 in 2003 to 0.67 in 2014, only to drop drastically to 0.2 in 2014 becoming the lowest across all firm types. Large local firms maintained the same level of engagement with the knowledge environment over the period 2003 to 2014. In contrast, improvement was seen from the small players. Micro and SME firms, both local and foreign, demonstrated continuous increase in their awareness of knowledge initiatives by government, universities and associations. During 2014, foreign micro and SME firms were the most active with regard to engagement with institutional knowledge environment. One underlying reason for this is that small providers have limited resources and can benefit from government programs and other initiatives by universities and associations to help small players.

Figure 18.5: General Environment Awareness of the Healthcare Industry



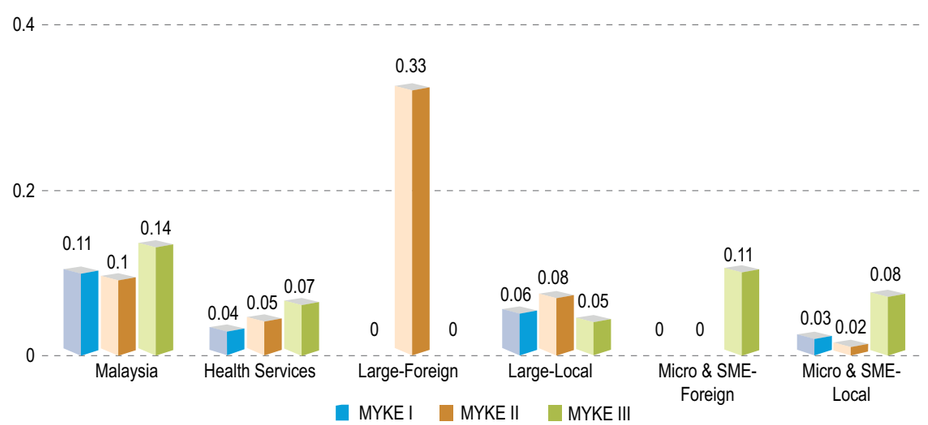
18.4 Knowledge Actions

18.4.1 Knowledge Generation

The healthcare industry performs very poorly with regard to knowledge generation, measured by R&D engagement and patent and copyright filings. The industry's level of knowledge generation is lower than the Malaysian aggregate. This demonstrates that healthcare providers in Malaysia focus on providing already established and tested treatments to their patients, but have very weak focus on discovery of new knowledge. Very few doctors in Malaysia conduct research or publish research papers, or collaborate with external parties on new surgical methods or clinical trials. This weak performance is consistent across the different firm categories. In the hope of changing this pattern, the government's ETP programs include an initiative to build a clinical trial network. This effort by the government aims at pushing forward R&D in the healthcare industry to increase knowledge generation.

Figure 18.6: Knowledge Generation Activity in the Healthcare Industry

Generation

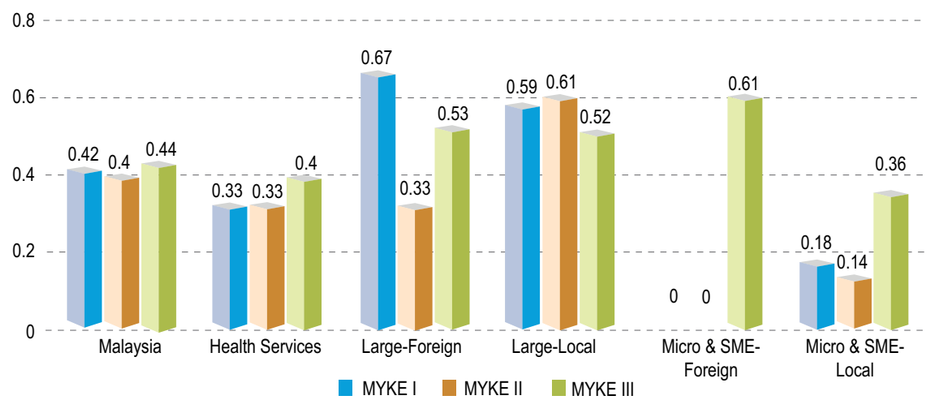


18.4.2 Knowledge Sharing

The healthcare industry shares knowledge at a lower degree than the Malaysian aggregate – knowledge sharing performance did not change much between 2003 to 2007, and only improved slightly in 2014. Within the industry itself, local large firms have been on par with foreign large firms; however, it is the small foreign firms that exhibit the highest knowledge sharing in the most recent assessment period (with an index of 0.61). Meanwhile, local small firms remain the furthest behind and are in dire need of catching up with other firms.

Figure 18.7: Knowledge Sharing Activity of the Healthcare Industry

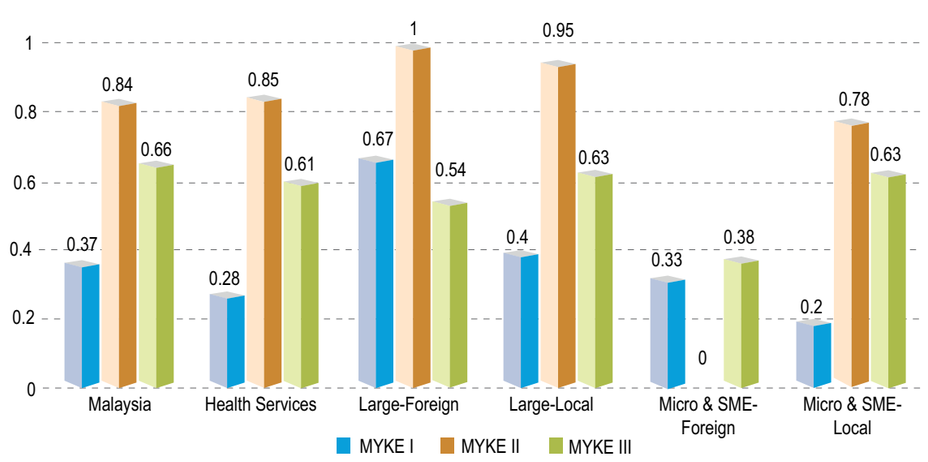
Sharing



18.4.3 Knowledge Utilisation

Knowledge utilisation in the healthcare services industry refers to the use of experiential learning knowledge and external knowledge. The industry's performance was below national aggregate in 2003, but caught up in 2007 and remained on par through 2014. Nonetheless, knowledge utilisation in the healthcare industry aligns closely with that of the Malaysian aggregate, when it improved in 2007, but then declined in 2014. This attribute is shared across all firm categories regardless of size or origin. The interesting development here is that local small firms kept to pace with the local large firms with regard to leveraging knowledge to create outcomes. In addition, local firms exhibit the highest level of knowledge utilisation in 2014.

Figure 18.8: Knowledge Utilisation Activity of the Healthcare Industry



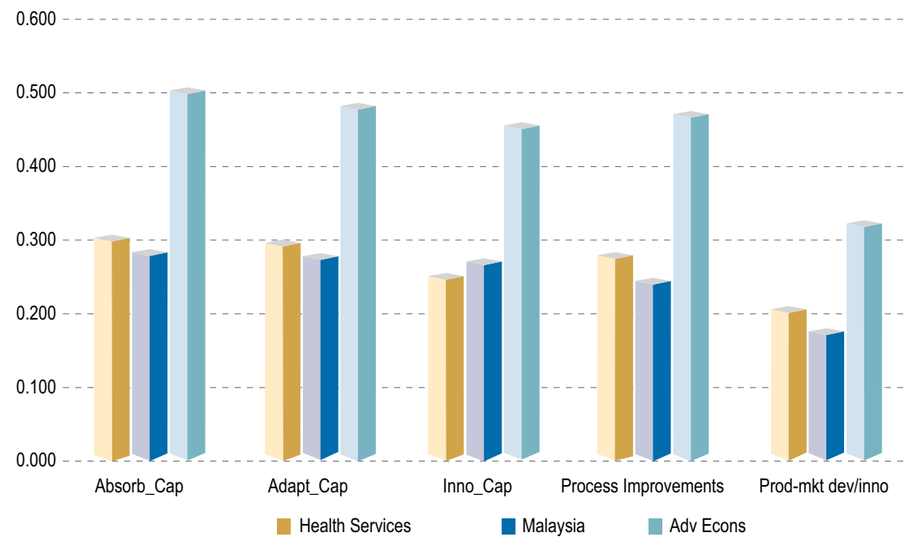
18.5 Dynamic Capabilities Profile for Healthcare Industry

Dynamic capabilities underwrite firm's ability to respond to changes in its environment by reallocating needed resources to create strategic advantages and a stronger competitive position. Absorptive, adaptive and innovative capabilities are the three components of dynamic capability.

Over the years, the healthcare industry made gradual improvements to its knowledge profile and managed to take positive steps to build stronger knowledge based foundations. Overtime, this also translated into improvement in the industry's dynamic capabilities.

Figure 18.9 shows the dynamic capability profile and innovation outcomes in the healthcare industry. The healthcare industry performs better than the Malaysian industry aggregate on absorptive and adaptive capabilities, but is lower than national aggregate on innovative capability. In terms of the process and product-market development outcomes, the industry outperforms the Malaysian industry aggregate.

Figure 18.9: Dynamic Capability Profile of the Healthcare Industry

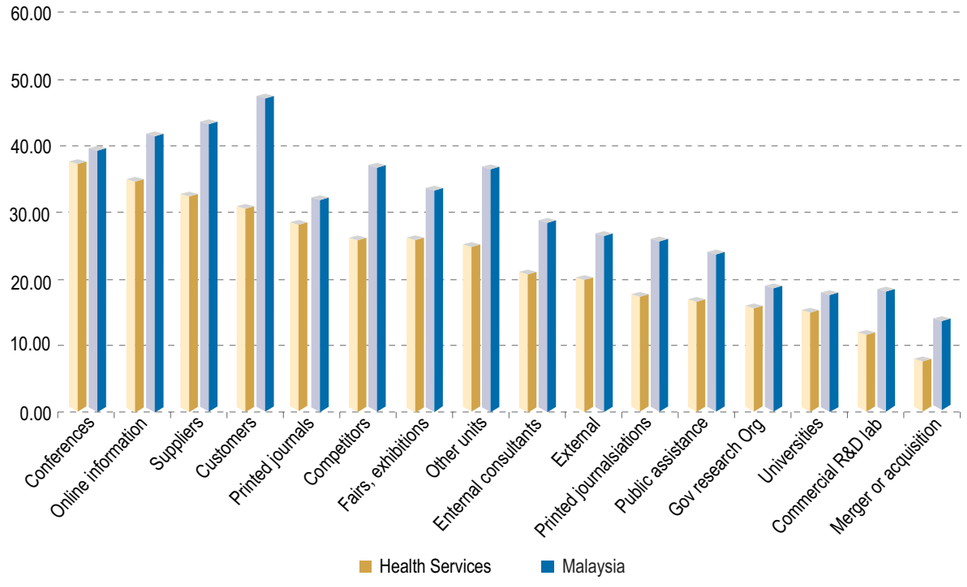


18.5.1 Absorptive Capability

Looking at **Figure 18.9**, the healthcare industry is above average in terms of absorptive capabilities. The industry has higher than national aggregate capability to scan the market for trends and new opportunities, and systematically gather, organise and share external knowledge. Healthcare providers also acquire technology from outside sources at a greater degree than the national average, and are better at redeploying such technology in the best capacity.

Given continuous improvements in the field of medicine and patient care, healthcare providers in Malaysia need to tap into more diverse sources of information to stay up to date with industry developments and new technologies. The results indicated by **Figure 18.10** show that the top three sources of knowledge are conferences, online information and suppliers. The industry also gets information from customers, journals, competitors and to a smaller extent, from the government and universities.

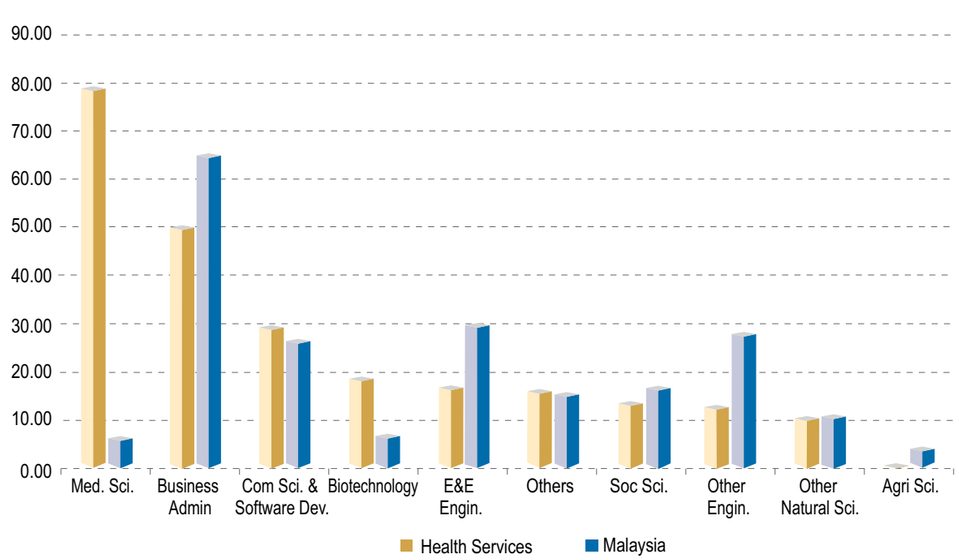
Figure 18.10: Sources of Knowledge in the Healthcare Industry



18.5.2 Adaptive Capability

Adaptive capabilities ensure that firms are able to use information and knowledge absorbed from the different external sources. Firms in the healthcare industry demonstrate positive level of adaptive capabilities. This means that firms have the capacity to rearrange their resources, processes and finances effectively to see innovation projects through. Companies with high adaptive capabilities continue to develop new structures and processes that align and allocate resources to exploit new opportunities. The healthcare industry's skills profile indicates that the sector is, as expected, comprised predominantly of medical science employees. The second largest group is business administration graduates. The industry employs graduates from other disciplines such as computer science, biotechnology, E&E and engineering, but at much lower levels, with the employment of graduates from computer science being notably higher than national aggregate. This shows that the healthcare industry's business operation is very technology-centric.

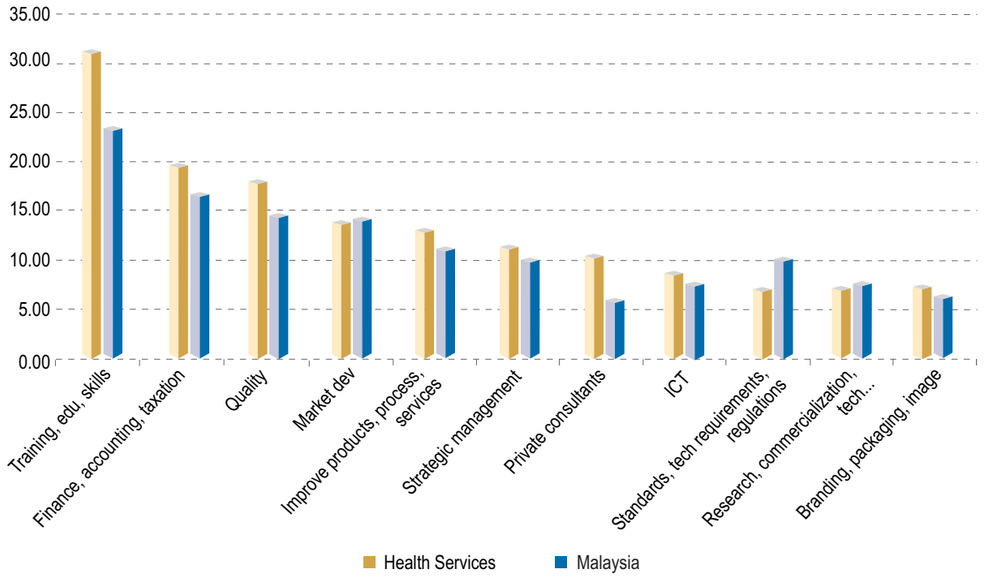
Figure 18.11: Skills Profile of the Healthcare Industry



Malaysia's institutional environment also contributes significantly to the capability building of industries (**Figure 18.12**). Firms in the healthcare industry receive assistance from a number of external sources such as government agencies, industry association and universities. The top activity taking place in the healthcare industry is human capability building in the form training, educational and skill enhancement. Healthcare providers also seek assistance from agencies to help them enhance skills in their finance, accounting, and market strategies, as well as improve quality of standards and processes.

Overall, the healthcare industry received advice and assistance at a level above the Malaysian average across many services. However, the industry receives below average support in areas such as improvement of standards and technological requirements, and development of research and commercialisation.

Figure 18.12: Role of Institutional Environment in Skill Building of the Healthcare Industry

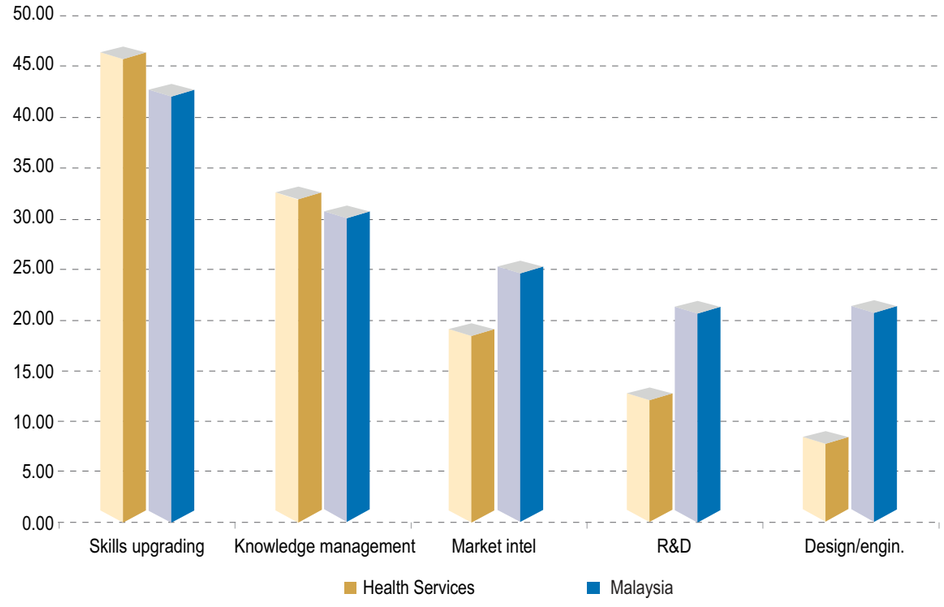


18.5.3 Innovative Capability

Despite doing better than national average in absorptive and adaptive capabilities, the healthcare industry is not able to maintain its positive performance in innovative capability. This component of dynamic capabilities entails execution of processes that integrate allocated resources with gathered knowledge and identified opportunities to create competitive advantage. Unfortunately, the healthcare industry shows a lower ability to translate knowledge into innovative outcomes.

As it shows in **Figure 18.13**, healthcare providers are not strongly engaged in innovative capability building activities, as compared to the Malaysian industry aggregate. Healthcare providers are only slightly better than the national aggregate in terms of skills upgrading and development of knowledge management. Unfortunately, their performance is much lower in terms of market intelligence, investment in R&D and design and engineering improvements. This undermines their innovative capability.

Figure 18.13: Knowledge Intensive Activities in the Healthcare Industry



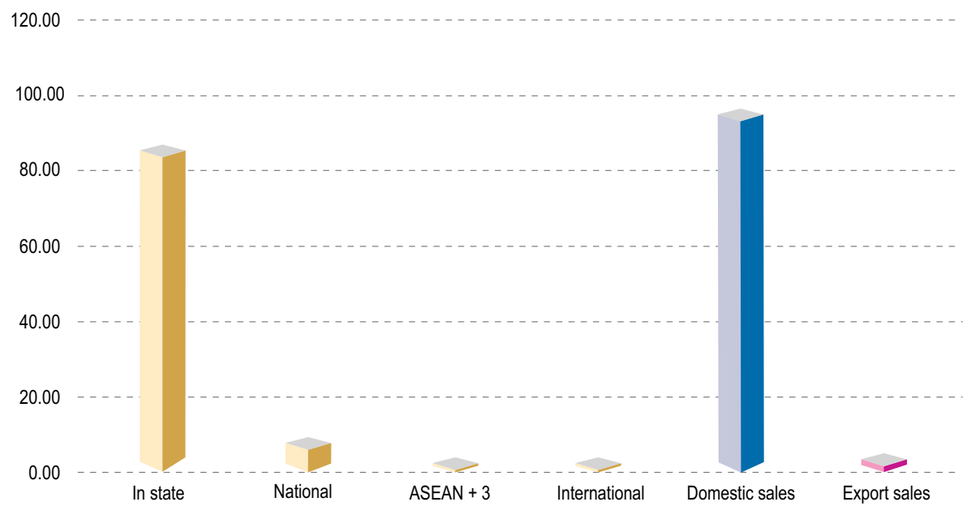
18.6 Outcomes of Dynamic Capabilities in the Healthcare Industry

The healthcare industry is heavily inward focused. As **Figure 18.14** shows, 96.03% of revenues in the healthcare industry come from the domestic market. Healthcare providers also tend to be state focused, with 86.56% of revenue coming from within state. Breakdown of export revenue show the regional market (ASEAN plus Japan, China and South Korea) to account for only 1.69%, with international revenue at only 2.29%. As such, Malaysian healthcare providers have a negligible international presence.

Lower level of innovative capability in the health industry implies lower ability to translate knowledge into new products and services. Surprisingly, the healthcare industry shows a positive level of outcomes in terms of improved product-market development. **Figure 18.14** indicates that the healthcare industry outperforms national aggregate level despite its weakness in the innovative capabilities.

A more detailed examination of the healthcare industry reveals that performance in terms of introducing new processes and developing products and markets is not the result of internal creative processes but arises from fortuitous environmental circumstances and considerable import of advanced medical equipment to render high quality medical service to patients from other countries. Having little investment in R&D, healthcare providers do not engage in innovative research and therefore do not develop new solutions by themselves. However, since they have high absorptive and adaptive capabilities they are able to identify new developments in other markets and hence try to assimilate and copy. Healthcare providers in Malaysia catch up with developments in the healthcare industry of developed countries through true acquisition of innovation and new trends that are taking shape. For example, some services such as care for the elderly and mobile healthcare are considered new service innovations in the Malaysian space but have existed in developed nations for a long time. Add to this, healthcare insurance companies are only now opening up to the possibility of covering non-life threatening treatments, demonstrating a process gap in healthcare related industries to support new services.

Figure 18.14: Market Presence of the Healthcare Industry

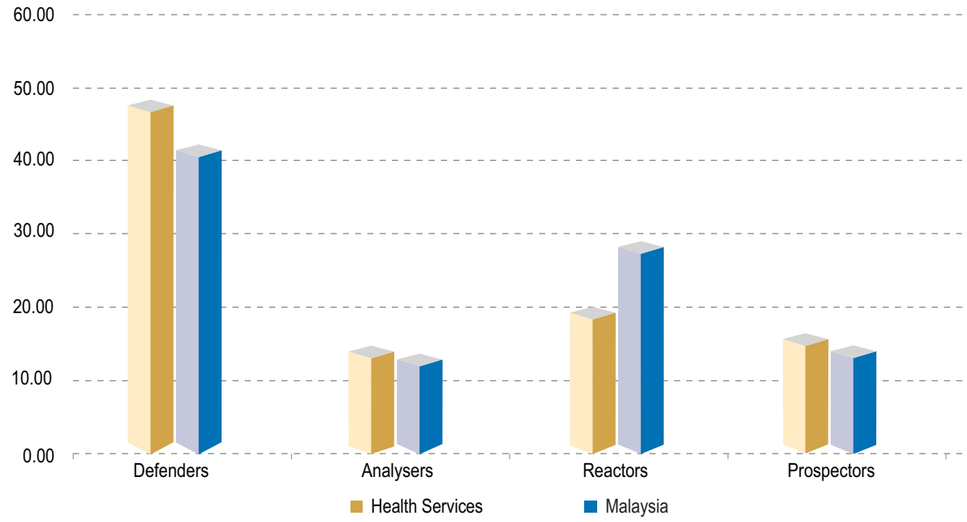


Note: The results are based on survey data.

Over the years, healthcare providers showed good improvement and positive signs of capability building in absorptive and adaptive capabilities. However, if innovative capabilities are not strengthened then the industry will constantly be following in the footsteps of advances made by others.

The healthcare industry strategic profile shows a dominance of Defender type firms which make up almost half of firms in the industry (48.76%). Defenders firms prefer to focus on market share retention through gradual improvement of existing propositions, rather than look to new innovations and markets. The second largest group is comprised by Reactor firms (19.83%). Reactor firms tend to only respond to change when their existence is threatened resulting from slow initial adaptation to changes in the marketplace. Defenders feature at a higher level than the Malaysian aggregate, whereas Reactors are lower. The third group are Prospectors (16.53%), while the smallest group is constituted by Analyser firms (14.88%). The healthcare industry has more Prospector firms than the Malaysian aggregate, and lower than the aggregate number of Analyser firms. Analyser firms adopt new ideas but only after extensive consideration, while Prospectors are inclined to aggressively plough investments into driving innovation. Unfortunately, both have only a small footprint in the industry.

Figure 18.15: Strategic Profile of Firms in the Healthcare Industry

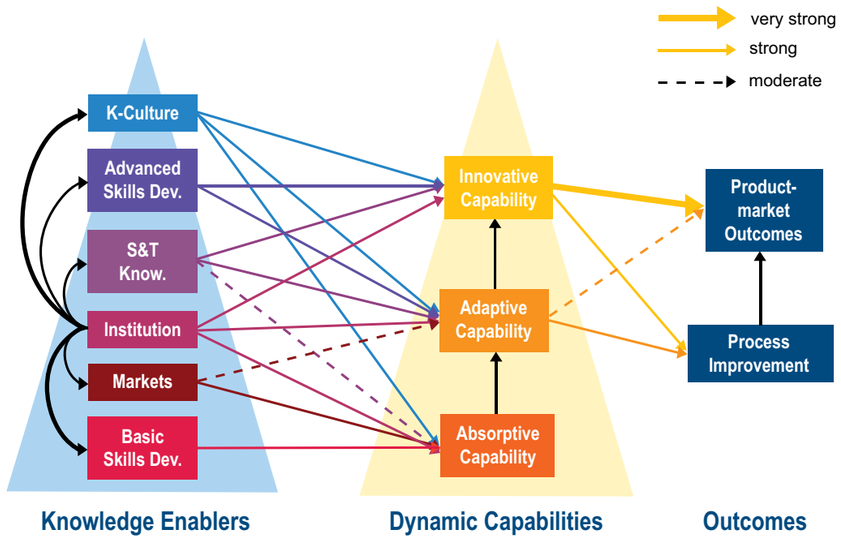


18.7 Relationships between the Key Blueprints of the Healthcare Knowledge Ecosystem

In this section, we discuss the relationship between the knowledge enablers, dynamic capabilities and economic outcomes for the healthcare industry. The Malaysian healthcare knowledge ecosystem is benchmarked against their counterparts in advanced countries (Australia, Canada, Japan, Sweden and US). Based on content analysis of these four countries and the data obtained from DOS for the Malaysian healthcare industry, the Malaysian healthcare knowledge ecosystem was benchmarked against that of these advanced countries. While the Malaysian healthcare industry is knowledge intensive compared to other industries, it is classified as a laggard industry since the level of innovation-driven enterprises is relatively low.

In **Figure 18.16**, the healthcare knowledge ecosystem for advanced countries is shown. In most of the advanced countries, the enablers for all three components of the dynamic capability are very strong. Sound absorbability capability in this industry provided good support for both adaptive and innovative capabilities for the industries. High level of dynamic capabilities have in these advanced countries have enabled the industry to develop new process improvements and generate new product outcomes. Sound healthcare industry has spawned a number of healthcare down-stream industries from these countries.

Figure 18.16: Knowledge Ecosystem of the Healthcare Industry in an Advanced Country



Note: Very strong impacts are represented by the bolded line, strong impacts are represented by normal lines and moderate impacts are represented by dotted lines.

The healthcare knowledge ecosystem for Malaysia is shown in **Figure 18.17** and it was classified as a laggard with a small percentage of firms that undertake innovative endeavours. Many of the healthcare providers are users of technology and knowledge from more advanced countries, but very few institutions are at the forefront of innovation. The Malaysian healthcare knowledge system shows that enablers to support the three dynamic capability components are relatively weak and are primarily to enhance process improvement. A summary of the strength of the agriculture ecosystems in advanced countries and in Malaysia are given in **Table 18.1.**

Figure 18.17: Knowledge Ecosystem of Healthcare Industry in Malaysia

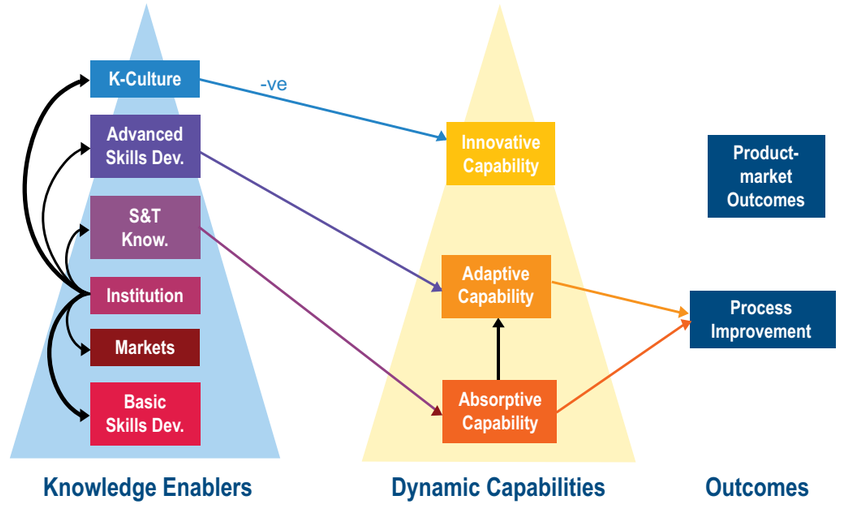


Table 18.1: Knowledge Enablers and Dynamic Capabilities for the Healthcare Industry

Advanced Countries	Malaysia
Basic Skills have a **positive and strong impact** on absorptive capability. The healthcare industry highly technology and knowledge intensive and undergoes continuous development and healthcare providers required to keep abreast with these new developments. In some cases, medical practitioners are required to sit for examinations to renew their licences. Regular trainings are made available via the various associations, universities and colleges to ensure healthcare specialists are using the most advanced technology and knowledge available to provide a high level of healthcare service.	Basic Skills have **no significant impact** on any of the dynamic capability components. The Malaysian healthcare industry does not mandate healthcare practitioners to update the qualifications as part of their medical licence recertification. There are very few healthcare providers that allocate resources to train their healthcare workers. A majority of clinics and healthcare services compete on prices and hence hire general healthcare practitioners to keep cost low.

Table 18.1: Knowledge Enablers and Dynamic Capabilities for the Healthcare Industry (cont'd)

Advanced Countries	Malaysia
Market Intelligence has a p**ositive and strong impact** on absorptive capability; and **positive and moderate impact** on adaptive capability. The healthcare industry and supply chain are really sophisticated and well networked and any new trends or discoveries are informed to the medical service providers. Widespread use of ICT among medical practitioners keeps them abreast of market conditions, new technology, innovations and scientific discoveries that will enhance the competitiveness of their businesses.	Market Intelligence **has no significant impact** on any of the dynamic capabilities. The interactions among the key stakeholders are patchy and fragmented. Many of small firms tend to rely on suppliers for information and knowledge. This is in part due to the skill set of healthcare providers (and support staff) and their ability to access the necessary information using modern technology and subsequently translate the information into knowledge that can be used for strategic decision making.
Institutions are **strong enablers** of the knowledge ecosystem and have **direct strong and positive impact** on all three dynamic capability components. In many of these countries, government agencies, industry associations and universities ensure that the environment is conducive to enhance all three dynamic capabilities components. Resources are channelled to government research institutions (GRI) and universities to train the best healthcare workers and undertake cutting-edge R&D activities. Regulators ensure that the best practice and standard are adhered to and the interest of consumers and practitioners are protected. Trade/ industry associations play a key role in dissemination best practices, ensuring the healthcare cluster is vibrant, assisting in the development of downstream industries and positioning the industry as globally competitive sector.	Institutions have a **strong impact on the enablers,** but **does not impact** the three dynamic capability components directly. Key institutions (government agencies, industry / trade associations, GRIs and universities) play key roles in ensuring the healthcare ecosystem is developed. However, these institutions' roles in directly impacting the dynamic capability components were found not to be significant. Impact. A number of challenges were identified that hindered dynamic capability components. Among them include the low level interaction between university and GRIs and healthcare providers and mission divergence. Considerable R&D taking place in a number of GRIs and universities, however access to these discoveries to the industry is limited because private healthcare is more concerned about providing best patient care and less on R&D. Many of the medical providers are users as opposed to creators of new innovations. Many do not use their institutions for clinical trials or other R&D activities. Further, many of the healthcare providers, especially the SMEs are unable to afford the cost training or time to undertake R&D or other innovative endeavours.

Table 18.1: Knowledge Enablers and Dynamic Capabilities for the Healthcare Industry (cont'd)

Advanced Countries	Malaysia
Science and technology knowledge has a positive and moderate impact on absorptive capability; but, **positive and strong impact** on adaptive and innovative capability. In most advanced countries, considerable resources are channelled to upgrade the S&T infrastructure and capability of staff in the entire value chain. The information dissemination of capability development is undertaken by both general and specialise IHLs.	Science and technology knowledge has **a positive and strong impact** on to absorptive capability. Most firms are users of advanced technology and knowledge and considerable resources are channelled to absorb the knowledge to use these new technology and innovations. Where there is a lack of local talent, the talent pool is supplemented with foreign talent.
Advanced Skills have **a positive and strong impact** on both innovative capability and adaptive capability. In these countries, significant resources are invested to not only strengthen the medical and healthcare R&D areas, but also develop better management methods and systems, software tools, marketing methods, supply chain networks, risk assessment and financial models to support a wide range of healthcare services. The strong linkages between all stakeholders help close the 'knowledge-commercialisation chasm'.	Advanced Skills have a p**ositive and significant impact** on adaptive capabilities only. There are R&D activities and advanced skills development in many of the universities and GRIs. However, the graduates and talent developed are primarily to adapt to existing technology or knowledge that in most cases developed in leading foreign centres of excellence or MNCs. Very few local healthcare providers undertake R&D and most of them are users of R&D and innovations from more advanced countries.
Knowledge culture has a **positive and strong impact** on all three dynamic capabilities. The level of knowledge competency and literacy among workers in the healthcare industry is very high. Most of them have access to information and data from government and trade associations; and some undertake their own data analytics to make informed choices and decisions. There is constant sharing of best practices and new innovations across the industry. Universities and research centres work closely with medical practitioners and other related healthcare industries.	Knowledge culture has a **negative impact** on innovative capability. Most establishments are reluctant to invest in staff development or creating a knowledge-driven culture, especially among SMEs, because many of them lack the resources and are risk-averse in undertaking R&D activities or training their workers. The latter is also due to the high talent poaching of skilled workforce in the healthcare industry.

Table 18.1: Knowledge Enablers and Dynamic Capabilities for the Healthcare Industry (cont'd)

Advanced Countries	Malaysia
The continuum from absorptive capability to adaptive capability to innovative capability is **present and strong.** In most advanced countries, the medical industry is a strategic industry that receives one of the highest funding. Significant resources are channelled to ensure all segments of the healthcare receive high quality services, R&D funding and support for commercialisation. Leading centres of excellence established to make important scientific and technological breakthroughs to raise the quality of the healthcare service.	The continuum from absorptive capability to adaptive capability to innovative capability **is present.** There are considerable resources channelled into the medical industry. The local medical cluster is relatively an infant stage and many parts of the cluster are still its early stage of development. Since there are still gaps in the healthcare knowledge ecosystems, in particular weak relationship between university and industry research and the low levels of R&D undertaken by industry in Malaysia, most of the Malaysian leading talent prefer working closely with large foreign players or migrate to advanced countries with better research environment and career prospects.

The impact of dynamic capabilities on economic outcomes for the healthcare industry for both advanced countries and Malaysia are summarised in **Table 18.2.**

Table 18.2: Dynamic Capabilities and Economic Outcomes for the Healthcare Industry

Advanced Countries	Malaysia
Adaptive capability has a **positive and strong impact** on process improvement and a positive and moderate impact on product market development. There is a wide range of healthcare firms and operators in value chain that support the healthcare cluster. A majority of the firms are technology savvy and are very strong in adapting and modifying new technology and innovations to improve existing line of products and services. Many of them also invest significant resources to push the boundaries of knowledge and innovations to discover new health products and services that are marketed globally. The healthcare cluster in many of these countries has very strong MNCs that support the development of the domestic supply chain and extend their reach to other global markets and supply network. The latter gives domestic firms from advanced countries access to talent, IPs, markets and other resources to enhance line of products.	Absorptive and Adaptive capabilities have **positive and strong impact** on process improvement only. The healthcare industry is knowledge intensive and has spawned a vibrant downstream industry (small holder, SMEs and large players). However, many of them use foreign technology and innovations to enhance absorptive and adaptive capabilities. These enable the firms to improve their processes and products and start new product development.

Table 18.2: Dynamic Capabilities and Economic Outcomes for the Healthcare Industry (cont'd)

Advanced Countries	Malaysia
Innovative capability has a **positive and strong impact** on process improvement and a positive and very strong impact on product market outcomes. Besides supporting R&D endeavours, significant resources are invested in translational research and outcomes. Strong linkages between all institutions facilitate the translational outcomes of the R&D outcomes, leading to generation of patents and other IPs that have commercial potential. Many of the MNCs are also key players of the innovation supply chain. These MNCs and larger firms both conduct their own R&D and also complement the R&D of other players in the industry. Hence, many of these firms in the industry are at the forefront developing new products and services and designs.	Innovative capability **has no significant impact** on process improvement and product market development. Most local healthcare firms are users of new technology and innovations from larger firms from more advanced countries. The primary objective of the firms in this industry is to be improving cost-efficiency, enhance service quality and meet domestic market demand. Very few healthcare providers and firms undertake cutting-edge R&D, clinical trials and/or major innovative endeavours that will lead to. Hence, most of the innovations undertaken by local players do not have significant impact on product market development and process improvement.
Process improvement positive and **moderate impact** on product market outcomes. The healthcare related clusters are well developed and form strong partnership with other industrial clusters that enable them to enhance product development within and across the different industries. The industry also allocates substantial resources to patenting, IP generation and commercialisation activities. Strong partnership between all stakeholders help increase both process and product development and linkage between the two.	Process improvement **does not impact** product market outcomes. A majority of the process improvements undertaken by firms in the healthcare industry are based on foreign knowledge, innovations and intellectual property. Hence, the potential of creating new products and services from the borrowed IPs are limited for the local firms.

18.8 Summary: Key Trends, Challenges, Way Forward and Best Practices

18.8.1 Industry Trends

The healthcare industry shows average performance and is generally on par with the national aggregate level in most knowledge enablers. Over the years, healthcare firms made improvement in knowledge documentation, adoption of technology and computers, engagement with institutions and associations, and engaging with the institutional environment. However, the industry lags behind the national aggregate in terms of knowledge generation and knowledge utilisation.

Having built some strength across a number of knowledge resource foundations, the industry performs better than the national aggregate in its absorptive and adaptive capabilities but is unable to maintain the positive performance with regard to innovative capabilities. Weakness in innovative capability occurs as a consequence of low involvement in a number of important capability building activities such as R&D and market intelligence. The industry largely comprises Defenders and Reactors, which highlights the low number of innovator firms in the industry. Most have low or altogether no tendency to generate new knowledge. Firms in the healthcare industry try to keep up to date with changes in the medical field that are taking place elsewhere, by bringing these innovations into the Malaysian market but are unable to create novel innovations themselves.

One of the main concerns in the healthcare industry is the drop in human capability. This needs to be addressed for the industry to leverage its resources and deliver innovative outcomes. Overall, the industry shows some promise but needs to invest in R&D activities and build stronger linkages with research institutions to push forward its capability building process and be competitive on a regional and international scale.

18.8.2 Challenges

The private healthcare industry has grown over the last two decades with increasing demand from the domestic and foreign markets. While the industry has significant growth potential, the industry faces a number of challenges to build its knowledge content and move up the innovation value chain. The key challenges faced by the industry are given below.

Institutions:

- Universities, GRIs and healthcare providers tend to have divergent organisational goals, leading to low levels of collaboration.
- Industry stakeholders seldom network due to absence of formal channels of interaction.
- Industry R&D mostly originates from GRIs and universities, rather than healthcare providers; the latter's business mandate renders it more focussed on patient care instead of developing new knowledge.
- Healthcare providers are acclimatized to shorter ROI cycles, and do not facilitate long-term, industry-wide value enhancements such as conducting clinical trials or contributing research teams.
- SMEs (clinics and other healthcare practitioners) are hard-pressed to remain competitive. Cost-consciousness and the absence of incentives by other industry stakeholders renders them averse to leading or participating in R&D efforts.

Basic Skills Development:

- Malaysian healthcare regulations do not require practitioners to update their qualifications for medical licence recertification. This leads to talent degradation in organisations that do not have global competitive/collaborative exposure (such as SMEs).
- Very few healthcare providers allocate resources to train their workers due to the cost of external training and poor staff retention. This results in a cascading effect and ultimately leads to the erosion of training budgets.
- Younger generation healthcare workers lack English language proficiency. This hinders their ability to learn new discoveries in the field and communicate effectively with patients from abroad.
- Low degree of service differentiation means most healthcare providers compete primarily on prices. In terms of hiring, general practitioners are favoured over specialists, in order to keep costs low.

Advanced Skills Development:

- Universities and GRIs mainly adapt existing technology or knowledge that mostly originates from overseas centres-of-excellence or MNCs.
- Healthcare providers repurpose and utilise foreign-sourced innovations instead of developing proprietary IP.
- Insufficient development in human capability. Rural and remote areas suffer from the lack of doctors, while public hospitals struggle to attain specialists.
- Shortage of healthcare professionals in Sabah and Sarawak to adequately fill support services, such as engineers, biomedical engineers and accountants due to limited experience within the available labour force.
- Small clinics and remote hospitals have problems in acquiring technology and modern equipment, leading to service degradation.

S&T Knowledge:

- Low internal R&D activity means firms tend to acquire new technologies instead of champion development of local innovation.
- The reliance on foreign talent to shore up domain-specific gaps where local talent is absent creates a potentially inhibitive dependency.
- Severely diminishing research talent. Many lead medical researchers are opting to practice in the private sector due to lucrative remuneration packages. This has an adverse impact on the R&D activities and innovative endeavours of the industry.
- Difficulty in retaining and recruiting qualified workers. Low industry wage levels has led to an ongoing talent drain and emigration of high-calibre healthcare workers.

Market Intelligence:

- Fragmentation of industry stakeholders limits the transference of knowledge between institutions.
- Smaller healthcare providers have weak marketing capability and are unable to scale-up beyond local coverage.

Knowledge Culture:

- Most establishments are profit-centric and do not prioritise investing in staff development or creating a knowledge-driven culture.
- Many SMEs lack resources and are risk-averse in undertaking R&D activities or training their workers.
- Prevalent talent poaching prevents skilled workforce from further developing their capabilities through organisational sponsors.

18.8.3 Way Forward

A number of steps and actions are required as part of the effort to transform the healthcare industry into a knowledge intensive industry and promote Malaysia as a leading healthcare haven in the region.

Recommendation 18.1: Create a Vibrant Healthcare R&D Ecosystem – Formation of Collaborative Research Excellence in Advanced Medicine (CREAM)

- Collaborative Research Excellence in Advanced Medicine (CREAM) should be established to provide direction for systematically enhancing the industry-wide innovation value chain, by aligning enterprise goals through multi-stakeholder partnerships.

- Collaborative R&D ensures the development of new knowledge remains focussed on areas relevant to all stakeholders; CREAM is committed to facilitating this endeavour over the next 10 years.

- Less fragmented research efforts allow consolidation of research grants to address common challenges within the industry; larger budgets also incentivise greater participation by the research community.

Recommendation 18.2: Talent Development in the Healthcare Industry

- Once the key healthcare priority for the next 10 years has been established, resources should be channelled to both public and private universities to increase the quality of talent, infrastructure and other support systems to strengthen the identified priority areas.

- Top local students should be given scholarships to pursue study in local institutions. The need to send students overseas for training should be considered only in areas of specialisations where the local tertiary industry does not have the relevant expertise.

- Industry placement and internship programs are critical for all levels of education.

Recommendation 18.3: Lean Healthcare and ICT for Operational Efficiencies (E-Health and Telemedicine)

With increased use of the internet and mobiles, health care organisations may be able to reduce the burden of patient and cost of processing patient records through deployment of sophisticated ICT based e-Health systems.

Telemedicine, patient management systems, and lifetime health records are core areas that can be streamlined and controlled through ICT-based processes.

Principles of lean management can be learnt and applied to improve processes, reduce waiting times and enhance health care support.

Recommendation 18.4: Malaysia as Healthcare Travel Destination

- Medical tourism in recent years has experienced sharp increase within the region. This potential can be tapped further through carefully crafted marketing and promotional activities to raise awareness of Malaysia's areas of medical expertise and hospital services.

These healthcare providers should be seamlessly integrated with the regional and global tourism industry players.

Recommendation 18.5 Developing Strong Supporting Supply Chain to the Healthcare Industry

- Developing a strong capability in the supporting supply chain, such as pharmaceutical medical equipment industry, medical allied services and nursing services helps improve the ability of the health care industry to deliver high quality service.

18.8.4 Best Practices

The healthcare industry in Malaysia is an attractive proposition, offering quality and affordable healthcare services. To ensure the healthcare industry moves up the knowledge value chain, the following best practices are proposed.

Best Practice 18.1: Create a Vibrant Healthcare R&D Ecosystem – Formation of Collaborative Research Excellence in Advanced Medicine (CREAM)

National Cancer Institute in United States

- As the leader of the National Cancer Program, NCI is involved in many research-related collaborations and partnerships. The partnerships involve US Federal Agencies, Foreign Governments, Industry/ Private Sector Organisations, Research Centres/ Oncology Care Providers, Cancer Research Societies and Advocacy Organisations.

- These collaborative efforts are an important component of many NCI activities, including conducting clinical trials, providing education and training programs, and developing new medical devices and therapies.

- Working with diverse partners allows NCI to engage in important research opportunities that otherwise might not be possible because of their complexity and cost, spurring innovation and ensuring the judicious use of public resources.

- By bringing together leading experts and organisations on a broad spectrum of cancer-related activities, these partnerships and collaborations have helped, and will continue to help, reduce the cancer burden in the United States and well beyond its borders.

Best Practices 18.2 and 18.5: Talent Development in the Healthcare Industry and Developing Strong Supporting Supply Chain to the Healthcare Industry

Mayo Clinic in the United States

- Mayo Clinic is a non-profit medical practice and medical research group based in Rochester, Minnesota. It employs more than 3,800 physicians and scientists and 50,900 allied health staff, over 70-plus hospitals as part of its integrated clinical practice (Mayo Clinic Health System). It also provides education and research facilities for industry.

- Focuses on the strategic alignment of supply chain with the cost and quality of patient care through its one-year and five-year rolling strategic plan refresh process. Supply chain strategy continues to be a model of steady improvement for this $9.8 billion healthcare provider across 22 hospitals and associated care sites in five states.

- Is a major proponent for Big Data and information inclusivity. It has incorporated analytics in its decision making processes, including talent management.

- Has major campuses in different locations in the United States, such as Minnesota, Arizona, and Florida. Its education program includes Mayo Graduate School, Mayo Medical School, Mayo School of Continuous Professional Development, Mayo School of Graduate Medical Education and Mayo School of Health Sciences.

- Mayo Clinic has a dedicated research faculty and conducts research and clinical trials. Nearly 400 doctoral level physicians and research scientists are employed, with an additional 2,800 other health personnel and students with appointments in research. In 2010, more than 2,300 research protocols were reviewed by the Mayo Clinic Institutional review board. The clinic has 8,000 on-going human research studies which led to more than 5,000 research publications and review articles in peer-review journals.

- Gartner's seventh annual Healthcare Supply Chain Top 25 ranking (2015) recognises companies across the healthcare value chain that demonstrate leadership in improving patient outcomes and lowering costs awarded the Mayo Clinic the number one spot in the ranking.

- Collaboration/partnerships initiatives with several strategic suppliers and service providers.

Best Practice 18.3: Lean Healthcare and ICT for Operational efficiencies (E-Health and Telemedicine)

E-Health: INDUSTRY 4.0-A Model for digital healthcare, Germany

- Established a very strong Platform for Industry 4.0 comprising key government agencies, industry, universities, federations and research institutes to roll out Industrie4.0.

- Close to Euro 200 million was allocated to Industry 4.0 to spearhead smart machines and instruments that incorporate embedded systems with links to electronics, communication technology and microsystems technology for the healthcare industry.

- These new machines and instruments become the 'building-block' of smart products, procedures and processes, which support the healthcare to leap-frog to higher knowledge content and spawn next generation industries.

- Leveraging on the strength in engineering and technology related areas, Industry 4.0 is envisaged to help Germany be lead provider of cyber-physical (Smart) systems and healthcare technology and service provider by 2020.

Best Practice 18.4: Malaysia as Healthcare Travel Destination

Medical Korea

- The total number of medical tourists that visited Korea in 2014 amounted to 266,501 patients, which represents a 26.2% increase compared to the year before.

- Since 2009 with the launch of Korean medical tourism, there has been a steady increase of foreign tourists visits for medical purposes over the period with significantly larger proportion of females seeking medical services. The average hospitalisation period of patients is 13.6 days and foreign patients visit from 191 nations.

- China accounts for a large portion in Korean medical tourism followed by the US, Japan and Mongolia.

- Foreign patients' most frequently requests treatments are for check-ups, dermatology, gynaecology, orthopaedics and general surgery.

- Strong institutional support includes simplifying regulations. For example, amendment of the Law and regulations on foreign patient attraction and establishment of medical visa (Medical Korea, 2016).

- Continuous service quality improvement and a strategic branding and promotion campaign are in place in key areas to attract medical tourists. Other features include healthcare workers who are multilingual and have sound understanding of inter-cultural competency.

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CHAPTER 19

KNOWLEDGE CONTENT OF THE IT SERVICES INDUSTRY

CHAPTER 19
Knowledge Content of the IT Services Industry

19.0 Introduction

The information technology (IT) industry is not only regarded as a vital wealth contributor for the country, but also as an important enabler for enhancing productivity of other industries, and for moving the Malaysian economy up the innovation value chain. Recognising the power of the IT revolution, the fourth Prime Minister of Malaysia Dr Mahathir Mohammad embarked on a visionary plan to transform the nation into a knowledge-based society by 2020 (also known as Vision 2020).

One of the core goals for Vision 2020 is providing Malaysian firms and population access to the global information highway. To ensure systematic development of the national ICT infrastructure, the government established the National IT Council (NITC) in 1996 with the mandate to lead the National IT Agenda (NITA). NITA provided a framework for the systematic roll-out ICT infrastructure and services in Malaysia. As part of NITA, the Multimedia Super Corridor (MSC) was conceived, with the vision of providing a platform for leading technology-based firms to use Malaysia as a test bed for developing customised next-generation multimedia technologies that spur will new growth industries.

The MSC was envisioned to provide a favourable ecosystem to spur creativity and innovation in the country. This was done by providing a competitive operating environment to local and foreign ICT-based companies with the objective of enabling faster technology transfer and quicker ICT adoption in Malaysia. Apart from being a centre for technology transfer, MSC also aimed to contribute to the development of the local content and creative industries, and new frontier technologies in the ICT related areas. Over the years, the MSC Malaysia has served as the country's ICT backbone, establishing business linkages connecting Malaysia to Japan, ASEAN countries, USA and Europe to promote bilateral and multilateral trade. According to MSC Malaysia (2016), there are 2,566 MSC Malaysia Status companies registered, creating over 63,000 knowledge-based jobs, 1,815 IP and patents, revenues of more than USD4 billion as well as exports worth over USD1.5 billion.

19.1 Key Developments and Initiatives

Under the Seventh (1996-2000), Eighth (2001-2005), Ninth (2006-2010) and Tenth (2011 – 2015) Malaysia Plans, several initiatives were undertaken to improve the ICT connectivity in the country and enhance the competitiveness of the ICT industry. The recent plans that gave impetus to the development of the ICT industry are the Economic Transformation Programme (ETP), ICT Strategic Roadmap and the Digital Malaysia plans. Under these plans, the following were achieved in the last five years:

- Household broadband penetration across the country increased to 70.2%, while the penetration rates in populated areas increased to 83.7% in 2014;
- 55,801 kilometres of fibre optic was deployed across the country;
- 1.63 million ports were installed to serve 2.4 million premises;
- Major overhaul of the submarine cables and systems have increased international capacity from 682 gigabytes per second (Gbps) in 2010 to 1.74 terabytes in 2014;
- Broadband for General Population (BBGP) for suburban and rural areas using fibre optic backhaul links increased in several locations – for example there were 53 links with 1,120 kilometres in Sabah; 23 links with 1,237 kilometres in Sarawak and 8 links with 300 kilometres links in Peninsula Malaysia;
- Upgrading the public industry ICT infrastructure, where the 1GovNet was introduced in 2012 to provide a platform to centrally manage the connectivity of 94% of the Federal Government Building and in 2014 over 70% of government services were online;
- There was major upgrade of ICT access to schools under the 1BestariNet Programme with a total of 10,132 schools were provided access via fibre optics (9 schools); WiMAX (6,628 schools), Asymmetric Digital Subscriber Line (ADSL, 1,086 schools), Very Small Aperture Terminal (VSAT, 2,129 schools) and wireless (280 schools);
- To provide underserved communities in rural and suburban areas access to ICT services, a number of initiatives were implemented, which included the following (as of April 2015): the establishment of 1,122 tele-centres; connectivity of 5,737 villages to the Kampung Tanpa Wayar programmes; construction of 971 cellular towers and distribution of 1 million netbooks.

A number of initiatives were also introduced to promote B2B electronic transactions. Among them include the TIGeR (Technology, Industry and Government for the e-Economic Revolution), which provide a platform for Malaysian firms to establish linkages with buyers from other countries and provide e-commerce services to firms in the manufacturing industry. Other online platforms were introduced for the business communities in Malaysia to increase their market reach. Among them include the Agribazaar and the Oilpalmworld.com. The former was to promote online trading of farm products and the latter an electronic exchange for the palm oil industry.

Major reforms were also undertaken to develop new regulatory architecture to support Malaysia's vision of becoming a leading ICT-hub in the region. Malaysia became a member of the World Intellectual Property Organisation (WIPO), Paris Convention, Berne Convention and signatory to the Agreement on Trade Related Aspects of Intellectual Property Rights (TRIPS) (MSC Malaysia, 2016). At the national level, support for protecting Intellectual Property Right (IPR) is through Intellectual Property Corporation of Malaysia (MyIPO) and Malaysian Communications and Multimedia Commission (MCMC). For example, IPR protection is entrenched in legislations such as Intellectual Property Corporation of Malaysia Act 2002 (Act 617), Trade Marks Act 1976 (Act 175), Patents Act 1983 (Act 291), Industrial Designs Act 1996 (Act 552), Geographical Indications Act 2000 (Act 602), Copyright Act 1987 (Act 332), Communications and Multimedia Act 1998, Malaysian Communications and Multimedia Commission Act (1998), Digital Signature Act (1997) and Electronic Commerce Act 2006 (Effective 19 October 2006).[6]

Investments in ICT industry over the last 10 years have resulted in strengthening of the industry in services trade, manufacturing, e-commerce, creative content and other multimedia. This has resulted in an expansion of the ICT industry by 6.8% per annum over the 2011 and 2015 period. The share of the industry as a percentage of the GDP increased from 15.8% (RM129.7 billion) in 2010 to 16.8% (RM192.6 billion) in 2015. The industry also saw a transition from manufacturing of ICT products to ICT services. This was reflected by an increase of the services, content and media industry contribution to GDP from 5.2% in 2010 to 5.5% in 2015.

One of the industries that received considerable attention over the last five years under the ETP was the development of the local creative content industry. Increasing convergence between creative content and communication providers, coupled with the roll-out of high speed broadband and more effective coordination among key stakeholders in the industry have been important drivers for enhancing growth of the domestic creative industry. The creative content industry grew more than double, from RM200 million prior to the ETP to RM608.7 million as at December 2014.[7] The ICT service industry was also seen to be more bullish due to increasing deployment of cloud computing, Internet-of-Things (IoT), wearable technology, new mobile applications, Big Data analytics and social media.

In spite of major improvements within the Malaysian ICT ecosystem to support local firms and allow them to keep pace with competition from international players, many of the local ICT firms found it difficult to navigate the turbulent and highly competitive global business environment. The export share of ICT goods from 2010 to 2013 saw a decline from 29.4% to 25.4%. The contribution of the ICT manufacturing industry declined from 4.6% to 3.9% from 2010 to 2015. The telecommunication industry experienced a decline from 64.4% in 2010 to 58.6% in 2014 and during the same period the computer services industry declined from 22.2% to 20%.[8] The decline is attributed to a number of reasons including the industry's transition from being manufacturing-based to becoming service-oriented with high value-added offerings. Another contributing factor is the increasing diffusion of E&E devices and systems into exporting industries. Finally, the decline is also associated with the changing landscape for ICT devices from traditional computers and laptops to smartphones, tablets and Internet of Things (IoT), which overwhelms the ability of the Malaysian IT services industry to keep up.

[6] Intellectual Property Corporation of Malaysia [MyIPO] (2016a; 2016b) [No copyright/trademark statistics published for IT industry. It is only aggregated figures.]

[7] Source: PEMANDU (2014)

[8] Source: PIKOM (2014)

As the national economy transitions to become more service-driven, the IT services industry is poised to play a key role in contributing to a greater share of the economic wealth of the country. However, increasing convergence in ICT platforms and emerging new technologies will not only open new opportunities, but also pose new challenges for Malaysian firms, especially for SMEs. Effective growth of the ICT services industry can only be sustained if firms adapt to the new changing landscape by enhancing knowledge intensity and move up the innovation value chain. To ensure Malaysian ICT firms are globally competitive, the ICT ecosystem should be continuously developed to enable firms to not only adopt new technology and knowledge, but also be at the frontier of knowledge creation and become key players within the supply chain.

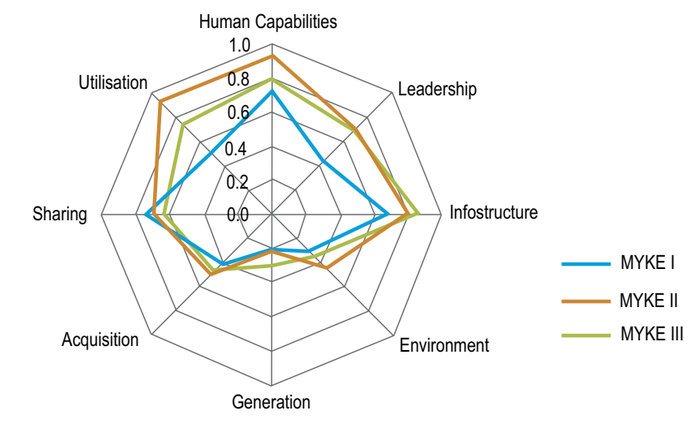
19.2 Knowledge Content

The sample used to map the knowledge ecosystem for the Malaysian ICT industry was based on the following samples for the three MYKE studies, respectively: 72, 74 and 66 as shown in Table 1.1. The number of SMEs and large players for the three sample periods were as follows: (SME, Large) are (33, 39); (57, 17); and, (41, 25), respectively.

The ICT knowledge content for the ICT industry for the three periods, MYKE I (2003), MYKE II (2007) and MYKE III (2014) is shown in **Figure 19.1**. There have been significant increases in human capabilities, leadership, infostructure and utilisation of knowledge from the MYKE I to the MYKE II period. However, with the exception of technology and infostructure, and knowledge generation, most of the knowledge pillars have experienced a decline. A detailed discussion of each of the knowledge pillars are given below.

Figure 19.1: Overview of Knowledge Enablers and Knowledge Actions for MYKE I, II and III

IT Services



19.3 Knowledge Enablers

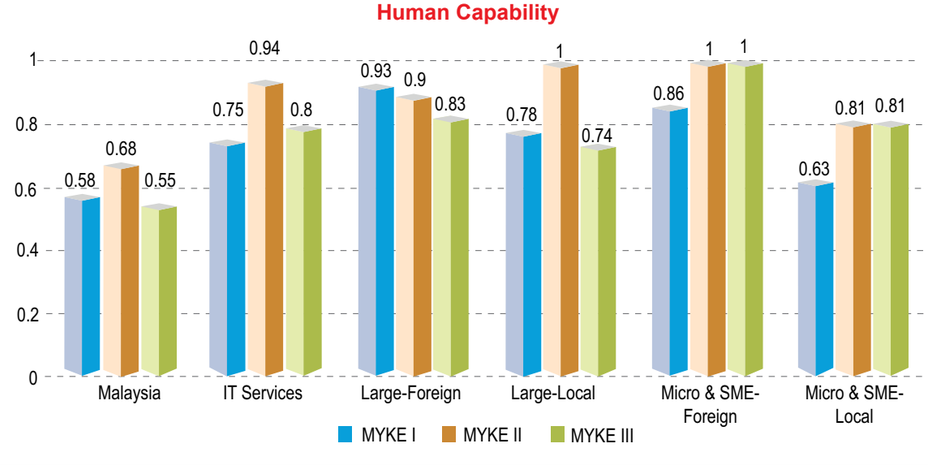
19.3.1 Human Capabilities

The IT industry has undergone major transformation under the three MYKE periods – transitioning from components manufacturing to become more service-driven. Dynamism in the industry in the early 2000 resulted in major investment in training and increasing enrolments in IT programs. This has resulted in an increase of the human capability measure for IT services from 0.75 in 2003 to 0.94 in 2007 (see **Figure 19.2**). This increase was significantly higher than the average human capital increase for all 21 industries.

However, a number of factors have resulted in a decline in human capability of the industry from 0.94 in 2007 to 0.80 in 2014. These factors include: (1) ICT curriculum in schools and institutes of higher learning have not kept pace with rapid innovations in ICT; (2) many of the ICT education and training programs lack industrial training, rendering many training programs unable to meet industry needs; and (3) lack of interest among ICT firms to obtain international certification, hence many invest very little resources for upgrading the stock of talent in the firm. One of the reasons for firms being unwilling to invest in training and development for staff is due

to intensive talent-poaching and talent migration to other neighbouring countries in search of more competitive remuneration. The patterns of investment by firms in talent development are also confirmed by two other studies, the MSC Talent Supply-Demand Study 2013-2017 and the PIKOM ICT Job Outlook 2014 Report.

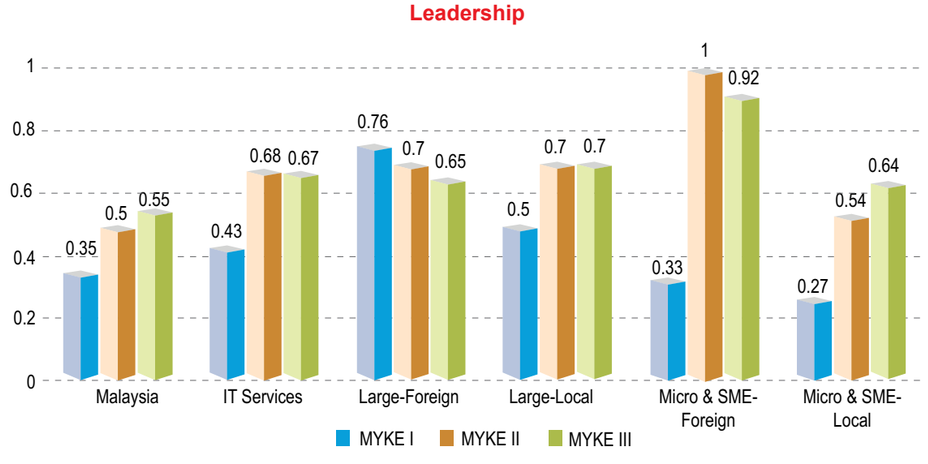
Figure 19.2: Human Capability of the IT Services Industry



19.3.2 Knowledge Systems and Leadership

The ICT industry showed a significant increase in the ability to institute formal approaches to the management of knowledge through the development of strategies, structures, systems, processes and committees for knowledge capture, generation and use from 0.43 in 2003 to 0.68 in 2007. Overall, industry average declined to 0.67 in 2014, however the average for large Malaysian firms did not decline, while micro and SMEs experienced an increase from 0.54 in 2003 to 0.64 in 2014 (see **Figure 19.3**).

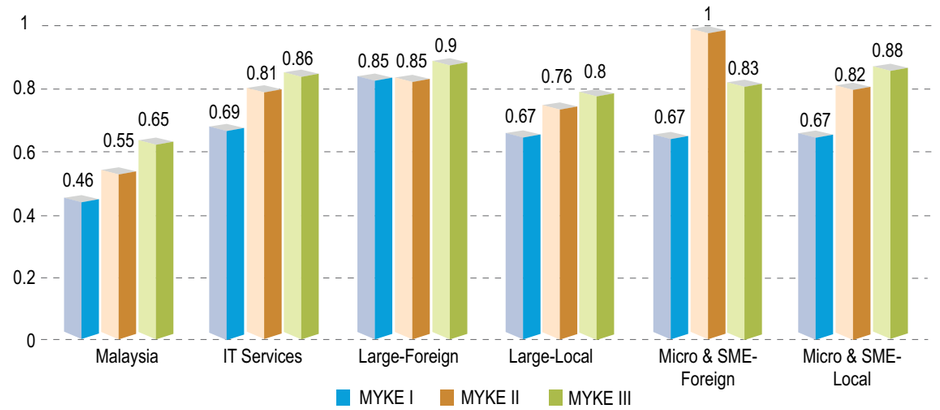
Figure 19.3: Knowledge Leadership in the IT Services Industry



19.3.3 Technology and Infostructure

The technology and infostructure have experienced a consistent growth from 2003 to 2014; increasing from 0.69 in 2003 to 0.81 in 2007 and 0.86 in 2014. Malaysia's ICT industry showed a significant increase in instituting formal approaches for knowledge management – much of this has been achieved through the development of strategies, structures, systems, processes and committees for knowledge capture, generation and use. The improvements among large, micro and SME Malaysian firms were also seen during this period. These positive outcomes from 2003 to 2014 are attributed to the following: (1) significant improvement in the general ICT infrastructure in the country; (2) incentives provided by the Malaysian Government to both consumers and firms to increase ownership and use of ICT; and, (3) significant reduction in the cost of ICT tools and services.

Figure 19.4: Technology and Infostructure of the IT Services Industry



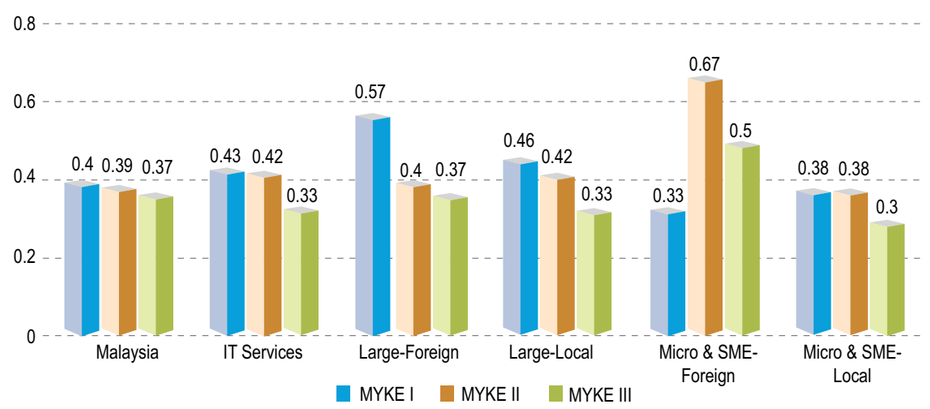
19.3.4 Knowledge Environment

The knowledge environment is measured by IT firms who are members of associations, aware of government knowledge plans and engaging in projects with universities and government. A number of interesting patterns emerge from the knowledge environment data for the three MYKE periods. First, the knowledge environment for the IT industry was found to be higher than the national knowledge environment in 2004 and 2007 (see **Figure 19.5**). However, the knowledge environment for the IT industry declined below the national average in 2014.

Second, in 2003 the knowledge environment of foreign larger firms was superior to other firms in the industry. However, the knowledge environment of smaller foreign firms in 2007 and 2014 has become more dominant than other firms.

Third, the knowledge environment of micro and small Malaysian firms recorded the lowest score for the 2007 and 2014 periods, lower than the national industry average. This result is confirmed by qualitative analysis whereby many of the smaller Malaysian firms believe associations do not provide enough assistance in helping them understand national plans and incentive programmes. In addition, they found little use in working with other research institutes to upgrade their knowledge and technical capability.

Figure 19.5: General Environment Awareness of the IT Services Industry



19.4 Knowledge Actions

19.4.1 Knowledge Generation

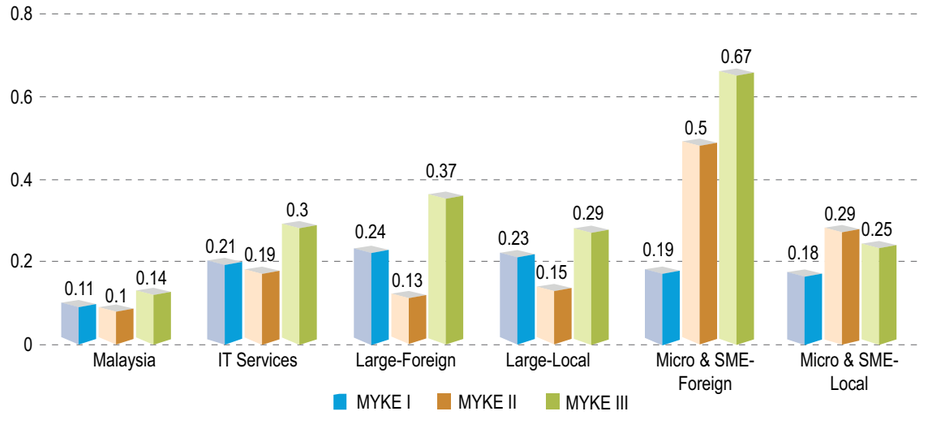
Knowledge generation of the IT services industry is measured by copyright filed, patent filed and number of firms engaged in R&D activities. The industry registers a higher knowledge generation compared to the national average for all industries for the three MYKE periods. The IT industry also registers a decline in knowledge from 0.21 in 2003 to 0.19 in 2007, but increased to 0.3 in 2014 (see **Figure 19.6**).

Within the IT services industry as few patterns emerge, which include in 2003, large foreign firms dominate knowledge generation, followed by large local firms. However, in MYKE III, foreign micro and small firms are the leader in knowledge generation in the Malaysia IT industry, increasing from 0.19 in 2003 to 0.5 in 2007 to 0.67 in 2014. Local firms still lag behind foreign firms in the knowledge generation process.

The low levels of knowledge generation among Malaysian firms are attributed to the inability of Malaysian firms to move up the innovation and knowledge value chain. This is due to a number of factors. First, demand for graduates in ICT related field exceeds the supply of graduates coming into the labour market. A study by MDEC shows that graduate in the core IT areas (e.g., computer science, software engineering, information system, networking, security, mobile technology, artificial intelligence and technology management) have declined from 8,327 in 2010 to 8,000 in 2014. On the other hand, the demand for graduates increased from 7,121 to 13,000 for the same period. Lack of technical capable human capital hinders the industry's innovative capacity.

Second, the training undertaken by graduates have not kept pace with the changing landscape in the industry. Third, research and development activities are not focused in key priority areas as identified by the National ICT Strategic Roadmap due to lack of one coordinating unit to channel R&D incentives to drive outcomes in these identified priority areas. Fourth, there is very little collaboration among Malaysian firms, especially SMEs with research institute to undertake product improvement and development. Finally, there is a lack of understanding among local firms on patent protection and commercialisation.

Figure 19.6: Knowledge Generation Activity in the IT Services Industry

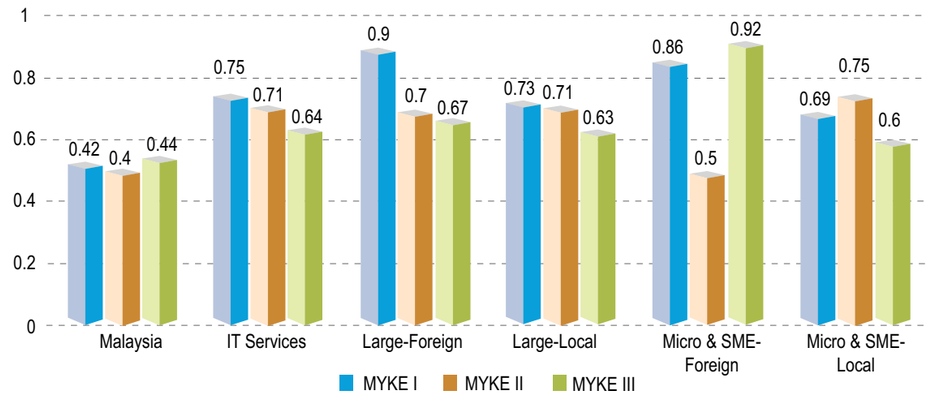


19.4.2 Knowledge Sharing

Knowledge sharing of the IT services industry is measured by use of project teams, sharing of knowledge electronically within and outside the firm. The industry registers a higher knowledge sharing compared to national average for all industries for the three MYKE periods (see **Figure 19.7**). Knowledge sharing among foreign firms is much higher than local firms for the three MYKE periods. In spite of lagging behind their foreign counterparts in knowledge sharing, local firms register a reasonably high knowledge sharing activity relative to the other local firms in the majority of other industries.

Interviews with firms in the industry suggest that increasing the entry of foreign players in the domestic market and increasing competition for global markets, coupled with incentives provided by the Malaysian Government to scale local firms are encouraging local firms to form partnership with foreign enterprises to enhance their technical capability, innovative capacity and market reach.

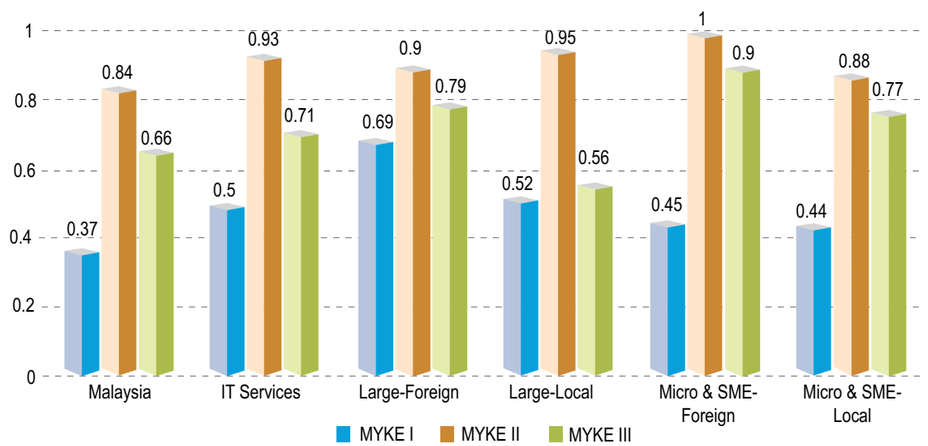
Figure 19.7 Knowledge Sharing Activity of the IT Services Industry



19.4.3 Knowledge Utilisation

Knowledge utilisation in the IT services industry is measured by the use of experiential learning knowledge and external knowledge. The industry registers a higher knowledge utilisation than the national average for all industries for the three MYKE periods. Knowledge utilisation among large firms, both foreign and local was the highest in 2003. However, by 2014 the landscape changed, with micro and small foreign firms leading, followed by large foreign firms, and finally micro and small local firms. Local large firms registered the lowest knowledge utilisation in 2014, lower than the national average (see Figure **19.8**).

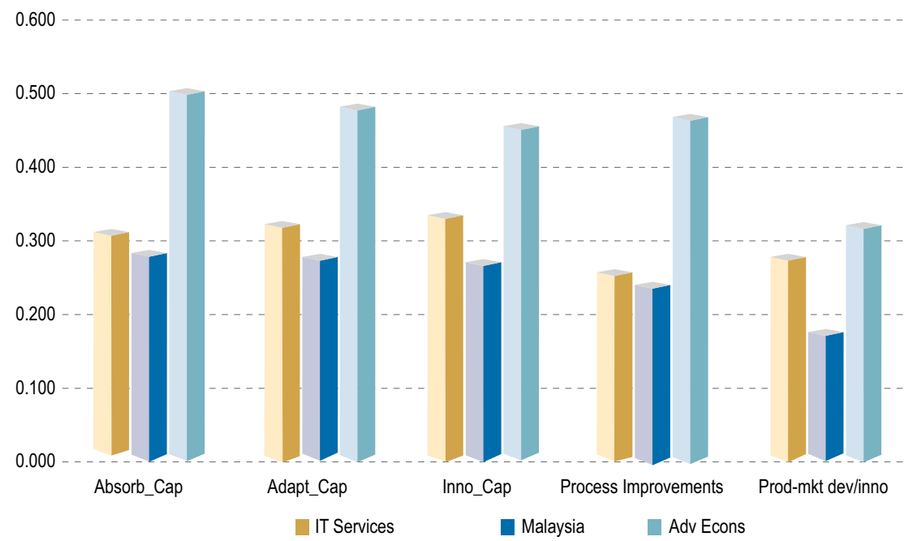
Figure 19.8: Knowledge Utilisation Activity of the IT Services Industry



19.5 Dynamic Capabilities Profile for the IT Services Industry

Dynamic capability entails the firms' ability to absorb new knowledge, adapt these new knowledge to generate new innovations that will add value to the firm's economic performance. Figure 19.9 below shows the dynamic capability components, innovative capability and economic output of firms in the IT services via-a-vis the national average. The survey results show that the absorptive capacity and adaptive capacity of firms in the IT services industry are higher than the national average. This corresponds to similar patterns for innovative capacity and economic performance of the IT services industry. A more detailed analysis of the components of dynamic capability, innovative capacity and economic performance is explored below.

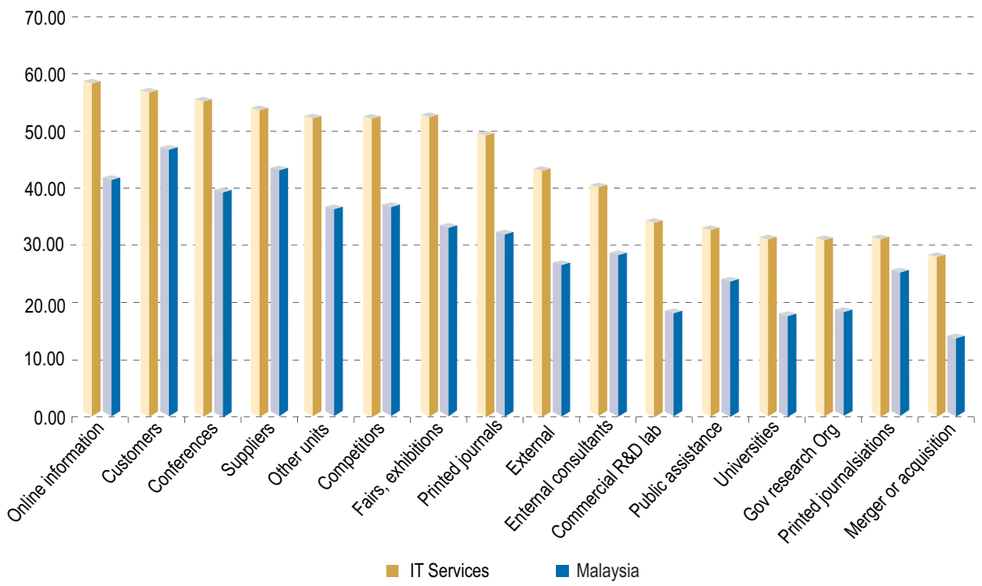
Figure 19.9: Dynamic Capabilities Profile for the IT Services Industry



19.5.1 Absorptive Capability

Information and knowledge flow within the industry have been quite intensive in the industry, much higher than the national average. **Figure 19.10** show the main sources of information and knowledge for firms in Malaysia and the IT services industry. The top five sources of information and knowledge are: online sources (60%); customers (58%), conferences (56%), suppliers (55%) and knowledge from within the firm itself (53%). The bottom five sources are: public sources (33%); universities (32%); government research organisations (32%); printed journals and publications (32%); and mergers or acquisition (29%).

Figure 19.10: Sources of Information and Knowledge in the IT Services Industry

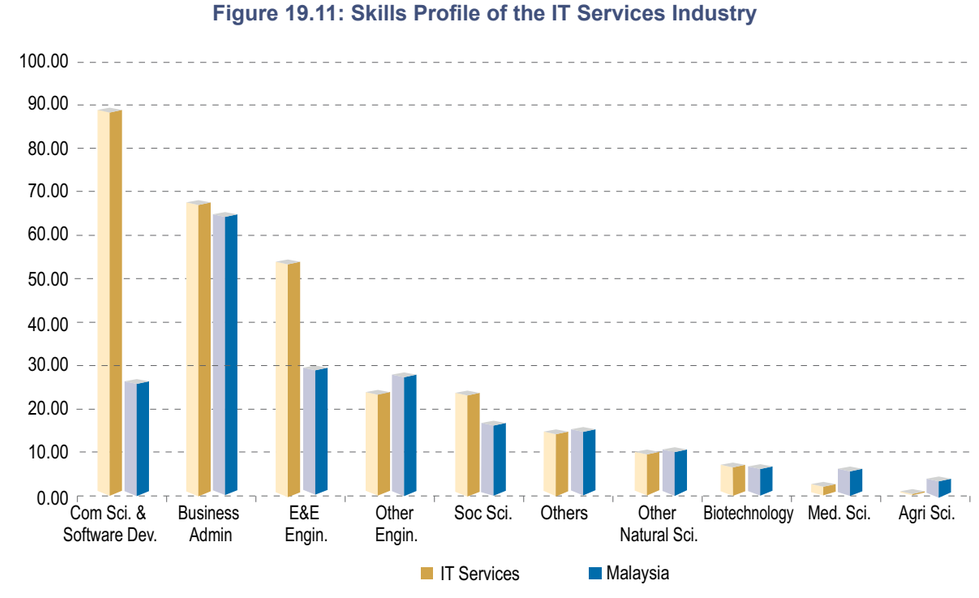


19.5.2 Adaptive Capability

The adaptive capability of firms is represented by their ability to acquire and use externally gained knowledge to change and improve current practices and generate new innovative solutions that are value creating. The IT industry's ability to adapt the changes taking place in the industry is strongly associated with the stock of talent within the firms in the industry. **Figure 19.11** shows that close to 90% of the firms employ graduates with computer science and software development skills. This is followed by 68% in the business administration area; and 55% with qualifications in electrical and electronics areas of specialisations.

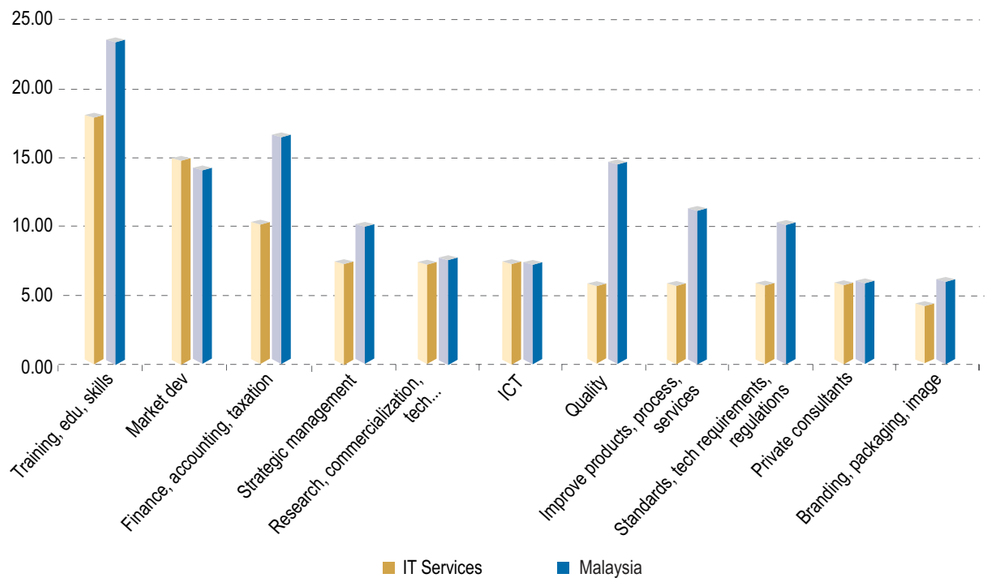
A strong presence of graduates in the computer science and software development skills, business administration and electrical and electronics areas shows that the IT industry has a solid foundation to move up the innovation value chain, but also develop new applications in other business related industry and the electrical and electronics industry. The strong presence of graduates in these areas also demonstrates the IT industry is able to adapt more quickly to seize the opportunities to drive the domestic business analytics, Big Data and IoT industries.

Figure 19.11: Skills Profile of the IT Services Industry



While percentage of firms employing graduates in the specific fields were high, institutional support for activities that support continuous development of innovative capability amidst a rapidly changing technological landscape are also important. This include investing into training, market development, market intelligence, R&D activities, branding and other value-enhancing capability development programs. **Figure 19.12** shows the percentage of firms in the IT services industry that engages in these value-enhancing activities are relatively lower than the national industry average.

Figure 19.12: Role of Institutional Environment in Skills Development in the IT Services Industry



19.5.3 Innovative Capability

Firms that exert higher innovate capability are often those able to integrate external knowledge with the existing stock of knowledge within the organisation while consistently gauging market needs, as well as improving processes and product development.

The knowledge-intensive activities in the IT services industry is shown in **Figure 19.13**. Foremost, it is evident that the industry has a higher innovative capability than the national average. The percentage of firms in the IT services industry that invest in skills upgrading, knowledge management, R&D activities, market intelligence and design and engineering are significantly higher the national average.

Figure 19.13: Knowledge Intensive Activities in the IT Services Industry

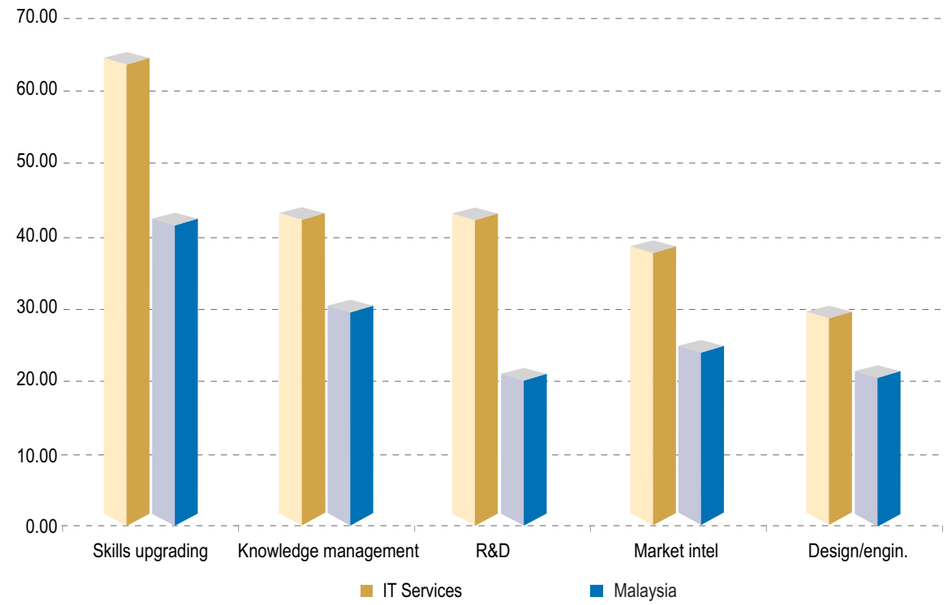
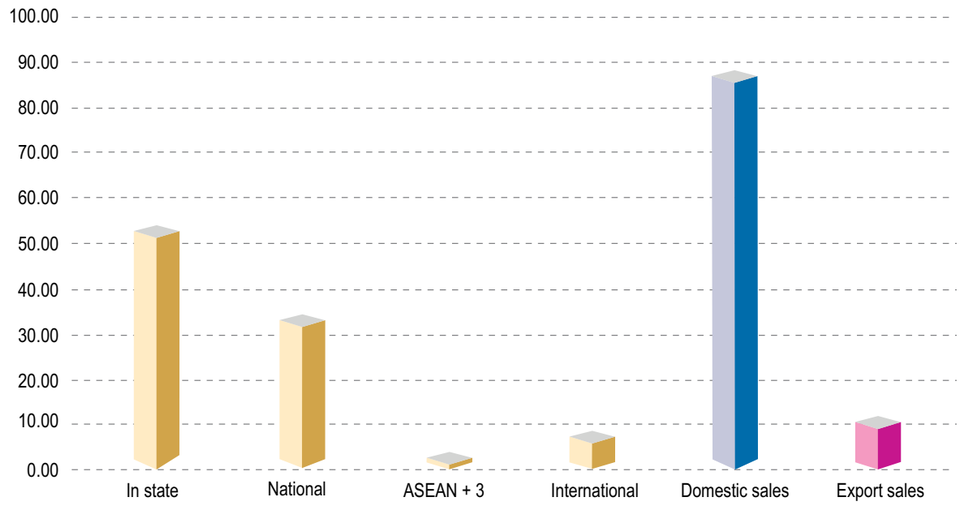


Figure 19.14: Market Presence of the IT Services Industry



Note: The results are based on survey data.

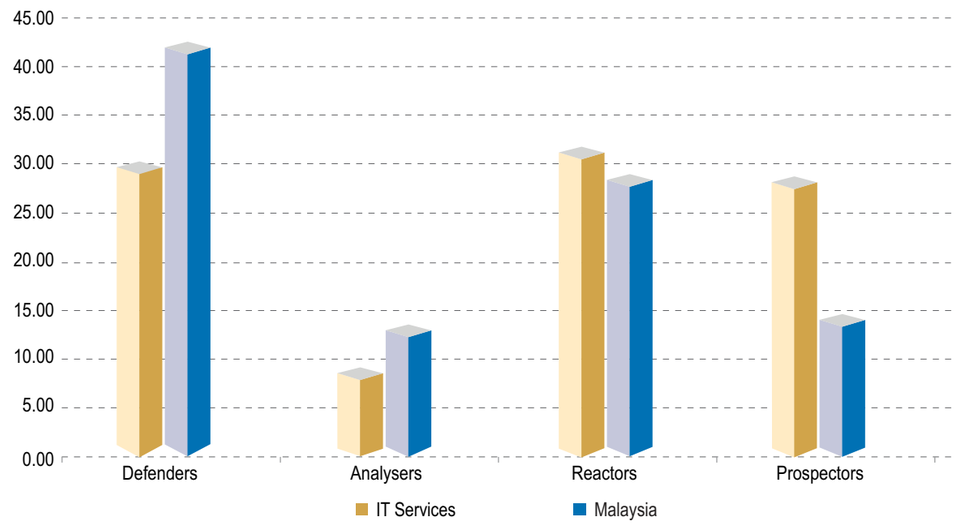
19.6 Outcomes of Dynamic Capability in the IT Services Industry

The IT services industry is primarily domestic-driven, where close to 88% of firms are focused on market sales within the country (see **Figure 19.14**). Within the domestic market, around 54% are within the state, while 34% across the country. Approximately 12% of the firms have registered an international market strategy, where 3% targeted the ASEAN market, while the remaining 9% are focused on other international markets.

Figure 19.15 shows the strategic position of the firms in the IT services industry. The IT services industry strategic profile suggests a strong presence of Reactors (32%). The Reactor firms in IT services industry are the ones that do not change their strategies despite technological or market shifts, unless their market position comes under threat. In many cases they are the last to make strategic changes and are often recipients of knowledge from their more innovative peers. Additionally, Reactors tend to operate at the lower value chain. The percentage of firms in the IT services industry that are Reactors is higher than the national average. This is unsurprising, given the large proportion of the local firms in this industry that are not investing in R&D and innovative endeavours. With rapid technological changes taking place in the industry, many of the local firms are highly dependent on foreign technology and knowledge.

The second largest portion in the industry is Defenders (30%), whose focus is not on innovation, but on operational efficiency and improvement of services. The third largest group are the Prospector firms (29%) that invest in innovative endeavours and are willing to take risks. The percentage of Prospector firms in the IT services industry is close to double that of the national average. The final group, which is the smallest group in the industry, is the Analysers (9%). In summary, the IT services industry is one of the most knowledge-intensive industries because the percentage of Prospector firms is relatively higher than the Malaysian industrial average.

Figure 19.15: Strategic Profile of Firms in the IT Services Industry

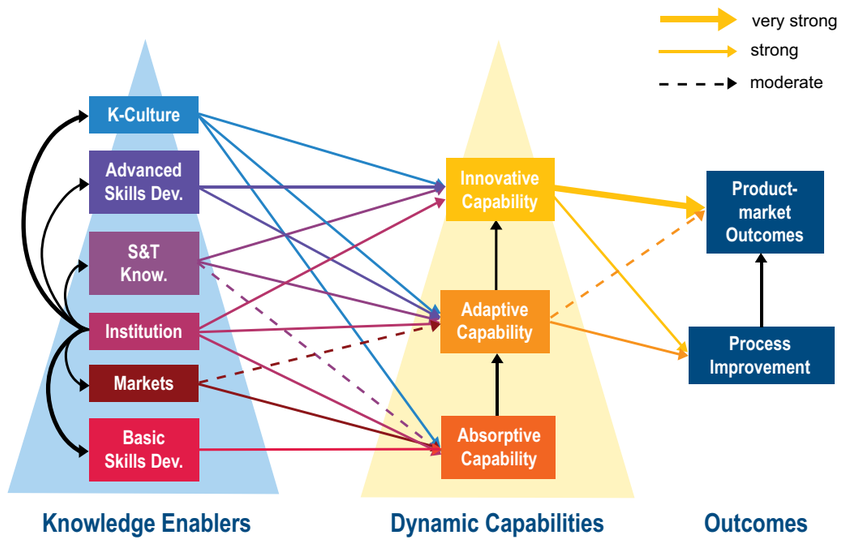


19.7 Relationships between the Key Blueprints of the IT Services Knowledge Ecosystem

In this section, we discuss the relationship between the knowledge enablers, dynamic capabilities and economic outcomes for the IT industry. The Malaysian IT knowledge ecosystem is benchmarked against their counterparts in advanced countries. Based on content analysis and the data obtained from DOS, this industry in advanced countries and in Malaysia is classified as a key pace-setter industry that not only has the highest knowledge content, but also acts as a key enabler of knowledge intensity in other industries.

In **Figure 19.16**, the IT knowledge ecosystem for advanced countries is shown. In these economies, supports for all three components of the dynamic capability are very strong. Strong absorbability capability in IT industry provides a good foundation for higher value-added innovative endeavours (adaptive capability); providing a strong support for some industry players to being globally innovative. Sound absorptive, adaptive and innovative capabilities have enabled the industry to develop new process improvements and generate new product outcomes.

Figure 19.16: Knowledge Ecosystem of the IT Services Industry in an Advanced Country



Note: Very strong impacts are represented by the bolded line, strong impacts are represented by normal lines and moderate impacts are represented by dotted lines.

The Malaysian IT knowledge ecosystem is shown in **Figure 19.17**. While the industry is considered as a pace-setter among the 21 industries in Malaysia, knowledge ecosystem was found to be relatively weaker than leading IT ecosystems in advanced countries. **Figure 19.17** show that while the Malaysian IT ecosystem supports all three dynamic capability components, they primarily enhance process improvement. A summary of the strength of the IT ecosystems in advanced countries and in Malaysia are given in **Table 19.1**.

Figure 19.17: Knowledge Ecosystem of IT Services Industry in Malaysia

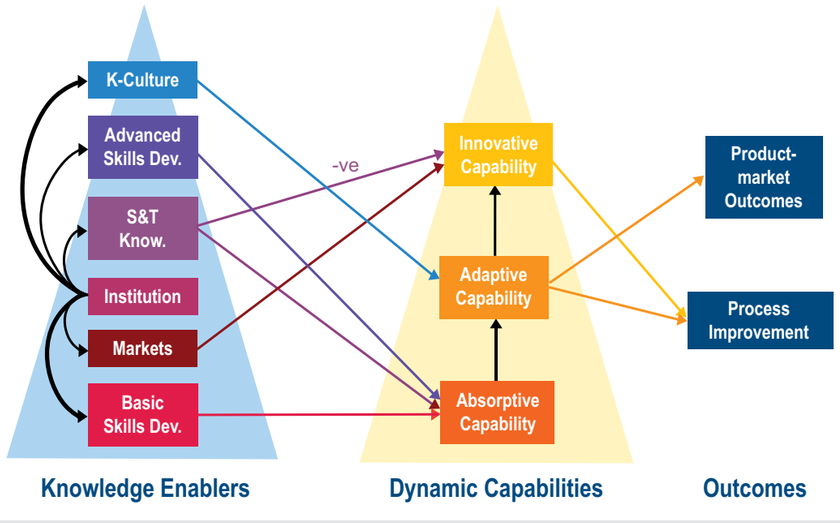


Table 19.1: Knowledge Enablers and Dynamic Capabilities for the IT Services Industry

Advanced Countries	Malaysia
Basic Skills have a **positive and strong impact** on absorptive capability. In most developed countries, the basic ICT skills levels are ubiquitous and are driven by all institutions (government agencies, regulatory authorities, industry associations and institutions of learning).	Basic Skills have a **positive and strong impact** on absorptive capability. In Malaysia, the ICT skills development are primarily undertaken by government, colleges, universities, medium and larger firms. Small firms invest very little resources for training due to lack of resources and time for training programs.
Market Intelligence has a **positive and strong impact** on absorptive capability; and positive and moderate impact on adaptive capability. In this industry, suppliers, customers, competitors, external consultants and commercial R&D centres are key network partners that enhance absorption and adaptation of new knowledge, technology, systems and processes to create user-friendly and	Market Intelligence has a **positive and strong impact** on innovative capabilities. There are Prospector and Analyser firms that use the market information to upgrade their knowledge and technological base to improve their innovative capabilities. A major of local firms, especially SMEs depend on suppliers, customers, competitors, external consultants and commercial R&D centres

Table 19.1: Knowledge Enablers and Dynamic Capabilities for the IT Services Industry(cont'd)

Advanced Countries	Malaysia
Cost-efficient ICT product and services. Regulatory structures are in place to help firms protect their IP and once appropriate measures are in place to protect these IP, the information is disseminated to the industry via the industrial networks, scientific and other forums.	to conduct R&D and innovations in the field. Local firms tend to modify foreign technology for the local context using a combination of local talent and talent from regional economies. The innovations are primarily to achieve cost advantage.
Institutions are **strong enablers** of the knowledge ecosystem and have direct **strong and positive impact** on all three dynamic capability components. Government research institutions (GRI), universities, regulators and trade associations play a key role in shaping the ICT ecosystem and influencing the dynamic capabilities components directly. For example, universities, industry and government agencies work closely to establish strong ICT clusters that are able to translate basic research into new applied and commercial products and services.	Institutions **strong enablers** for all the other knowledge enablers, but **does not impact** the three dynamic capability components directly. Key institutions such as the regulators, trade association, universities and government agencies play key roles in ensuring the ICT ecosystem is developed. This was clearly evident by the establishing of number of government agencies to develop the MSC initiative and local ICT regulations. However, the roles of these institutions in directly impacting the dynamic capability components were found not to be a significant impact. For example, while there are a number of institutions in Malaysia that provide ICT training, the impact of the training on the dynamic capability components of the firms in the ICT industry is negligible. This may be due to the fact the SMEs in the industry are not gaining access to this workforce. Many of the talented ICT workers prefer working for foreign large multinational companies. There are also cohorts of students that come into the market with skills that does not meet the needs of a rapidly changing industry.
Science and technology knowledge has a **positive and moderate impact** on absorptive capability; but, **positive and strong impact** on adaptive and innovative capability.	Science and technology knowledge has a **positive and strong impact** on to absorptive capability. On the other hand, Science and technology has a **negative and strong impact** on innovative capability. The latter results show that **S&T knowledge has an opportunity cost** to the innovative capability of the industry.

Table 19.1: Knowledge Enablers and Dynamic Capabilities for the IT Services Industry (cont'd)

Advanced Countries	Malaysia
In most advanced countries, basic and applied R&D activities in the ICT related areas are very strong and focussed on key strategic areas that will power the next generation products and services in diverse industries. Significant resources are also invested to ensure that there are strong partnerships between all stakeholders in the ICT ecosystem. Strong collaborations between SMEs and large organisations with universities and research institute results in spill-over benefits in the form of SMEs having access to new technology and knowledge that help them build absorptive and adaptive capabilities. Larger firms tend to invest significant resources within research universities or develop their own research laboratories and encourage strong research linkages to leading research universities and centres. Some universities work closely with the industry to spawn new spin-off companies that are built around a technology or intellectual property that have commercial value.	The R&D in the local ICT related areas is not frontier research – local R&D tends to lag behind more developed countries. Lack of talented staff in key research priority areas and weak industry-university partnership has led to a majority of the firms in the industry being dependent on foreign technology and know-how to create value for their operations. This suggests that most of the S&T knowledge is to improve the absorptive capacity of a majority of the industry players in Malaysia. Lack of high-end research personnel in Malaysia and low commercial value for local research may result in high opportunity cost of investing in high R&D for local firms. Firms, including local firms, prefer investing in R&D in countries such as Singapore, India and US that have adequate supply of talented staff, access to cutting-edge facilities and strong industry-university linkages.
Advanced Skills have **a positive and strong impact** on both innovative capability and adaptive capability. In many of advanced countries, significant resources are invested to strengthen the STEM, computer science, data analytics and ICT areas. These countries invest in research programs, PhD courses and develop incentive schemes to attract the best talent to the countries to develop the industry. Strong partnerships between industry and universities also help these countries close the 'knowledge-commercialisation chasm' – firms are able to enhance their adaptive and innovative capability.	Advanced Skills have **a positive and significant impact** on absorptive capabilities only. There have been significant increase in skilled workforce in the ICT areas; however, the diffusion of knowledge and innovation in the industry has increased due to inflow of foreign firms. The local industry is still dependent in foreign knowledge and expertise. A majority of the talented workforce are users of new technology and innovations from foreign firms with advanced R&D capabilities. Further, talent with highly specialised skills tends to work for foreign multinational companies or migrate to more advanced countries where the opportunities to undertake cutting-edge R&D and career prospects are much better. The 'brain-drain' problem hinder the industry for translating the advanced skills development in building adaptive and innovative capabilities of the industry.

Table 19.1: Knowledge Enablers and Dynamic Capabilities for the IT Services Industry (cont'd)

Advanced Countries	Malaysia
Knowledge culture has a **positive and strong impact** on all three dynamic capabilities. The lead firms in many of the developed countries are rather flat and innovation is everyone's responsibility. Diversity in skills and expertise are valued and many of firms multidisciplinary R&D endeavours. Constant fore-sighting and competitor analysis is undertaken to ensure the firms are at the frontier of development. Firms also constantly scout talent globally. These firms also put in place tools for employees to experiment and simulations – that is take 'Green-Alert Risks'. There is also constant sharing of best practices and new innovations across the firms and in some cases the best failures are also rewarded – this is to inculcate the notion that it is okay to fail and learn from the failure. Further, it is common for universities and research centres to spawn new start-up companies that operate at all levels of the innovation spectrum.	Knowledge culture has a **positive and strong impact** on adaptive capability. A small segment of the Prospector and Analyser firms invest in attracting talent and nurturing creativity among its workforce and encouraging incremental innovations – this include modifying and adapting existing innovations to meet the needs of local market demand. Some try to develop home-grown innovations, but have to compete with more established players in the market. Most local firms are dependent on foreign knowledge and expertise. Hence, many do not invest in hiring the best talent to undertake home-grown R&D and innovations. The talent hired are to learn foreign technology or innovation; and at best modify them to meet local market demand. The culture in the industry, especially SMEs tend to be 'top-down' and 'risk-averse'. Sharing of best practices or ideas is not a common practice due to lack of trust in employees, high staff turn-over and competitive nature of the industry.
The continuum from absorptive capability to adaptive capability to innovative capability is **present and strong.** In most advanced countries, the talent management plan is holistic in that there is a very strong education system that gives emphasis to a STEM education at all levels of education, from high school, technical school, polytechnics, universities and post-doctoral centres. This is further supported by strong interactions among schools, colleges, universities and industries. The ICT clusters in many of the developed countries work closely with other industrial clusters. In countries such as Korea, Japan and Germany priority is given to support local industries – "buy local products first". As such, the industries in these advanced countries have very strong absorptive, adaptive and innovative capability; continuously enabling firms to move up the innovation value chain.	The continuum from absorptive capability to adaptive capability to innovative capability **is present.** Increase in investment in higher education, especially in the ICT related areas have resulted in local industry developing absorptive and adaptive capability to cutting-edge technology and innovations for more developed countries. In some cases, the local firms are able to modify foreign technology to meet both local and regional demand. Many of the local firms also tend be part of the foreign firms' supply network in providing services and support to foreign firms to produce more innovative and creative products and services for the global market. The local cluster network is not strong, but tends to be dominated by foreign players, hence there is tendency to support the best technology provider as opposed to supporting local players to move up the innovation value chain.

The impact of dynamic capabilities on economic outcomes in the ICT industry for both advanced countries and Malaysia are summarised in **Table 19.2.** In advanced countries, adaptive capability for the ICT was found to have a positive and strong impact on process improvements; and, positive and moderate impact on product market outcomes. On the other hand, innovative capability was found to have a positive and strong impact on process improvement and a very strong to-product-market outcomes. This suggests that this pace-setter industry very strong in producing process improvement and generating new market outcomes.

In the case of Malaysian ICT industry, the empirical analysis show that adaptive capability was found to have a strong and positive impact on both process improvement and product market development. However, innovative capability only contributes to process improvements. Much of the innovation adopted by firms ensure that the products and services are globally competitive by adopting new improved processes, improved internal management and organisational methods and improved marketing approaches. These improvements ensure the products and services are cost competitive.

Table 19.2: Dynamic Capabilities and Economic Outcomes for the IT Services Industry

Advanced Countries	Malaysia
Adaptive capability has a **positive and strong impact** on process improvement and a **positive and moderate impact** on product market development. There are firms, in particular SMEs that are very strong in adapting new technology and innovations to improve existing products and services. Some of these firms are new start-up firms that emerge from universities and research institute that are able to create new applications for the ICT services industry and other industries.	Adaptive capability has a **positive and strong impact** on process improvement and a positive and strong impact on product market development. The local firms build their capability by leveraging on knowledge technology developed in more advanced countries. Much of the focus is to enhance process improvements. There are firms in the industry that able to produce niche products primarily adapting existing technology for the local and regional markets.
Innovative capability has a **positive and strong impact** on process improvement and a **positive and very strong** impact on product market outcomes. High investment in R&D and skilled workforce from across the globe enable some of the larger firms to produce new products and services. These firms also are able to improve their reach and richness of existing line of products and services, enabling them to pursue economies of scale and scope.	Innovative capability has a **strong impact** on process improvement only. Innovative **does not impact** product market outcomes. Most local firms adopt new technology and innovations from more advanced countries to improve cost-efficiency, service quality and meet domestic market demand.
Process improvement positive and **moderate impact** on product market outcomes. Strong clusters and S&T base in many of the developed countries enable translational research and new applications both within the ICT industry and across other industries. These have several spill-over benefits, which include increase demand for ICT products and services and improvements in productivity across other industry and the overall economy.	Process improvement **does not impact** product market outcomes. A majority of the process improvements undertaken by firms in the industry are based on foreign technology and intellectual property. Hence, the potential of creating new products and services from the borrowed IPs are limited for the local firms.

19.8 Summary: Key Trends, Challenges, Way Forward and Best Practices

19.8.1 Industry Trend

The global IT services landscape has undergone major structural changes powered by new technological breakthroughs in high-performance computing, cloud technology, mobile communication technology and converging technological platforms. Firms that are leading the transformation in the industry are investing significant resources in talent, R&D and nurturing new networks that can enhance, extend and enrich their products and services to a broader, global consumer base. Rapid innovations in the field have seen the emergence of disruptive technologies that are changing business models and sources of competitive advantage. Firms that are unable to keep pace with these technological changes are finding it hard to stay competitive.

Over the last decade, the Malaysian Government has invested significant resources to enhance the ICT ecosystem and provide incentives for Malaysian firms to move up the innovation and knowledge value chain. From these initiatives, a number of Malaysian players and products have gained both regional and global presence. In spite of the success attained by the IT services industry, a significant proportion of firms, especially micro and SMEs are finding it hard to weather competitive pressures from regional and global players.

19.8.2 Challenges

Key challenges encountered by firms in the IT services industry include the following:

Institutions:

- The industry is undergoing rapid change and key institutions responsible for developing the ICT ecosystem are not keeping pace with the changes and shifts in the ICT services industry. Lack of fore-sighting, prioritisation, planning and implementation strategy across the various sectors of the economy continues to plague the industry.
- Lack of cooperation and collaboration between all stakeholders, in particular among the 21 industries. This results in varying levels and sophistication in the use of ICT across industries and hinders the ability of the industry to gain economies of scale and scope.

Basic Skills Development:

- Level of ICT literacy and use among the business population is relatively low compared to more advanced countries.
- Quality of ICT infrastructure lags other regional economies.
- ICT education in the school and university systems lags behind the needs of a fast changing industry.
- ICT use among the SMEs is relatively low.

S&T Knowledge:

- Shortage of creative ICT skilled talent and researchers in key frontier technology areas. There is a major brain-drain problem with talented individuals moving to advanced countries.
- Lack of investment in high-end R&D by firms creates high dependency on foreign firms for technology and innovations. This perpetuates the 'lock-in' effect that crowds out local innovations.
- Firms, especially SMEs are not investing in S&T skills development program due to the high cost of training programs and fear of talent poaching after individuals have been trained.
- SMEs have difficulties hiring good ICT graduates or trained personnel due to unattractive remuneration and working conditions. Local ICT graduates prefer working overseas or with MNCs.

Advanced Skills Development:

- Large local firms provide adequate support for staff to acquire knowledge to be creative and analytical. Many send staff for advanced training (S&T, marketing. branding and entrepreneurship), including for Masters and doctoral training. However, local SMEs do not invest in the above advanced capability development programs due to the high cost of such training programs.
- Local institutions train graduates to be good users of existing ICT, but do not adequately equip them to become creators of new innovations. ICT graduates also lack the interdisciplinary knowledge to develop applications for other industries.

Market Intelligence:

- Lack of coordination and knowledge sharing among key institutions. Most work in 'silos'.
- Low use of ICT among SMEs limits their ability to acquire the necessary market intelligence for business success.
- Sharing among firms in the industry is limited due to lack of understanding and failure to adhere to formal business practices (NDA's and IPs).

Knowledge Culture:

- Local firms are highly dependent on foreign firms for technology. This is especially the case for SMEs. Dependency creates 'lock-in effect', which crowds out local innovations.
- Low levels of knowledge transfer take place between large and small firms; and between local and foreign firms.
- Firms (especially SMEs) are risk averse and willing to 'cash-out' their IPs/innovations to bigger players or foreign MNCs.
- Nurturing start-up firms in local research institutions is not a common practice. The university ecosystem is not sufficiently developed to spawn start-ups around core R&D required by industry.

19.8.3 Way Forward

A sustainable, vibrant and competitive ICT services industry is a key enabler for all industries to move up the knowledge and innovation value chain. A robust and dynamic IT services industry is an important catalyst for transforming Malaysia into a developed high income economy. While much of the ICT industry development has been government driven via key agencies, such as the MDEC and others, there needs a greater push from GLCs and multinational companies to work closely with universities, research institutes and local SMEs to develop a more dynamic and vibrant ICT cluster. To ensure IT services industry contribute to national development, there should be a major transformation in the industry, from structural policies to perceptions among stakeholders, to ensure the dynamic capabilities of firms are enhanced. Five key areas for development are discussed below:

Recommendation 19.1: Focus Development Key Priority Areas and Frontier Technology

- Institution (government agencies, trade associations, universities) should work together to formulate a more holistic and collective plan to achieve the following:
- Focus development of key technologies and services: digital and creative content, software testing, Internet of Things (IoT), data centres, cloud computing, cyber security, informatics and big data analytics.

- Invest in applications of the above technologies and services to the broader sector of the economy (the remaining 20 industries). Align existing research funding program to these priority areas through mechanisms such as TechnoFund, InnoFund and ScienceFund.

- Develop large scale university-industry research programs and doctoral courses in the above mentioned areas and applications.

- Establish transnational research centres that work with leading global centres of excellence to develop indigenous technology and innovations.

- Train global leaders and thinkers in the field, with greater focus on technology transfer between foreign and local firms; and large and SMEs.

Recommendation 19.2: Nurturing ICT Savvy Talent and Creative Workforce

- Intensify ICT education at all levels of the school, college and university systems. Specific emphasis needs to be placed on ensuring teachers are trained to design creative and innovative curriculum and pedagogy using ICT.

- Increase courses in software development and other ICT applications in in technical colleges and polytechnics. This will involve working closely with major industry players. The programs offered by MDEC are commendable and should be intensified.

- Increase industry and government support for internships, work placements and industry research programs (MyBrain and MyMaster programs by MOHE).

Recommendation 19.3: Enhancing the E&E Business Ecosystem – Key Feature of MSC Initiatives

- Establish Share Cloud Enterprise Services – provide access to valuable software and expertise for firms to develop their businesses.

- Intensify One-stop centres, such as eRezeki, eUsahawan, SMECloud Adoption and similar initiatives for SMEs.

- Develop government and GLCs as key users and promoters of local technology and innovations.

- Increase ICT and e-commerce in all the government transactions and procurements – Public Sector ICT Plan by MAMPU.

- Strengthen the ICT regulatory systems and cyber security – Cyber Security Malaysia.

- Foster strong strategic partnership between firms and universities to create IP, patents and commercialisation activities.

Recommendation 19.4: Access to High Quality and Affordable ICT Infrastructure and Services

- Speed up access to high quality and affordable ICT infrastructure, services and training programs. This should be made part of the ICT National Infrastructure Plan.

- Increase ICT literacy and adoption among SMEs across the country by holding demonstration events for specific industries on the benefits of ICT in terms of improved productivity, time-efficiency, building networks, enhanced market reach, improved quality and customer satisfaction.

19.8.4 Best Practices

The IT services industry has made significant progress since the launch of the MSC initiative in the 1990s. The industry is not only a source of revenue for the country, but also an enabler for raising the productivity and efficiency of other industries. Knowledge content and dynamic capability of the industry can be enhanced through emulation of some key best practices found in pace-setter countries. Some of the best practices are discussed below.

Best Practice 19.1: Focus Development Key Priority Areas and Frontier Technology

Informatisation of the Korean Economy

- Success of countries in ICT and other related areas can be traced back to systematic development and implementation of the national ICT plans. These plans not only emphasize on the information economy, but also are prioritising and channelling investment in frontier technology that will help lead not just the ICT industry, but also other industries. A country that has undertaken such development is South Korea. A brief case study of South Korea is given below.

- Key stakeholders (government, industry, trade associations and universities) cooperated to transform the economy from a production based economy to a create economy in five phases:
  - *Digitalisation (1987-1994)* – digitisation of public administration, world's first 64 DRAM working die, world's first memory device production.

  - *Informatisation (1995-2002)* – Basic Plan for Informatisation Promotion, comprehensive e-government implementation, world's first commercial CDMA.

  - *E-Government (2003-2007*) – Basic Plan for u-Korea, construction of high speed information network, worlds fastest high-speed internet service, world's first commercial services of DMB (2005) and WiBro (2006).

  - *Integration (2008-2012)* – fostering converging technology platforms and applications – 4G LTE, Green energy, Smart Phone, Cloud Computing (VDI).

  - *Creative Economy (2013-Present)* – Government 3.0, where ICT is used in creative ways in all sectors of the economy, spawning strong new industries (such as software industry, education, creative content, movie industry, broadcasting & communication services, fast and secure internet environment) to create new jobs and address social issues in society.

- The systematic development of the IT strategy has helped other industries raise their global competitiveness. This enabled Korea to become a developed country in relatively short period of time.

Best Practice 19.2: Nurturing ICT Savvy Creative Talent and Workforce

Coupling Creative Learning and Content Industry in Finland

- Finland is regarded as having one of the best education systems in the world and this is attributed to the high use of digital learning platforms to acquire knowledge from multiple sources from around the globe.

- Finland's education made a paradigm shift from technology-driven innovation to human-centred innovation, where technology was a key enabler to foster creativity among students – the foundation for the development of creative industries and transforming Finland into a creative economy.

- Extensive use of state-of-the-art ICT tools in schools and tertiary institutions have enabled teachers and students to acquire knowledge from formal and informal setting. Design curriculum that fosters independent learning and introduces teaching approaches that enrich student learning experience. Among the key initiatives is the introduction of the flipped classroom, games and virtual environments that help enrich student teaching and learning.

- The private sector, working closely with the school system and tertiary sector in Finland introduced ICT projects that provided student multiple learning experiences in an industrial setting. The strong partnerships between educational institutions and industry enabled students to be exposed to “green-alert risks” (risks that have minimal impact to the organisation, but lessons from failure provide valuable experience to the learning process of the student). Students were exposed to “green-alert risks” using virtual learning platforms and simulation tools.

- There is also a strong push to create education material using the Finnish language. This has had positive spill-over effects on the content and new media industry.

Best Practice 19.3: Enhancing the ICT Business Ecosystem

Seoul’s e-government system - driver of a dynamic business ecosystem for all industries

- The Seoul e-governance program is ranked as the best among OECD member countries. The program entail 477 types of information systems covering public services to all industries, urban planning, culture, housing, tourism, health, transportation and 127 housing divisions.

- As part of the initiative, a plan was put in place to create ‘Big-Data’ platforms, which helped create a scientific, innovative and people/firm-centric municipal administration and services. The data was extensively used for policy formulation and tracking of projects are implemented effectively.

- There was also a rollout of mobile-based municipal administration to provide transparent, efficient and personalised services to firms and the public. The city also provided easy access to data and information on all government services via mobile devices and public apps and active participation in policy making process, e-voting and process improvement.

- To enhance innovation, the city provides oversight to the “Seoul App Centre”, which offers office space, education and training courses and consulting services to potential app developers. This initiative creates new jobs, startup companies and enhanced the development of the local creative industry.

- The city also provides recycled second-hand PCs and devices for disadvantaged communities with the objective of closing the digital and knowledge divide among vulnerable groups in the city.

Best Practice 19.4: Access to High Quality and Affordable ICT Infrastructure and Services

European e-Business Support Network (eBSN) for SMEs

One of the major challenges encountered by SMEs is to be connected to larger and thriving firms. The eBSN program was an excellent initiate to help connect SMEs to large firms via digital value chain:

- A series of applications were developed to establish interoperable e-Business framework to help SMEs to achieve the following: facilitation of market entry; efficient collaboration with larger firms; assist businesses to fully integrate into the international value chain; streamline business processes; increase return on investment of ICT; improve quality of business transactions; and reduce administrative cost, overheads and errors.

- The benefits for larger companies are: increase innovative capacity via partnerships with innovative SMEs; improve customer satisfaction via more flexible and personalised services; reduce the time to get to market.

- The benefits for the economy are: a more dynamic business environment that is open, transparent and facilitates market entry of new players.

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CHAPTER 20

KNOWLEDGE CONTENT OF THE BUSINESS SERVICES

CHAPTER 20
Knowledge Content of the Business Services

20.0 Introduction

The business services industry in South-East Asia registered a 73% growth in 2014, making this industry the fastest growing in the region, driven by Malaysia, Indonesia and the Philippines. It is the second-fastest growing industry within Malaysia with double-digit growth registered for green technology and datacentres (ETP Annual Report, 2014).

Malaysia Productivity Corporation (MPC) notes the three categories covered under business services as: (1) professional, scientific and technical services (e.g. management consultancy, market research, veterinary, legal, accounting, architecture, engineering, surveying and advertising); (2) real estate services (own or fee/contract properties) and (3) administrative and support services (e.g. rental/leasing, employment, security/investigation, services to building/landscape activities and office administrative/business support activities) (Malaysia Productivity Corporation [MPC], 2016). A major push for all three categories of the business services industry in Malaysia is provided by the government's programme for infrastructure development which rose from $6 billion to $16 billion between 2005 and 2013, and infrastructure spending is expected to grow by approximately 9% per annum between 2013 and 2025 (Wong, 2014).

Malaysia's superb performance is due to its competitive labour cost and capital efficiency. The business services industry registered an added value growth of 8.9% in 2012 compared to 7.2% in the previous year, and in the first quarter of 2014 it grew 9.8%, in line with higher demand for professional services, particularly engineering services in the construction industry as well as computer services (Ministry of Finance, 2014). The business services industry grew by 7.3% for Q1 2016 (Q4 2015: 7.1%), particularly due to professional services (Ministry of Finance, 2016). The government's liberalisation of the services industry in 2009 played a pivotal role in transforming Malaysia into a major regional player in this space, strengthening the industry's competitiveness by attracting foreign direct investment, human capital and technology into Malaysia.

Business services industry is vital for Malaysia because it enables other dependent industries to perform at the highest level – the major ones being manufacturing, agriculture, mining and construction. Its importance is recognised in Malaysia's ETP as one of the 12 NKEAs.

There is a shift towards capital-intensive operations as Malaysia lays the foundation for future development under the ETP, by focusing on high-value industries demarcated through the six EPPs (ETP Annual Report, 2014), namely: aviation maintenance, repair and overhaul, shared services and outsourcing, datacentre hub, green technology, engineering services, ship building and repair.

Malaysia's business services industry is dominated by small and medium sized consulting firms, with some large multinational consultancies and professional services firms, such as the 'Big Four' accounting and business consultancies – Deloitte, Ernst & Young, KPMG, and PwC; and shipping giants – Boustead and Shin Yang.

20.1 Key Developments and Initiatives

A number of recent developments have had a profound impact on the business services industry, and are discussed below:

20.1.1 AFTA (ASEAN Free Trade Area)

AFTA agreement has opened markets for Malaysian business services providers to export their expertise. However, this has also increased the level of competition in their own local markets. Currently, Malaysia's capability as an exporter of specialised business services is still not extensive and much potential exists to improve the sector, particularly in the areas of engineering and construction services.
Tax incentives provided by the government for companies in business services mostly falls under Pioneer Status and Investment Tax Allowance. These incentives have attracted both local and foreign direct investments and should continue to improve business services especially in highly specialised and technical areas in manufacturing, agriculture, tourism, R&D, training and environmental protection activities.

20.1.2 Aerospace Blueprint (2015-2030)

The blueprint outlines the government's plan to create South-East Asia's leading aerospace industry in Malaysia by 2030. Its goal is further supported by an accompanying EPP mandate (EPP7) under the business services NKEA resolution. EPP7 aims to establish Malaysia as the SE Asia hub for Aerospace OEMs with a targeted contribution of RM1 billion to GNI by 2020. The two major challenges which lie in Malaysia's path to fulfilling this ambitious aim are: (1) human capital needs to be developed to supply the industry's demand for skilled labour; (2) manufacturing sub-industry and local SMEs need assistance to develop a global OEM presence (ETP Annual Report, 2014).

20.1.3 Building Shared Services and Outsourcing (SSO)

Malaysia has a global reputation for shared services and outsourcing, and according to AT Kearney's Global Location Services index, it has maintained its global ranking as the third-best location for SSO for the past ten years (MSC Malaysia, 2016). Export sales generated by global business services rose by 9% in 2014 from the previous year, contributing RM9.19 billion to the Malaysian economy. This high performance is mostly driven by the 34% growth in knowledge process outsourcing companies in the finance and accounting industries (MDEC, 2015).

Building a globally competitive SSO is another key development under the EPP – the plan being to specialise in high-value niches, such as analytics.

Another avenue for transformation is through the automotive industry. There is an increasing attention placed on the development of automotive-related business services solutions such as the launching of the Goldbury Global IT Automotive Outsourcing Hub in Medini Iskandar, Nusajaya. This initiative is projected to generate RM113 million in GNI by 2020 and will launch Goldbury as a prominent player in the global automotive services scene.

20.1.4 Investment in Green Technology

EPP4 was conceived to jumpstart a vibrant green technology industry in Malaysia. Government incentives to encourage green technology in building and construction, computing, management of waste and energy generation are initiatives which ride on the global trend towards building sustainable cities.

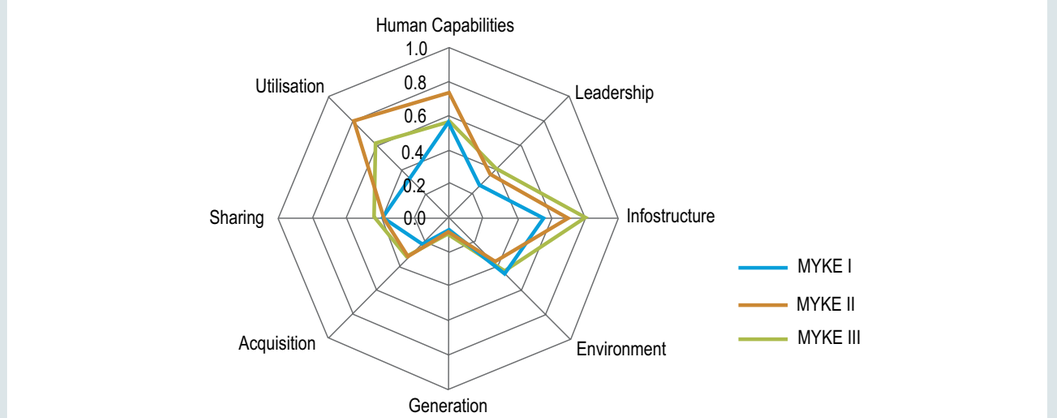
Incentive schemes include the Green Tech Financing Scheme (GTFS), Green Building Index Certification Incentive, and the Feed-in-Tariff Programme.

20.2 Knowledge Content

Figure 20.1 illustrates the development of business services industry's knowledge resource foundations over the three MYKE assessment periods from 2003 to 2014. Overall, incremental progress is observed over the three MYKE assessment periods for most parameters except for human capabilities, which after a significant improvement from 2003 to 2007, regressed in 2014. Knowledge actions were mediocre over the three MYKE periods – knowledge generation was poor, and knowledge utilisation experienced a similar trend as other industries with a sharp improvement between 2003 and 2007, but declined significantly in 2014.

Next, a discussion of the elements in the two categories of Knowledge Enablers and Knowledge Actions is presented to fully understand how the business services industry has progressed in building its knowledge resource foundations.

Figure 20.1: Overview of Knowledge Enablers and Knowledge Actions for MYKE I, II and III



20.3 Knowledge Enablers

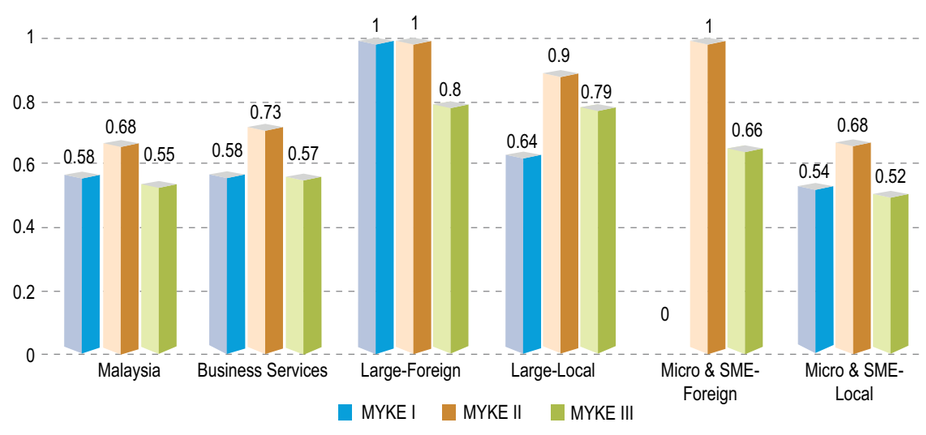
20.3.1 Human Capabilities

Malaysia recognises the importance of building and attracting skilled talent to the business services industry as this industry is a key enabler for Malaysia's progress. The results paint a relatively bleak picture and suggest an urgent need to improve the industry's ability to attract talent. Human capability follows a similar trend as the Malaysian aggregate with a relatively sharp increase from MYKE I (0.58) to MYKE II (0.73), an index which was well above the national aggregate of 0.68. Unfortunately, just as fast as it rose, the index fell in 2014, to just below its original MYKE I status at 0.57.

Analysis of firm-specific performance reveals that all firms, irrespective of size and origin/ownership, suffered a decline in 2014. Large local firms (0.79) are almost at par with large foreign firms (0.8) in their ability to attract and build skilled talent. The small, local business services firms tend to be least attractive, possibly because of the nature of this industry – the opportunities and experience an employee gains from working for large firms and foreign firms in business services are perceived as significantly better than smaller, local firms.

Human capability of foreign firms, regardless of size, declined between MYKE II and MYKE III – this may be a result of such organisations using their own foreign talent overseas for high-end technical projects, and leaving support and administration functions to the local workforce.

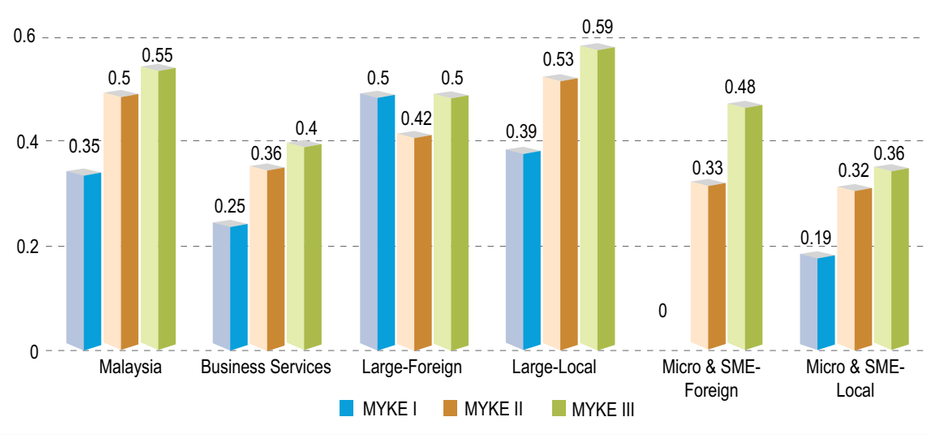
Figure 20.2: Human Capability of the Business Services Industry



20.3.2 Knowledge Systems and Leadership

Knowledge leadership within the business services industry follows a very slow upward trend similar to the Malaysian industry aggregate over the three MYKE periods with an index of 0.25, 0.36 and 0.4 respectively. It is surprising that the Malaysian business services industry's knowledge leadership is at levels below the national aggregate, and it appears that this feature is caused by small firms, particularly local ones. Large firms seem to be moving slowly forward in formulating knowledge strategies and carrying out knowledge development – here, large local firms lead the charge, overtaking large foreign firms in 2007 and 2014. In the most recent assessment, large local business services firms constitute the only category that exceeds the national aggregate, with an index of 0.59. This positive result is an indication that the government's initiative in prioritising business services by assisting local firms is bearing fruit.

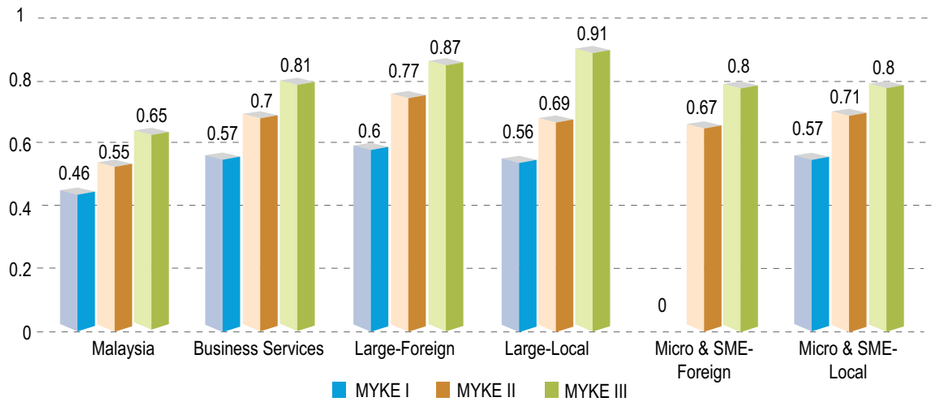
Figure 20.3 Knowledge Leadership in the Business Services Industry



20.3.3 Technology and Infostructure

Technology and infostructure for the business services industry is very positive and strides ahead of Malaysian aggregate across all three MYKE periods (0.57 in 2003, 0.7 in 2007, and 0.81 in 2014). This healthy outlook is made possible through the formation of MDEC and the Multimedia Super-corridor, both of which have promoted IT and ICT enhancement across all Malaysian industries. Often, the business services industry leverages on technology-driven solutions to create scalable, commoditised value for its clients – as such, strong performance in technology and infostructure is characteristic of the industry. While all the firms share a similarly high index in 2014 (ranging from 0.8 to 0.91), it is the large local firms which lead the pack (0.91), followed by large foreign firms (0.87).

Figure 20.4: Technology Infostructure of the Business Services Industry

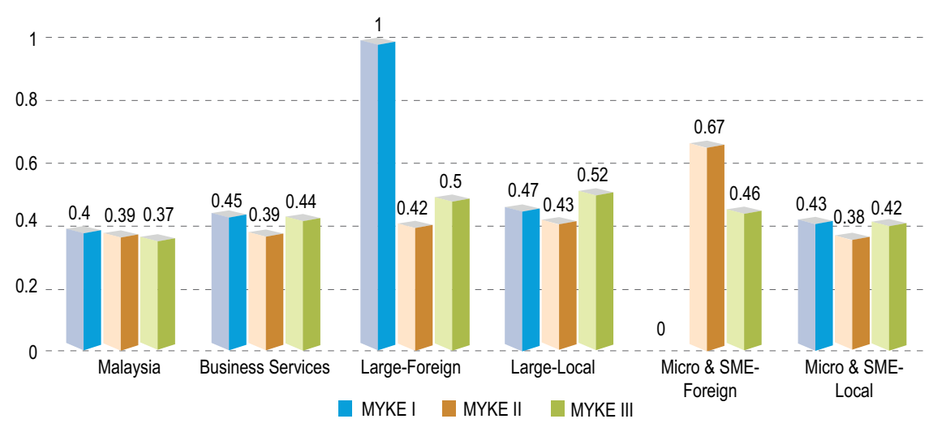


20.3.4 Knowledge Environment

After suffering a decline from an index of 0.45 in MYKE I to 0.39 in MYKE II, the knowledge environment for the business services industry rebounded in MYKE III to just below its original MYKE I level with an index of 0.44. Business services firms are somewhat aware of the government's knowledge plans and make attempts to engage with universities – at a higher level than the national aggregate in 2014. Unsurprisingly, it is the large business services firms which perform better than smaller firms, foreign and local alike.

Large foreign business services firms declined by more than half from 2003 to 2007 (from a perfect score of 1 in 2003 to 0.42 in 2007). A minor improvement to 0.5 was observed in 2014, though this is a far cry from earlier levels of engagement with government and universities in the MYKE I peak. Large local firms in turn maintained a performance which is marginally higher than their foreign counterparts for MYKE II and MYKE III.

Figure 20.5: General Environment Awareness of the Business Services Industry

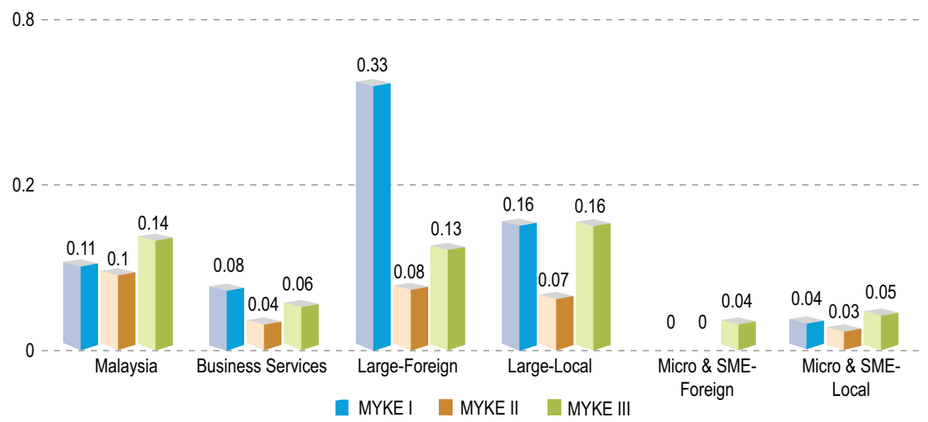


20.4 Knowledge Actions

20.4.1 Knowledge Generation

A rather dismal picture is observed in the **Figure 20.6** for knowledge generation, with indices well below the national aggregate at 0.08 in 2003, 0.04 in 2007, and 0.06 in 2014. Deeper analysis reveals the possible cause for this: that large foreign firms dialled back on R&D initiatives in Malaysia, and reduced patent- and copyright-filing in recent periods. This is possibly because increasing competitiveness of the market has made infringement issues of even greater concern. Large local firms have now outpaced large foreign firms in knowledge generation, with smaller firms, whether foreign or local, trailing far behind.

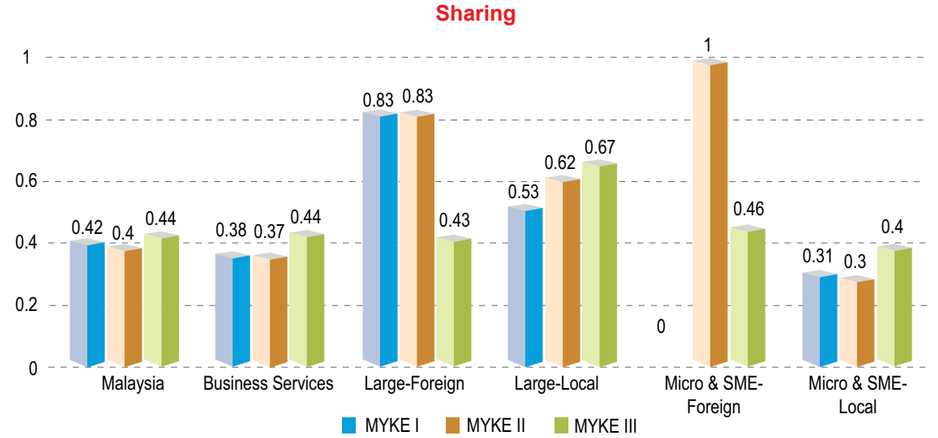
Figure 20.6: Knowledge Generation Activity in the Business Services Industry



20.4.2 Knowledge Sharing

Knowledge sharing in the business services industry improved from MYKE I (0.38), reaching the same level as the national aggregate in MYKE III with an index of 0.44. This positive increment in the MYKE III period is driven by large local firms which have been consistent in sharing knowledge (from 0.53 in 2003, to 0.62 in 2007 and 0.67 in 2014). Conversely, large foreign firms have reduced their knowledge sharing activities in MYKE III (0.43) by almost half that of the MYKE I and II assessment periods (both 0.83). Small foreign firms have also drastically reduced their knowledge sharing from a perfect index of 1 in 2007 to 0.46 in 2014. This pattern follows the one depicted above, in knowledge generation – foreign firms appear to be holding back their development of knowledge and innovation, while the local large firms are taking over as leaders in the knowledge economy.

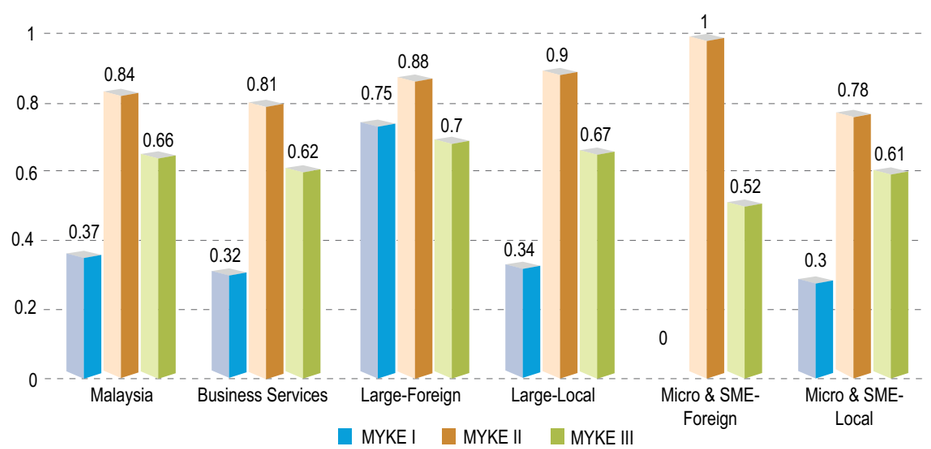
Figure 20.7 Knowledge Sharing Activity of the Business Services Industry



20.4.3 Knowledge Utilisation

Similar to the national aggregate, knowledge utilisation for business services experienced a sharp increase from 2003 with an index of 0.32, to 0.81 in 2007, but was unable to sustain the momentum, resulting in an eventual fall to 0.62. All firms of all sizes and origin/ownership have experienced the same periodic trend, although the small foreign firms declined the most from MYKE II (index of 1) to MYKE III (index of 0.52). Large foreign firms performed marginally better than the other firms in utilising knowledge.

Figure 20.8: Knowledge Utilisation Activity of the Business Services Industry



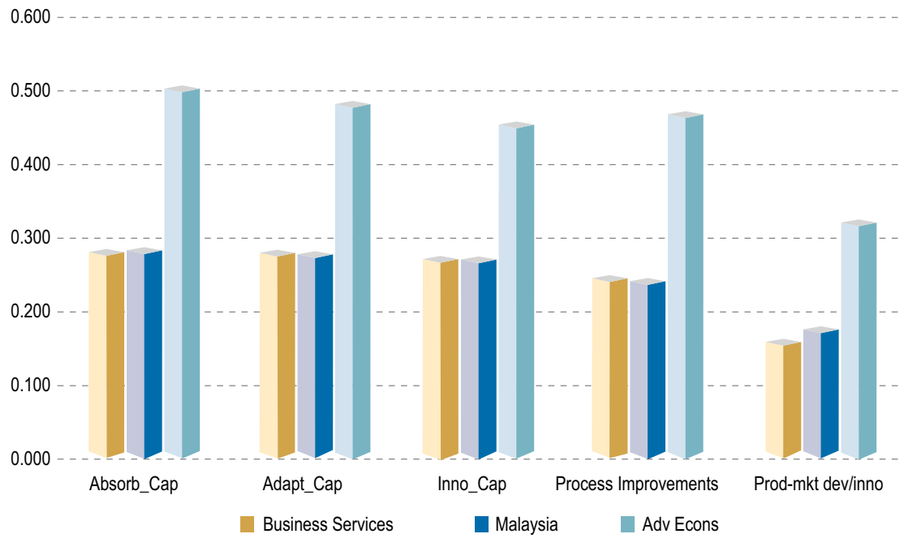
20.5 Dynamic Capabilities Profile for the Business Services Industry

Fundamentally, the three components which make up a firm's dynamic capabilities are absorptive capability, adaptive capability and innovative capability. Firms with low levels of dynamic capabilities have difficulty adapting to technological shifts, market changes or competitive pressure while firms with high levels of dynamic capabilities are able to respond and take advantage of these environmental changes to secure their positions in the marketplace.

The dynamic capabilities profile of the business services industry (**Figure 20.9**) shows an industry that is performing at the same level as other Malaysian industries. Its average performance in building its dynamic capabilities profile may be due to its slow progress in building its knowledge resource foundations, where only infostructure showed significant progress from 2003 to 2014.

The average, but still positive dynamic capabilities position resulted in outcomes which were either at the same level as the national aggregate (process improvement) or below the national aggregate (product-market development).

Figure 20.9: Dynamic Capabilities Profile of the Business Services Industry

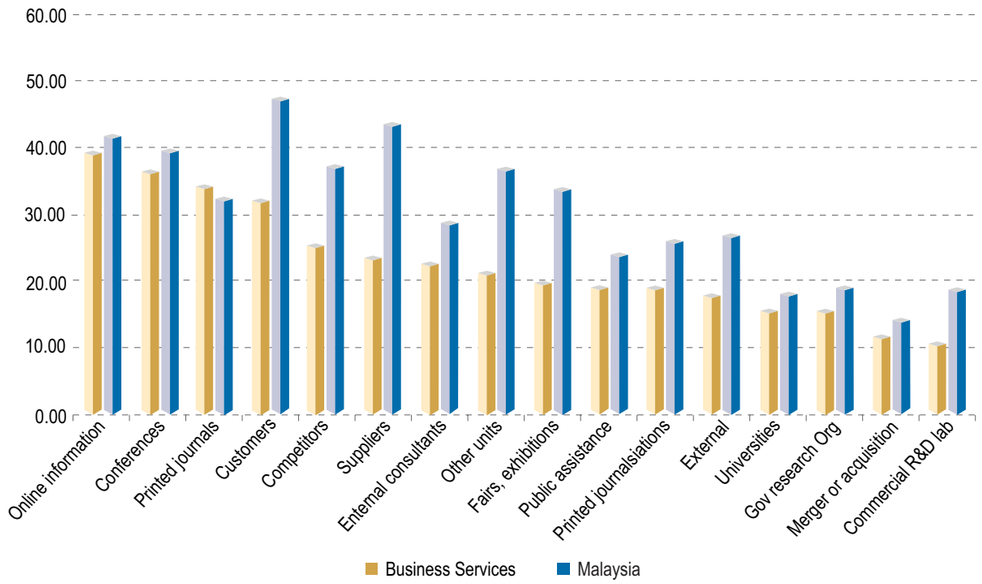


20.5.1 Absorptive Capability

The results reveal that the industry is quite active in collecting information from its customers, and able to translate information into meaningful knowledge and communicate information internally across the units in the firm. Unfortunately, they are not particularly active in acquiring new technology or storing information for future opportunities. This resulted in a mediocre display of absorptive capability.

The Business Services industry acquires its information from a wide range of sources, but is below the national aggregate in terms of sourcing knowledge from all sources noted in **Figure 20.10,** except for using printed journals as a source of knowledge, which was only slightly above the Malaysian aggregate. The nature of the industry influences the types of information sources used – in this case, business services firms' top three sources are online information, conferences and printed journals, followed by customers and competitors. Overall, the relatively low usage of knowledge sources is of concern given the role of business services as a key enabler for driving Malaysia's knowledge economy.

Figure 20.10: Sources of Knowledge in the Business Services Industry



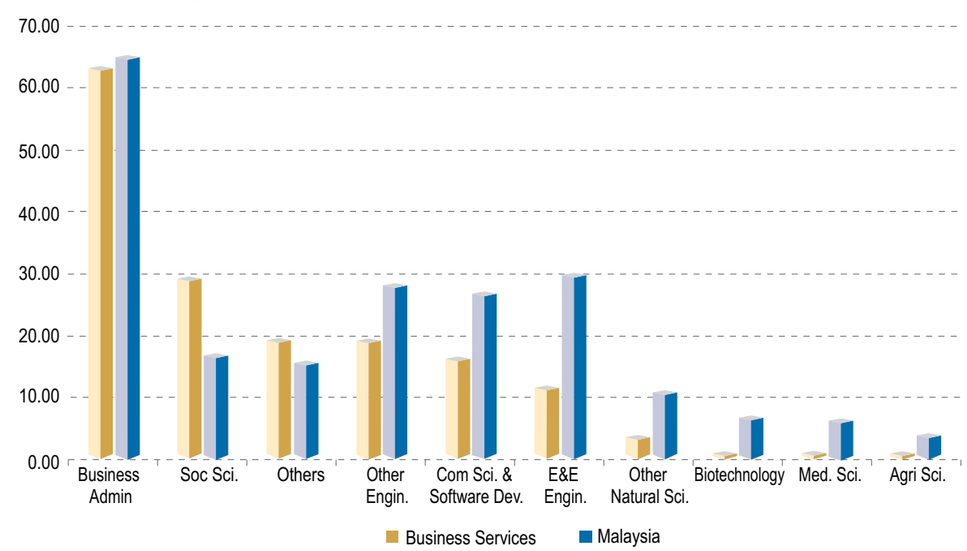
20.5.2 Adaptive Capability

Firms in the business services industry have invested sufficient resources in marketing, and in building processes and structures. However, the industry remains below the national aggregate in its investment on innovation. The business services industry has a moderate adaptive capability, suggesting that it is sufficiently endowed with the capability to create and use knowledge to allow firms to adapt to changes in customer needs and competitive manoeuvres. However, its lower-than-average level of investment in technology may cause business services firms to struggle with technological shifts.

The skills profile of firms in the industry suggest the industry has sufficient general business and management consultancy skills but may lack technical skills (e.g. science, engineering and computing) to drive scientific research and development, and consultancy within these areas. While business administration skills form the largest group, it is slightly lower than the national aggregate. Skills from the social sciences form the second largest group and this is much higher than the national aggregate. The skills profile may be a reflection of the type of business services represented in the survey and country – that is, business, management and legal services. Regardless, the business services industry may ultimately be suffering from inadequate skill distribution, culminating in its average adaptive capability. The skills profile shows that the industry requires appropriate strategies to improve its human capability foundations in order to provide sufficient value to its dependent industries.

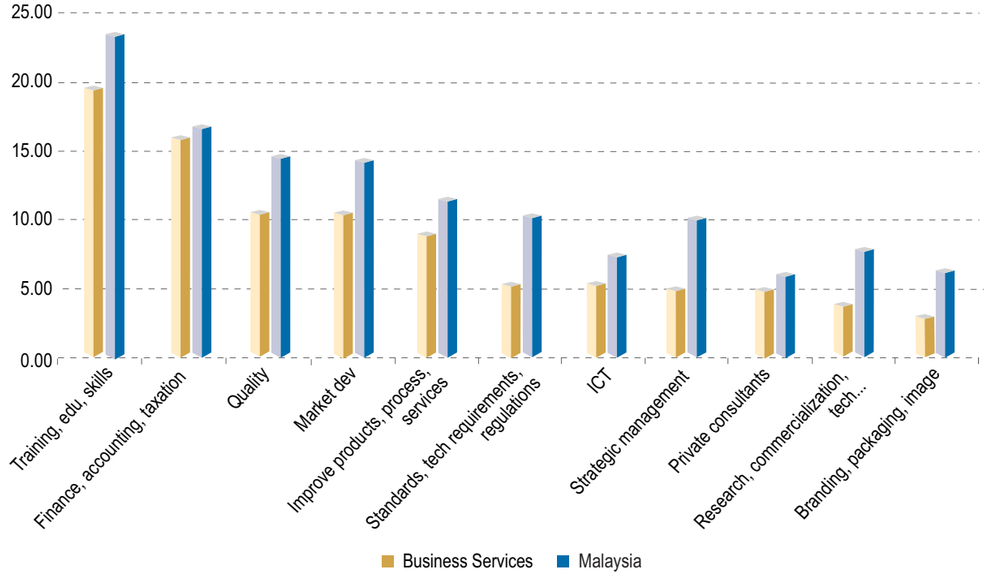
An examination on the business services industry's utilisation of services in the institutional environment has provided more insight into the industry's adaptive capability. Malaysia has a range of services to support firms in building capabilities through institutions such as government agencies, associations, universities and research institutions.

Figure 20.11: Skills Profile of the Business Services Industry



Firms in the business services industry are not very active in building human capability and do not appear to be very proactive in seeking advice – **Figure 20.12** shows that the industry is below the national aggregate in all services available to them. There is an evident proclivity for human capability investment through training, education and skills development, albeit at a lower level than other industries.

Figure 20.12: Role of Institutional Environment in the Business Services Industry



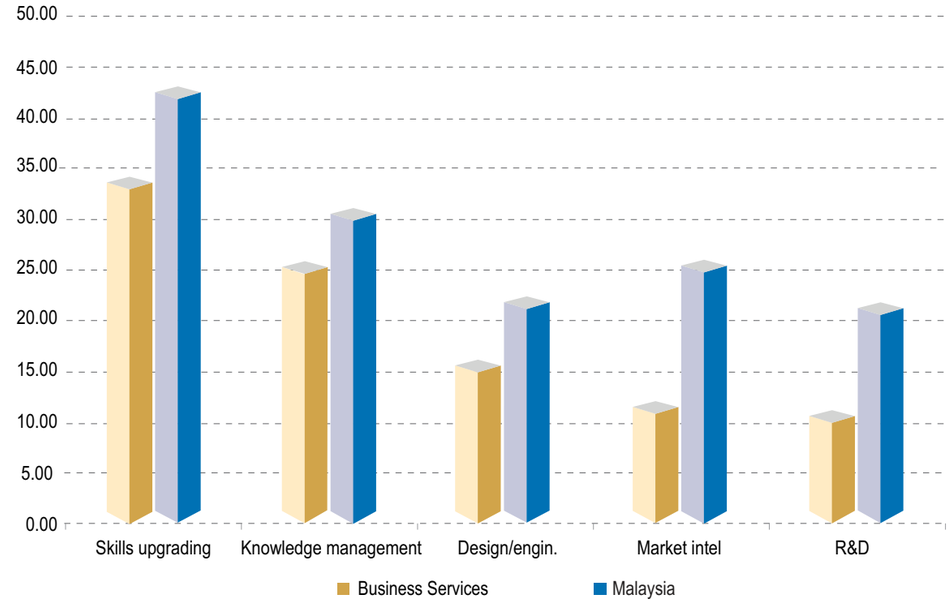
20.5.3 Innovative Capability

In addition to absorptive and adaptive capabilities, positive outcomes are dependent on the firms' ability to integrate and assimilate knowledge with the people and processes within the firm to create new product-markets or processes. Firms in the business services industry are on par with others in Malaysia with regards to innovative capability – specifically the ability to integrate resources and knowledge. However, the industry falls below the national aggregate in its ability to leverage existing market knowledge and technological capability in its development of new products. This observation supports earlier conclusions that lacklustre performance in technology may cause this industry to struggle with market-wide technological shifts.

Compared to other industries in Malaysia, firms in the business services industry are not engaging at a sufficiently high level of innovative capability building activities. **Figure 20.13** shows that business services firms are involved at a lower level than the Malaysian aggregate for all knowledge intensive activities; they perform half as well as the national aggregate for

R&D and market intelligence. Its lack of engagement in knowledge intensive activities is worrying given that knowledge is central to their business.

Figure 20.13: Knowledge Intensive Activities in the Business Services Industry



20.6 Outcomes of Dynamic Capabilities in the Business Service Industry

Figure 20.14 shows that the business services industry is almost totally focused on the domestic market with 98% of the revenue originating from the home market, it also appears that much of business services are practiced locally at the state level and not at a national level. However, the predominance of a domestic market is not surprising given the industry is just building its knowledge resources and dynamic capabilities. The results also suggest that the industry is not making any inroads regionally or globally, and it may be quite a challenge to export business services because of the lack of dynamic capabilities.

Figure 20.14: Market Presence of the Business Services Industry

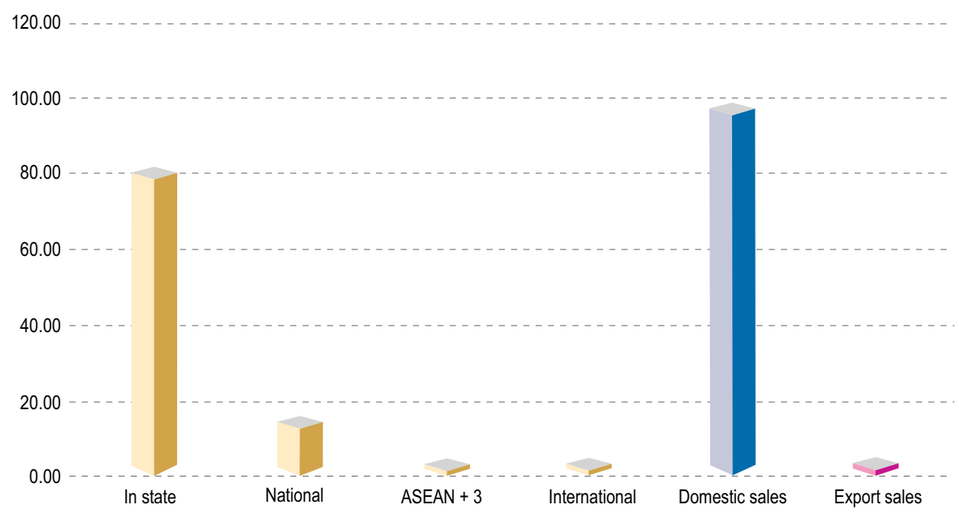


Figure 20.15: Strategic Profile of Firms in the Business Services Industry

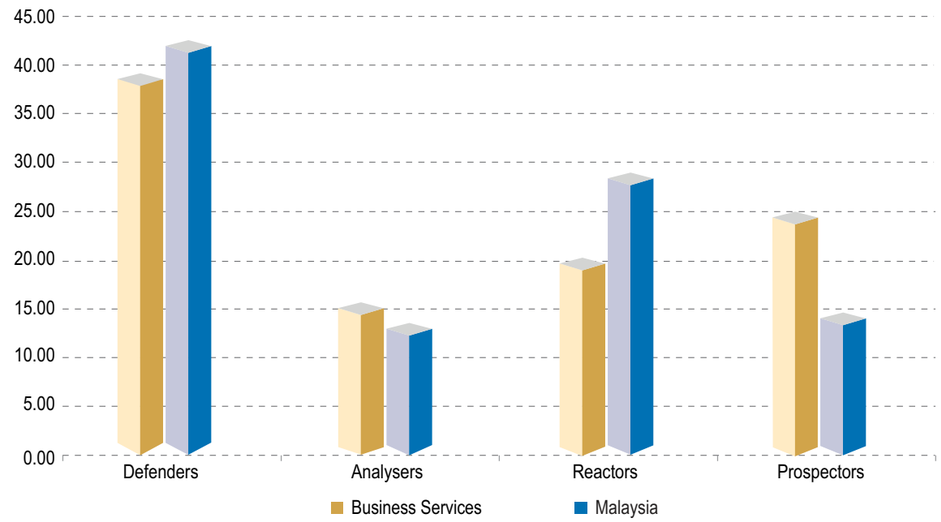


Figure 20.15 presents an interesting picture of the strategic profile of business services firms. The industry possesses a higher proportion of Analysers and Prospectors than the national aggregate (16% and 25% respectively). While these two groups only make up 41% of the firms in the industry, this is a significant proportion in comparison with the national aggregate and is encouraging because it indicates that there are firms in the industry which possess the right mind-set to push through boundaries and challenge conventions. Prospectors are highly innovative and are prepared to take risks in their investments on new markets or products. Analysers are willing to adopt new ideas but are more careful in their investment decisions, pursuing new markets and products while also maintaining their current market share.

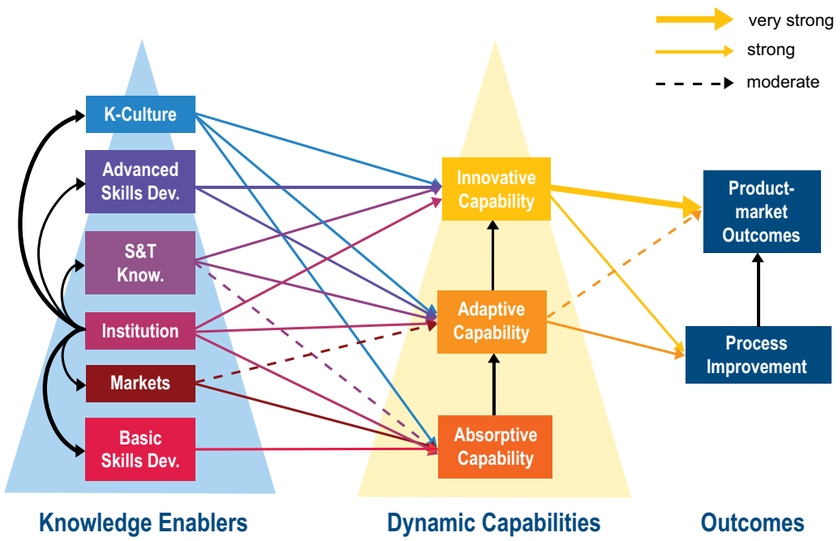
The majority of business services firms are Defenders (39%), and together with the Reactors (20%) make up a marginal majority of business services firms. Defenders aim to serve existing customers to protect their current market share and thus tend to focus on a narrow range of services with the aim of providing quality and optimising operational costs. Reactors aim to operate without disruption and will not change or adapt unless it becomes a matter of survival for the firm. These two groups will not be the ones that drive change and innovation in the industry. Fortunately, the industry has a sizable proportion of Prospectors and Analysers which are more willing to take advantage of opportunities, invest in innovation, and explore new products and markets.

20.7 Relationships between the Key Blueprints of the Business Services Knowledge Ecosystem

This section explains the relationship between the knowledge enablers, dynamic capabilities and economic outcomes for the knowledge ecosystem in the business services industry. In particular, the knowledge ecosystem of the business services industry in Malaysia is compared to that of advanced sector countries (e.g., Germany, Poland, Singapore, Turkey, and United Kingdom). Based on its knowledge content and outcomes, the business services industry in Malaysia is regarded as an Imitator.

The knowledge ecosystem for the business services industry in advanced sector countries is provided in **Figure 20.16.** The knowledge enablers in advanced sector countries appear to be very rich and strong in their nurturance of dynamic capabilities. Business services in these countries possess a strong absorbability capability foundation that feeds into and enriches both adaptive and innovative capabilities. The strength in absorptive, adaptive and innovative capabilities facilitates the development of highly efficient service processes, as well as significant levels of improvements in the provision of business services. Ripple effects into down-stream industries are created from these outcomes, thereby providing greater support to the national knowledge ecosystem in advanced sector countries such that the industries in these counties are comprehensively connected for global competitiveness.

Figure 20.16: Knowledge Ecosystem of the Business Services Industry in Advanced Country



Note: Very strong impacts are represented by the bolded line, strong impacts are represented by normal lines and moderate impacts are represented by dotted lines.

The knowledge ecosystem for the business services industry in Malaysia is presented in **Figure 20.17**. The knowledge enablers that are required to support the components of dynamic capability in the business services industry in Malaysia appear to be weak and incapable of creating sufficient depth to yield strong outcomes. The strengths of the knowledge ecosystem for the business services industry in advanced sector countries and in Malaysia are compared in **Table 20.1.**

Figure 20.17: Knowledge Ecosystem of Business Services Industry in Malaysia

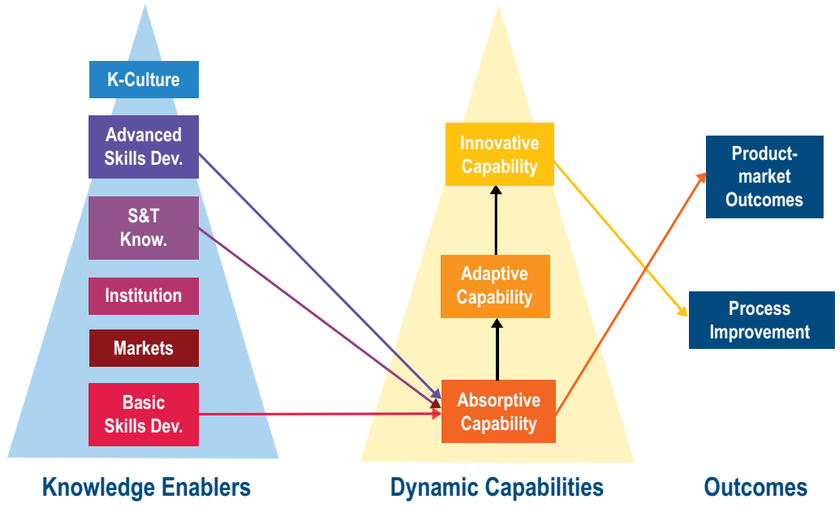


Table 20.1: Knowledge Enablers and Dynamic Capabilities for the Business Services Industry

Advanced Countries	Malaysia
Basic skills have a **positive and strong impact** on absorptive capability. The business services industry in advanced sector countries is an essential source of income. Engineering, science, and technical skills are continuously improved through significant investments that enable continuous and timely updating of knowledge in curriculums delivered by community colleges, technical colleges, polytechnics and universities. The business services industry is technology- and knowledge-intensive and undergoes continuous development. Constant technological and scientific shifts require business service providers to keep abreast with contemporary changes, and thus close collaborations with educational institutions and other agencies becomes vital. In addition, training and updating of the workforce is a constant activity to maintain a global lead and competitiveness.	Basic skills have a **significant impact** on absorptive capability. The business services industry in Malaysia is labour intensive compared to advanced sector countries. There is some reluctance to invest heavily in training and development since the workforce is perceived to highly transient and mobile. However, certain level of training is required to enable productive use of the workforce (the skills level of workers in the Malaysian business services industry ranges from middle to low). Notably, highly sought after top talent move out of Malaysia for a variety of reasons, creating a significant leakage problem in the local talent system.

Table 20.1: Knowledge Enablers and Dynamic Capabilities for the Business Services Industry (cont'd)

Advanced Countries	Malaysia
Market intelligence has a **positive and strong impact** on absorptive capability and a positive and moderate impact on adaptive capability. Key stakeholders of market intelligence, such as suppliers, customers, competitors, external consultants, and R&D centres, collaborate proactively and facilitate the process of absorption and adaptation of new knowledge, technology, systems, and processes. Key drivers of the business services industry in advanced sector countries include productive efficiency and new technologies and service knowledge. These drivers are typically driven by significant investment in people and technical knowledge. A strong market orientation helps to ensure that the business service providers in advanced sector countries are always in touch with upstream and downstream shifts and are able to leverage new technology, innovations, and scientific discoveries for differentiated marketplace positioning.	Market intelligence **has no significant impact** on any of the components of dynamic capability. Interactions among the key stakeholders, who are inputs to market intelligence appear to be patchy and fragmented in the business services industry in Malaysia. Upstream parts of the knowledge supply chain are a driving force for change but unfortunately are not sufficiently strong to produce strong downstream effects. Markets are perceived to be price sensitive and the end goal is primarily to be able to imitate the services offered by other business service providers at the lowest cost.
Institutions are **strong enablers** of the knowledge ecosystem and have a **direct strong and positive impact** on all three components of dynamic capability. A rich tapestry of support from the state and local bodies is available in advanced sector countries, which helps to ensure that the different institutions come together to create significantly positive impact that helps to drive the business services industry. A strong focus on developing service and technical is present. Significant amount of incentives (fiscal and non-fiscal) are provided to universities, regulators, and trade associations to collaborate closely with each other. This helps to dovetail their strengths and maximise the impact in developing a vibrant and strong business services ecosystem with strong firm level dynamic capabilities.	Institutions have an **indirect impact on the enablers**, but **no significant direct impact** on all three components of dynamic capability. Key institutions, such as the regulators, trade association, universities, and government agencies have important roles in the development of the business services industry in Malaysia. However, these institutions are unable to sufficiently materialise the development of the components of dynamic capability. A key challenge here is related to the ability of the industry to attract and retain the quantity and quality of intellectual capital. Most often, perceptions of poor working conditions and organisational culture make it difficult for business service providers to acquire the right type of people from the pipeline of local human talent.

Table 20.1: Knowledge Enablers and Dynamic Capabilities for the Business Services Industry (cont'd)

Advanced Countries	Malaysia
S&T knowledge has a **positive and moderate impact** on absorptive capability, but a **positive and strong impact** on adaptive and innovative capability. Basic and applied R&D activities are prominent in the business services industry in advanced sector countries in which a high focus on key strategic areas that bring together upstream and downstream industries to mutually reinforce each other's' advantage. Significant resources are invested to ensure global competitiveness of the business services industry. Among the types of investments made in this regard include (1) continuous upgrading of technological infrastructure and R&D capabilities of leading research centres and universities. This in turn allows business service providers in advanced sector countries to have access to leading edge fundamental advances, (2) support of industries to develop new service and technical knowledge by working hand in hand with research universities, centres, and global players, (3) dovetailing of industry-university-government partnerships to ensure R&D undertaken is relevant to all stakeholders and diverse industries, and (4) support the development of SMEs to gain stronger and stable footing whilst supporting bigger players to enhance their global reach.	S&T knowledge has a **positive and strong impact** on absorptive capability. Basic and applied R&D activities in the business services industry in Malaysia is relatively weak. There is an apparent shortage of talented workers in key research priority areas and a weak industry-university partnership, which have caused business service providers in Malaysia to rely heavily on foreign technology and know-how in their pursuit of creating value for their clients. Notably, much of the S&T knowledge that exists is directed toward improving absorptive capacity of business service providers. Most of SMEs in the business services industry in Malaysia do not have the financial resources to undertake R&D to move up to adapt and modify existing technology. Many of these service providers tend to be risk averse and prefer to use technology that has wider market acceptability and viability. A vast majority of resources is invested in training workers in this industry to use foreign technology.
Advanced skills have **a positive and strong impact** on innovative and adaptive capabilities. Significant resources are invested to strengthen fundamental research in technology-related business solutions, including the derivative applications arising out of fundamental advances. High level skills that are developed from research programs and doctoral courses are supported with substantial incentive schemes to attract and retain the best talent within the business services industry in advanced sector countries. In addition, the strong engagement between universities and the industry ensures that business service providers in advanced sector countries are able to translate	Advanced skills have **a positive and significant impact** on absorptive capability. Despite considerable effort invested to increase R&D activities and improve advanced skills in Malaysia, the graduates and talent produced continue to adapt existing technology or knowledge developed by leading foreign centres of excellence or MNCs. A common problem that persist in the business services industry in Malaysia is that only a few local business service providers are engaging in cutting-edge R&D or innovative endeavours. Consequently, the best talent finds little opportunity to deploy and practice their skills to greater effect. The lack of highly specialised and challenging tasks

Table 20.1: Knowledge Enablers and Dynamic Capabilities for the Business Services Industry (cont'd)

Advanced Countries	Malaysia
technical and service knowledge advances and bring them out of the lab into the commercial marketplace as viable service offerings. Strong linkages between key stakeholders closes the 'knowledge-commercialisation chasm', enabling all economic agents in the industry to enhance their adaptive and innovative capabilities.	and an appropriately positive environment within which to exercise their Advanced Skills have led to a serious 'brain-drain' that hinders building higher level adaptive and innovative capabilities.
Knowledge culture has a **positive and strong impact** on all three components of dynamic capability. A knowledge culture of sharing and working collaboratively with different stakeholders features strongly in the business services industry in the advanced sector countries. Industry players as well as universities and agencies are well informed about key developments, market conditions, and innovations that are taking place in local and global markets. In addition, access to information and data from government and trade associations is widely accessible and available. Considerable information and knowledge processing takes place in order to make informed choices and decisions. As such, the business services industry in advanced sector countries is noted as one that has strong coupling between government agencies, trade/industry associations, and universities that helps to ensure strong flows of knowledge and sharing of best practices.	Knowledge culture has a **no significant impact** on all three components of dynamic capability. Knowledge competency and sharing among key stakeholders in the business services industry in Malaysia is relatively low. A competitive mentality pervades the industry as most business service providers compete simply on the basis of price. Additionally, there is also a strong reliance on the government, suppliers, and other intermediaries for information, technology, and knowledge. This position is worsened by a culture of dependency among business service providers, especially among SMEs. These instances produces several negative spill-over effects that hinder innovative capability of business service providers in Malaysia such as (1) complacency among business service providers to engage in the arduous and uncertain task of R&D led innovations, (2) shortage of resources despite willingness to accept the risks of R&D activities, (3) quick monetisation in the form of selling IPs to others (due to a lack of resources, stamina, and long term view to reap the high returns from their IP), (4) market failures, such as weak protection of IP perpetuated by leakages by intermediaries. All of these hinder development of the necessary level of dynamic capabilities.

Table 20.1: Knowledge Enablers and Dynamic Capabilities for the Business Services Industry (cont'd)

Advanced Countries	Malaysia
The continuum from absorptive capability to adaptive capability to innovative capability is **present and strong.** The business services industry in advanced sector countries is perceived to be a key driver to the national economy, and features strongly within their national strategic priorities. Significant resources are channelled to ensure that the business services industry remains productive and globally competitive. Notably, such focus is the basis in nurturing strong capability building efforts to ensure that all components aspects of the industry are not only nurtured but are constantly refreshed to ensure business services.	The continuum from absorptive capability to adaptive capability to innovative capability **is present.** Despite considerable investment to strengthen the capability of business service providers in Malaysia, significant weaknesses in the nature and strength of dynamic capabilities continues to persist. The best and brightest of talent in Malaysia are often recruited by MNCs and firms from foreign countries that are able to offer organisational environments and rewards that commensurate with their skills and contributions. In addition, due to a lack of R&D endeavour among business service providers in Malaysia, many of the local talent, even when they possess the skills for innovation, are primarily focused on modifying foreign technology and knowledge for local and regional demand. This risk averse proclivity of business service providers leads them to provide services that support to foreign firms to produce more innovative and creative offerings rather than undertake the effort to create innovations themselves. Hence, in such circumstances, IP and patents produced are passed over to foreign firms.

A summary of the impact of dynamic capabilities on economic outcomes for the business services industry for both advanced sector countries and Malaysia is provided in **Table 20.2.** When advanced sector countries are considered, adaptive capability is found to have a positive and strong impact on process improvements and a positive and moderate impact on product market outcomes, whereas innovative capability has a positive and strong impact on process improvement and a very strong to product market outcomes. Process innovation is noted to produce a strong feed into the development of improved product offerings in the form of the new business service offerings. Thus, the business services industry is an important driver of efficiencies and product (business service) innovations in advanced sector countries.

When Malaysia is considered, the data in the study suggests that absorptive capability influences the release of business service innovations that are imitative of others. The focus of innovative capability is to primarily drive process improvements. The mainstay focus of the highest level dynamic capability component, namely innovative capability, of business service providers in Malaysia is to reduce costs of imitative products based on innovations developed by others. Business service providers in Malaysia utilise a range of strategies from buying knowledge and innovations developed by others to drive their systems and processes in a cost competitive manner.

Table 20.2: Dynamic Capabilities and Economic Outcomes for the Business Services Industry

Advanced Countries	Malaysia
Adaptive capability has a **positive and strong impact** on process improvement and a **positive and moderate impact** on product market development. A wide range of business service providers operate at different levels of the innovation value chain in the business services industry in advanced sector countries. Most business service providers, even SMEs, are very strong in adapting new technology and innovations to improve existing business service offerings. Firms in the industry play a key role in providing business solutions for firms in other industries.	Absorptive capability has a **positive and strong impact** on product-market innovation. Industries that are served by the business services industry receive imitative business solutions. Foreign technology and innovations are absorbed and used to churn out business solutions that are generic versions of innovations developed by others. Business service providers in Malaysia build their capability by leveraging on knowledge and technology developed in advanced sector countries.
Innovative capability has a **positive and strong impact** on process improvement and a positive and very strong impact on product market outcomes. Significant investment in R&D and skilled workforce by government institutions and universities are widely available in advanced sector countries for the business services industry. This enables business service providers to deliver business solutions in a highly efficiently manner and at the same time introduce new innovations and offerings. Unsurprisingly, many business service providers in advanced sector countries have global reach and brand presence.	Innovative capability **has a positive significant impact** on process improvement but not on product market development. Most business services providers in Malaysia adopt new technology and innovations from advanced sector countries to improve cost-efficiency, service quality, and meet domestic market demand. Notably, little R&D and innovation takes place in the Malaysian business services industry.
Process improvement leads to strong positive **impact** on product market outcomes. The business services industry in advanced sector countries is driven by a strong linkage between process innovation and product innovation. Innovations produced by business service providers are delivered at a highly cost competitive basis as a consequence of a strong focus on continuous improvement of business service processes. This enables business service providers to translate process improvements into new product (business service solutions) development.	Process improvement **does not impact** product market outcomes. Process improvements undertaken by business service providers in Malaysia are often a result of acquisition of foreign technology, IP, or services. Thus, the potential of creating novel business service solutions is highly limited.

20.8 Summary: Key Trends, Challenges, Way Forward and Best Practices

20.8.1 Industry Trends

The Malaysian business services industry is performing adequately along certain parameters and not so well across others. As one of the 12 NKEAs, the Malaysian Government has developed an ambitious plan (as noted in the ETP 2014) to support its progress. Although the industry is on a positive trajectory towards fulfilling the aims of the government's ETP, examination of its knowledge resource foundations and dynamic capabilities profile suggests that its ability to maintain its course in the face of increasing competition and rapid change needs to be monitored.

Other than continuous improvement in building its infostructure, the industry has not made major progress in other knowledge foundations, other than minor improvements in knowledge systems and leadership, and knowledge sharing. The lack of improvement in some elements of the knowledge resources is likely to impede the industry's progress. Human capabilities, knowledge generation and the utilisation of knowledge are key areas of concern. The lack of knowledge generation, including R&D output as well as patents and copyrights filed, may be a result of the relatively low levels of human capability, knowledge leadership and engagement in the knowledge environment. This suggests that having a strong technology infostructure is insufficient for building a robust knowledge economy; all the other knowledge resources elements must also be given due attention.

Possessing an average store of knowledge results in the industry displaying an average dynamic capabilities profile and outcomes. Building human capabilities appear to be most challenging for the industry, and this is reflected quite strongly in both the knowledge foundations and in the dynamic capabilities profile. The industry appears to have difficulty attracting talent and lacks training expertise to enhance existing talent in the industry.

The business services industry's weak level of dynamic capabilities is reflected in its moderate improvement in developing more efficient operations and better managed processes, and its inability to translate its capabilities into the development of new or improved products. While the business services industry may have some capabilities to respond to new opportunities, the industry is in a vulnerable position. Given its role as a key enabling industry, it should be performing at a much higher level than most of the other Malaysian industries across all three dynamic capability components.

20.8.2 Challenges

The business services industry provides a wide range of services that cuts across all industries. While there is potential for this industry to be an important source of economic wealth for the country, the industry faces a number of challenges and they are discussed below.

Institutions:

- The industry is fragmented and lacks a long-term plan with clear tractable KPIs, milestones, regular audits and refinements. This makes it difficult for institutional agencies to engage in effective dialogue and make provisions for its development.
- Highly competitive global industry requiring a clear planned approach yet cooperation and collaboration between stakeholders is patchy and weak.
- Inability of the industry to attract and retain the requisite quantity and quality of intellectual capital.

Basic Skills Development:

- Skills needed are varied and in short supply, making it difficult to meet the diversified demands of client industries.
- High turnover rate of the workforce in the industry makes it difficult to accumulate sufficient skill base to allow building of a sound foundation on which higher level skills can be built.

- Over reliance on foreign talent for shared services, leading clients to go direct and outsource services to neighbouring countries.

Advanced Skills Development:

- Fast pace industry that requires constant development to keep pace with rapid changes taking place in client industries, especially technological developments that are constantly changing the competitive landscape of the industry.

- Constant reliance on foreign technology and knowledge within the industry, and the local firms often adapt others' technology and knowledge.

- Lack of specialised and challenging tasks in Malaysian firms. In such environments, the best talent lacks opportunity to further deploy and develop their skills. They leave to work for foreign firms that offer a better career development.

- Shortage of technical and advanced skills due to high level of skills leakage, i.e., brain-drain.

S&T Knowledge:

- Fundamental and applied R&D activities in the industry are relatively weak.

- Skills of graduate do not meet the creative and innovative needs of the industry. Most S&T graduates are adept users of foreign S&T but fail to create new innovations and applications suited for the local and regional industries.

- SMEs have major challenges recruiting high calibre workers. SMEs are not focused sufficiently on R&D and therefore well qualified individuals opt to work overseas or with MNCs.

Market Intelligence:

- Strong competition within the industry, especially for non-accredited professional services. Most of the non-accredited professional services are SMEs, who spend very little resources for market intelligence or capability development programs for their employees. These firms tend to provide single element services for clients instead of providing end to end services.

- Most local SMEs are not savvy in using new technologies such as the Cloud and Big Data Analytics to gauge changes taking place in the industry, especially changes in the underlying structure of the economy, labour market, and competitive nature of the industry and trends in customer preference and needs. Lack of evidence-based information hinders these firms from optimally investing their resources in services that increase their return on investment.

Knowledge Culture:

- Larger firms are able to invest in the creation of a knowledge base to align to emerging competitive priorities. SMEs and micro firms find this task very difficult with limited R&D budgets and depend on other to develop their knowledge and technology capabilities.

- Firms in the sector exhibit low disposition to build fundamental knowledge in order to drive the development of their high-value product portfolio. The primary focus is on cost cutting as a basis for market competition.

- A culture of dependency, especially among SMEs, gives rise to complacency among firms. Given the shortage of resources to compete in R&D intensive environments, many firms that create IP pursue quick monetisation by selling their IPs for quick returns. This reflex is fuelled by general belief that with weak IP protection in Malaysia, they will lose IPs assets as a consequence of "leakages" within the system.

20.8.3 Way Forward

The business services industry is a major contributor to the Malaysian economy in terms of improving productivity in other industries and a major source of employment. The industry covers a wide range of sectors and any improvements in this industry will have an important spill-over impact on other industries and the broader economy. To facilitate the growth of business services industry, the industry needs to move up the knowledge and innovation value chain. The following are recommended to enhance the business services ecosystem.

Recommendation 20.1: Focussed and Strategic Development of the Industry

The business services industry has developed in an ad-hoc way and its footprint needs to be extended beyond support and administrative outsourcing. It is necessary to explore avenues for alternative high value propositions that are targeted at client industries. Malaysia has over the years built expertise in a wide range of areas, including the following: engineering services; architecture and construction; agriculture and plantation management; IT; e-commerce and e-government; human resource management; strategic planning and business process re-engineering; legal, accounting and financial services; and many other areas. To support the development of these local industries the following are proposed:

- A high level advisory panel should be established consisting of members from the business services industry, public sector and other industries to effectively foster stronger collaborative endeavours between firms in the business services industry and the other stakeholder. This forum can be used to examine the needs of the industry and public sector; and ways in which the business services can value-add to their operations. This will also assist the industry a future strategic plan and implementation mechanisms to map the future direction and areas of focus for the industry.

- Government agencies, MNCs and GLCs are encouraged to use local firms for professional services for enhancing their productivity and profile in the country and region.

- Key trade organisations, foreign trade offices and embassies should be 'champions' of local professional and business services in overseas markets.

- Establish a business services "one-stop portal" listing major players in the key business services industry. The portal should also include information on rules, regulations, incentives and networking opportunities in Malaysia and other countries in the region, especially the ASEAN market.

- Industry association, government agencies and universities should organise regular forums and capability development programs for firms in the industry. These forums should cover the latest technology trends, business models, knowledge systems and governance mechanisms that will expand the reach and richness of the services provided by the local players.

Recommendation 20.2: Strategic Approach to Talent Development for Long-Term Sustainability of the Industry

There should be greater cooperation and collaboration between all institutions (government, industry associations and educational institutions) in mapping out key professional and business services that are needed by industries in Malaysia and the region. As the region continues to develop, there is a need for talent in a wide range of areas from STEM related areas to architects, social scientists, accountants, financial experts, sociologist, psychologist, IT specialist, data analyst, branding and other experts that will help government, industry and community organisations become more knowledge intensive and adapt to the fourth industrial revolution.

The industry is also shifting gears in becoming customer-centric with good understanding on multicultural context of the business environment; intensifying deeper global engagement of firms through partnership and engagement with overseas firms; and increasing demand for end-to-end services. To cater for this new changing landscape of the business services industry, the workforce must have the following skills-sets: digital skills, data analytical skills and computational thinking; good communication and inter-personal skills; management skills; higher order skills such as complex problem solving and trouble-shooting skills; sound knowledge of environmental sustainability; and ability to work across multiple industries and sectors.

To ensure Malaysia has adequate talent to cater for the domestic and regional economies, the following are proposed:

- Assist and incentivise talented Malaysian living abroad to relocate back to the country. Among the incentives proposed to attract those back to Malaysia include the following: providing their families permanent residency on arrival; covering some of the relocation expenses; and giving recognition of their professional qualifications and experience abroad.

- Ensure local qualifications are recognised by international professional bodies and governments in other countries. This enables Malaysians with local qualifications to undertake professional work in other countries. More importantly, these qualifications and trainings embed skill-sets required for the industry such as:

  - Ability to work with large data – sound knowledge of data analytics, mathematics, statistics, computational thinking, information systems and cyber security.

  - Sound use of social media for business development – good knowledge on the use of multimedia and social media for developing creative content.
  - Good communication skills, both spoken and written in multiple languages.

  - Cultural competence – good working knowledge in diverse cultural setting.

  - High order skills set – sound critical thinking, business literacy and problem solving.

  - Expert knowledge in niche areas such as environmental sustainability, sound understanding of global standards and best practice, including religious based business regulations and standards (halal industry).

- Foster strong 'industry-professional body-university' partnerships through work placement and internships programs. One such best practice is the post degree industrial training called the Financial Sector Talent Enrichment Program (FSTEP) introduced by Bank Negara. Other professions should also introduce similar types of programs to strengthen talent development in the respective fields.

- Joint industry-government funds should be established to develop a competitive internship and work-placement scholarships (for newly minted graduates) in key business and professional services fields that Malaysia has competitive and comparative advantage.

20.8.4 Best Practices

In this section, the best practices from pace-setter countries in the business services industry are discussed. These case studies provide valuable insights on the strategies the local business services industry should put in place to become knowledge intensive and globally competitive.

Best Practice 20.1: Focussed and Strategic Development of the Industry

Canadian Business Services Sector – A Global Leader

The Canadian Business Service sector is one of the global leaders in a number of areas such as human resource management, customer relations management, knowledge process outsourcing, data mining, application development, project management, business continuity disaster planning support. The business services sector is a major contributor to the Canadian economy, where the professional, scientific and technical services a sub-component the business service industry created employment for 820,307 jobs and contributed C$83.5 billion to the economy in 2013 (Invest Canada, 2014). Success of the Canadian Business Services Sector is attributed to a systematic plan to develop the ecosystem in a holistic way, which includes ensuring the following (Invest Canada, 2014):

- State-of-the-art physical infrastructure (road, ports, bridges, commuter rail and other public infrastructure) that support a vibrant services sector.

- A business and investor-friendly environment that provide transparent, quick and customer-centric services – rated as the best pace among G-20 countries to do business rated by Economist Intelligence Unit.

- A strong data protection act in place; and this is important for services such as human resources management, finance and accounting outsourcing.

- High quality workforce in all fields that are critical for the business services industry – most of the institutions of learning are ranked very well in all the global university ranking; and these institutions have strong collaborations with industry players in the business services industry.

- The cost structure and tax regime are competitive compare to other G-7 countries. The corporate tax (both the federal and provincial) is 26.3%, which is 12.8 percentage points lower than the USA. This has led to large firms from US relocating to Canada, creating employment and contributing to the wealth of Canada.

- Canada pursues a pro-trade policy and party to the North American Free Trade Agreement (NAFTA), Transpacific Partnership Agreement and free trade agreement with European Union; all of which will open opportunities for Canadian firm to expand their market reach to these vibrant and attractive markets.

- Canada also provides very generous tax exemptions and funding for business services industry, among them include the following:
  - *Scientific Research and Experimental Development (SR&ED)* scheme, which provide firms tax credit and refund for any expenditure undertaken for eligible R&D activities in Canada (it covers wages, materials, some overhead and SR&ED contracts).

  - *Industrial Research Assistance Program (IRAP),* supports path-breaking R&D activities and commercialisation of new products and services for SMEs.

  - *Export Development Canada (EDC) and Business Development Bank of Canada (BDC)* provide flexible financing programs for foreign firms that invest in Canada.

Best Practice 20.2: Strategic Approach to Talent Development for Long-Term Sustainability of the Industry

Talent Management Strategy in the Australian Business Services Industry

The business services industry in Australia is one of the most globally competitive industries. Over the years, the industry has undergone major changes impacted by a number of domestic and global issues. Among the domestic issues include the downturn in mining industry, which saw business services catering for this industry experiencing major downturn. Other factors that adversely impacted the industry are the economic contraction in major developed markets and global competition from other countries. To raise the global competitiveness of the Australian business services, there were concerted efforts by the industry associations and government to undertake major overhaul of the talent required to give the industry a competitive edge in the domestic and international market. The Innovation & Business Skills Australia (IBSA) conducts regular surveys to identify changing structure of the economy and labour market needs of industries. Based on the analysis, various policy measures are undertaken to ensure the talent development strategy supports the development and competitiveness of the industry. The following focus areas were identified to help strengthen the industry and they are outlined below (IBSA, 2015; 2014):

- To cater for diverse life-styles, support work life balance and reduce staff turnover, the industry has adopted flexible work arrangements using virtual teams and digital learning platforms.

- The industry has developed a Core Skills Framework for the industry. The attributes articulated of the Core Skills Framework is incorporated in all training programs, university courses and programs. The framework also maps a clear pathway for career development from certificate (lower level qualification) to vocational training; and from vocational training to tertiary qualifications.

- The business services industry works closely with tertiary institutions, colleges and training providers to achieve the following:

  - Instil a high degree of professionalism - good inter-personal skills, multi-cultural competence and be multi-lingual (both spoken and written).

  - Nurture critical and creative thinking, sound business literacy, problem solving skills.

  - Enhance the use of information communication technology (ICT), social networking technology, knowledge management system and data analytical tools for business decision making and training at all levels. The ICT skills competency is integral to the Core Skills Framework.

  - Ensure adequate training and support for niche areas of expertise, such as in engineering, architectural, finance and other related areas.

  - Ensure that adequate training and support is provided for micro and small businesses.

  - Ensure that there are adequate skills and leadership trainings, mentorship and coaching programs for first-time managers and front-line workers.

  - Undertake regular surveys (industry and employee feedback and review) of the training programs and courses to ensure that it meets the manpower needs of a fast changing industry.

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CHAPTER 21

KNOWLEDGE CONTENT OF THE WHOLESALE AND RETAIL TRADE INDUSTRY

CHAPTER 21
Knowledge Content of the Wholesale and Retail Trade Industry

21.0 Introduction

Wholesale and retail industry is an important component of the Malaysian economy, and is identified as a National Key Economic Areas (NKEAs), with domestic consumption making up 60 to 70 % of the country's GDP (Inside Malaysia, 2012). In 2013, the wholesale and retail trade contributed 14.4% to Malaysia's GDP and employed 16.8% of the country's total workforce. There were 1.7 million employees in the distributive trade, with the majority of workers employed in retail trade (53.6%), followed by wholesale trade (30.2%), and motor vehicles trade (16.2%) (Department of Statistics Malaysia, 2015). In 2013, there were a total of 370,725 establishments undertaking distributive trade services in Malaysia, of which 70.3% were in the retail trade; 15.4% were engaged in wholesale trade activity and 14.3 % involved in motor vehicles trade (Department of Statistics Malaysia, 2015) (see **Table 21.1**). As of 2013, there are 189 foreign hypermarkets, superstores and departmental stores in Malaysia. (Malaysia Productivity Corporation [MPC], 2014). The economic circumstances buoying this growth has attracted significant foreign competition. According to Malaysia Productivity Corporation [MPC] (2016), wholesale and retail trade industry registered a higher productivity performance during the period of 2011-2015 with a CAGR of 2.7%. In the second quarter of 2016, the sale value of wholesale and retail trade sector achieved RM261.3 billion including wholesale trade (RM127.9 billion), retail trade (RM98.5 billion) and motor vehicles (RM34.9 billion) (Department of Statistics Malaysia, 2016).

Table 21.1: Number of Establishments, Sales Value and Number of Employees in the Wholesale and Retail Industry 2014 (Reference Year 2013)

	No. of Establishments	Sales value	No. of employees
Total	370,725	RM841.6 billion	1.7 million
Retail Trade	260,664 (70.3%)	RM279.1 billion (33.2%)	53.6%
Wholesale Trade	57,050 (15.4%)	RM442.2 billion (52.5%)	30.2%
Motor vehicle Trade	53,011 (14.3%)	RM120.4 billion (14.3%)	16.2%

Source: Department of Statistics Malaysia (2015)

According to the recent report by Oxford Business Group (2015), there were 66 and 58 shopping malls in Kuala Lumpur and Selangor itself as of 2012. These add up to 3.37 million square metres of commercial space. For the country as a whole, retail space occupied 12,390,753 square metres in total (among 873 commercial complexes) at the end of Q4 2013 (Oxford Business Group, 2015). The continued mushrooming of retail space and new shopping centres signify the growing opportunity of wholesale and retail sector in Malaysia.

21.1 Key Developments and Initiatives

Malaysia's wholesale and retail trade industry is heavily focused on the domestic market and its performance relies on the disposable income and purchasing power of Malaysians. According to Oxford Business Group (2015), Malaysia's GDP per capita rose by 50% between 2009 and 2013, from $6700 to $10,600 – this is expected to reach $15,000 by 2020 given increasing numbers of affluent consumers with a taste for luxury items and imported brands. The rise in purchasing power is a key driver of the wholesale and retail trade. The rapid growth in domestic consumption has made Malaysia an attractive location for many renowned luxury brands to open branches. This has also led to the emergence of local premium offshoot brands, with domestic players beginning to introduce new product lines to cater for affluent customers. However, industry growth may be limited by rising costs of living and higher borrowing costs in Malaysia (Malaysia Productivity Corporation [MPC], 2014). This leaves the retail industry vulnerable to domestic economic volatility.

The potential of wholesale and retail market (especially retail) has attracted large established global brands to set up franchise or branches in Malaysia. Duty-free policies increase the attractiveness of the Malaysian market. As reported in the Economic Transformation Programme Annual Report 2014 (ETP Annual Report, 2014), the CIF (Cost, Insurance & Freight) value of the 328 goods declared duty-free since January 2011 has increased to RM6.97 billion (December 2014) from RM3.01 billion (2011). International retailers such as Dairy Farm International (Cold Storage and Giant), Tesco and AEON dominate the retail market. Malaysia currently has over 450 hypermarkets and supermarkets combined, and about 1,000 convenience stores. 45 to 60% of urban household shoppers use them as the main outlet for packaged groceries shopping (Australia Trade and Investment Commission, 2014; DPO International, n.d.). Overall, liberalising trade and business policies implemented since 1995, have led Malaysia to possess the largest share (28%) of foreign groceries in the Asian-Pacific region. (Inside Malaysia, 2012)

With strong movement toward online shopping in Malaysia, the market is expected to grow to RM5 billion in 2014 (Ministry of Finance, 2014). Some online stores like Groupon, Zalora and Lazada only recently emerged on the online shopping scene, but are building strong presence in the country. As these online stores establish a track record of credibility and reliability, consumers who were reluctant at the beginning are starting to engage in online shopping. Furthermore, Malaysia is recognised as one of the top shopping destinations globally. In 2016, Malaysia was ranked 3rd in A.T. Kearney Global Retail Development index (A.T. Kearney, 2016). Shoppers from the Middle-East, Europe and Singapore take

advantage of favourable exchange rates, duty-free zones and the availability of premium outlets.

To propel the growth of domestic players in the wholesale and retail industry, the government took on a number of initiatives to support local businesses, especially small companies. For example, The Small Retailer Transformation Programme (TUKAR) was launched in 2011 to modernise traditional retail shops and increase their level of competitiveness. As of December 2014, 1,914 stores were transformed (ETP Annual Report, 2014). Also, the Guidelines on Foreign Participation in the Distributive Trade Services Malaysia 2004 (revised in 2010) were designed to restrict activities of hypermarket chains. For example, any store with a floor space larger than 5000 square metres should be located outside of the 3.5 km radius of a town centre, with only one foreign hypermarket permitted for every 250,000 inhabitants. Hypermarkets are not allowed to operate around-the-clock, with business hours mandated from 10am to 10pm on weekdays.

21.2 Knowledge Content

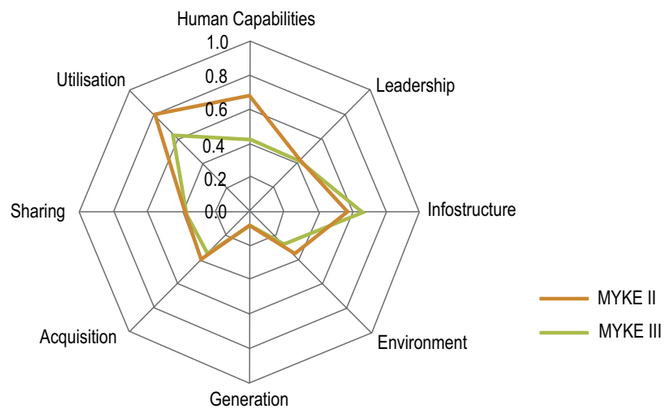
This section discusses the development in knowledge content (knowledge resource foundations) in the wholesale and retail industry over the period 2007 to 2014. Knowledge resource foundations are composed of two main categories, knowledge enablers and knowledge actions.

From 2007 to 2014, the only knowledge element where the wholesale and retail industry shows positive progress is infostructure. The score increased from 0.58 in 2007 to 0.65 in 2014. In contrast, rapid decrease is observed in human capabilities and knowledge utilisation. From 2007 to 2014, the score of human capabilities dropped significantly from 0.7 to 0.43, and the score of knowledge utilisation decreased from 0.82 to 0.65.

In general, the wholesale and retail industry scored lower than the Malaysian industry average on most knowledge foundations, except infostructure and knowledge utilisation where the scores are almost on par with the national aggregate (see **Figure 21.2 to Figure 21.8**).

Figure 21.1: Overview of Knowledge Enablers and Knowledge Actions for MYKE II and III

Wholesale and Retail Trade



Note: No data for MYKE I.

21.3 Knowledge Enablers

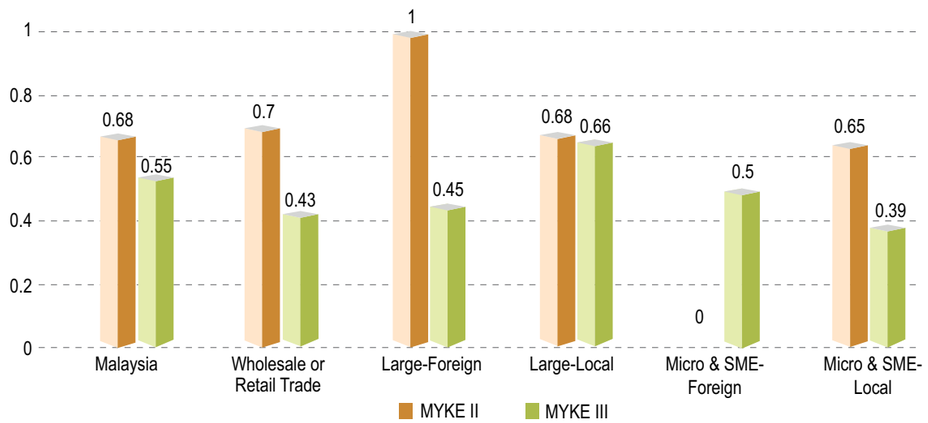
21.3.1 Human Capabilities

In line with the national trend, human capability in the wholesale and retail industry dropped significantly from 0.7 in 2007 to 0.43 in 2014 (see **Figure 21.2)**. The score in 2014 was below the Malaysia industry average (0.55). Similarly, a diminishing trend is observed among local micro- and SME firms.

The evidence demonstrates a decline of wholesaler and retailer investments in employee training, and a fall in the number of individuals with degrees employed by the industry. At the same time, firms are increasingly recruiting foreign labour for their business operations. Instead of sending employees for formal training, on-the-job training features as the primary mechanism for skill enhancement, often as a casual practice whereby senior staff would mentor their junior counterparts without any formal processes in place. This practice is particularly common in the training of foreign labour.

Figure 21.2: Human Capability of the Wholesale and Retail Industry

Human Capability

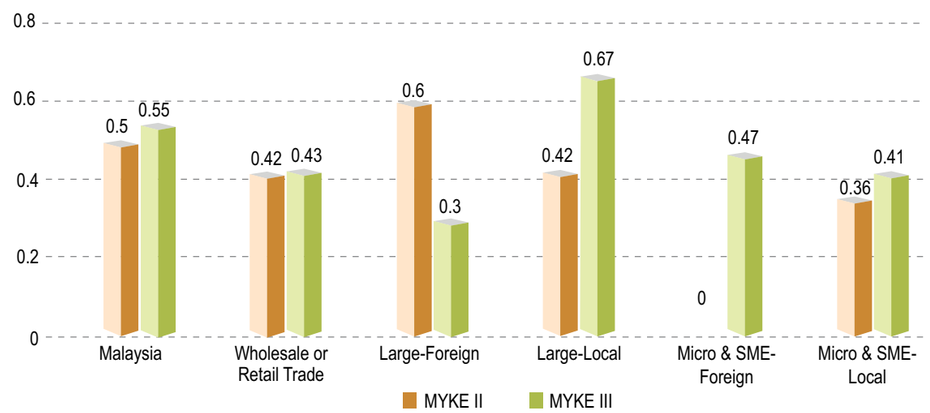


21.3.2 Knowledge Systems and Leadership

Approach to management of knowledge moved marginally from 0.42 in 2007 to 0.43 in 2014, (see **Figure 21.3**), and the score is lower than the Malaysian industry average (0.55). This indicates weakness in the industry's approach to documenting knowledge and knowledge processes.

Among wholesale and retailers, local large firms score highest in knowledge leadership (0.67) in 2014, and also perform above the national aggregate (0.55). Local large firms are stronger in formalising their knowledge and knowledge development procedures. The large retailers tend to have a greater level of resources to enable systematic knowledge documentation. Smaller wholesalers and retailers face higher financial and human resource constraints. This limits their ability to implement formal knowledge processes.

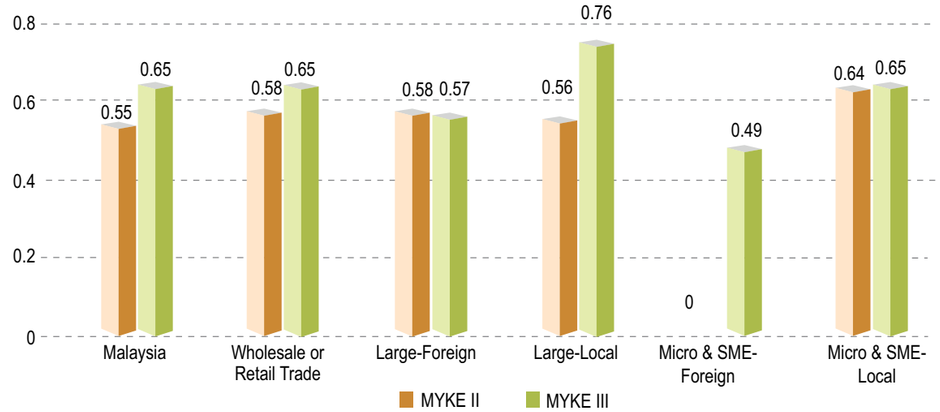
Figure 21.3: Knowledge Leadership in the Wholesale and Retail Industry



21.3.3 Technology and Infostructure

Score of infostructure in the wholesale and retail industry increased from 0.58 in 2007 to 0.65 in 2014 (see **Figure 21.4**). The score in 2014 was the same as Malaysia industry average. Among all wholesalers and retailers, large local firms show the strongest improvement. In contrast, the smaller firms show only marginal improvements. The contrasting performance between the different categories of firms arises from the greater financial resource position of large companies who are able to invest more in computer and information technology compared to micro and SME firms.

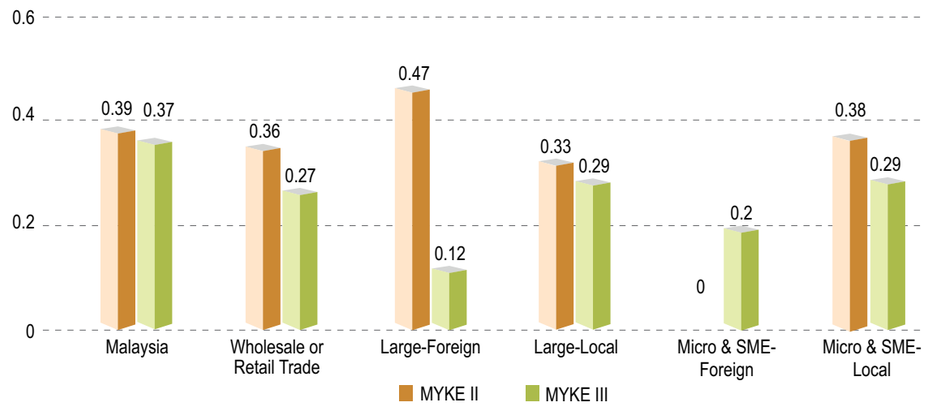
Figure 21.4: Technology and Infostructure of the Wholesale and Retail Industry



21.3.4 Knowledge Environment

According to Figure 21.5, the score attributed to knowledge environment in the wholesale and retail industry dropped between 2007 (0.36) and 2014 (0.27), and is below the Malaysian industry average in 2014 (0.37). A significant decline from 0.47 to 0.12 is observed among large foreign wholesalers and retailers, indicating these firms are becoming less involved with industry associations, less active in seeking information about Government policies, as well as less likely to work with other firms. A possible explanation for this is that large foreign wholesalers and retailers have become represented by more mature companies who began operating in the country over the last decade and are not dependent on external agencies for support.

Figure 21.5: General Environment Awareness of the Wholesale and Retail Industry

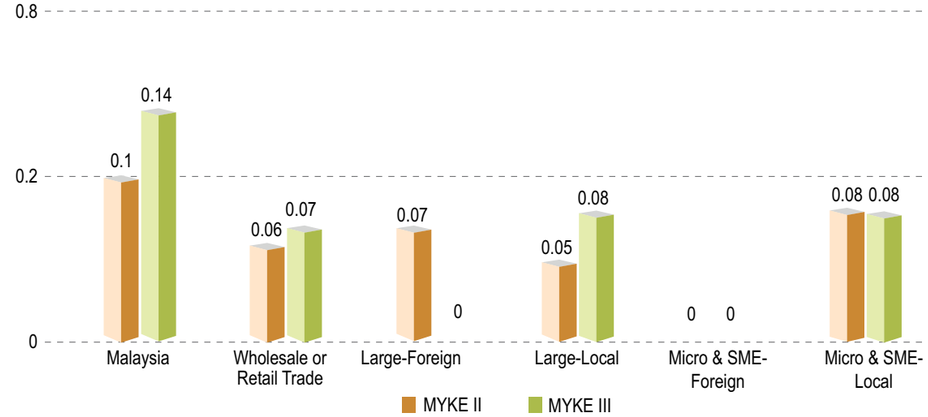


21.4 Knowledge Actions

21.4.1 Knowledge Generation

The wholesale and retail industry in Malaysia has a very low score in terms of knowledge generation. The score rose marginally between 2007 (0.06) and 2014 (0.07), but presently remains well below Malaysian industry average (0.14). Knowledge generation activities, such as R&D are rare in the Malaysia wholesale and retail industry. Such initiatives are mainly focused on incremental improvements to service delivery and efficiency levels of existing systems. Little ground-breaking R&D activity was accomplished (or even endeavoured) due to the nature of the industry.

Figure 21.6: Knowledge Generation Activity in the Wholesale and Retail Industry



21.4.2 Knowledge Sharing

As shown in **Figure 21.7**, performance in knowledge sharing dropped by a slight margin between 2007 (0.39) and 2014 (0.38), and is currently below the Malaysian industry average (0.44). A similar decline is observed among local micro- and SME firms. A large decline from 0.87 to 0.27 is observed among large foreign firms between MYKE II and MYKE III as well. In contrast, knowledge sharing of local large firms has increased steadily. This shows that large foreign firms are becoming reserved in sharing knowledge, while large local firms are becoming more engaged in knowledge sharing activities.

21.4.3 Knowledge Utilisation

Knowledge utilisation declined in the wholesale and retail industry. The score in 2014 (0.65) is close to the Malaysian industry average (0.66) (see **Figure 21.8**). The downward trend is observed for all firm size categories. The drop for foreign large wholesaler and retailers is much more significant, from 0.9 to 0.51. Interestingly, local firms, both large and small, exhibit better knowledge utilisation than foreign firms in the wholesale and retail industry.

Figure 21.7: Knowledge Sharing Activity of the Wholesale and Retail Industry

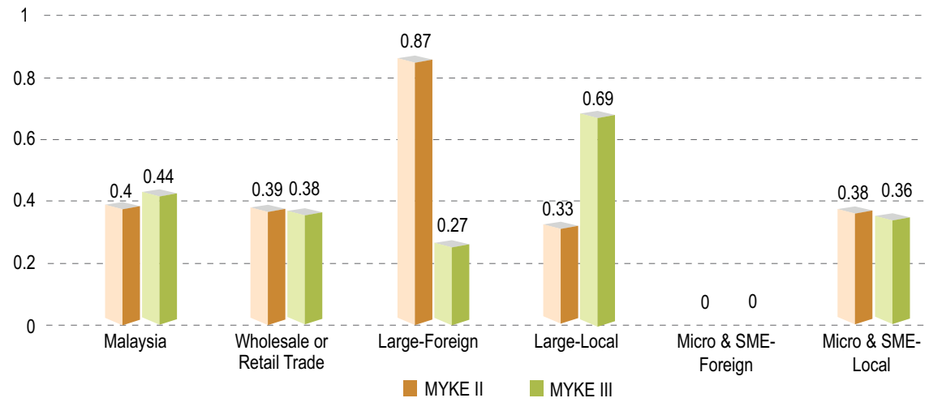
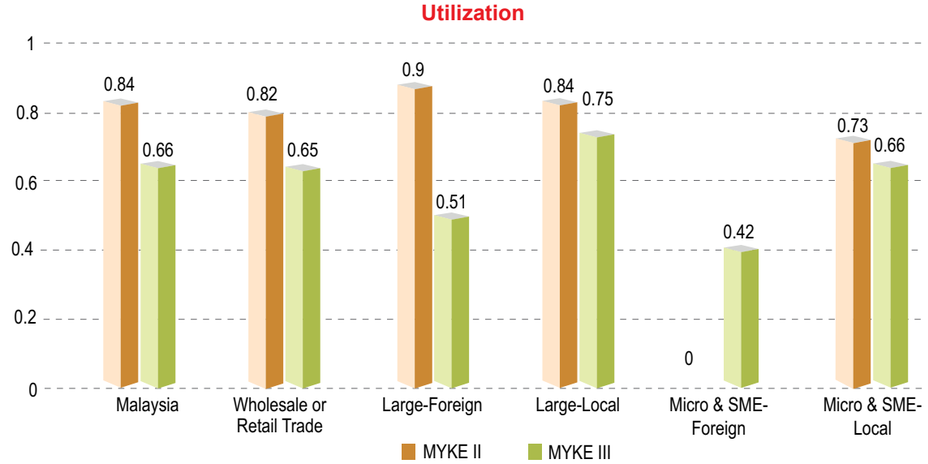


Figure 21.8: Knowledge Utilisation Activity of the Wholesale and Retail Industry

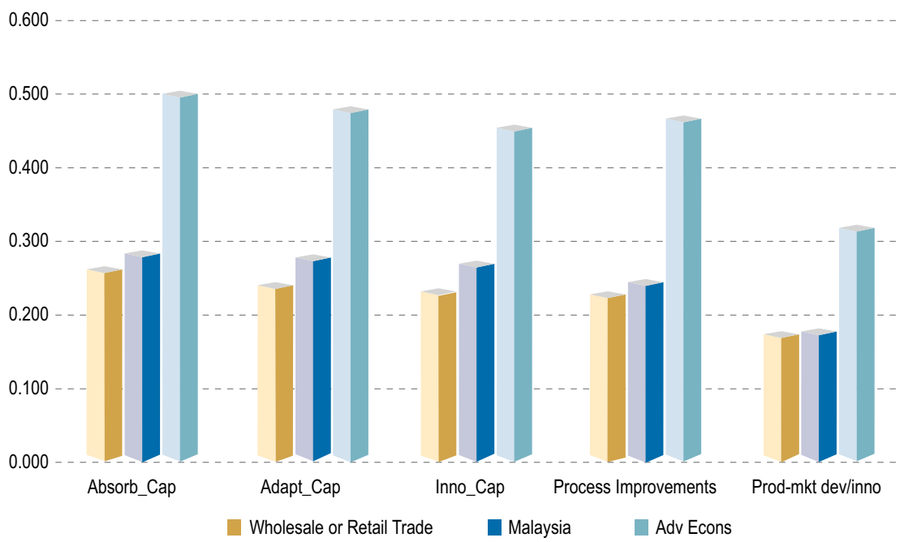


21.5 Dynamic Capabilities Profile of the Wholesale and Retail Industry

Dynamic capabilities determine firm success in adapting to changes in the market landscape and creating competitive positions. Dynamic capabilities are composed of three main driving factors: absorptive capabilities, adaptive capabilities and innovative capabilities.

Overall, the wholesale and retail industry does not perform well on dynamic capabilities. **Figure 21.9** shows the wholesale and retail industry scores below Malaysia industry aggregate across all three types of dynamic capabilities. Performance with regard to innovation outcomes is also below the aggregate level in both process improvement and product-market development.

Figure 21.9: Dynamic Capabilities and Outcomes of the Wholesale and Retail Industry

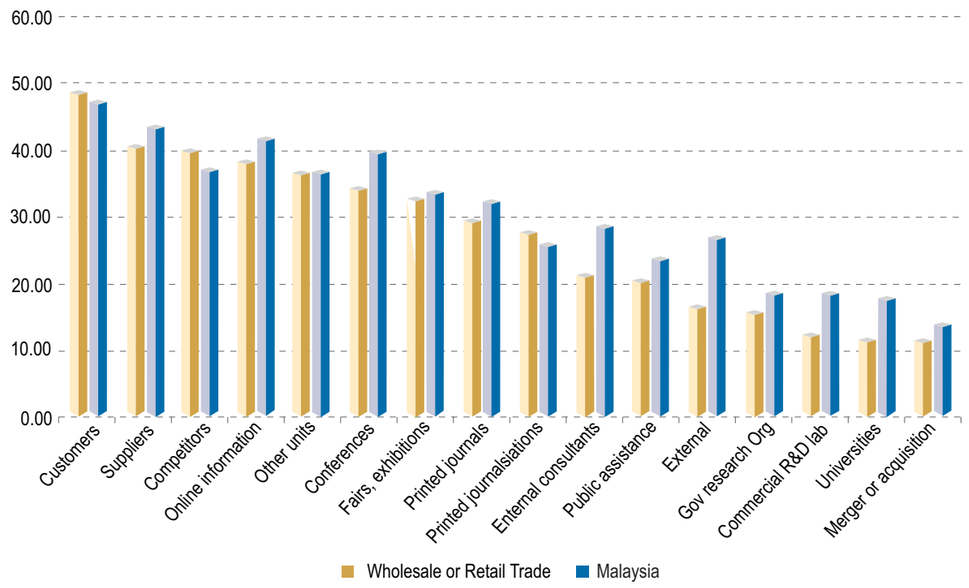


21.5.1 Absorptive Capability

Absorptive capabilities refer to firms' ability to collect knowledge from external sources and be able to process it and understand it. Firms in the industry perform adequately in terms of scanning the market and sharing it internally within the firm. However, the industry's ability to adopt new technologies and systematically store new knowledge for future reference is rather weak.

Firms in the wholesale and retail industry tap into different sources of knowledge (see **Figure 21.10**). In the wholesale and retail industry, consumers are the most important source of information, followed by suppliers and then competitors. Firms also get their knowledge from online information, internal units, conferences, fairs, and journals. A lower level of information comes from government research organisations, R&D labs and universities. Overall, in terms of sourcing knowledge, the wholesale and retail industry is below the Malaysian industry aggregate level across most sources of knowledge.

Figure 21.10: Sources of Knowledge in the Wholesale and Retail Industry

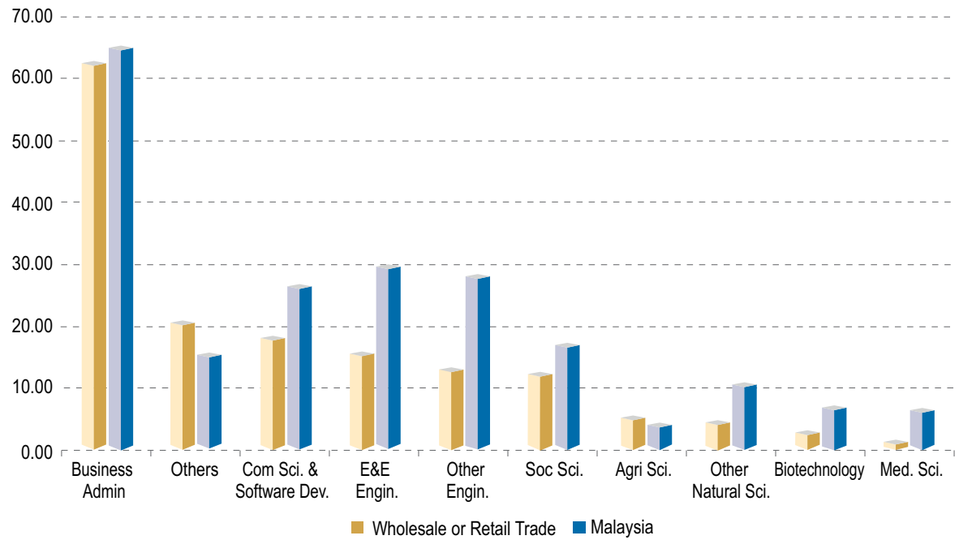


21.5.2 Adaptive Capability

Having high adaptive capabilities infers firms' capability to make financial and other resource commitment to innovation projects, and the ability to reconfigure their resources in order to align with market changes. Unfortunately, the wholesale and retail industry scores below national aggregate in terms of adaptive capabilities (see **Figure 21.9**). This suggests that the wholesale and retail industry's capability in utilising knowledge absorbed from external sources is relatively weak. Firms in the industry do not seem to be extensively involved in innovation projects or make strong efforts to upgrade their marketing capability. Also, there is limited improvement in internal structures and processes. Overall, the industry does not possess capabilities to sufficiently adjust to change or to rapidly take advantage of emerging opportunities.

The skills profile of firms is shown in **Figure 21.11.** The figure shows firms in the industry heavily rely on Business and Administration graduates, which is not surprising. Other skills, such as computer science, engineering and social science graduates are also present. The industry scores below national aggregate in almost all skill types. This suggests that the industry has limitations in attracting skilled workers into the wholesale and retail industry compared to other industries. Such poorly balanced internal competencies have translated into a measurable weakness in adaptive capability within the industry.

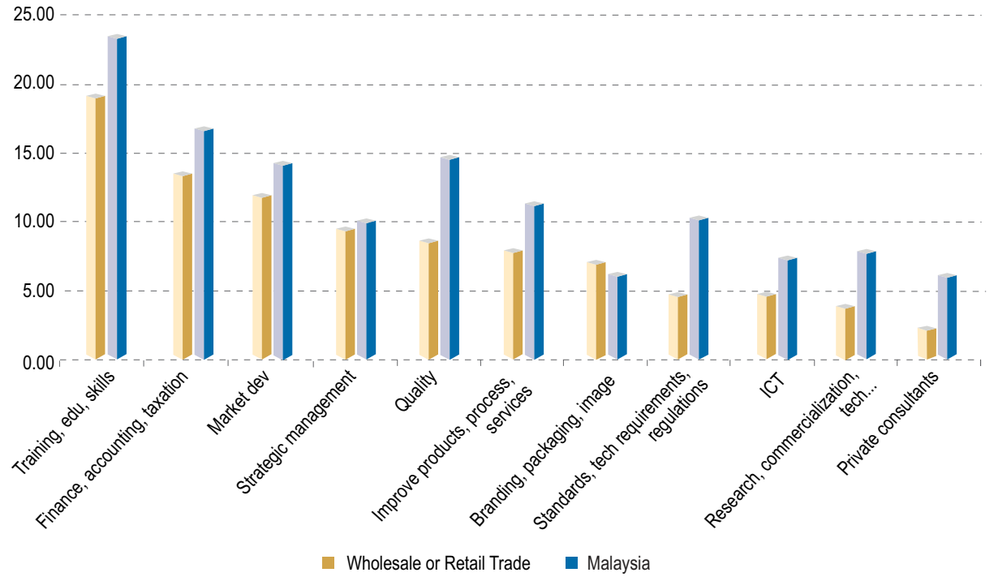
Figure 21.11: Skills Profile of the Wholesale and Retail Industry



Suria KLCC Mall in Kuala Lumpur

A number of institutes and agencies (e.g., government, university and associations) provide a range of capability-building assistance and support to the industry. **Figure 21.12** shows firms in the wholesale and retail industry seek highest level of help in training, educational and skills enhancement activities. They also receive help in marketing and strategic management. To a lesser extent the industry receives help with improving standards, and branding and image improvement. Although the wholesale and retail industry receives assistance across a wide range of activities, the industry scores much lower than the national aggregate across all activities (except branding, packaging and image improvement).

Figure 21.12: Role of Institutional Environment in Skill Building of the Wholesale and Retail Industry

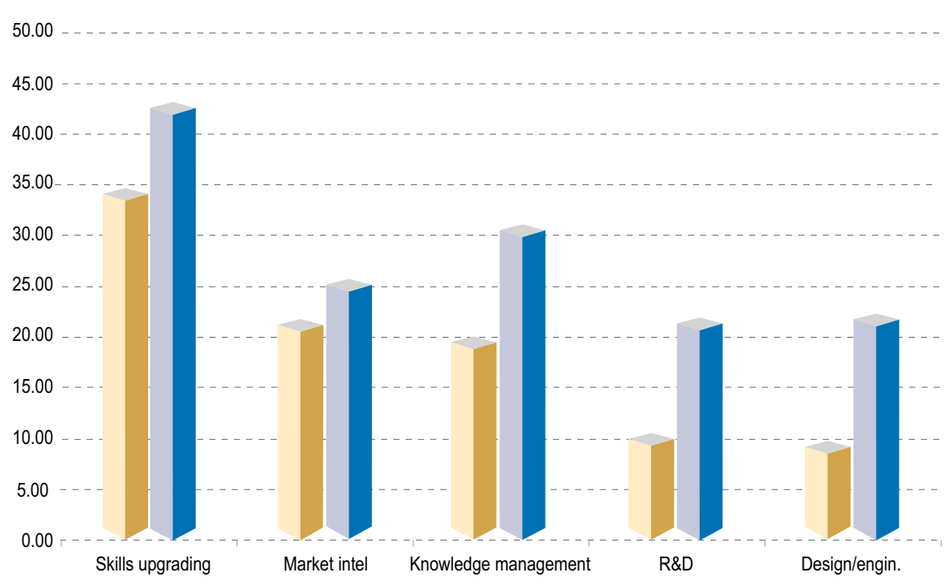


21.5.3 Innovative Capability

Innovative capabilities relate to execution of processes that bring together knowledge to create innovation internal to the firm and also new products and services for the marketplace. The wholesale and retail industry demonstrates low innovative capabilities, suggesting a limited ability to integrate knowledge with other resources within the firm to create new products and innovations. Given the industry's weakness in absorbing knowledge, as well as low resource investment in processes and people to make use of knowledge internally, firms in the industry are constrained in their ability to enter international markets with new product and service offerings.

The wholesale and retail industry shows low levels of engagement in developing innovative capability compared to the Malaysian industry aggregate (see **Figure 21.9**). Wholesale and retail firms have significantly lower levels of investment in R&D and design engineering, and are engage weakly in knowledge management. Firms in the industry also show lower skill upgrading activity.

Figure 21.13: Knowledge Intensive Activities in the Wholesale and Retail Industry

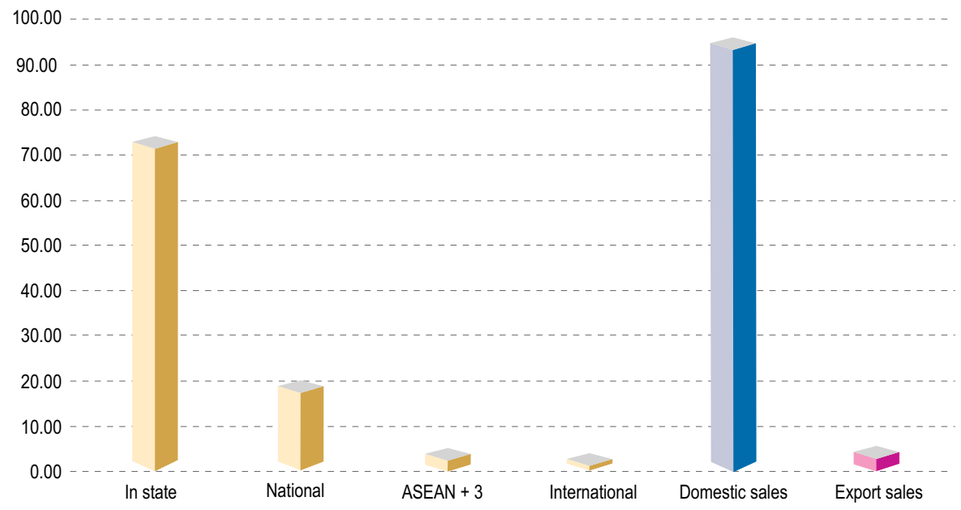


21.6 Outcomes of Dynamic Capabilities in the Wholesale and Retail Industry

Firms in the wholesale and retail industry gain around 94.35% of their revenues from the home market. Furthermore, 81.84% of the revenues are generated from within the state sales. Export sales are small and mostly derived from the regional market (ASEAN plus Japan, China and South Korea) which accounts for 4.31%. International sales account for only 1.34%, indicating a weak presence of Malaysian wholesale and retail companies in both regional and international markets.

Due to weakness in knowledge resource foundations, the wholesale and retail industry exhibits low absorptive, adaptive and innovative capabilities. This handicap in dynamic capabilities spills over in weak level of process improvement as well as weak product-market development (**Figure 21.9**). Although to some extent, firms in the wholesale and retail industry have improved their marketing activity, they remain weak in terms of adopting new technologies to improve their key processes and operations. As for product-market development, the wholesale and retail industry performs slightly below Malaysia industry aggregate.

Figure 21.14: Market Presence of the Wholesale and Retail Industry



Note: The results are based on survey data.

Figure 21.15: Strategic Profile of Firms in the Wholesale and Retail Industry

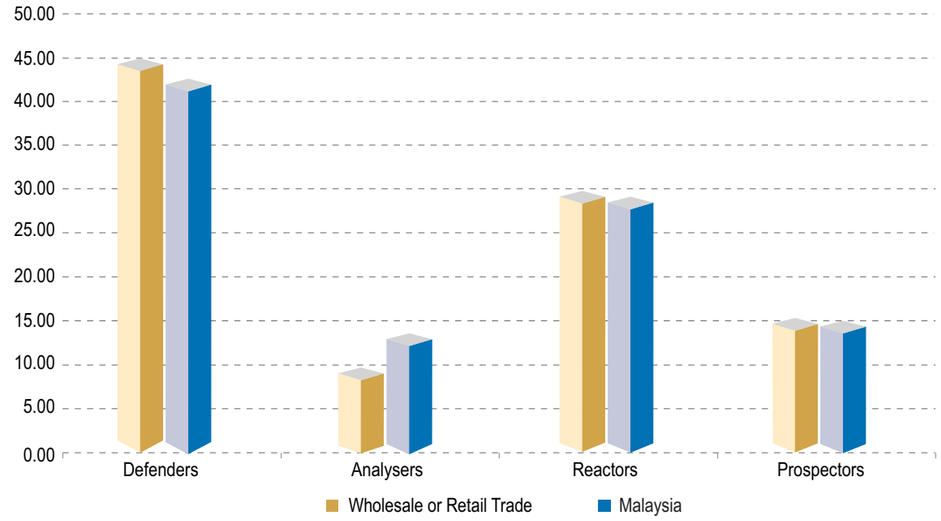


Figure 21.15 shows the strategic profile of firms in the wholesale and retail industry. There is a prevalence of Defenders (45.16%) and Reactors (29.84%). Defender companies do not focus on innovation but concentrate on reinforcing existing products and services. Reactor firms are generally backward-looking and only make changes when they are forced by overwhelming market circumstances. Overall, the wholesale and retail industry has strong presence of Defender and Reactor firms (total of 75%). These firms are not market innovators and do not take risks by exploring new business and technological avenues. Both Defenders and Reactor firm feature at a higher level than the Malaysian aggregate.

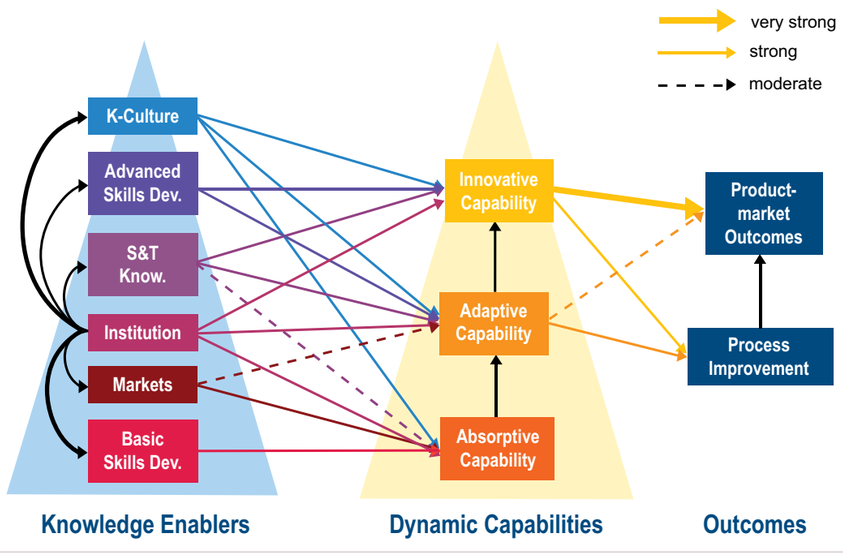
The third largest group in the industry is Prospector firms. Prospectors are highly innovative companies but only make up 15.32% of firms in the industry. The industry, however, has a higher representation of prospectors compared to the national aggregate showing some promise that dynamic capability building efforts in the industry can help increase the level of innovation and number of innovative firms into the future. Finally, the smallest group is Analyser firms (9.68%). The wholesale and retail industry has lower number of Analysers than the national aggregate.

21.7 Relationships between the Key Blueprints of the Wholesale and Retail Trade Knowledge Ecosystem

In this section, the relationship between the knowledge enablers, dynamic capabilities, and economic outcomes for the knowledge ecosystem in the wholesale and retail trade industry is scrutinised. Analyses and comparisons are made between the knowledge ecosystem of the wholesale and retail trade industry in Malaysia and in advanced sector countries (e.g., Japan, Singapore, United Kingdom, and United States). The knowledge content and outcomes observed from the wholesale and retail trade industry suggest that the industry is an Imitator.

Figure 21.16 provides an illustration of the knowledge ecosystem for the wholesale and retail trade industry in advanced sector countries. From this figure, it is observed that the knowledge enablers in advanced sector countries appear to be very rich and strong in their nurturance of dynamic capabilities. Moreover, in these countries, wholesalers and retailers possess a strong foundation in absorbability capability that feeds into and enriches both adaptive and innovative capabilities, whereby the strength in absorptive, adaptive, and innovative capabilities enables these firms to innovatively simplify the purchasing process that individual and business customers go through at wholesale and retail stores and creatively enhance the shopping value and purchasing experience of these customers.

Figure 21.16: Knowledge Ecosystem of the Wholesale and Retail Trade Industry in Advanced Country



Note: Very strong impacts are represented by the bolded line, strong impacts are represented by normal lines and moderate impacts are represented by dotted lines.

Figure 21.17 presents an illustration of the knowledge ecosystem for the wholesale and retail trade industry in Malaysia. From this figure, it can be observed that the knowledge enablers supporting absorptive, adaptive, and innovative capabilities in the wholesale and retail trade industry in Malaysia appear to be weak (i.e., incapable of creating sufficient depth in these components of dynamic capability so that creative and innovative customer-centric outcomes can be produced). **Table 21.2** provides a detail comparison of the strengths of the knowledge ecosystem for the wholesale and retail trade industry in advanced sector countries and in Malaysia.

Figure 21.17: Knowledge Ecosystem of Wholesale and Retail Trade Industry in Malaysia

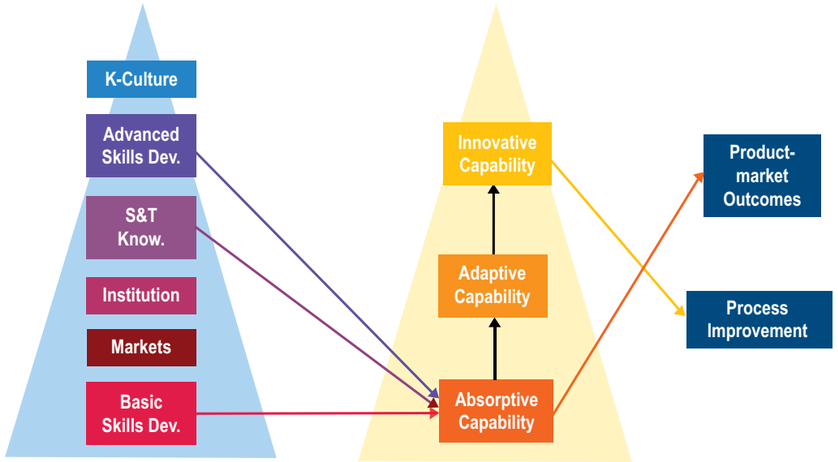


Table 21.2: Knowledge Enablers and Dynamic Capabilities for the Wholesale and Retail Trade Industry

Advanced Countries	Malaysia
Basic skills produce a **positive and strong impact** on absorptive capability. In advanced sector countries, the wholesale and retail trade industry is a major source of income. Core skills are regularly enhanced with the help of and contribution from significant investments toward continuous and timely updating of knowledge in curriculums delivered by community colleges, technical colleges, polytechnics, and universities. The wholesale and retail trade industry is knowledge and technology intensive in which continuous development is present. Due to regular technological shifts in the industry, wholesalers and retailers need keep abreast of the new avenues that can be useful to better reach and serve target customers, such as smart mobile	Basic skills produce a **significant impact** on absorptive capability. In Malaysia, the wholesale and retail trade industry is labour intensive – a significant number of foreign labour from neighbouring countries are employed, and thus the transient nature of this workforce causes many wholesalers and retailers to be reluctant when it comes to investments for training and development. It should be noted, nonetheless, that a certain level of training is required to enable the productive use of the workforce. Moreover, the high dependence on foreign workers, especially those who have acquired skills and experience over time, creates leakage in the system when foreign work permits expire.

Table 21.2: Knowledge Enablers and Dynamic Capabilities for the Wholesale and Retail Trade Industry (cont'd)

Advanced Countries	Malaysia
shopping applications and contemporary online shopping platforms (e.g. group buying websites). This can be done through close collaborations with relevant stakeholders, such as educational institutions and digital media agencies. Besides that, the training and modernising of skills among talent in the workforce is commonly carried out in order for wholesalers and retailers in advanced sector countries to maintain global lead and competitiveness.	
Market intelligence produces a **positive and strong impact** on absorptive capability and a positive and moderate impact on adaptive capability. In advanced sector countries, suppliers, customers, competitors, external consultants, and R&D centres are key stakeholders of market intelligence for the wholesale and retail trade industry. These stakeholders are often seen to collaborate proactively and facilitate the process of absorption and adaptation of new knowledge, technology, systems, and processes. Among the drivers of the wholesale and retail trade industry in advanced sector countries include productive efficiency and new technologies, which are often driven by significant investment in R&D by both public and private institutions.	Market intelligence **does not produce any significant impact** on absorptive, adaptive, and innovative capabilities. In Malaysia, interactions among the key stakeholders of market intelligence for the wholesale and retail trade industry is patchy and fragmented. Individual and business customers are perceived to be price sensitive. Most wholesalers and retailers in Malaysia provide offerings that are similar to other wholesalers and retailers at the lowest cost.
Institutions represent **strong enablers** of the knowledge ecosystem and produce a **direct strong and positive impact** on absorptive, adaptive, and innovative capabilities. In advanced sector countries, a rich tapestry of support from the state and local authorities and agencies contributes to encouraging different institutions to come together to create significantly positive impact that drives the wholesale and retail trade industry. Concerted efforts to develop knowledge-based capabilities are present, and a significant level of incentives (fiscal and non-fiscal) are offered to government research institutions (GRI), universities, regulators, and	Institutions produce an **indirect impact on the enablers**, but **no significant direct impact** on absorptive, adaptive, and innovative capabilities. In Malaysia, regulators, trade association, universities, and government agencies play key roles in developing and progressing the wholesale and retail trade industry to a globally competitive level. Unfortunately, these institutions have been unable to sufficiently develop absorptive, adaptive, and innovative capabilities of wholesalers and retailers in the nation, which may be attributed to the industry's weaknesses in attracting and retaining the quantity and quality of intellectual

Table 21.2: Knowledge Enablers and Dynamic Capabilities for the Wholesale and Retail Trade Industry (cont'd)

Advanced Countries	Malaysia
trade associations to encourage greater and closer collaborations with one another and to dovetail their strengths to maximise the impact in producing a vibrant and strong wholesale and retail trade ecosystem with strong firm level dynamic capabilities.	capital. Perceptions of working in the wholesale and retail trade industry are often undesirable – many perceive jobs in this industry as boring due to routine processes and job roles. This makes it difficult for wholesalers and retailers to acquire talent from the pipeline of local talent.
S&T knowledge produces a **positive and moderate impact** on absorptive capability, but a **positive and strong impact** on adaptive and innovative capability. In advanced sector countries, the wholesale and retail trade industry has a large presence of basic and applied R&D activities to help wholesalers and retailers to deliver their offerings to individual and business customers more efficiently and attractively. Significant resources are invested to ensure global competitiveness of the wholesale and retail trade industry in these countries, such as continuous upgrading of technological infrastructure and R&D capabilities of leading research centres and universities. This ensures wholesalers and retailers have access to leading edge fundamental advances, encouraging support between industries to undertake R&D and commercialisation activities by working hand in hand with research universities, centres, and global players. This helps dovetail industry-university-government partnerships to ensure R&D and education are relevant to all stakeholders and diverse industries, and also support the development of small and medium sized wholesalers and retailers.	S&T knowledge produces a **positive and strong impact** on absorptive capability. In Malaysia, basic and applied R&D activities is relatively weak in the wholesale and retail trade industry. There is a shortage of talented workers in key research priority areas and a weak industry-university partnership. These weaknesses have caused wholesalers and retailers in Malaysia to depend heavily on foreign technology and know-how in value creation activities. S&T knowledge in the wholesale and retail trade industry is often directed toward improving absorptive capacity, which may be due to insufficient financial resources among many small and medium sized wholesalers and retailers to undertake R&D to adapt and modify existing technology. Many wholesalers and retailers in Malaysia are risk averse and prefer to use technology that has wider market acceptability and viability, such as inventory and procurement systems that are only available at physical wholesale and retail outlets instead of those that are accessible online through web based and cloud systems. Most of their available resources are used to train workers in the use of foreign technology.
Advanced skills produce a **positive and strong impact** on innovative and adaptive capabilities. In advanced sector countries, the strengthening of fundamental research in technology-related wholesaling and retailing solutions, including the derivative applications arising out of the advances,	Advanced skills produce **a positive and significant impact** on absorptive capability. In Malaysia, considerable effort and resources have been invested to increase technical activities and improve advanced skills in the wholesale and retail trade industry. However, the graduates and talent

Table 21.2: Knowledge Enablers and Dynamic Capabilities for the Wholesale and Retail Trade Industry (cont'd)

Advanced Countries	Malaysia
is supported by significant investments. Education and research programs are supported with substantial incentive schemes to develop high level skills, and subsequently to attract and retain the best talent within the wholesale and retail trade industry. Strong engagement between universities and the industry ensures that wholesalers and retailers that operate in advanced sector countries are able to translate technical advances into attractive and effective purchasing and service processes and offerings. Strong linkages between key stakeholders is also present, which help to close the 'knowledge-commercialisation chasm', thereby facilitating enhancement of adaptive and innovative capabilities of all economic agents in the wholesale and retail trade industry.	produced simply adapt existing technology and knowledge developed by leading foreign centres of excellence or MNCs. Only a few local wholesalers and retailers engage in cutting-edge distribution and logistics and retail formats that the top talent considers to be attractive enough opportunity for them to deploy and practice their skills. As a result of the shortage of highly specialised and lacking an environment within which top talent is able to exercise it's their advanced skills leads to a serious 'brain-drain' that hampers the potential of building higher level adaptive and innovative capabilities.
Knowledge culture produces a **positive and strong impact** on absorptive, adaptive, and innovative capabilities. In advanced sector countries, the wholesale and retail trade industry is characterised with a strong knowledge culture of sharing and working collaboratively with different stakeholders. Wholesalers, retailers, and relevant stakeholders are well informed about key developments, market conditions, and innovations that are taking place in domestic and international markets. This is due a wide accessibility and availability of information and data from government and trade associations, and the considerable information and knowledge processing that takes place to facilitate informed choices and decisions. A strong coupling between government agencies, trade/industry associations, and universities inherently contributes to strong flows of knowledge and sharing of best practices in the wholesale and retail trade industry, such as those related to inventory and procurement systems, in advanced sector countries.	Knowledge culture produces a **no significant impact** on absorptive, adaptive, and innovative capabilities. In Malaysia, knowledge competency and knowledge sharing is relatively poor among stakeholders in the wholesale and retail trade industry. This may be attributed to a competitive mentality that pervades the industry as most wholesalers and retailers primarily compete on price. There is also a strong reliance on the government, suppliers, and other intermediaries for information, technology, and knowledge, made worse by a culture of dependency, especially among SMEs. These features combine to create negative spill-over effects, which hinder innovative capability of wholesalers and retailers in Malaysia.

Table 21.2: Knowledge Enablers and Dynamic Capabilities for the Wholesale and Retail Trade Industry (cont'd)

Advanced Countries	Malaysia
The continuum from absorptive capability to adaptive capability to innovative capability is **present and strong.** In advanced sector countries, the wholesale and retail trade industry is considered as a key driver to the national economy, which explains its inclusion in national strategic priorities. A significant amount of resources is invested to ensure that the wholesale and retail trade industry remain productive and competitive, which in turn contributes to nurturing strong capability building efforts that ensures all components aspects of the industry are not only enforce but also mutually reinforce each other for competitive advantage.	The continuum from absorptive capability to adaptive capability to innovative capability i**s present.** In Malaysia, significant weaknesses in the nature and strength of dynamic capabilities continue to persist even though significance investments have been allocated. Most often, the cream of the crop in terms of talent in Malaysia are hired by MNCs and firms from foreign countries that are attractive since they are able to offer organisational environments and rewards that commensurate with their skills and contributions. As such, many of the local talent that remain in Malaysia are geared toward modifications of foreign technology even if they have the necessary skills to innovate. This highlights the risk averse proclivity of wholesalers and retailers in Malaysia.

Table 21.3 provides a summary of the impact of dynamic capabilities on economic outcomes for the wholesale and retail trade industry for both advanced sector countries and Malaysia. More specifically, in advanced sector countries, adaptive capability produces a positive and strong impact on process improvements and a positive and moderate impact on product market outcomes, and innovative capability produces a positive and strong impact on process improvement and a very strong impact to product market outcomes. Most notably, process innovation produces a strong feed into the development of improved wholesale and retail trade offerings. As such, the wholesale and retail trade industry is regarded as an important driver of efficiencies and innovations in advanced sector countries.

In contrast, in Malaysia, absorptive capability influences the release of wholesale and retail trade innovations that are imitative of others, and the innovative capability is mainly geared toward process improvements. This suggests that the mainstay focus of wholesalers and retailers in Malaysia is to reduce costs of providing imitative offerings based on innovations developed by others. In particular, wholesalers and retailers in Malaysia commonly deploy a range of strategies, such as employing cheap foreign labour and purchasing technology and innovations produced by others, in driving their systems and processes to become cost efficient and competitive.

Table 21.3: Dynamic Capabilities and Economic Outcomes for the Wholesale and Retail Trade Industry

Advanced Countries	Malaysia
Adaptive capability produces a **positive and strong impact** on process improvement and a **positive and moderate impact** on product market development. In advanced sector countries, various wholesalers and retailers operate at differing levels of the innovation value chain. Most wholesalers and retailers, even SMEs, are very strong in adapting new technology and innovations to improve on the delivery of their offerings. In addition, wholesalers and retailers play a key role in becoming a key contact point for materials required by firms in other industries.	Absorptive capability produces a **positive and strong impact** on product-market innovation. In Malaysia, stakeholders in the other industries that rely on the supply of products from wholesalers and retailers receive imitative service offerings. Foreign technology and innovations are absorbed and used to churn out service offerings that are generic versions of innovations developed by others. Wholesalers and retailers in Malaysia build their capability by leveraging on the knowledge and technology that are developed by others, especially those from advanced sector countries.
Innovative capability produces a **positive and strong impact** on process improvement and a positive and very strong impact on product market outcomes. In advanced sector countries, significant investment in R&D and skilled workforce by government institutions and universities contribute to development of the wholesale and retail trade industry. This enables wholesalers and retailers to deliver their offerings more efficiently as well as to introduce new innovations and offerings. Thus, many wholesalers and retailers originating from advanced sector countries have global reach and brand presence.	Innovative capability produces a **positive significant impact** on process improvement but **not on** product market development. In Malaysia, wholesalers and retailers adopt new technology and innovations from advanced sector countries. These are used to improve cost-efficiency, service quality, and meet domestic market demand. Unfortunately, little R&D and innovation takes place in the wholesale and retail trade industry in Malaysia.
Process improvement produces a **strong positive impact** on product market outcomes. In advanced sector countries, the wholesale and retail trade industry is driven by a strong linkage between process innovation and product innovation. More specifically, innovations produced by wholesalers and retailers are cost competitive as a positive consequence from their strong focus on continuous improvement of operational and service processes. As such, wholesalers and retailers in advance countries have the ability to translate process improvements into new product and service offerings.	Process improvement does **not produce any impact** product market outcomes. In Malaysia, wholesalers and retailers who engage in process improvements tend to do so by acquiring foreign technology and systems. Though there are some improvements in processes, the potential of creating novel wholesale and retail trade offerings is extremely limited.

21.8 Summary: Key Trends, Challenges, Way Forward and Best Practices

21.8.1 Industry Trends

Overall, the wholesale and retail industry does not show encouraging development in its knowledge resource foundations. In 2014, the industry scored lower than Malaysian industry average on most knowledge resource foundations. From 2007 to 2014, the only knowledge element where the wholesale and retail industry showed progress was infostructure. However, this small success is overshadowed by significant declines in human capabilities and knowledge utilisation.

Given its weak knowledge resource foundation, the wholesale and retail industry does not perform well on dynamic capabilities. The industry scored below Malaysian industry aggregate across all three types of dynamic capabilities. The wholesale and retail industry is one of the weakest industries in learning and knowledge within the country, and its performance with regard to generating innovation outcomes is also below the national aggregate level in both process improvement and product-market development.

Despite major shortcomings in innovation, the wholesale and retail industry remains a big contributor to the Malaysia's economy and an important employer. Moreover, with rising spending power among Malaysians as well as the growth of tourism industry, the future of wholesale and retail industry in Malaysia is promising, at least from a business standpoint. The visible market opportunity has attracted increasing number of well-established global brands to set up in Malaysia. The emergence of global competition, in addition to rising costs of operation, means that local players must take greater measures to improve their knowledge resource foundations and dynamic capabilities, and ultimately create new synergies and efficiencies within their businesses in order to remain viable.

21.8.2 Challenges

The wholesale and retail industry is very important for the Malaysian economy. However, the industry is experiencing a number of challenges that hinder it from becoming a knowledge intensive industry; and these challenges are discussed below.

Institutions:

- The establishment of a variety of associations within the industry often leads to confusion and complacency in the industry instead of increasing competency and capabilities. There is a lack of clarity of "voice" making it difficult to chart a direction that is mutually beneficial for all stakeholders.

- Lack of coordination and collaboration between the key agencies and institutions in the industry. Lacking co-ordination, the industry players adopt an individualistic and "silo" mentality.

- Institutions such as universities, colleges, training schools are accorded low priority in employment of worker for the industry. It primarily recruits low skills and unspecialised workforce. Heavy reliance on foreign workforce also contributes to lower importance being given to the educational sector for the future wellbeing of the industry.

Basic Skills Development:

- Employees in this sector make up the biggest slice of Malaysia's total workforce making it an economically crucial sector for Malaysia. Yet, there is significant lack of initiatives for the development and upgrading of the workforce.

- Heavy reliance on foreign workers introduces language proficiency issues, especially in the English language.

Advanced Skills Development:

- Large retailers require professional staff who are bright, motivated and capable individuals with a range of personal and technical and marketing skills. However, most of the graduates in retail and wholesale lack experience and specialist knowledge of retailing and wholesale industry and the key technologies that underpin them.

- The industry is plagued with high turnover rate of the workforce. Many job hop from one industry to another since they are unable to identify long term career prospects. The structure of careers makes worker highly transient.

- SMEs do not see the importance of having professional staff. They rely heavily on foreign workers due to the emphasis on low costs and setup of the industry.

S&T Knowledge:

- Weak R&D within the industry. Industry players do not see the need to engage in R&D since the retail and wholesale is not perceived to be technologically driven.

- S&T knowledge is limited to adapting and modifying existing technology. Strong preference to only use technology that has already been established within the market (mostly foreign technology).

- There is significant shortage of S&T workforce across a range of research priority areas. This problem has become pressing because industry players' lack of market and technological foresight. Hence they are unable to proactively plan for the future.

Market Intelligence:

- Fierce competition between large players and SMEs in both retail and wholesale industry due to lack of differentiated positioning.

- Retailers rely heavily on price reduction as a major promotional tool.

- The industry is subjected to cumbersome rules and regulations creating lethargy rather than nimble adaptation to change.

- Firms are not savvy in using ICT to gain market intelligence and knowledge from the suppliers, customers and other external players.

Knowledge Culture:

- Poor knowledge sharing among stakeholders in the industry.

- Strong competitive mentality practiced by the industry players creates a narrow silo-mentality across the spread of the industry: micro, small, medium and large firms all fail to see the collective benefit of charting long run strategic development of the industry.

- Over reliance on government, suppliers and other intermediaries for information, technology and knowledge. The culture of dependency hinders efforts to develop innovative capability of the firm as well as the industry.

21.8.3 Way Forward

To move up the knowledge and innovation value chain, the Malaysian wholesale and retail industry should improve a number of factors that impact the knowledge intensity and competitiveness of the industry. Key areas of improvements are discussed below.

Recommendation 21.1: Create ICT Based Retail Environment

- Equip the industry with the necessary technological sophistication to facilitate the transition to a "cashless society."

- Institutional stakeholders need to support the transition to high-tech retail and wholesale environment by making available financial assistance and incentives (e.g., tax relief) for technological upgrading.

- Technological infrastructure needs to be built to support the industry's move towards ICT, including adhering to competitive international standards for seamless transactions.

- Provision of training to develop skills that make SMEs ready for ICT based environment.

- Improve and upscale support platforms available for online retailing and wholesale. Issues of internet security, scams, etc. need to be tackled to create investor and customer confidence to conduct online transactions (e.g. Groupon, Lazada, 11 Street, etc.).

Recommendation 21.2: Improve the Quality and Skills of Workers in the Industry

- Training and development of both local and foreign workers is required to ensure those recruited by the retail and wholesale industries are competent enough to contribute to creative and innovative outcomes.

- Work permits for foreign workers should be granted based on satisfying the specific human capital needs of the industry. Institutional agencies need to work in close collaboration with industry to help fill shortfalls in the workforce.

- Industry needs to work closely with educational institutions to ensure that courses and programmes offered to local graduates create the range of skills and at a level required by industry. Imperative that the industry has a resilient and professional workforce capable of delivering highest level of service quality as well as high competency in new technologies driving the retail and wholesale sector.

- The industry and relevant institutions should work towards creating a positive outlook within the industry through wage/salary revisions, structured career pathways. This is required to attract skilled graduates to the industry, who will drive innovation and enhance technological capabilities.

Recommendation 21.3: Promote the Malaysian Experience while Making Malaysia an International Shopping Haven

- Create an attractive and conducive shopping environment and experience for foreign tourists and local shoppers by identifying the types of experiences required by different segments.

- Alongside conventional franchise of international brands, it is imperative to create strong local brands through the crafting of effective marketing strategies. This will help establish a stronger footing for local firms and SMEs. Strong brand building is required to penetrate international markets and help the industry become a net wealth contributor and not just a consumer of foreign products.

- Establish a few really outstanding global brands, and position others products and services around the premium identity that they create. Investigate brand building opportunities through systematic market research. Sources such as local handicrafts, batik, locally made foods and beverages (e.g, Tongkat Ali), and holiday destinations with pristine coral reefs are good starting point exercises in local brand building.

- Provide platforms for firms to showcase their products and R&D development to the local and foreign market through EXPOs, exhibitions, fairs and roadshows (e.g. MIHAS showcase, Trade Shows & Fairs, ARCHIDEX, MIFF, MATRADE etc.). The platforms provide opportunity for the local industry to expand their business and clientele to foreign markets. However, the platforms must be manned by individuals with high expertise, depth of knowledge and marketing skills to promote Malaysian products and services.

Recommendation 21.4: Town and Urban Planning for Enhanced Customer Experiences

- Strategically planned geographic dispersion of different type of retailers and wholesalers to facilitate balanced growth and access throughout the industry and country.

- Systematic civic planning and infrastructure planning to facilitate growth and establishments of shopping malls, hypermarkets and retail shops and business centres for a continuous growth of the industry.

- Significant investment towards the development of proper infrastructure to promote and protect both local retailers and wholesalers (e.g. GM Klang, wholesale markets and factories etc.) as well as open the market for foreign retailers for healthy and vigorous development of the industry to attain international standards.

21.8.4 Best Practices

The wholesale and retail industry has the potential to grow and become a major contributor to the national economy. However, competition for talent and markets from regional economies have intensified as more countries adopt more sophisticated technology, improve their manpower training and more effective governance systems. For the industry to increase its knowledge content, the local industry should emulate some of the best practices in pace-setter countries. Some of the best practices in the pace-setter countries are discussed below.

Best Practice 21.1: Create ICT Based Retail Environment

Firms in the industry are transitioning to a "cashless society" by making transactions frictionless and secure for both consumers and merchants. The industry is also moving toward seamless tracking using RFID and express self-checkout.

Global Online Business in China

China is the second largest retail market in the world after the United States of America. Rapid development of the industry is due to intensifying ICT use within the industry. A number of policies were implemented to speed up e-commerce and online business development. Among the key initiatives include the following:

- The government put in place a plan to speed up the development of E-Commerce in a systematic and holistic way. The E-commerce plan was seen as a key source of promoting employment and an important impetus to speed up the development of the wholesale and retail industry using the digital economy.

- Key departments such as General Administration of Quality Supervision Inspection and Quarantine (AQSIQ) and Administration of Foreign Exchange were working in collaboration to support the development cross border e-commerce. Among the key initiatives include all day (24 hours) custom clearance using the digital medium to support cross-border e-commerce from May 2015 onwards. A plan is also in place to accelerate systems and mechanisms for inspection and quarantine activities, and a record management system for all cross-border e-commerce activities.

- In 2015, the State Administration of Foreign Exchange (SAFE) proposed a plan to rollout a cross-border foreign exchange payment system, increasing the quantum per online transaction from USD10,000 to USD50,000 (State Administration of Foreign Exchange, 2015).

- As the e-commerce and online infrastructure, regulations and support systems improved, the corporate sector started to play a more dominant role in facilitating e-commerce and online activities. General improvement in the ecosystem saw the emergence of Alibaba of China, a major global e-commerce company and its various online business facilitation services. Alibaba business model includes consumer-to-consumer, business-to-consumer and business-to-business sales services via its web portals. The portal provides online sales and service to consumers regardless of size of the transactions. It also has a wider reach than most retail stores or portals to customers.

Best Practice 21.2: Improve the Quality and Skills of Workers in the Industry

Retail Sector Manpower Plan in Singapore

- The retail industry is an important sector that contributed to 1.4% of the GDP and employed close to 125,000 workers in 2014 (SPRING Singapore & Singapore Workforce Development Agency, 2016). To strengthen the industry global competitiveness, a Retail Sectoral Manpower Plan was introduced under the SkillsFuture initiative. The initiative is a collaboration initiative among all institutions (government agencies, unions, employers, and education and training institutions) to identify future skills required by the industry and career pathways for individuals planning to enter the industry. The plan addresses the following needs of the industry (SPRING Singapore & Singapore Workforce Development Agency, 2016):
  - *Remodelling businesses & redesigning jobs in the industry:* Able to create a leaner and create high-income jobs; have sustainable growth in income; ability to deploy the workforce relatively quickly; and be more service-focussed. To achieve these objectives, the manpower training should incorporate the following: Use of latest retail technology (lean solutions, RFID and other technology); streamline job functions so that employees can focus on more strategic and value-adding tasks; and, standardisation of HR policies and trainings so that there is a common vision among all units within an organisation and industry.
  - *Strengthening core human resource competencies:* Continuously review current practice using various scientific and diagnostic methods; put in place mechanisms to improve the HR capability and training programs; and ensure they are competitive and meet global best practices.
  - *Supporting transition into retail workforce:* Provide students various career options in the retail industry and provide appropriate training and capability development trainings for fresh graduates. Among the programs in place are grants for internships stipends and access to new graduates, with the institutions involved play a key role in creating a positive image of the industry, ensuring students have a positive internship experience by providing options to work in different areas, coupled with structured capability development programs.
  - *Encouraging continuous learning:* Fore-sighting the future needs of the industry and ensure deepening and mastery of skills needed to move the industry up the knowledge and innovation value chain. One of the programs is the Skills Study Award, awards to support early and mid-career workers to develop specialist skills in key priority areas such as e-commerce, digital marketing and data analytics.

Best Practice 21.3: Promote the Malaysian Experience while Making Malaysia an International Shopping Haven

Creating a Shopping Haven by Building Integrated City Community

- The Sunway Group has created Bandar Sunway by thinking through all the different components necessary to create a vibrant city community.

- Sunway Group's 800-acre Sunway Resort City is the country's first fully integrated green township as certified by the Green Building Index (GBI) of Malaysia. It has transformed the former tin mining wasteland into one of Malaysia's premier example of urban town planning.

- Bandar Sunway boasts a comprehensive network of roadways, elevated mass transit, public transport systems and covered pedestrian walkways that link the retail hub to the customer catchment areas consisting of residential, educational, work and health service locations.

- Sunway Resort City has also established itself as an iconic tourist destination in the form of Sunway Lagoon, which contributes significantly to tourist arrivals from within and outside the country. The tourist arrivals contribute to a vibrant retail culture that has become an important source of income for the region and nation.

Best Practice 21.4: Town and Urban Planning for Enhanced Customer Experiences

Creating Immersive Experiences: Walt Disney Company

- The Walt Disney Company is a major theme-park and entertainment/movie company that has created a major presence in the retail space. The company has strong global retail sales and in 2013 has a sales close to $40.9 billion, across 340 stores in the US and Europe and other sales channels worldwide (License Global, 2014).

- The Disney retail stores continuously innovate to provide customers an "experience" similar to visiting a Disney theme park. Through branding and innovative design of the stores and products, customers forget that they are entering a store, but a location that is entertaining and brings to the consumer nostalgia associated with Disney characters. The 'experiential lock-in' is intergenerational, where it is passed on to the next generation; and forms the source of sustainable growth for the Disney franchise of companies.

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CHAPTER 23
Conclusion

Phase 1 of this study examined the state of development of the knowledge ecosystems for the 21 industries in Malaysia. Based on the analysis of the knowledge ecosystems, the state of the development of Malaysia's knowledge economy vis-à-vis a comparison to more developed countries can be ascertained. Weaknesses in the knowledge ecosystems of each of the 21 industries were identified and the report sought to provide guidance to the development of the way forward to improve the ecosystem in these industries.

In this chapter, we will adopt a macro view to inspect Malaysia's knowledge economy based on quantitative and qualitative data analysis in order to define cross-cutting issues and the thematic underpinnings of the economy that span different sectors. To enable the discussion, we begin with a summary of the 21 industries by presenting an overall mapping of their knowledge content and innovation. This mapping interlinks with the knowledge flows across industries, and highlights the enabling and support inter-dependencies of one industry with another. We also comparatively summarise the knowledge ecosystems of more advanced countries and that of Malaysia. The process of comparative benchmarking provides valuable insights on the gaps in Malaysia's overall knowledge ecosystem as well as those in the 21 industries. Based on the identified gaps, key challenges facing the Malaysian economy are identified and strategies to transform Malaysia into a high income knowledge economy are proposed.

23.1 Knowledge Content and Innovation

The knowledge content, innovative capacity and knowledge flows of firms in the 21 industries is captured by examining innovative capacities of firms, measured by technology innovation and overall innovation. **Table 23.1** shows that firms in industries with highest knowledge content (K-score) are also the ones that register the highest technological innovation and overall innovation. Technological Innovation is defined as developing technologically new or significantly improved products or processes or both. The broader measure of overall innovation not only captures innovation in products or processes, but also improvements in internal management, organisational methods, marketing concepts and business strategies.

Table 23.1: Knowledge Content and Innovative Capacity of Firms

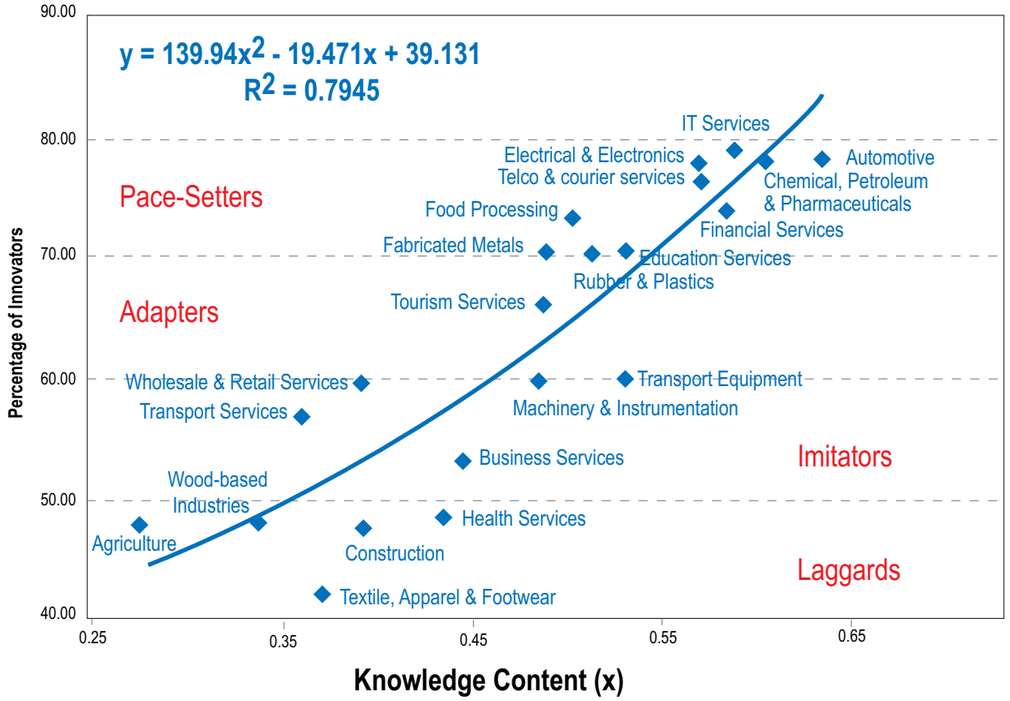
	Number of firms	Average K-score	Technology Innovators	Technology Innovators %	Technology Innovators K-score	Innovators	Innovators %	Innovators K-score	Non-Innovators	Non-Innovators %	Non-Innovators K-score
Automotive	69	0.64	49	71.01	0.70	54	78.26	0.69	15	21.74	0.43
Chem, Pet, Pharma	100	0.61	65	65.00	0.67	78	78.00	0.65	22	22.00	0.44
IT Services	66	0.59	44	66.67	0.65	52	78.79	0.62	14	21.21	0.47
Finance Services	23	0.59	10	43.48	0.65	17	73.91	0.61	6	26.09	0.52
Teleco & Courier Services	30	0.57	13	43.33	0.64	23	76.67	0.62	7	23.33	0.42
Electrical and Electronic	125	0.57	75	60.00	0.61	97	77.60	0.60	28	22.40	0.47
Transport Equipment	40	0.53	22	55.00	0.65	24	60.00	0.66	16	40.00	0.35
Education Services	58	0.53	30	51.72	0.64	41	70.69	0.62	17	29.31	0.31
Rubber and Plastic Products	148	0.51	89	60.14	0.56	104	70.27	0.57	44	29.73	0.39
Food Processing	157	0.50	97	61.78	0.56	115	73.25	0.55	42	26.75	0.39
Fabricated Metals	139	0.49	82	58.99	0.55	98	70.50	0.55	41	29.50	0.36
Tourism Services	165	0.49	71	43.03	0.58	109	66.06	0.56	56	33.94	0.35
Machinery and Instruments	52	0.49	27	51.92	0.57	31	59.62	0.57	21	40.38	0.37
Business Services	253	0.45	88	34.78	0.55	134	52.96	0.53	119	47.04	0.36
Health Services	122	0.44	45	36.89	0.57	59	48.36	0.55	63	51.64	0.33
Construction	217	0.39	59	27.19	0.52	103	47.47	0.49	114	52.53	0.31
Wholesale or Retail Trade	124	0.39	44	35.48	0.49	74	59.68	0.48	50	40.32	0.26
Textile, Apparel and Footwear	76	0.37	22	28.95	0.54	32	42.11	0.51	44	57.89	0.28
Transportation Services	192	0.36	64	33.33	0.50	109	56.77	0.46	83	43.23	0.24
Wood-Based Products	102	0.34	31	30.39	0.47	49	48.04	0.44	53	51.96	0.25
Agriculture	88	0.28	32	36.36	0.38	42	47.73	0.37	46	52.27	0.20

Notes:

1. Technology Innovators are firms that reported having developed technologically new or significant improved products or processes or both.

2. Innovators are firms that reported significant improvements not only in products or processes but also improvements in internal management, organisational methods, marketing concepts or business strategies.

Figure 23.1: Industry Knowledge Content and Innovation Mapping



Note: Innovators are firms that reported significant improvements not only in products or processes, but also in internal management, organizational methods, marketing, concepts and business strategies.

The top three industries with the highest knowledge content are automotive; chemicals, petroleum & pharmaceutical; and IT services. In contrast, the three industries with the lowest knowledge content are agriculture, wood-based products and transportation services. Mapping the knowledge content against the level of innovation, the 21 industries can be divided into four distinct category groupings:

- ***Pace-setters*** – Percentage of innovators range is from 70% to 80%. It comprises the following industries in Malaysia: Food Processing; Chemicals, Petroleum & Pharmaceuticals; Electrical & Electronics; Financial Services; Telecommunications & Courier Services; IT Services; and Automotive.

- ***Adapters*** – Percentage of innovators range is from 60% to 70%. It comprises the following industries: Rubber & Plastic Products; Fabricated Metals; Education Services; and Tourism Services.

- ***Imitators*** – Percentage of innovators a range is from 50% to 60%. It includes the following industries: Transport Equipment; Machinery & Instruments; Transportation Services; Business Services; and Wholesale & Retail.

- ***Laggards*** – Percentage of innovators range is from 40% to 50%. This group includes the following industries: Agriculture; Wood-Based Products; Textile, Apparel & Footwear; Health Services; and Construction sectors.

23.2 Knowledge Flows Across the Different Industries

The mapping and grouping into Pace Setters, Adapters, Imitators and Laggards does not surface inter-linkages that exist between industries. The inter-links between industries can be elucidated by looking at the flow of knowledge between source and recipients. Access to knowledge is critical for a firm to move up the innovation value chain. **Table 23.2** shows that the biggest providers of knowledge are firms from their own industry. Firms also receive knowledge from others from different industries. The intensity of inter- and intra-industry knowledge flows are given in **Table 23.2** with summary of knowledge flows for each sector.

Table 23.2 Source-Acquirer of Knowledge for the 21 Industries in MYKE III

Acquirer \ Source	Agriculture	Food Processing	Chemicals, Petroleum, Pharmaceuticals	Rubber and Plastic Products	Wood-Based Products	Fabricated Metals	Automotive	Transport Equipment	Textile, Apparel and Footwear	Electrical and Electronic	Machinery and Instruments	Education Services	Transportation Services	Finance Services	Tourism Services	Telecommunications and Courier Services	Health Services	IT Services	Business Services	Wholesale or Retail Trade	Construction
Agriculture	28.4	8.0	2.3	1.1	0.0	0.0	0.0	1.1	0.0	0.0	2.3	0.0	5.7	0.0	0.0	1.1	1.1	0.0	8.0	9.1	0.0
Food Processing	16.6	26.8	0.6	1.3	3.0	1.9	0.0	1.9	0.0	1.3	11.5	1.9	0.0	1.9	0.0	0.0	2.5	3.8	8.3	7.0	2.0
Chemicals, Petroleum, Pharmaceuticals	5.0	4.0	35.0	9.0	0.7	3.4	6.8	2.0	0.0	1.0	11.0	4.0	3.4	5.8	2.4	0.0	0.7	0.7	7.0	2.0	2.0
Rubber and Plastic Products	2.7	0.0	4.7	34.5	0.7	3.4	2.0	2.0	0.0	6.1	12.2	0.7	4.9	3.4	0.7	1.4	0.0	0.0	9.5	2.7	5.9
Wood-Based Products	1.0	0.0	1.0	2.0	22.5	25.2	0.0	2.9	1.4	1.0	7.8	1.0	0.7	1.0	0.0	0.0	0.0	0.0	5.9	1.0	11.5
Fabricated Metals	0.7	2.2	4.3	0.7	1.4	25.2	2.9	1.4	0.0	4.3	10.1	0.7	0.7	0.7	0.0	0.0	0.0	0.0	6.5	0.7	1.4
Automotive	0.0	0.0	0.0	4.3	0.0	8.7	42.0	8.7	1.4	4.3	26.1	2.9	0.7	5.8	0.0	0.0	0.0	0.0	7.2	0.0	5.0
Transport Equipment	2.5	0.0	2.5	0.0	0.0	10.0	5.0	25.0	0.0	5.0	17.5	5.0	2.9	2.5	0.0	0.0	0.0	0.0	10.0	0.0	0.0
Textile, Apparel and Footwear	1.3	1.3	1.3	0.0	1.3	0.0	0.0	1.3	18.4	1.3	3.9	0.0	3.9	2.6	1.3	0.0	0.0	0.0	5.3	0.0	0.0
Electrical and Electronic	0.0	0.8	4.0	3.2	0.0	4.0	6.4	0.0	0.0	35.2	18.4	2.4	3.2	2.4	0.0	0.0	0.0	0.0	11.2	0.8	3.2
Machinery and Instruments	1.9	0.0	1.9	0.0	0.0	1.9	1.9	3.8	0.0	7.7	23.1	5.8	3.8	1.9	1.9	0.0	0.0	0.0	7.7	0.0	3.8
Education Services	1.7	0.0	1.7	0.0	0.0	1.7	5.2	1.7	0.0	1.7	3.4	41.4	1.6	8.6	3.4	3.4	0.0	0.0	13.8	3.4	0.0
Transportation Services	0.0	0.0	2.6	0.5	0.5	0.5	2.1	8.9	0.5	1.6	3.1	1.6	19.8	3.1	2.6	3.1	0.0	0.0	4.2	1.0	0.5
Finance Services	8.7	13.0	4.3	8.7	4.3	0.0	4.3	0.0	0.0	4.3	4.3	0.0	3.4	17.4	4.3	0.0	0.0	0.0	4.3	4.3	0.0
Tourism Services	0.6	5.5	1.2	0.0	0.0	0.0	0.0	1.2	0.6	1.8	0.6	3.6	5.5	5.5	39.4	3.6	30.0	0.0	11.5	3.0	10.0
Telecommunications and Courier Services	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.0	0.0	3.3	0.0	3.3	13.3	6.7	0.0	30.0	0.0	13.6	16.7	9.8	18.2
Health Services	0.0	0.0	2.5	0.0	0.0	0.0	0.0	0.0	0.0	0.8	2.5	6.6	0.8	3.3	6.6	0.0	34.4	0.0	18.2	0.0	19.0
IT Services	1.5	0.0	1.5	0.0	0.0	0.0	0.0	0.0	0.0	6.1	1.5	3.0	1.6	9.1	0.0	13.6	0.0	45.5	7.5	3.2	1.8
Business Services	0.0	0.0	1.6	0.8	0.4	0.4	0.4	0.8	0.0	2.4	2.4	2.0	1.6	7.1	1.2	1.6	0.8	0.0	4.8	14.5	0.8
Wholesale or Retail Trade	2.4	2.4	3.2	1.6	0.0	0.8	9.7	1.6	4.0	1.6	5.6	2.4	1.6	2.4	0.8	0.8	1.6	0.0	4.8	14.5	0.5
Construction	0.5	0.0	1.4	0.0	2.3	1.8	0.5	1.4	0.5	3.2	9.7	2.8	0.0	1.8	0.0	0.0	0.0	0.0	7.4	0.5	28.6

The table above shows that there is knowledge-transfer within and across the different industries. These flows are summarised below.

- ***Agriculture:*** agriculture (28.4%); wholesale & retail trade (9.1%); food processing (8.0%); business services (8.0%); and transport services (5.7%);
- ***Food Processing:*** food processing (26.8%); agriculture (16.6%); machinery & instrumentation (11.5%); business services (8.3%) and wholesale & retail (7%);
- ***Chemicals, Petroleum & Pharmaceuticals:*** chemicals, petroleum & pharmaceuticals (35%); machinery & instrumentation (11.0%); rubber &plastic products (9.0%); business services (7%) and wholesale & retail (7%); agriculture (5%);
- ***Rubber and Plastic Products: rubber and plastic products (34.5%);*** machinery & instrumentation (12.2%); business services (5.9%); and electrical & electronics (6.1%);
- ***Wood-based Products:*** wood-based products (22.5%); machinery & instrumentation (7.8%); business services (5.9%) and construction (5.9%);
- ***Fabricated Metals:*** fabricated metals (25.2%); construction (11.5%); and business services (6.5%);
- ***Automotive: automotive (43%);*** machinery & instrumentation (26.1%); fabricated metals (8.7%), transport equipment (8.7%); business services (7.2%) and financial services (5.8%);
- ***Transport Equipment:*** transport equipment (25%); machinery & instruments (17.5%); fabricated metals (10%); business services (10%); construction (5%) and education services (5%);
- ***Textile, Apparel and Footwear:*** textile, apparel and footwear (18.4%); and business services (5.3%);
- ***Electrical & Electronics:*** electrical & electronics (35.2%); machinery & instruments (18.4%); business services (11.2%); IT services (7.2%); and automotive (6.4%);
- ***Machinery & Instruments:*** machinery & instrumentation (23.1%); electrical & electronics (7.7%); business services (7.7%) and education services (5.8%);
- ***Education Services:*** education services (41.4%); IT services (20.7%); business services (13.8%) and automotive (5.2%);
- ***Transportation Services:*** transportation services (19.8%); and transport equipment (8.9%);
- ***Financial Services: financial services (17.4%);*** food processing (13%); agriculture (8.7%) and rubber & plastic products (8.7%);
- ***Tourism Services: tourism services (39.4%);*** IT services (13.3%); business services (11.5%); transportation services (5.5%); finance services (5.5%); and food processing (5.5%);
- ***Telecommunication & Courier Services:*** telecommunication & courier services (30%); business services (16.7%); transportation services (13.3%); transport equipment (10%); wholesale & retail (10%); and finance services (6.7%);
- ***Health Services: health services (34.4%);*** IT services (13.1%); business services (9.8%); finance services (6.6%); and tourism services (6.6%);
- ***IT Services:*** IT services (45.5%); business services (18.2%); telecommunication & courier services (13.6%); finance service (9.1%); electrical & electronics (6.1)%;
- ***Business Services***: business services (19%); construction (10.7%); IT services (7.5%) and finance services (7.1%);
- ***Wholesale & Retail:*** wholesale & retail (14.5%); automotive (9.7%) and machinery & instruments (5.6%);
- ***Construction:*** construction (28.6); machinery & instruments (9.7%) and business services (7.4%).

The knowledge flow analysis between source and recipients indicate that the following industries are important knowledge enablers for the economy at large: IT Services; Business Services; Education Services; Financial Services; Transportation Services; Electrical and Electronics; Machinery and Instrumentation; and Chemical, Petroleum and Pharmaceutical. The enabling industries are a foundational base and must be strong in order to drive the development of inter-linked industries.

23.3 Knowledge Ecosystems of Malaysia and Advanced Countries

Comparing the knowledge ecosystems of advanced countries to that of Malaysia draws out interesting insights on Malaysia's relative position of strength or weakness. **Figure 23.3** shows the knowledge ecosystem of advanced countries based on extensive survey of research literature. Based on the data obtained from Department of Statistics, the knowledge ecosystem for Malaysia is shown in **Figure 23.4**. A summary of the flows between the knowledge enablers and dynamic capabilities is presented in **Table 23.2**. The flows between dynamic capabilities to economic outcomes are summarised in **Table 23.4.**

Figure 23.2: A Developed Country's Knowledge Ecosystem

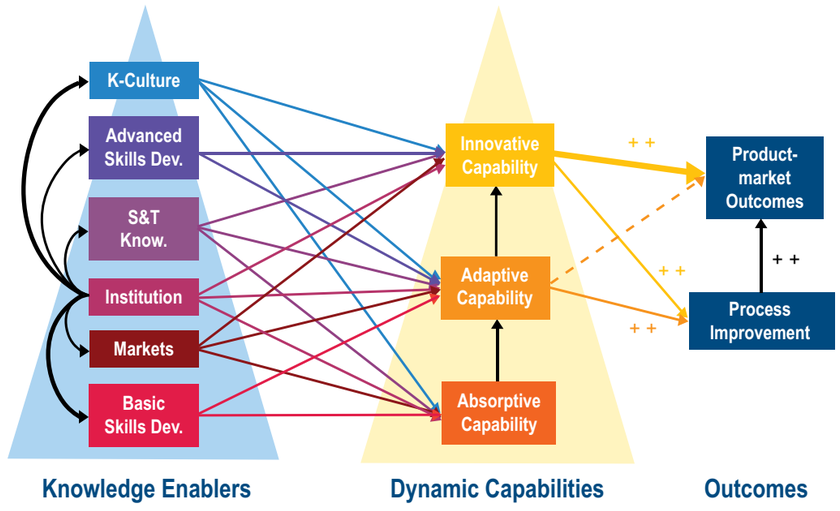


Figure 23.3: Malaysia's Knowledge Ecosystem

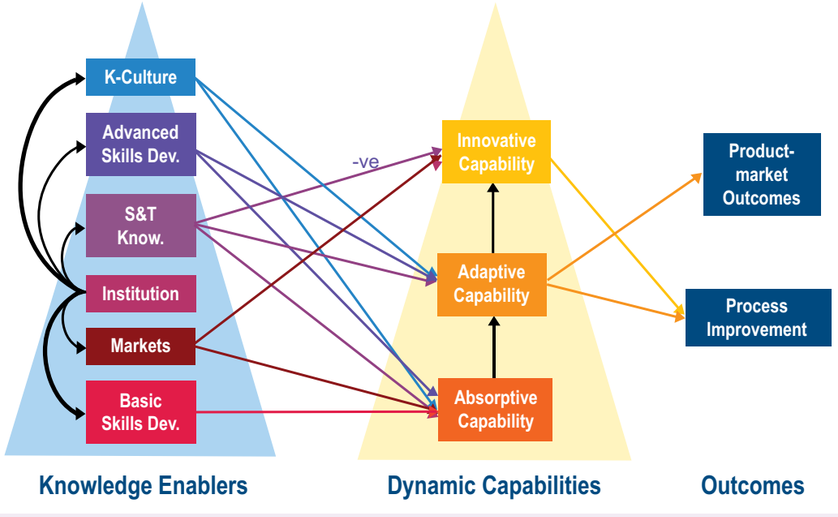


Table 23.3: Knowledge Enablers and Dynamic Capabilities (Overall Economy)

Advanced Countries – Overall Economy	Malaysia – Overall Economy
Basic Skills have a **strong and positive impact** on absorptive and adaptive capability.	Basic Skills have a strong and positive impact on absorptive capability only.
Market Intelligence has a **strong impact** on all three dynamic capability components.	Market Intelligence has a **strong and positive impact** on innovative and adaptive capabilities.
Institutions are **strong enablers** of the knowledge ecosystem and have **direct strong and positive impact** on all three dynamic capability components.	Institutions are **strong enablers** of the knowledge ecosystem. But, institutions **do not impact** the three dynamic capability components directly.
Science and Technological knowledge has a **strong and positive impact** on all three dynamic capability components.	Science and Technological knowledge has a **strong and positive impact** on absorptive and adaptive capabilities. However, Science and Technological knowledge has **a strong and negative impact** on innovative capability. The latter results suggest that S&T knowledge has a **high opportunity** cost on the innovative capability of the country.
Advanced Skills have a **strong and positive impact** on both innovative capability and adaptive capabilities.	Advanced Skills have **strong and positive impact** on adaptive and absorptive capabilities.
Knowledge culture a **strong and positive impact** on all three dynamic capability components.	Knowledge culture has **strong and positive impact** on adaptive and absorptive capabilities only. Knowledge culture **does not impact** innovative capability.
The continuum from absorptive capability to adaptive capability to innovative capability is **present and strong.**	The continuum from absorptive capability to adaptive capability to innovative capability is **present.**

The comparative analysis shows that the knowledge ecosystem of Malaysia is relatively weaker than that of more advanced countries. In particular, knowledge enablers of Malaysia are unable to provide sufficient support for the strong development of adaptive and innovative capabilities among Malaysian firms. As in advanced countries, institutions (government agencies, trade associations and universities) in Malaysia are important enablers of the national knowledge ecosystem. However, in contrast to advanced countries, Malaysian institutions do not play a direct role in influencing the three components of dynamic capability. In advanced countries, institutions play a dual role in nurturing a vibrant knowledge ecosystem as well as exerting strong direct influence in the nurturance of the three dynamic capability components.

The flow from absorptive capability to adaptive capability and innovative capability is present in both advanced countries and in Malaysia. This suggests a hierarchical building blocks structure in the three dynamic capability components. Each one supports and reinforces the effect of the other in a mutually intertwined and dependent manner. Any weakness in one component has an effect on the others. The connections suggest that foundational knowledge in the form of absorptive and adaptive capabilities set the base that helps spur incremental innovations. Further, incremental innovations are, per se, a pathway for driving more advanced innovation.

The interconnected impact of the three dynamic capability components ultimately leads to innovation and economic outcomes. These are summarised in **Table 23.3** for advanced countries and Malaysia.

The analysis in **Table 23.4** shows that Malaysia's knowledge ecosystems primarily generates process outcomes and lower levels of product outcomes compared to more advanced countries. This result is not surprising as the key enablers of Malaysia's knowledge ecosystem primarily contribute to absorptive and to some extent adaptive capabilities, and feature at a much smaller level in the development of innovative capability.

Table 23.4: Dynamic Capabilities and Economic Outcomes (Overall Economy)

Advanced Countries – Overall Economy	Malaysia – Overall Economy
Adaptive capability has a **positive and very strong impact** on process improvement. Adaptive capability also has a **positive and strong impact** on product market outcomes.	Adaptive capability has a **positive and strong impact** on process improvement and a **positive impact** on product market outcomes.
Innovative capability has a **very strong positive impact** on process improvement and product market outcomes.	Innovative capability has a strong **positive impact** on process improvement only.
Process improvement has a **positive and strong impact** on product market outcomes.	Process improvement has **no impact** on product market outcomes.

The comparative analysis shows that the overall knowledge ecosystem of Malaysia is able to generate all three dynamic capabilities at a level such that they are able to achieve process innovation and product development in narrow and niche areas. The analysis of the 21 industries also highlights that Malaysia possesses knowledge intensive and high-tech industries that have the potential to move the economy up the innovation value chain. To ensure that the economy transforms into a knowledge intensive high income economy, five major strategic thrusts require attention. These five strategic thrusts are outlined in brief below.

Strategic Thrust 1: A holistic talent development strategy for a knowledge-intensive economy

The global economy and industrial structure is undergoing rapid transformation due to converging technological platforms. Consequently, industries that exist today may not be around in the next 5 to 10 years. Some of the key global change drivers include the following[9]:

- Demographic Shifts;
- Economic Turbulence;
- Complex Geopolitics – issues of security, environment, and trade liberalisation;
- Business Agenda 3.0 – managing the 'triple bottom line': people, planet and profits;
- Industry 4.0;
- Talent Poaching;
- Disruptive Technologies & Business Models, Networks and Partnerships;
- Science and Technology becoming pervasive in the competitiveness of nations; and
- Natural Resources limitations.

The key question is whether our educational institutions who are training the next generation talent themselves possess the skills to tackle the global challenges; and are in a fit position to power the next generation industries. Or is it the case that our education institutions are simply churning out skills for tomorrows 'sun-set' industries?

To ensure that students and future graduates are capable of transforming Malaysian industry into a knowledge intensive and globally competitive marketplace, there needs to be concerted efforts among all parties to foresight changes taking place in the domestic, regional and global economy. These changes will define the types of jobs that will be created and disappear; and the joint collaborative efforts that will be needed between institutions of learning, industry, industry associations, government agencies and community associations in designing the curriculum at all levels – pre-school to post-doctoral training to meet the creative talent needs of the country.

Mechanisms and institutional infrastructure need to be put in place to facilitate continuous review and refinement of the education and training resource requirement, such that it is closely aligned with industry's future needs. This requires a broad strategy of fostering creativity, agility and mobility of talent such that it is able to bridge current industry needs with prospective future industry needs.

[9]Refer to Talwar and Hancock (2010) and World Economic Forum (2016) on the changing global industrial structure and employment market.

Strategic Thrust 2: Focus and Invest in R&D frontier technologies to enable Malaysian industries to 'leap-frog' to higher innovation value chain

The R&D focus areas in most of Malaysian industries are relatively narrow and uncoordinated. Increasingly converging technological platforms and knowledge systems require inter-disciplinary and inter-industrial collaboration. To move up the innovation value chain, innovation agencies in partnership with relevant ministries, industry associations and other key stakeholders must map key frontier R&D and technologies and the developmental pathways that Malaysia should invest into over the next 10 years to transform its key industries to become globally competitive.

Prioritisation of R&D across all the industrial sectors will be essential for the long-term sustainability of the industries. Concerted effort is needed to identify the state of play of the current ecosystems, gaps and the types of resources required to transform them into vibrant and effective ecosystems. These frontier R&D and technologies should be monitored on a regular basis and refinements should be made to R&D plans to ensure industries are at the fore-front of development.

Strategic Thrust 3: Nurture next-generation leaders to power Malaysia's knowledge economy

As part of the talent development strategy, industry associations in partnership with industries and government agencies must invest in nurturing the next-generation leaders to transform industries to be innovative and globally competitive. One of the best practices in Malaysia in terms of leadership development comes from the Finance sector, where a number of institutes have been specifically established to help the industry become regionally competitive and globally innovative in niche areas, such as Islamic banking and finance.

The strength of the Finance industry best practice originates from the richness of its knowledge ecosystem to develop robust leadership in the niche area of Islamic banking and finance. A number of key agents come into play, and include among them the *Malaysian Insurance Institute (MII), the Institute of Bankers Malaysia (IBBM), Islamic Banking and Finance Institute Malaysia (IBFIM), International Centre for Leadership in Finance (ICLIF), International Centre for Education in Islamic Finance (INCIEF), Financial Sector Talent Enrichment Programme (FSTEP), International Shariah Research Academy for Islamic Finance (ISRA), Financial Institutions Directors' Education Programme (FIDE), and Asian Institute of Finance (AIF).* These institutions were established to ensure the continuous development of talent and leadership in the industry. Strong and visionary leaders will be key drivers for transforming laggard industries into pace-setter industries.

The best practices from the finance industry are an invaluable reminder to other industries of what can be achieved with a systematic approach and when the community of leaders are able to make decisions for the common good of the broader industry and economy instead of focusing solely on short-term spikes in revenue or shareholder value. Leaders of tomorrow need to possess leadership styles that are ambidextrous to balance between short-term needs and long-term sustainability, have high emotional intelligence, and foster a practical wisdom through which they can mentors others to success. Leaders, at all levels, are a vital component in the task of creating a vibrant innovation ecosystem.

Strategic Thrust 4: Strengthen 'quadruple-helix' to create multiplier effect

Strong partnership and a shared common vision among stakeholders (industry, industry associations, government, institutions of learning and community organisations) in an industrial ecosystem are critical factors for raising the dynamic capability and competitiveness of industries. In many advanced countries the lead orchestrators of a cohesive and competitive industrial cluster are government (lead ministry or government agency) and industry players themselves and their associations. All parties dovetail and work in synergy to maximise the outcomes from their resource outlays.

For the 21 industry clusters to enhance their dynamic capabilities and economic outcomes, a high level industry panel consisting of key representatives should be established to develop an industry roadmap that charts out a five-year plan to enhance the innovative capacity of the industry. The plan should give attention to the following:

- Current state of play of the industry;
- Identify key R&D priority areas;
- Identify lead players (institutions) in the cluster;
- Resources (fiscal and non-fiscal incentives) needed to develop enhance translational research and industry take-up of the innovations from the R&D endeavours;
- Identify key inter- and intra-industrial knowledge flows that will enhance the multiplier-effect; and
- Establish key performance indicators (KPIs) and tracking mechanisms. A clear framework (dashboard) should be in place to regularly monitor progress and undertake refinements to ensure the industry is progressing as envisioned in the roadmap.

Strategic Thrust 5: Nurture a business friendly knowledge ecosystem

Advanced countries typically have very effective support systems that ensure firms have access to the necessary resources, accurate information and advanced knowledge sources to allow them to make strategic decisions relatively quickly. To ensure the support environment is conducive in meeting needs of firms, the industry panel should provide oversight to the resources and support systems to be knowledge-intensive and globally competitive. The support systems must assure non-duplication and flexibility of processes to ensure industry is nimble and accurate in its strategic decision making.

Key resources and support systems that require attention include the following: ensure testing and proto-tying facilities are available for firms; certification approvals are simplified and streamlined so as to reduce the turnaround time; enhance the capability of Global Business Services; ensure adequate funding is available for SMEs and start-ups; assistance for firms to internationalise their operations; high use of technology; availability of R&D funding and technical support; availability of knowledge and resources for marketing, branding and positioning; provision of services to help SMEs obtain resources for business development; a robust and sound patenting ecosystem; a sound regulatory and legal system; and other business friendly services that reduce cost, improve efficiency, increase financial investment and enhance knowledge transfer.

23.4 Concluding Remarks

The MYKE III (Phase 1) study provides valuable information on the knowledge ecosystems for the 21 industries in Malaysia. Using survey method, interviews and focus group studies, strengths and challenges in the knowledge ecosystems were identified. The information on the strengths and gaps of the ecosystems coupled with feedback from captains of industry and stakeholders provided insights on key policies and strategies to strengthen the ecosystems to move up the knowledge value chain.

While the study provided valuable insights for policy formulation, the study is not without limitations. There are four major caveats for the results obtained from this study. First, use of a purposive sampling frame means the results obtained may not be generalisable to the 21 industries in the country. Second, some of the instruments used from MYKE I and MYKE II, which had to be utilised in MYKE III (Phase 1), do not accurately represent the constructs for knowledge in the conceptual model. Hence, the framework used may not capture the knowledge ecosystem accurately. Third, the data used does not capture the diversity in sub-sectors in each of the 21 industries. As a consequence of this, the empirical results for the ecosystems may suffer from an over-aggregation bias. Fourth, the original questionnaire was adopted from MYKE-II,, so that comparative analysis could be conducted between the current study and previous MYKE studies. The original questionnaire was found to be lengthy and for a number of questions respondents were unable to or unwilling to provide accurate answers. Finally, even though the sample was segmented into 21 industries it is important to note that for a number of industries the subsamples were susceptible to a 'small-sample bias problem', making them insufficiently representative of the population they represent. To overcome the 'small sample bias problem' in the data, industries were classified into four categories (Laggards, Imitators, Adapter and Pace-setters). The knowledge ecosystems for these four groupings were measured and inferences for each of the industries were made based on the four groupings. The knowledge ecosystems models based on these classifications may not fully capture the knowledge ecosystems for each of the industries individually.

Despite the limitations, the empirical analysis from the MYKE III (Phase 1) study provides valuable insights into the strengths and weaknesses of the knowledge ecosystem for the 21 industries in Malaysia. Future studies should use a probability based sampling method as opposed to convenient sampling to more accurately capture the underlying knowledge ecosystems for the 21 industries and Malaysia. This will lead to a more accurate picture on which to base policies and strategies to strengthen the knowledge ecosystems for the 21 industries.

Reference

1. Talwar, R. and Hancock, T. (2010). *The Shape of Jobs to Come*: Possible New Careers Emerging from Advances in Science and Technology (2010-2030), Fast Future. Retrieved from www.fastfuture.com.

2. World Economic Forum. (2016). *The Future of Jobs: Employment, Skills and Workforce Strategy for Fourth Industrial Revolution,* Global Challenge Insight Report, WEF. Retrieved from http://reports.weforum.org/future-of-jobs-2016/

Appendices

Appendix I: Focus Group Discussion Guide

Basic Focus: How to improve innovation performance (competitiveness) and productivity of companies (efficiency of the Industry sector).

Warm Up & Introduction

- Consent forms, inform respondents of recording and note taking.
- Introduce self and then ask each participant to introduce themselves.

A. Industry Sector Characteristics

1. General characteristics of the industry sector in Malaysia
2. What opportunities do companies in your sector have? How are these taken advantage of?
3. What challenges do companies face in your sector? How are these addressed?
4. Industry sector life cycle? Is it declining/mature/growing? How is this conclusion reached?
5. International competitors and how Malaysia fare in international markets?
6. What can we learn from international competitors?

B. Capability

1. How capable are Malaysian companies of competing in this sector?
2. What are our (Malaysian industry) areas of strength?
3. Who should help us to improve our capability to compete (Innovate, improve productivity)? How? Discuss and probe: University, industry bodies and government

C. Learning and Improvement

1. How does your company learn (improve its capability)?
2. Where would you go to build necessary skills to improve your company performance?
3. How do companies in your sector plan for the future? What strategies are used in your sector?
4. How do you build human capability? Who helps you build human capability?

D. Building Blocks

1. What do you think is most important necessary building block for improving productivity/innovation in your sector? How important are these?

Close:

- Is there anything else you would like to add?

Thank the participants

Appendix II: Questionnaire in English

DEPARTMENT OF STATISTICS, MALAYSIA
www.statistics.gov.my

Please make a copy for your record

Confidential when filled with data

MALAYSIAN KNOWLEDGE CONTENT SURVEY 2015
(FOR REFERENCE YEAR 2014)

Name of estant and postal address

Please amend if there are any changes in the above postal address

For enquiries, please contact:

Tel. No.: _____

Fax. No.: _____

Email: _____

OFFICE USE

Serial Number

DECLARATION

Name:

Designation:

Telephone:

Fax. No.:

Email:

I hereby declare that the information given in this return is complete and correct to the best of my knowledge and belief.

Singature:

Date:

GENERAL INFORMATION

a. The Department of Statistics, Malaysia is conducting the Malaysian Knowledge Content Survey 2015 (for reference year 2014).

b. The main objective is to provide assessment of knowledge content and practices in key economic sectors to formulate policies, strategies and action plans in promoting greater application of knowledge and technology.

c. The information is gathered under the provisions of the Statistics Act 1965 (Revised - 1989). Section 5 of this Act requires all establishments operating in Malaysia to provide actual information or best estimates to the Department. The Act stipulates that the contents of the individual returns are CONFIDENTIAL and will not be divulged to any person or institution outside this Department. Meanwhile, Section 7 under the same Act provides the penalty to the respondent that could not comply with the survey undertaken.

d. You are requested to provide information related to your establishment as stated above and return the completed questionnaire to the Department.

DATUK DR. HJ. ABDUL RAHMAN HASAN
CHIEF STATISTICIAN, MALAYSIA

Date:

Your co-operation in ensuring the success of this survey is very much appreciated

Lampiran II: Borang soal selidik dalam Bahasa Malaysia

JABATAN PERANGKAAN MALAYSIA
www.statistics.gov.my

Sulit selepas data diisi

Sila buat satu salinan untuk rekod tua

PENYIASATAN KANDUNGAN PENGETAHUAN MALAYSIA 2014
(BAGI TAHUN RUJUKAN 2013)

Nama pertubuhan dan alamat pos

Sila pinda jika ada perubahan pada alamat pos di atas

Bagi sebarang pertanyaan, sila hubungi:

No. Tel : _____

No. Faks. : _____

E-mel : _____

KEGUNAAN PEJABAT

Nombor Siri

PENGAKUAN

Nama:

Jawatan:

Telefon:

No. Faks.:

E-mel:

Dengan ini saya mengesahkan bahawa maklumat yang diberi adalah lengkap dan betul sepanjang pengetahuan dan kepercayaan saya.

Tandatangan:

Tarikh:

MAKLUMAN AM

a. Jabatan Perangkaan Malaysia sedang melaksanakan Penyiasatan Kandungan Pengetahuan Malaysia 2014 (bagi tahun rujukan 2013).

b. Tujuan utama ialah untuk menyediakan penilaian kandungan pengetahuan dan amalannya dalam sektor utama ekonomi bagi membentuk polisi, strategi dan pelan tindakan dalam menggalakkan lagi penggunaan pengetahuan dan teknologi.

c. Maklumat yang dikumpul adalah mengikut peruntukan di bawah Akta Perangkaan 1965 (Disemak - 1989). Seksyen 5 di bawah Akta ini menghendaki mana-mana pertubuhan yang beroperasi di Malaysia untuk memberikan maklumat sebenar atau anggaran terbaik kepada Jabatan. Mengikut Akta ini, kandungan soal selidik pertubuhan yang diterima adalah SULIT dan tidak boleh dihebahkan kepada sesiapa atau mana-mana institusi di luar Jabatan ini. Sementara itu, Seksyen 7 di bawah Akta yang sama memperuntukkan denda kepada responden yang gagal memberi kerjasama kepada penyiasatan yang dijalankan.

d. Tuan diminta melaporkan butir-butir yang berkaitan dengan pertubuhan tuan seperti tercatat di atas dan mengembalikan soal selidik yang lengkap ke Jabatan ini.

DATUK DR. HJ. ABDUL RAHMAN HASAN
KETUA PERANGKAWAN MALAYSIA

Tarikh:

Kerjasama tuan/puan dalam menjayakan penyiasatan ini sangatlah dihargai

End of Final Report

CHAPTER 22

KNOWLEDGE CONTENT OF THE CONSTRUCTION INDUSTRY

CHAPTER 22
Knowledge Content of the Construction Industry

22.0 Introduction

The Malaysian construction industry emerged as a principal sector for economic growth in the 1990s, where major infrastructure projects were initiated to propel the nation to become an industrial powerhouse and a developed country. Currently, the construction industry makes a significant contribution to the Malaysian economy, although its contribution is small in comparison to other industries such as services, manufacturing and agriculture. The average contribution of the construction industry to GDP averages at 4.4% in second quarter, 2016. In comparison, the average contribution by the services industry in the same period is 54%, whereas manufacturing contributed 23.5% and agriculture, 7.8% (Department of Statistics, 2016).

While the contribution of this industry may be less significant than other industries, it cannot be neglected because it is a vital enabler that supports the growth of the national economy given its linkages with all other industries. According to RAM Ratings (2016), the construction industry was the fastest-growing economic sector in 2015, with a registered GDP growth rate of 8.2% year-on-year. As the economy continues to grow, private investment is becoming even more significant. This is in line with the government's aim to encourage private investment projects.

The Malaysian construction industry is divided into four main categories and they are: civil engineering, special trade activities, residential properties and non-residential properties. In the second quarter of 2016, the industry generated a value of RM30.4 billion, where 21.6% were for civil engineering, 13.5% for special trade activities, 12.5% residential properties and 2.1 non-residential properties (Department of Statistics Malaysia, 2016). The construction industry outlook is rather bullish due to the government's mega transport and infrastructure projects rolled out under the 11th Malaysia Plan.

To ensure the systematic development of the construction industry, the Construction Industry Development Board (CIDB) was established in 1994 and CIDB's roles are to (CIDB, 2014): (1) Develop a world class construction industry; (2) Work with key stakeholders to develop the Malaysian construction industry; (3) Develop the capacity and capability of the construction industry through the enhancement of quality and productivity by placing great emphasis on professionalism, innovation and knowledge in the endeavour to improve the quality of life; and (4) Enhance the competitiveness of the Malaysian construction industry.

22.1 Key Developments and Initiatives

The Construction Industry Master Plan (CIMP) 2006-2015 was developed to chart the strategic position and future direction of the Malaysian construction industry over 10 years. The plan aimed to improve the construction industry by upgrading skills and knowledge, modernising the industry, applying new technology and continuous innovation.

Several initiatives as a result of the CIMP continue to make headway in the construction industry and among them include the following:

- *Building Information Modelling (BIM):* The government continues to encourage the adoption of IT and IS in construction to improve efficiency and productivity. BIM is an emerging technology used in planning, design, construction and facility management.
- *Industrialised Building System (IBS):* The government recognises the need to transform the labour-intensive nature of the construction industry to become more technology and knowledge-based. IBS construction can help construction companies improve their overall performance through mechanisation and automation, resulting in faster completion and better quality construction. However, 15 years since its introduction, the adoption of this system is still relatively slow because industry players are indifferent to the system and not totally convinced of its benefits. Other reasons for slow adoption include resistance to change, high cost of implementation, and low labour cost. To tackle this, the government has introduced policies and incentive schemes to encourage the adoption of IBS to reduce reliance on foreign labour.
- *Sustainability and the Green Building Index:* Although there is no policy which mandates sustainable building, the awareness of sustainability and sustainable development has been created through public awareness campaigns. The Green Building Index (GBI) was introduced in 2009 with a number of Malaysian companies taking up the responsibility of adopting sustainable building practices and technologies.

The 11th Malaysia Plan and subsequent budgets 2015, 2016 and 2017 revealed the government's plan to continue investing in the construction industry with several mega infrastructure projects to be implemented over the next 5 years. This will help boost the construction industry, address the nation's infrastructure needs and the overall economy. It will also help Malaysia to compete against her ASEAN neighbours for investments.

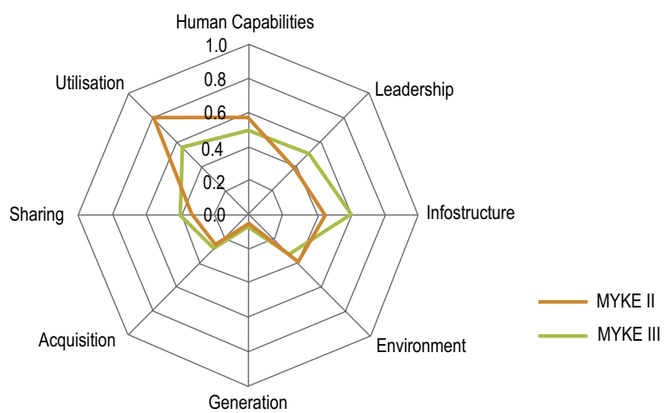
22.2 Knowledge Content

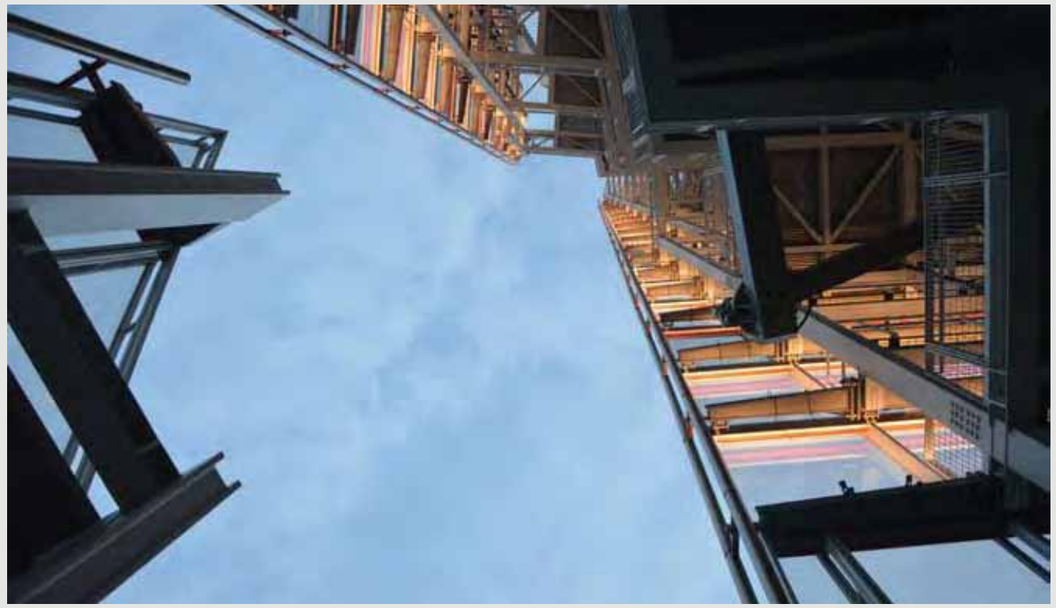
Figure 22.1 shows changes in the knowledge resource foundations for the construction industry over the MYKE II to MYKE III assessment periods. Overall, there is improvement in some knowledge enabler and knowledge action dimensions, but some areas registered a decline, with knowledge utilisation and human capabilities showing the sharpest falls.

Next a detailed analysis is presented to understand how the dimensions of knowledge enablers and knowledge actions in the construction industry are performing.

Figure 22.1: Overview of Knowledge Enablers and Knowledge Actions for MYKE II and III

Construction





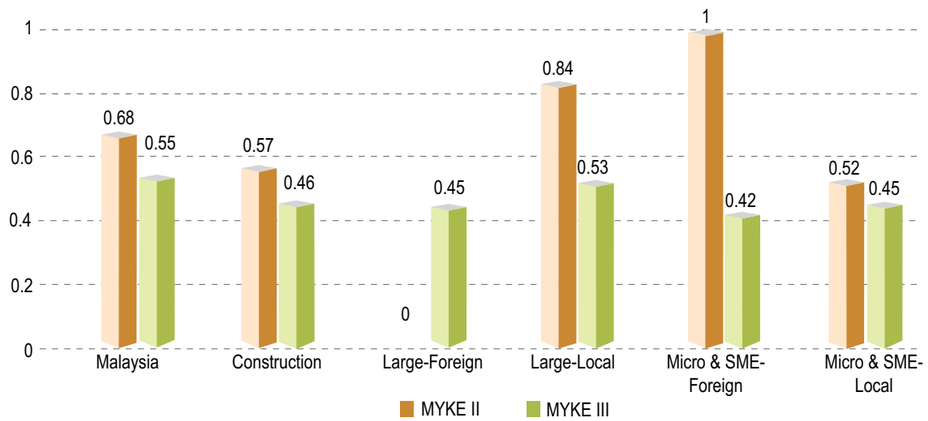
22.3 Knowledge Enablers

22.3.1 Human Capabilities

The construction industry's ability to attract skilled talent appears to be limited and falls below the national aggregate with an index of 0.57 in 2007 and 0.46 in 2014. The construction industry is less attractive to skilled jobseekers, most of which gravitate toward openings in the service sector, or with fixed attachments in urban hubs. Attempts are being made by the government and associations to encourage firms in the construction industry to adopt technology, for example Industrialised Building System (IBS) and Building Information Modelling (BIM). Nevertheless, the industry has not advanced enough to draw in skilled talent with higher education. Human capabilities fell between MYKE II and MYKE III regardless of the type of firm.

Figure 22.2: Human Capability of the Construction Industry

Human Capability

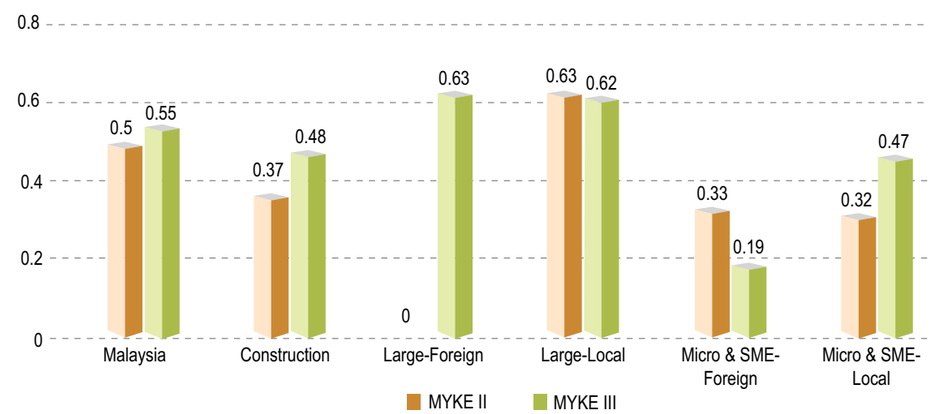


Note: Number of foreign (large and SMEs) construction firms in the sample is small, and hence caution must be taken when interpreting data comparisons of these groups.

22.3.2 Knowledge Systems and Leadership

There is a positive incremental improvement in the construction industry's knowledge systems and leadership. Both local and foreign large firms appear to be similarly contributing towards formalising knowledge systems and strategies. Local SMEs also seems to understand the importance of having knowledge strategy and development. Most firm categories have demonstrated stable performance in overall knowledge leadership, with the exception of small foreign firms, which have significantly regressed from 0.33 in 2007 to 0.19 in 2014. These firms started at the same level of knowledge leadership as the small local firms, and while they declined, their local counterparts charged ahead with an index of 0.47 in 2014 from 0.32 in 2007.

Figure 22.3: Knowledge Leadership in the Construction Industry

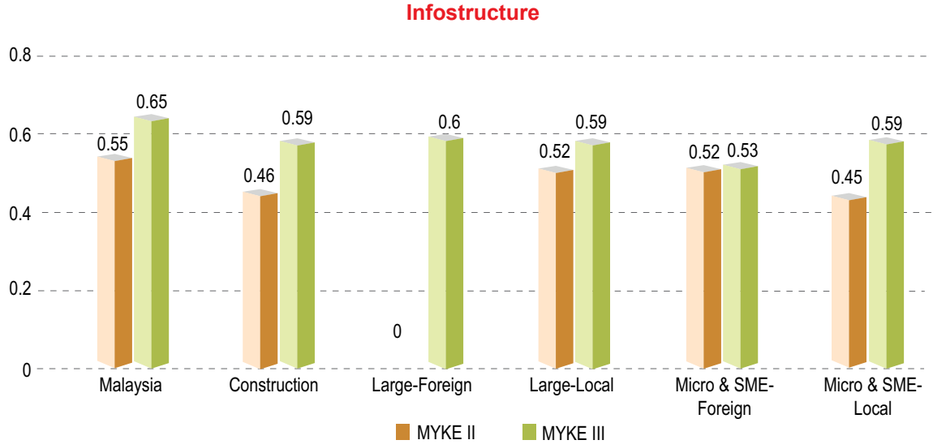


Note: Number of foreign (large and SMEs) construction firms in the sample is small , and hence caution must be taken when interpreting data comparisons of these groups.

22.3.3 Technology and Infostructure

While construction has not advanced as much as the rest of Malaysia in its technology and infostructure, it has improved from 2003 with an index of 0.46 to an index of 0.59 in 2014 with all the firms, regardless of type, showing positive increments in technology and infostructure. This is a positive indication that construction firms are taking steps to implement the systems (e.g. IBS and BIM) imposed by the industry and government in order to qualify for government tenders.

Figure 22.4: Technology and Infostructure of the Construction Industry

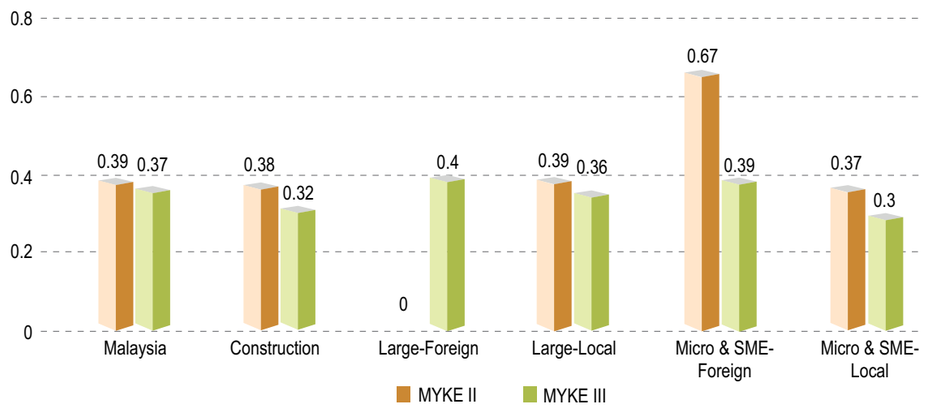


Note: Number of foreign (large and SMEs) construction firms in the sample is small , and hence caution must be taken when interpreting data comparisons of these groups.

22.3.4 Knowledge Environment

The construction industry's knowledge environment has marginally underperformed compared to the Malaysian aggregate, though it mirrors the nationwide downward trend between the MYKE II and MYKE III periods. The whole industry, regardless of the type of firm, did not engage very actively with government and universities (having clocked an environment awareness index between 0.3 and 0.4 in the latest assessment period). The knowledge environment dimension for small foreign firms started from a relatively strong index of 0.67 in 2007 but nevertheless dropped to 0.39 in 2014, on par with the rest of the industry.

Figure 22.5: General Environment Awareness of the Construction Industry



Note: Number of foreign (large and SMEs) construction firms in the sample is small , and hence caution must be taken when interpreting data comparisons of these groups.

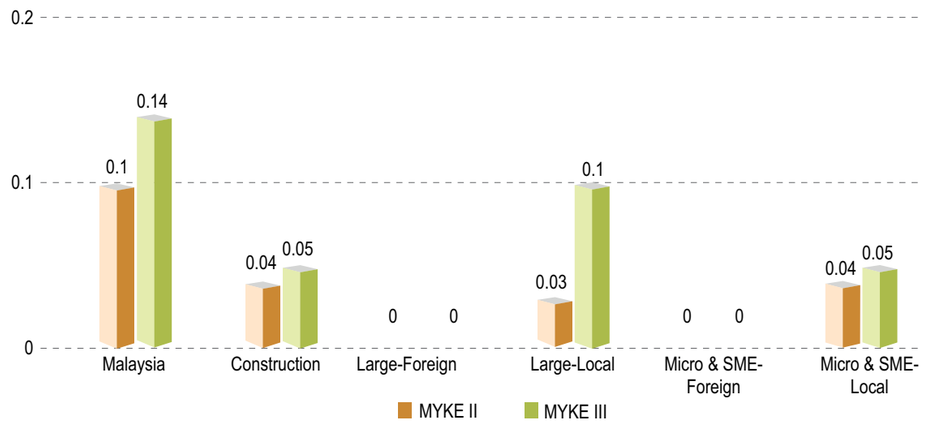
22.4 Knowledge Actions

22.4.1 Knowledge Generation

The construction industry does not seem to generate any knowledge and its index over both MYKE periods is much lower than the national aggregate (0.04 in 2007 and 0.05 in 2014). It is interesting to note that the foreign firms are not engaged in any R&D and have not filed any patents at all. Only the local firms are engaged in knowledge generation with the large local firms making significant improvement in knowledge generation from being the poorest performer in 2007 (0.03) to becoming the industry-wide leader in 2014 (0.1).

Knowledge generation in the construction industry appears to be impeded by the industry's own established practices. The abundance of relatively cheap labour has allowed firms to sustain themselves through manual labour without needing to invest into R&D and patents aimed at creating process and operation improvements. In addition, foreign firms seem to be reluctant to engage in research and are weary of filing for patents for fear of imitation by competitors. This is reflected in their low levels of sharing (see **Figure 22.7**)

Figure 22.6: Knowledge Generation Activity in the Construction Industry

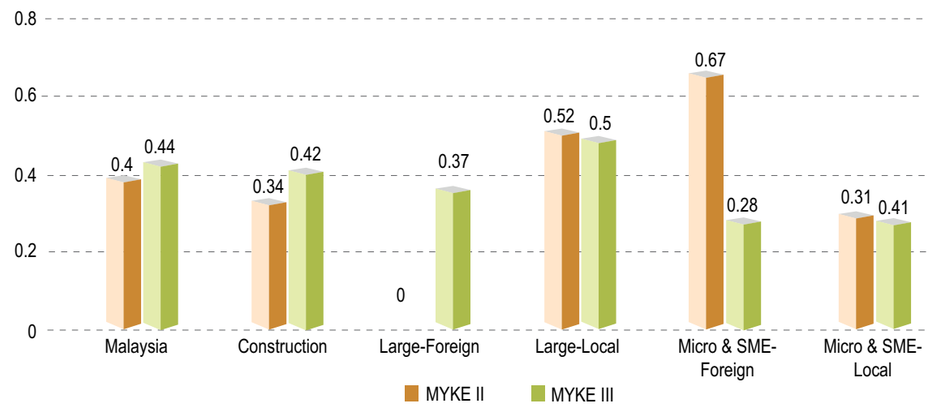


Note: Number of foreign (large and SMEs) construction firms in the sample is small , and hence caution must be taken when interpreting data comparisons of these groups.

22.4.2 Knowledge Sharing

Knowledge sharing in the construction industry is relatively low, although it is still much higher than knowledge generation. In the MYKE II period, the industry is scored at 0.34, compared to national aggregate of 0.4. However, subsequent improvements have placed it almost on par with the national aggregate, at 0.42 to 0.44 respectively. The main driver of this improvement comes from the local firms where the large local firms registered an index of 0.5 and the small local firms 0.41. Foreign firms, especially the smaller ones appear to be reluctant to share knowledge. This may be due to fear of competitors infringing on their proprietary ideas and innovation.

Figure 22.7: Knowledge Sharing Activity of the Construction Industry



Note: Number of foreign (large and SMEs) construction firms in the sample is small , and hence caution must be taken when interpreting data comparisons of these groups.

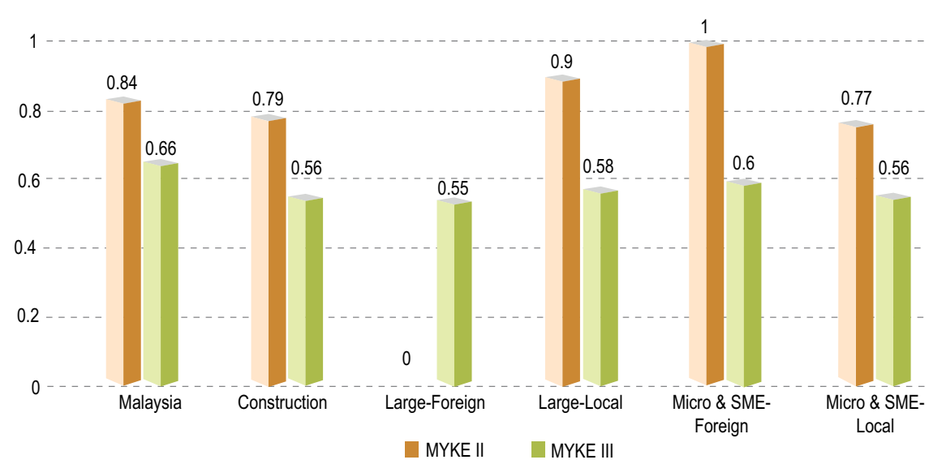
22.4.3. Knowledge Utilisation

Similar to firms in other industries, knowledge utilisation registered a significant decline from MYKE II to MYKE III assessment periods (0.79 to 0.56), and is below the national aggregate (0.84 to 0.66). This sharp decline is evident for all firms, although the absence of data on large foreign firms from the MYKE II period limits the analysis on the results. Regardless, this trend is of concern since knowledge utilisation is an important knowledge action dimension.

The results suggest that the knowledge resource foundations for the construction industry over the period MYKE II to MYKE III assessment are still relatively weak compared to the Malaysian aggregate. All knowledge enablers and knowledge actions are lower than national aggregate for both MYKE periods. Apart from technology and infostructure, knowledge leadership and sharing, other dimensions show little-to-no improvement over the two MYKE periods.

On a positive note, the industry is moving in the right direction in formalising its knowledge systems with the local industry players taking knowledge leadership much more seriously than their foreign counterparts. This suggests that local construction companies regardless of size are capable of leading the industry. With this positive attitude towards knowledge leadership alongside support by the government's technology and infostructure initiatives, as well as the opportunities presented by megaprojects planned for 2015 and beyond, the construction industry has the capacity to make significant progress. However, in order to accelerate this, it needs to make a concerted effort to fully embrace technology and R&D, and employ highly skilled people to improve the quality of its outputs, instead of continuing its current reliance of cheap and manual labour.

Figure 22.8: Knowledge Utilisation Activity of the Construction Industry



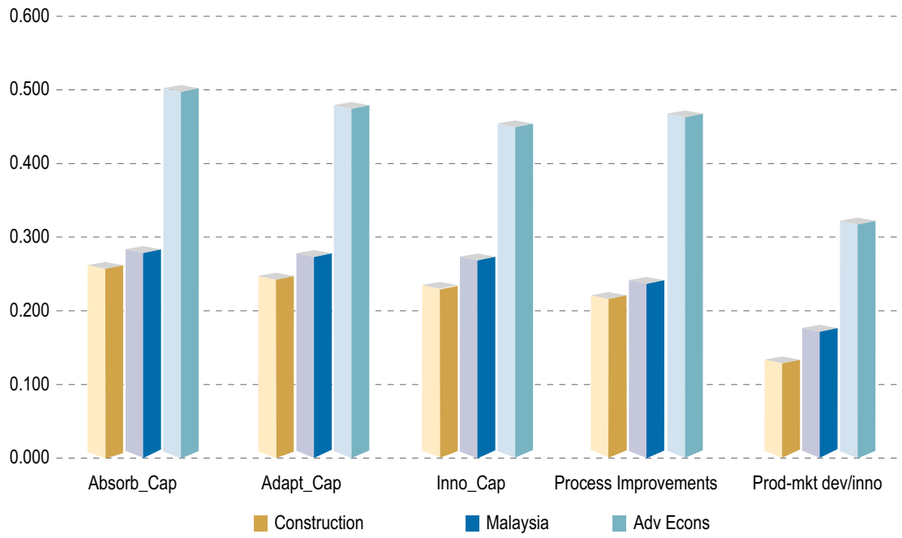
Note: Number of foreign (large and SMEs) construction firms in the sample is small , and hence caution must be taken when interpreting data comparisons of these groups.

22.5 Dynamic Capabilities Profile of the Construction Industry

Dynamic capabilities are the intangible resources, such as skills, processes and structures, which are acquired over time and feed into a firm's ability to adapt to changing needs of customers and to defend itself against competition. The three components which constitute dynamic capabilities include absorptive capability, adaptive capability and innovative capability.

Figure 22.9 shows that the construction industry is ranked below the national aggregate for all three dynamic capabilities. This weak performance bears out in its poor process improvement and new product-market development outcomes.

Figure 22.9: Dynamic Capabilities Profile of the Construction Industry

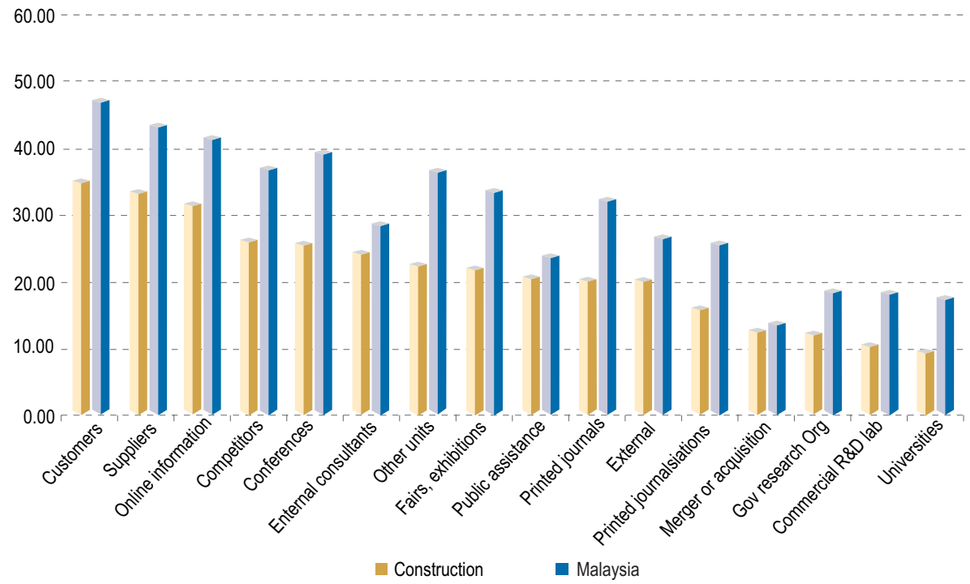


22.5.1 Absorptive Capability

The construction industry is not very active in gathering market information and does not have strong systems to handle or store information. It is also not active in acquiring technology and exhibits moderate performance in absorptive capability.

Although the industry gets its information from numerous sources, all these sources are applied to a lesser degree than the Malaysian aggregate (**Figure 22.10**), showing that it is relatively passive in its quest for knowledge. Its top three sources of information are customers, suppliers and online information. This is followed by competitors and conferences. Customers and suppliers are of almost equal importance as sources of information, suggesting the industry is market-focused, working closely with suppliers to understand the needs and developments of the marketplace. The reliance on online information ahead of more credible sources of information, such as conferences or printed journals, suggests that firms in this industry may not have a very systematic and rigorous approach to building knowledge foundations.

Figure 22.10: Sources of Knowledge in the Construction Industry

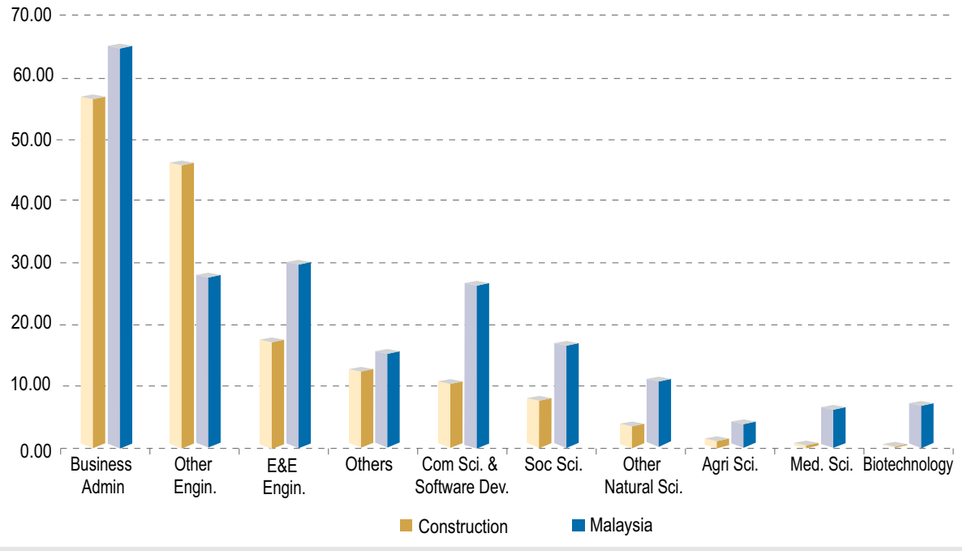


22.5.2 Adaptive Capability

Adaptive capability is essential as it ensures firms have the ability to align its structure, processes and resources with the market ecosystem, ultimately enabling them to use external knowledge to build their innovative capacities. The construction industry has not invested as much as most other Malaysian industries in technology or in improving its processes and structures. With weak adaptive capabilities, it is less able to swiftly respond to environmental changes or shifts in customer needs.

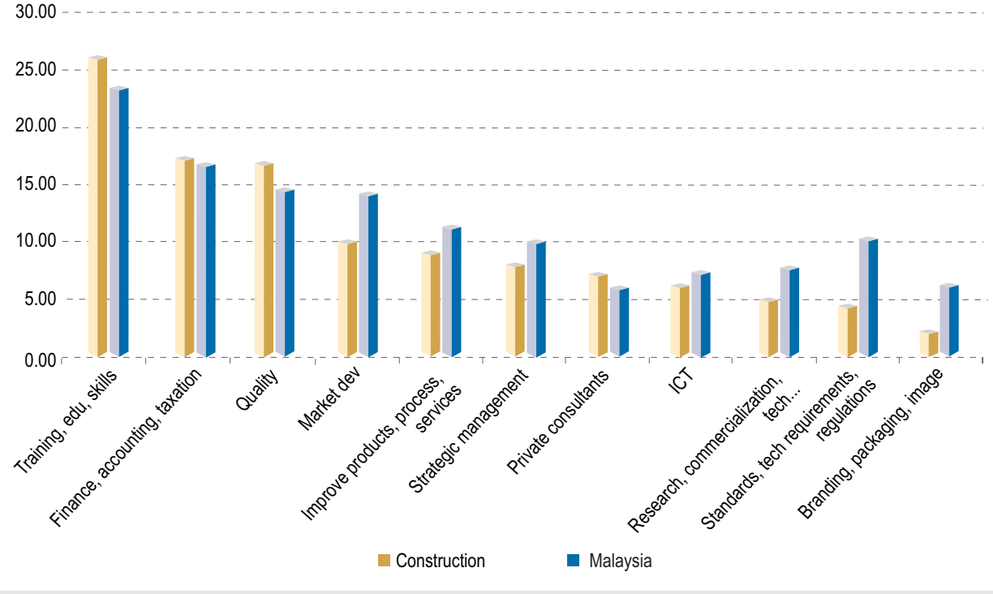
The construction industry employs more people with general engineering qualifications than the Malaysian aggregate. This is a reflection of the industry's innate demand, requiring higher levels of engineering expertise than other types of technical skills. The industry has less business and administration expertise than the national aggregate. This may be contributing to the current mediocre state of its dynamic capabilities profile. In other words, its focus on the core activity, construction, may have side-lined other important contributors to success, such as good organisational management and marketing.

Figure 22.11: Skills Profile of the Construction Industry



The institutional environment plays an important role in building capabilities, and institutions such as government agencies, universities and associations offer a range of services to support firms in the construction industry. The construction industry is quite selective in its utilisation of services available. It utilises four main services at a higher level than the Malaysian aggregate. These are namely training, education and skills development; finance, accounting and taxation services; quality assurance; and private consultation. Aside from these however, it appears the industry is not building expertise in management and marketing despite glaring gaps in its capability. This can be explained by the industry's conservative tunnel-vision, being overinvested in the development of technical and engineering knowledge.

Figure 22.12: Role of Institutional Environment in Skill Building of the Construction Industry

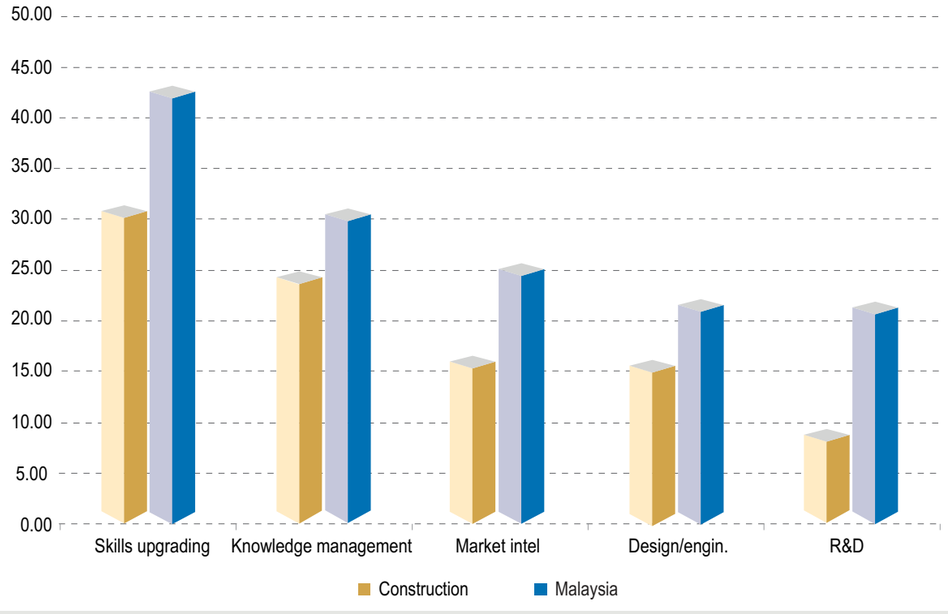


22.5.3 Innovative Capability

The construction industry also falls short in terms of being able to integrate and assimilate external knowledge into their organisations. This weakness, coupled with its moderate levels of absorptive and adaptive capabilities, means firms in the construction industry are less able to translate their dynamic capabilities into improved or new processes or new product-market outcomes.

Construction firms are not actively engaged in innovative capability building activities, with levels lower than the Malaysian aggregate for all activities noted in **Figure 22.13**. Thus, firms are not investing at the same level as other industries in upgrading skills, knowledge management, market intelligence and design engineering. The industry is particularly poor in R&D activities, marking a level of 9.2% compared to the national aggregate of 21.8%. These results are indicative of an industry which is not attuned to market or technological developments.

Figure 22.13: Knowledge Intensive Activities in the Construction Industry

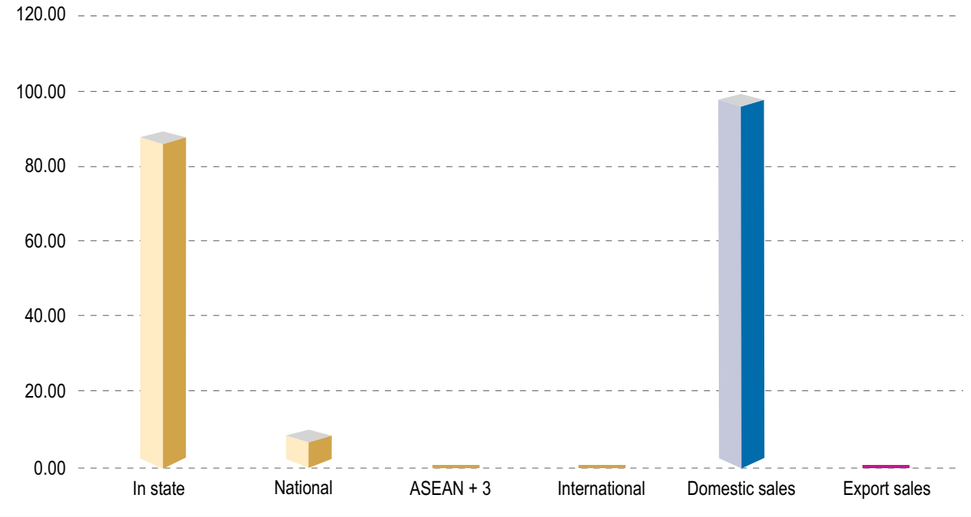


22.6 Outcomes of Dynamic Capabilities in the Construction Industry

Almost all of the construction industry business occurs in the home market (99%) with most of its revenue originating from within the state (89.2%), indicating limited corridor influence. The 1% revenue generated from the export market is contributed by local firms both large and small. Firms of the industry only have minor presence in the regional and international markets. This result is not surprising because the high proportion of the government's budget provided for infrastructure development in the country has provided construction companies with a steady stream of projects in the home market. While government and private projects are separately contributing to the construction boom, it may also be the cause of the current lack of attention on building knowledge resource foundations and dynamic capabilities.

The strategic profile of construction firms is indicative of a conservative industry where the majority of firms take a defensive (or reactive) stance in the face of competition. The industry is mainly represented by Defenders (36.4%) and Reactors (36.3%). Defender companies are narrow in focus, prioritising on operational efficiency instead of innovation, while Reactors try to maintain their status quo and prefer not to overtly respond to marketplace changes unless their positions are threatened. It is interesting to note, however, that the industry has more Analysers (16.6%) than the national aggregate of 13.7%, but only a small group of Prospectors (9.7%) compared to the national aggregate of 14.5%.

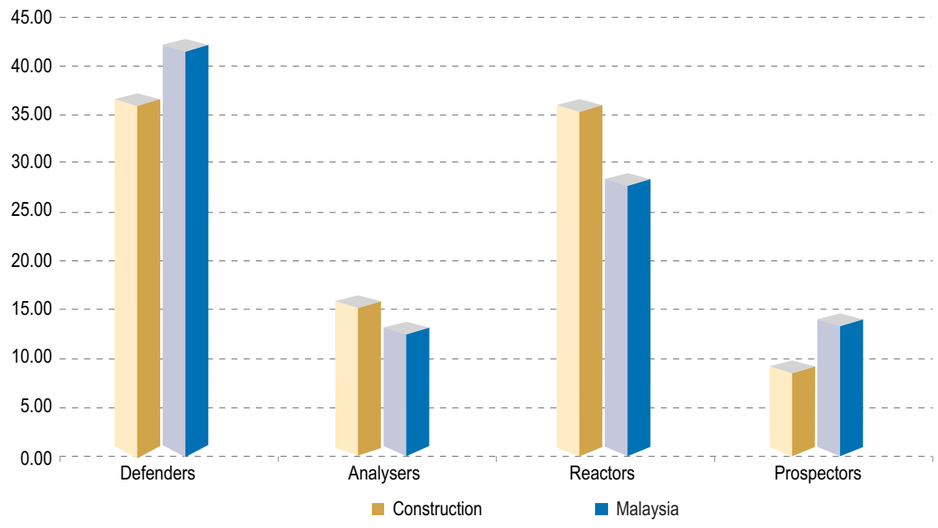
Figure 22.14: Market Presence of the Construction Industry



Note: The results are based on survey data.

Almost three-quarters of construction firms exhibit Defender and Reactor characteristics, which explains the lack of innovation outcomes and is a concern for the industry. However, a quarter of the firms are Analysers and Prospectors. While still a small group, it shows that there are still some firms which are prepared to invest in new and innovative projects and this group of firms are likely to adopt technological improvements to push the industry forward.

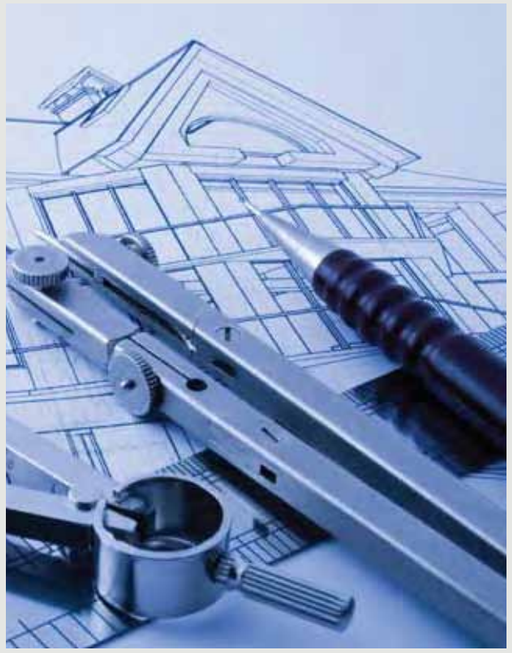
Figure 22.15 Strategic Profile of Firms in the Construction Industry



22.7 Relationships between the Key Blueprints of the Construction Industry Knowledge Ecosystem

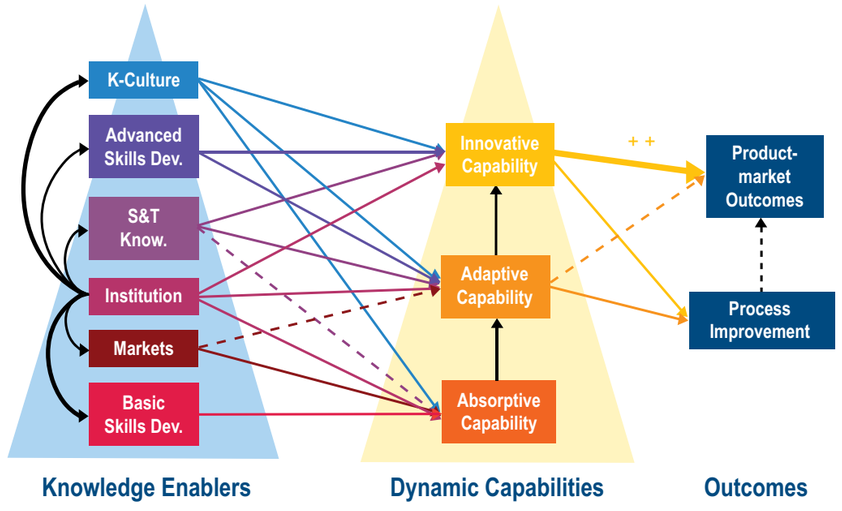
In this section, the relationships between knowledge enablers, dynamic capabilities, and economic outcomes for the construction industry are scrutinised. The study benchmarks the Malaysian construction knowledge ecosystem against that of advanced countries (Australia, Singapore, United Kingdom, and United States). Content analysis of data and market reports for the construction industry in advanced countries and the data obtained from DOS for Malaysian construction industry suggest that the Malaysian construction industry is a laggard industry in terms of knowledge content.

The knowledge ecosystem in advanced countries for the construction industry is illustrated in **Figure 22.16.** Enablers for absorptive, adaptive, and innovative capabilities are quite strong. The presence of a very strong absorptive capability provides a solid foundation for the nurturance and leverage of higher level adaptive and innovative capabilities of construction firms in advanced countries. Strength



across the three components of dynamic capability enables the construction industry in advanced countries to create process improvements and generate new product-market outcomes.

Figure 22.16: Knowledge Ecosystem of the Construction Industry in an Advanced Country



Note: the very strong bold lines (++), bold lines and dotted lines imply a very strong, strong and moderate impact respectively.

The knowledge ecosystem in Malaysia for the construction industry, a laggard industry with low knowledge content, is illustrated in **Figure 22.17.** Enablers that support the components of dynamic capability in the construction industry in Malaysia are relatively weak. Additionally, the focus of absorptive and adaptive capabilities of firms is primarily channelled toward process improvement. A summary of the relationships between knowledge enablers and dynamic capabilities for the construction industry in advanced countries and in Malaysia is provided in **Table 22.1.**

Figure 22.17: Knowledge Ecosystem of Construction Industry in Malaysia

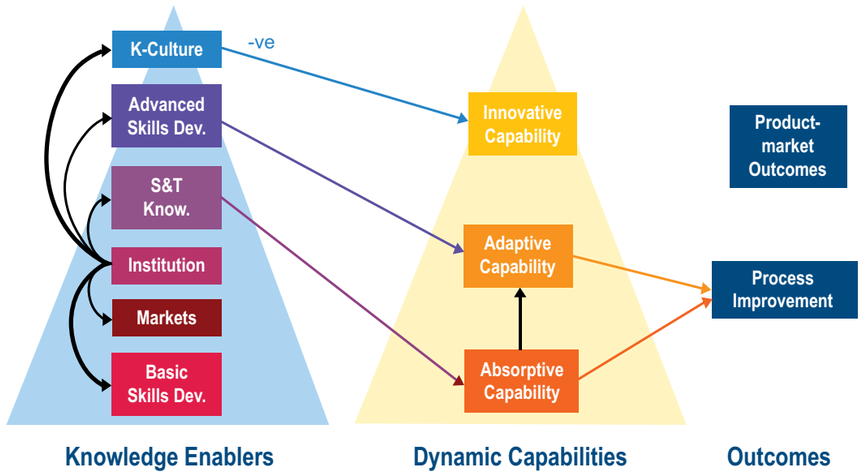


Table 22.1: Knowledge Enablers and Dynamic Capabilities for the Construction Industry

Advanced Countries	Malaysia
Basic skills have a **positive and strong impact** on absorptive capability. In advanced countries, the construction industry is an important source of revenue. Significant investments are present to continuously help construction firms to improve their basic skills through apprenticeships and education at community colleges, technical colleges, polytechnics, and universities. The construction industry is reasonably technology- and knowledge- intensive and undergoes continuous change and development. To cope with change, regular trainings are sought and provided. These help construction firms to learn and stay updated with the most recent advances and knowledge. Deep knowledge of using and operating the most advanced technology improves the quality and quantity of construction-related projects.	Basic skills have **no significant impact** on any of the components of dynamic capability. The Malaysian construction industry is a labour intensive industry, and is highly dependent on foreign labour from neighbouring countries. Little resource is invested into training foreign recruits. The competitiveness of construction firms in Malaysia hinges on cheap labour cost.

Table 22.1: Knowledge Enablers and Dynamic Capabilities for the Construction Industry (cont'd)

Advanced Countries	Malaysia
Market intelligence has a **positive and strong impact** on absorptive capability and a **positive and moderate impact** on adaptive capability. In advanced countries, stakeholders, such as suppliers, customers, competitors, external consultants, R&D centres, and logistic providers, are key drivers in the absorption and adaptation of new knowledge, technology, systems, and processes in the construction industry. There is significant investment in R&D by both public and private institutions. This helps to produce a positive impact on the productivity and efficiency of firms in this industry. Construction firms keep themselves updated with the latest market conditions, new technology, innovations, and scientific discoveries in order to evaluate their usefulness to improve process efficiency and the productivity or develop new features in their product-market offerings.	Market intelligence **has no significant impact** on any of the components of dynamic capability. In Malaysia, the interactions among key stakeholders in the construction industry are patchy and fragmented. Often partnerships with key stakeholders are dominated by monopolistic behaviour, creating 'lock-in' that prevents construction firms from getting the best technology, knowledge, or innovations. Use of ICT and new technology is relatively low as the construction industry is plagued by intermediaries and rent-seeking behaviour vis-à-vis untrained or unscrupulous sub-contractors.
Institutions are **strong enablers** of the knowledge ecosystem and have **direct strong and positive impact** on all three components of dynamic capability. In advanced countries, the federal, state, and local governments take considerable steps to ensure that the construction industry is well connected to key institutions that directly and indirectly enhance productivity, efficiency, and market reach of firms. Moreover, government research institutions (GRI), universities, regulators, and trade associations often receive many fiscal and non-fiscal incentives to play an active role in shaping the construction ecosystem. Consequently institutions in advanced countries have a direct influence on the components of dynamic capabilities in the construction knowledge ecosystem.	Institutions have a **strong impact on the enablers,** but **does not have any direct impact** on all three components of dynamic capability. In Malaysia, institutions, such as regulators, trade association, universities, and government agencies, play important role in the development of the local construction industry. Even though this institutions do not yield significant impact on the components of dynamic capability of firms. This may be attributed to the absence of institution that are truly centres of excellence in their field of specialism. Consequently there is poor accessibility to new knowledge and technology, as well deficiency in quantity and quality of local talent pool.

Table 22.1: Knowledge Enablers and Dynamic Capabilities for the Construction Industry (cont'd)

Advanced Countries	Malaysia
S&T knowledge has a **positive and moderate impact** on absorptive capability, but a **positive and strong impact** on adaptive and innovative capabilities. In advanced countries, the construction industry is characterised by strong basic and applied R&D activities. Significant resources are invested in key strategic areas to enhance productivity, which helps construction firms to become globally competitive. Investments and strategies include continuous upgrading of technological infrastructure and research centres that produce industry relevant research.	S&T knowledge has a **positive and strong** impact on absorptive capability. In Malaysia, the construction industry is characterised by weak R&D activity. There is a lack of a high quality research talent. This hampers development of innovative solutions to enhance the productivity and competitiveness of construction firms. Additionally, there is high dependence on foreign technology and know-how to create value in the local construction industry. S&T knowledge in the local construction industry is mainly directed towards improving absorptive capacity of firms in the industry. A majority of resources is channelled to training workers in the use of conventional existing bought from foreign firms.
Advanced skills have **a positive and strong impact** on both innovative and adaptive capabilities. In advanced countries, the strength in research and business processes (e.g. production, marketing, accounting, etc.) support firms. This can be attributed to significant investments in education and training to develop advanced skills. There is also a strong partnership between construction firms and their stakeholders, creating seamless facilitation of knowledge. This helps prevent the 'knowledge-commercialisation chasm'.	Advanced skills have a **positive and significant impact** on adaptive capability. In Malaysia, significant resources are invested to improve advanced skills and R&D capabilities. Unfortunately, the talent pool produced is unable to use its knowledge set in Malaysian firm environments. Without scope for experimentation, individuals become simple agents who adapt existing and foreign technology. Most construction firms in the country do not undertake cutting-edge R&D or engage in strong innovative endeavour. Consequently, many of the best talent leaves for better firm environments, especially overseas. The problem of brain drain further hinders the translation of advanced skills into building innovative capabilities among firms in the local construction industry.

Table 22.1: Knowledge Enablers and Dynamic Capabilities for the Construction Industry (cont'd)

Advanced Countries	Malaysia
Knowledge culture has a **positive and strong impact** on all three components of dynamic capability. In advanced countries, the construction industry is characterised by high industry-relevant knowledge (e.g. through data and market reports from governments and trade associations) and high ICT literacy. Most construction firms are well informed about market developments and innovations that are taking place inside and outside their countries.	Knowledge culture has **a negative impact** on innovative capability. In Malaysia, the construction industry is characterised by low industry-relevant competency and low ICT literacy. There is reluctance to undertake R&D or seek creative ways to enhance productivity. There is a strong proclivity in these local firms to rely on foreign firms' knowledge and technology. This dependency severely constrains the level of innovation that can take place.
The continuum from absorptive capability to adaptive capability to innovative capability is **present and strong.** In advanced countries, the quality and quantity of construction activities (e.g. general construction and special trades) are raised through scientific and technological breakthroughs, which are backed by significant resources. Most construction firms are able to leverage on R&D conducted in centres of excellence to develop strong competitive positions. They also lead in global environmental standards and best practices.	The continuum from absorptive capability to adaptive capability to innovative capability **is present.** In Malaysia, the construction industry suffers from a lack of competent talent despite significant investments to improve the quality and quantity of industry-relevant graduates and workers. Most workers in the local construction industry do not pursue research endeavours that produce new and innovative construction designs or materials. The majority of Malaysian workers are only at a level of absorbing and adapting existing and foreign technology in the building and manufacturing process. This limits their ability to create strong product-market outcomes.

A summary of the impact of dynamic capabilities on economic outcomes for advanced countries' and Malaysia's construction industry is provided in **Table 22.2.** For advanced countries, adaptive capability produces a positive and strong impact on process improvements as well as a positive and moderate impact on product market outcomes. Innovative capability produces a positive and strong impact on process improvement and a very strong to product-market outcomes.

For Malaysia, absorptive and adaptive capabilities produce a strong and positive impact on process improvement, but innovative capability does not produce any significant impact on process improvement or new product-market outcomes. This may be due to the high dependence on cheap foreign labour and the strong focus on cost competitiveness through the adoption of foreign technology and innovations in construction-related systems and processes improvements.

Table 22.2: Dynamic Capabilities and Economic Outcomes for the Construction Industry

Advanced Countries	Malaysia
Adaptive capability has a **positive and strong impact** on process improvement and a positive and moderate impact on product-market outcomes. In advanced countries, most construction firms are very strong in adapting new technology and innovations to improve existing processes and product-market outcomes. In many instances, special raw material firms supply advanced construction materials and training to general builders. This allows general builders to understand novel materials and subsequently feed this into their construction projects.	Absorptive and adaptive capabilities have **positive and strong impact** on process improvement. In Malaysia, most construction firms are labour intensive and not technological advanced. They rely heavily on cheap foreign labour and use foreign technology and innovations to improve their processes and value chain. There is little breakthrough in the discovery of construction materials or novel approach to building construction.
Innovative capability has a **positive and strong impact** on process improvement and a **positive and very strong** impact on product-market outcomes. In advanced countries, significant resources are invested in R&D and skilled workforce to improve process efficiency and productivity. Many builders in the industry have wide market reach and richness of heritage and experience in the buildings that they build. By combining novel materials and advanced architectural knowledge firms in the industry are able to develop novel solutions to the building challenges they face.	Innovative capability has no significant impact on process improvement and product-market outcomes. In Malaysia, most construction firms adopt new technology and innovations from more advanced countries to improve cost-efficiency and focus their attention to meet domestic market demand. A low quality and quantum of R&D is undertaken by these firms since most engage in projects that are conventional. Experimental and advanced projects are left to foreign firms.
Process improvement has a positive and **moderate impact** on product-market outcomes. In advanced countries, construction firms form strong partnerships with a range of stakeholders and learn novel approach to meet client construction expectations of high quality at lowest cost. Strong learning approach allows them to translate process improvements into new and competitive construction materials and properties.	Process improvement **does not have any impact** on product-market outcomes. In Malaysia, process improvements undertaken by construction firms are dependent on foreign technology and intellectual property. This limits the potential of creating new and competitive construction materials and properties.

22.8 Summary: Key Trends, Challenges, Way Forward and Best Practices

22.8.1 Industry Trends

The construction industry is an important driver for the economic performance of the nation. The industry's significant underperformance in all three dynamic capabilities results in low innovation in terms of internal process improvements and new product-market development. The construction industry's weak dynamic capabilities in comparison to the Malaysian industries aggregate is not surprising given its lacklustre track record in building knowledge resource foundations to transform knowledge into a high level of dynamic capabilities. The industry's weak dynamic capabilities may undermine its ability to remain competitive in the long-term. Additionally, a majority of players are Defenders (36.4%) and Reactors (36.3%) with a narrow focus on operational efficiency and not on innovative endeavours.

Avenues for future improvement remain significant despite weaknesses in the industry sector. The industry must begin by devoting it resources to take advantage of construction opportunities created by development projects around the region. However, to seize the many opportunities will require numerous firms to undergo complete overhaul in their approach to strategic thinking. A systematic approach to building knowledge capability in the form of dynamic capabilities is essential for the sustainability of the industry.

There is little evidence to suggest that the Construction Industry Master Plan's (2006-2015) aim of upgrading the industry's skills and knowledge, and applying new technology and continuous innovation has moved the industry up the knowledge value chain. Liberalisation of the industry in future will lead to intensifying competition from foreign players that have greater economies scale and better technology, may capture market share of domestic players. Without an international strategy among the domestic firms and a plan to improve knowledge intensity, long-term sustainability of the industry may be at risk.

22.8.2 Challenges

The Malaysian construction industry is an important contributor to the Malaysian economy and national development. Increasing competition from global construction companies and weaknesses in the local ecosystem poses major challenges to local firms in construction industry. Major weaknesses in the local ecosystem are outlined below.

Institutions:

- Current expansion in the construction Industry is highly influenced by government infrastructure spending, residential and non-residential property markets. The industry is sensitive to any economic uncertainties and changes in government policies. Lack of regular industry fore-sighting hinders the industry from mitigating the risks associated with economic volatilities, changing government regulations, shifting consumer preferences and converging technology platforms.

- Lack of collaboration among business associations, government agencies and universities, firms in the industry result in fragmentation of value-chain in the industry. This hinders the scope of knowledge and technology transfer among local firms.

- There are very few research institutes and centres-of-excellence that lead scientific developments for the industry. Hence the industry is dependent on foreign firms and research institutes for new innovations.

Basic Skills Development:

- The industry spends very little on basic skills development due to its high dependence on unskilled workforce from neighbouring countries, the uncertainties of the business cycle and a high staff turnover rate.

Advanced Skills Development:

- Advanced skilled development in this industry is relatively low compared to most of the other industries for the following reasons:

- There is a lack of mentors with high technical skills and this hinder sustained development of talent in this industry.

- There is a major brain-drain problem in the industry, as local talent tends to explore career prospects in more developed countries with more competitive remuneration packages and working environment.

- There is a mismatch in the talent needed by the industry and the talent produced by the local institutions of higher learning.

- There is no impetus for pursuing cutting edge R&D that will contribute to new innovations for the industry. Simple adaptation of existing and foreign technology is adequate for construction firms to be profitable.

S&T Knowledge:

- Weak R&D activity due to uncertainty on the returns on investment and existing technology and 'know-how' is sufficient for major players to be profitable.

- Lack of research talent to develop cutting edge R&D activities for the construction industry.

- High dependence on imported foreign technology and equipment.

- Most of the available resources are spent on hiring low-skilled foreign labourers.

Market Intelligence:

- Fragmented interaction between stakeholders preventing full exploitation of market knowledge.

- Monopolistic/'lock-in' behaviour holds back innovation, technology & knowledge sharing activities.

- Low ICT use among firms, especially SMEs hinders them from getting access to information and knowledge that are strategic to their development.

Knowledge Culture:

- Low industry-relevant competency and lack of skilled personnel impact the knowledge content and innovations in the industry as firms are risk averse in undertaking R&D activities.

- Local firms are very reliant on foreign knowledge and technology, which constrains local innovation in this industry. There is a fair degree of 'lock-in' of foreign technology in the local industry and this crowd-out the development of local innovations.

- Low use of ICT and e-governance systems in the industry perpetuates a culture of non-transparent business dealings and rent-seeking culture, which hinder knowledge acquisition, sharing and development in the industry.

22.8.3 Way Forward

The industry has the potential of moving up the innovation value chain. The transition to a more knowledge-intensive industry will not only have significant impact on the construction industry, but also the broader economy. The following measures are proposed to improve the knowledge content of the construction industry.

Recommendation 22.1: Focus Development in Key Priority Areas that the Local Industry Can Build Comparative and Competitive Advantage

With rapid growth in demand of infrastructure development, residential and non-residential properties in Malaysia and the region, the industry should focus development in areas that will give firms in the industry comparative and competitive advantage using state-of-the-art technology. Among the key initiates are as follows:

- Focus development in the following areas
  - Prefabricated modular homes – they are: durable; easy to transport; simple design; low cost of construction, production and assembly; easily scalable; flexible use for residential and non-residential properties; and portable, which can be used in onsite locations such as labour camps and temporary offices.
  - Environmentally-friendly construction materials – buildings that energy efficient, use recyclable and advanced materials (including textiles and fabric) that does not harm the environment.
  - Smart residential/non-residential properties and other infrastructure (road, ports, airports, etc.) - construction applications, digital design and intelligent systems that meet the needs of a wide spectrum of industries and life-styles of people of all walks of life.
  - Invest in R&D that lead innovations in key focus areas of development:
  - Establish centres of excellence and research focus areas mentioned above in local universities and government research institute.
  - Local centres of research excellence should establish strong collaborations with industry and leading global centres of excellence to undertake translational research, testing and commercialisation activities. This can be done via establishing prestigious strategic research grants, doctoral scholarships and post-doctoral fellowships that address priorities areas in Malaysia. Once such grant is the "Newton-Ungku Omar Fund" funded by the UK and Malaysian governments.
  - Local industry association in partnership with government agencies and industry associations should promote the R&D undertaken by local researchers – government agencies and government linked companies should support innovations undertaken by firms in the local construction industry.

Recommendation 22.2: Enhance Skill-Set of Workers in the Industry and Attract Top Talent into the Industry

One of the major challenges encountered by the industry is the ability to attract workers to this industry. In this industry "on the job training" and apprenticeship programs are critical for workers to acquire advanced knowledge and skills in the industry. To encourage more skilled workforce to enter into the construction industry with advanced skills and experience that are relevant to the industry, the following suggestions are proposed:

- Key institutions (government agencies, unions, employers, and education and training institutions) should identify future skills and competencies required by the construction industry and map a clear career pathway that help workers transition into a high-income job.

- Establish post-secondary skills training programs that are relevant to the construction industry through the various community colleges, technical colleges and polytechnics. These programs should have incorporate internship and on-the-job training with local construction companies so as to ensure that they have guaranteed employment upon completing their certification and training. The programs should also provide pathway for workers to pursue university qualifications and/or certifications with key professional bodies in engineering, architecture and other construction related professional associations.

- Establish a mentorship program for high school, college and undergraduate students who may be curious and keen to learn about employment prospects in a wide range of construction related careers such design, landscaping, architecture, advanced material, ICT related areas and other construction related fields. As part of the mentorship program students are given an opportunity to work on an industry related project under the guidance of a mentor from the industry.

- To address labour shortages in the industry, specific programs for quality retired men and women from the Armed Forces should be designed for them to develop promising careers in the relevant subject matter in the construction industry.

Recommendation 22.3: Enhance Greater Efficiency within Supply Chain Using More Sophisticated Technology

Close collaboration between all parties in the industry is critical for the success of the industry enhancing its competitive position in a more open and competitive national and regional economic climate. Collaboration between key players is fragmented and this hinders the industry in moving up the innovation and knowledge value chain. One of the ways to overcome this challenge is to use more effective technology platforms to foster strong collaborative working relationship among all parties. Widespread use of integrated information management systems among the public sector and firms in the construction industry will go a long way in achieving the following:

- Provide all parties access to information and market intelligence for strategic decision making;
- Provide a database of all services providers in the industry, thus fostering stronger network externalities;
- Enable SMEs to access vital information, advice, resource and networks to enhance their competitive position;
- Reduce transactional cost and improve operational efficiency;
- Enable greater efficiency and effectiveness of the supply chains in the construction industry; and
- Mitigate risks associated to rent-seeking behaviour that is prevalent in the industry.

Recommendation 22.4: Improve Government to Government Support for Business Expansion

Establish strong government to government (G-to-G) partnership with major global players such as China, USA, UK, Japan, Korea and other developed economies, who will assist local firms, research community and trade associations to establish strong partnerships that are mutually beneficial in areas such as:

- Open access to domestic and regional markets for local firms to jointly participate with their foreign counterparts to bid for major construction projects;
- Jointly fund large infrastructure development projects overseas, providing appropriate financing, expertise and resources for local firms to expand their footprints in other countries;
- Develop cooperation for large scale frontier R&D projects that will be mutually beneficial to both firms from both countries;
- Share best practices and experience and put in place support such as technology grants and capability development programs for firms to adopt these new global best practices and standards.

22.8.4 Best Practices

The transformation of the Malaysian construction industry into a knowledge-intensive industry will have a significant spill-over impact on the construction, other industries and the overall economy. Below are some of the best practices from pace-setter countries, which contain the potential transform the local construction industry into a knowledge-intensive industry.

Best Practice 22.1: Transforming the Industry into a Modern and Knowledge Intensive Industry

Frontier R&D and Innovation in the construction industry, European Union

The EU has in place a 20-year strategy to support frontier R&D and innovations for the construction industry. A research network consisting of 18 partners from 8 countries within the EU cooperated and coordinated their research programs to ensure the construction is undertaken in a sustainable way and that the innovations undertaken will enhance its global competitiveness. The R&D investments were channelled to develop the following priority areas: resource efficient and clean buildings; innovative value-added construction products and services; industrialisation and informatisation of the industry using new integrated construction processes and systems.

The R&D in the above areas enabled EU to lead in those fields; and they include real estate subjects such as:

- Intelligent residential and non-residential properties;
- Safer, faster and most cost-effective tunnels using more durable, environment-friendly construction materials and intelligent system.
- Development and incorporation of seamlessly integrated systems (13CON Integrated Project) and applications that provide end-to-end solutions, more transparent access to information and knowledge. The SMEs in the industry were the biggest beneficiaries of the system, as they were able to access the relevant information, knowledge, resources, networks and markets.
- Textile and advanced material R&D for the construction industry, which has significant potential in terms of smart design and architecture, lightness environmental-friendly, fire-resistant and other multifunctional applications in the construction industry.
- The innovations derived from the above R&D initiatives not only has a market with EU, but also has strong demand across the globe, especially in the developing world, where income levels are on an upward trend.

Best Practice 22.2: Enhance Skill-Set of Workers in the Industry and Attract Top Talent into the Industry

Holistic talent development strategy for the construction industry, USA

The construction industry has been undergoing rapid transformation and the US Department of Labour has been working closely with the industry associations and training institutes, colleges and universities to provide the following upgrade to the skill-set of the labour force in the US construction industry. Among the initiative include the following:

- Providing training in a wide range of jobs in the construction (more than 500 job categories) industry using state-of-the-art technology. The program includes apprenticeship, on-the-job training programs, research and other academic programs with various institutes, colleges, technical colleges and universities.
- Some of the trainings provide incorporate professional certification and a pathway to continuing education and other higher certification and academic qualification. Professional certifications help some of the workers improve employment opportunities and obtain a stable income.
- Other innovative approaches to training include the 'Helmets to Hardhats', a program to assist retired armed forces workers with good technical skills to obtain relevant training to create a promising career for themselves in the construction industry. An example of such an initiative is the Veterans in Constructions Electrical (VICE) Program which provides retired army personnel a 14-week intensive training in electrical and electronics

to enable them to work in the electrical industry for the construction sector. Similar program is available for a wide range of construction related industries such as piping, telecommunication and railroads. These programs address the shortage of skilled workforce in the construction industry and provide employment opportunities for retired army personnel who are highly disciplined and trainable personnel. For more details, refer to Helmets to Hardhats (2016).

- Another innovative program is the Architecture, Construction and Engineering (ACE) program, where high school students receive mentorships from professionals and practitioners on building a career in design and construction. The students obtain 'hand-on' experience under this program with leading construction companies and SMEs in the industry. The program is the fastest growing mentorship program with more than 8000 students enrol in the program, with a total of USD14 million scholarships and grants are provided to promising students. A five year ACE Strategic Plan (2016-2021) was established to expand the outreach program to more students. This program has been successful in attracting young creative talent into the construction industry. For more details, refer to ACE Mentor Program. (2016).

Best Practice 22.3: Enhance Greater Efficiency within Supply Chain Using More Sophisticated Technology

Use of advanced technology to improve operational efficiency within the supply chain, UK

The UK construction industry uses advanced technology such as the Business Information Modelling (BIM) technology, BIM-Design technology for manufacturing assembly (DFMA) and 'lean' construction processes to improve the efficiency in the three phases within the construction industry - design, development and management of the assets.

This technology is used extensively by the public and private sector in a wide range of construction activities to achieve the following: instil greater transparency and reduce asymmetric information among all economic agents; increase operational efficiency; and prevent rent-seeking behaviour. The information system also provides consumers and suppliers opportunities to provide feedback on the quality of service and feedback to improve the assets and service. The system also fosters strong collaboration and cooperation among government agencies, industry association, firms, suppliers and consumers. Best practices and new innovations within the industry are also communicated quickly to all stakeholders using the digital medium. In essence, the use of advanced technology - such as BIM, BIM-DFMA and 'lean' construction processes- instils a continuously improvement culture within the construction industry.

Best Practice 22.4: Improve Government to Government Support for Business Expansion

EU-China Cooperation to enhance global reach

The construction industry from EU is one of the most sophisticated. On the other hand, the construction industry from China has been growing over the last few decades and has expanded its reach across most continents. Some of the Chinese construction companies are regarded as one of the largest and most competitive globally. To synergise on the strengths of the construction industries in both region; both EU and China have established government to government cooperation that are mutually beneficial to the firms and construction industry in these countries. Among the key collaborative initiatives include the following:

- Share experiences and best practices on science and technological programs that lead to new innovations in the construction industry.
- Identify key socioeconomic challenges that impact communities in EU, China and globally, and find solutions to these challenges through collaborative R&D programs. These include developing the following areas that benefit the construction industry in both regions:
  - Low carbon energy and energy-efficient systems for the construction industry
  - Development of sustainable and smart cities;
  - Advance and composite materials that are relevant the construction industry; and,
  - Communication, digital applications and knowledge management systems that improve the efficiency and productivity of firms in the construction industry.
- Open the research, development and innovation outcomes to industries in the EU and China, with a special focus on facilitating the scaling-up and internationalisation of SME operations in both continents.
- Facilitate and support firms from the EU to gain access (via joint-ventures) to Chinese technology, knowledge and markets; and, vice-versa.
- Enable Chinese and EU construction companies to collaborate major infrastructure development projects such as highways, port, airport and other mega construction initiatives.

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CHAPTER 23
Conclusion

Phase 1 of this study examined the state of development of the knowledge ecosystems for the 21 industries in Malaysia. Based on the analysis of the knowledge ecosystems, the state of the development of Malaysia's knowledge economy vis-à-vis a comparison to more developed countries can be ascertained. Weaknesses in the knowledge ecosystems of each of the 21 industries were identified and the report sought to provide guidance to the development of the way forward to improve the ecosystem in these industries.

In this chapter, we will adopt a macro view to inspect Malaysia's knowledge economy based on quantitative and qualitative data analysis in order to define cross-cutting issues and the thematic underpinnings of the economy that span different sectors. To enable the discussion, we begin with a summary of the 21 industries by presenting an overall mapping of their knowledge content and innovation. This mapping interlinks with the knowledge flows across industries, and highlights the enabling and support inter-dependencies of one industry with another. We also comparatively summarise the knowledge ecosystems of more advanced countries and that of Malaysia. The process of comparative benchmarking provides valuable insights on the gaps in Malaysia's overall knowledge ecosystem as well as those in the 21 industries. Based on the identified gaps, key challenges facing the Malaysian economy are identified and strategies to transform Malaysia into a high income knowledge economy are proposed.

23.1 Knowledge Content and Innovation

The knowledge content, innovative capacity and knowledge flows of firms in the 21 industries is captured by examining innovative capacities of firms, measured by technology innovation and overall innovation. **Table 23.1** shows that firms in industries with highest knowledge content (K-score) are also the ones that register the highest technological innovation and overall innovation. Technological Innovation is defined as developing technologically new or significantly improved products or processes or both. The broader measure of overall innovation not only captures innovation in products or processes, but also improvements in internal management, organisational methods, marketing concepts and business strategies.

Table 23.1: Knowledge Content and Innovative Capacity of Firms

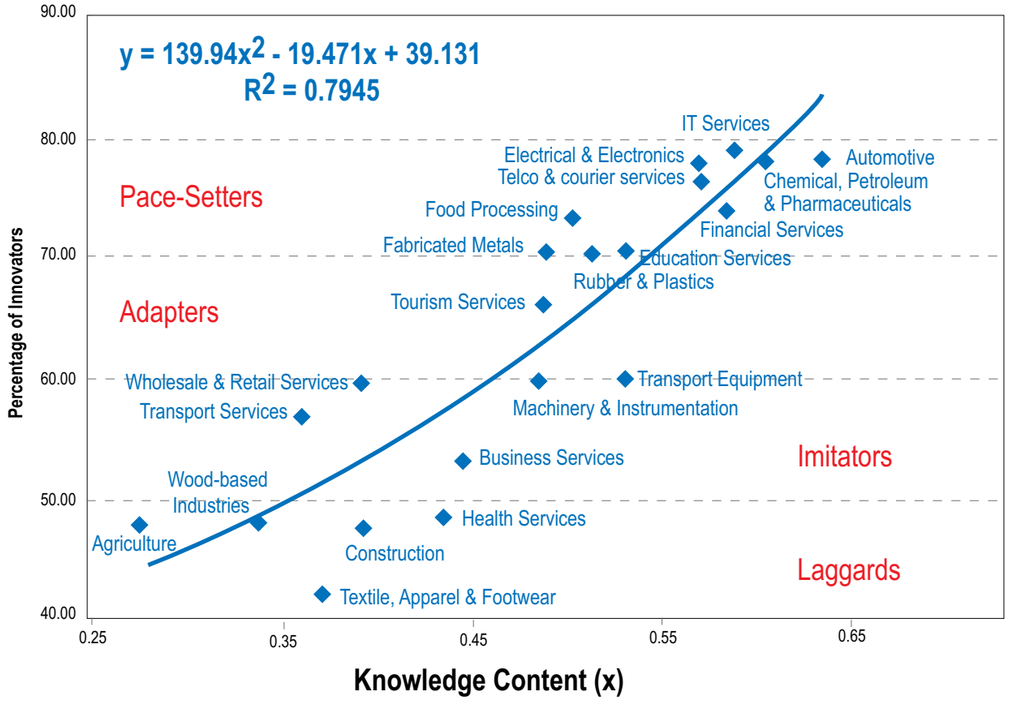
	Number of firms	Average K-score	Technology Innovators	Technology Innovators %	Technology Innovators K-score	Innovators	Innovators %	Innovators K-score	Non-Innovators	Non-Innovators %	Non-Innovators K-score
Automotive	69	0.64	49	71.01	0.70	54	78.26	0.69	15	21.74	0.43
Chem, Pet, Pharma	100	0.61	65	65.00	0.67	78	78.00	0.65	22	22.00	0.44
IT Services	66	0.59	44	66.67	0.65	52	78.79	0.62	14	21.21	0.47
Finance Services	23	0.59	10	43.48	0.65	17	73.91	0.61	6	26.09	0.52
Teleco & Courier Services	30	0.57	13	43.33	0.64	23	76.67	0.62	7	23.33	0.42
Electrical and Electronic	125	0.57	75	60.00	0.61	97	77.60	0.60	28	22.40	0.47
Transport Equipment	40	0.53	22	55.00	0.65	24	60.00	0.66	16	40.00	0.35
Education Services	58	0.53	30	51.72	0.64	41	70.69	0.62	17	29.31	0.31
Rubber and Plastic Products	148	0.51	89	60.14	0.56	104	70.27	0.57	44	29.73	0.39
Food Processing	157	0.50	97	61.78	0.56	115	73.25	0.55	42	26.75	0.39
Fabricated Metals	139	0.49	82	58.99	0.55	98	70.50	0.55	41	29.50	0.36
Tourism Services	165	0.49	71	43.03	0.58	109	66.06	0.56	56	33.94	0.35
Machinery and Instruments	52	0.49	27	51.92	0.57	31	59.62	0.57	21	40.38	0.37
Business Services	253	0.45	88	34.78	0.55	134	52.96	0.53	119	47.04	0.36
Health Services	122	0.44	45	36.89	0.57	59	48.36	0.55	63	51.64	0.33
Construction	217	0.39	59	27.19	0.52	103	47.47	0.49	114	52.53	0.31
Wholesale or Retail Trade	124	0.39	44	35.48	0.49	74	59.68	0.48	50	40.32	0.26
Textile, Apparel and Footwear	76	0.37	22	28.95	0.54	32	42.11	0.51	44	57.89	0.28
Transportation Services	192	0.36	64	33.33	0.50	109	56.77	0.46	83	43.23	0.24
Wood-Based Products	102	0.34	31	30.39	0.47	49	48.04	0.44	53	51.96	0.25
Agriculture	88	0.28	32	36.36	0.38	42	47.73	0.37	46	52.27	0.20

Notes:

1. Technology Innovators are firms that reported having developed technologically new or significant improved products or processes or both.

2. Innovators are firms that reported significant improvements not only in products or processes but also improvements in internal management, organisational methods, marketing concepts or business strategies.

Figure 23.1: Industry Knowledge Content and Innovation Mapping



Note: Innovators are firms that reported significant improvements not only in products or processes, but also in internal management, organizational methods, marketing, concepts and business strategies.

The top three industries with the highest knowledge content are automotive; chemicals, petroleum & pharmaceutical; and IT services. In contrast, the three industries with the lowest knowledge content are agriculture, wood-based products and transportation services. Mapping the knowledge content against the level of innovation, the 21 industries can be divided into four distinct category groupings:

- ***Pace-setters*** – Percentage of innovators range is from 70% to 80%. It comprises the following industries in Malaysia: Food Processing; Chemicals, Petroleum & Pharmaceuticals; Electrical & Electronics; Financial Services; Telecommunications & Courier Services; IT Services; and Automotive.

- ***Adapters*** – Percentage of innovators range is from 60% to 70%. It comprises the following industries: Rubber & Plastic Products; Fabricated Metals; Education Services; and Tourism Services.

- ***Imitators*** – Percentage of innovators a range is from 50% to 60%. It includes the following industries: Transport Equipment; Machinery & Instruments; Transportation Services; Business Services; and Wholesale & Retail.

- ***Laggards*** – Percentage of innovators range is from 40% to 50%. This group includes the following industries: Agriculture; Wood-Based Products; Textile, Apparel & Footwear; Health Services; and Construction sectors.

23.2 Knowledge Flows Across the Different Industries

The mapping and grouping into Pace Setters, Adapters, Imitators and Laggards does not surface inter-linkages that exist between industries. The inter-links between industries can be elucidated by looking at the flow of knowledge between source and recipients. Access to knowledge is critical for a firm to move up the innovation value chain. **Table 23.2** shows that the biggest providers of knowledge are firms from their own industry. Firms also receive knowledge from others from different industries. The intensity of inter- and intra-industry knowledge flows are given in **Table 23.2** with summary of knowledge flows for each sector.

Table 23.2 Source-Acquirer of Knowledge for the 21 Industries in MYKE III

Acquirer \ Source	Agriculture	Food Processing	Chemicals, Petroleum, Pharmaceuticals	Rubber and Plastic Products	Wood-Based Products	Fabricated Metals	Automotive	Transport Equipment	Textile, Apparel and Footwear	Electrical and Electronic	Machinery and Instruments	Education Services	Transportation Services	Finance Services	Tourism Services	Telecommunications and Courier Services	Health Services	IT Services	Business Services	Wholesale or Retail Trade	Construction
Agriculture	28.4	8.0	2.3	1.1	0.0	0.0	0.0	1.1	0.0	0.0	2.3	0.0	5.7	0.0	0.0	1.1	1.1	0.0	8.0	9.1	0.0
Food Processing	16.6	26.8	0.6	1.3	3.0	1.9	0.0	1.9	0.0	1.3	11.5	1.9	0.0	1.9	0.0	0.0	2.5	3.8	8.3	7.0	2.0
Chemicals, Petroleum, Pharmaceuticals	5.0	4.0	35.0	9.0	0.7	3.4	6.8	2.0	0.0	1.0	11.0	4.0	3.4	5.8	2.4	0.0	0.7	0.7	7.0	2.0	2.0
Rubber and Plastic Products	2.7	0.0	4.7	34.5	0.7	3.4	2.0	2.0	0.0	6.1	12.2	0.7	4.9	3.4	0.7	1.4	0.0	0.0	9.5	2.7	5.9
Wood-Based Products	1.0	0.0	1.0	2.0	22.5	25.2	0.0	2.9	1.4	1.0	7.8	1.0	0.7	1.0	0.0	0.0	0.0	0.0	5.9	1.0	11.5
Fabricated Metals	0.7	2.2	4.3	0.7	1.4	25.2	2.9	1.4	0.0	4.3	10.1	0.7	0.7	0.7	0.0	0.0	0.0	0.0	6.5	0.7	1.4
Automotive	0.0	0.0	0.0	4.3	0.0	8.7	42.0	8.7	1.4	4.3	26.1	2.9	0.7	5.8	0.0	0.0	0.0	0.0	7.2	0.0	5.0
Transport Equipment	2.5	0.0	2.5	0.0	0.0	10.0	5.0	25.0	0.0	5.0	17.5	5.0	2.9	2.5	0.0	0.0	0.0	0.0	10.0	0.0	0.0
Textile, Apparel and Footwear	1.3	1.3	1.3	0.0	1.3	0.0	0.0	1.3	18.4	1.3	3.9	0.0	3.9	2.6	1.3	0.0	0.0	0.0	5.3	0.0	0.0
Electrical and Electronic	0.0	0.8	4.0	3.2	0.0	4.0	6.4	0.0	0.0	35.2	18.4	2.4	3.2	2.4	0.0	0.0	0.0	0.0	11.2	0.8	3.2
Machinery and Instruments	1.9	0.0	1.9	0.0	0.0	1.9	1.9	3.8	0.0	7.7	23.1	5.8	3.8	1.9	1.9	0.0	0.0	0.0	7.7	0.0	3.8
Education Services	1.7	0.0	1.7	0.0	0.0	1.7	5.2	1.7	0.0	1.7	3.4	41.4	1.6	8.6	3.4	3.4	0.0	0.0	13.8	3.4	0.0
Transportation Services	0.0	0.0	2.6	0.5	0.5	0.5	2.1	8.9	0.5	1.6	3.1	1.6	19.8	3.1	2.6	3.1	0.0	0.0	4.2	1.0	0.5
Finance Services	8.7	13.0	4.3	8.7	4.3	0.0	4.3	0.0	0.0	4.3	4.3	0.0	3.4	17.4	4.3	0.0	0.0	0.0	4.3	4.3	0.0
Tourism Services	0.6	5.5	1.2	0.0	0.0	0.0	0.0	1.2	0.6	1.8	0.6	3.6	5.5	5.5	39.4	3.6	30.0	0.0	11.5	3.0	10.0
Telecommunications and Courier Services	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.0	0.0	3.3	0.0	3.3	13.3	6.7	0.0	30.0	0.0	13.6	16.7	9.8	18.2
Health Services	0.0	0.0	2.5	0.0	0.0	0.0	0.0	0.0	0.0	0.8	2.5	6.6	0.8	3.3	6.6	0.0	34.4	0.0	18.2	0.0	19.0
IT Services	1.5	0.0	1.5	0.0	0.0	0.0	0.0	0.0	0.0	6.1	1.5	3.0	1.6	9.1	0.0	13.6	0.0	45.5	7.5	3.2	1.8
Business Services	0.0	0.0	1.6	0.8	0.4	0.4	0.4	0.8	0.0	2.4	2.4	2.0	1.6	7.1	1.2	1.6	0.8	0.0	4.8	14.5	0.8
Wholesale or Retail Trade	2.4	2.4	3.2	1.6	0.0	0.8	9.7	1.6	4.0	1.6	5.6	2.4	1.6	2.4	0.8	0.8	1.6	0.0	4.8	14.5	0.5
Construction	0.5	0.0	1.4	0.0	2.3	1.8	0.5	1.4	0.5	3.2	9.7	2.8	0.0	1.8	0.0	0.0	0.0	0.0	7.4	0.5	28.6

The table above shows that there is knowledge-transfer within and across the different industries. These flows are summarised below.

- ***Agriculture:*** agriculture (28.4%); wholesale & retail trade (9.1%); food processing (8.0%); business services (8.0%); and transport services (5.7%);
- ***Food Processing:*** food processing (26.8%); agriculture (16.6%); machinery & instrumentation (11.5%); business services (8.3%) and wholesale & retail (7%);
- ***Chemicals, Petroleum & Pharmaceuticals:*** chemicals, petroleum & pharmaceuticals (35%); machinery & instrumentation (11.0%); rubber &plastic products (9.0%); business services (7%) and wholesale & retail (7%); agriculture (5%);
- ***Rubber and Plastic Products: rubber and plastic products (34.5%);*** machinery & instrumentation (12.2%); business services (5.9%); and electrical & electronics (6.1%);
- ***Wood-based Products:*** wood-based products (22.5%); machinery & instrumentation (7.8%); business services (5.9%) and construction (5.9%);
- ***Fabricated Metals:*** fabricated metals (25.2%); construction (11.5%); and business services (6.5%);
- ***Automotive: automotive (43%);*** machinery & instrumentation (26.1%); fabricated metals (8.7%), transport equipment (8.7%); business services (7.2%) and financial services (5.8%);
- ***Transport Equipment:*** transport equipment (25%); machinery & instruments (17.5%); fabricated metals (10%); business services (10%); construction (5%) and education services (5%);
- ***Textile, Apparel and Footwear:*** textile, apparel and footwear (18.4%); and business services (5.3%);
- ***Electrical & Electronics:*** electrical & electronics (35.2%); machinery & instruments (18.4%); business services (11.2%); IT services (7.2%); and automotive (6.4%);
- ***Machinery & Instruments:*** machinery & instrumentation (23.1%); electrical & electronics (7.7%); business services (7.7%) and education services (5.8%);
- ***Education Services:*** education services (41.4%); IT services (20.7%); business services (13.8%) and automotive (5.2%);
- ***Transportation Services:*** transportation services (19.8%); and transport equipment (8.9%);
- ***Financial Services: financial services (17.4%);*** food processing (13%); agriculture (8.7%) and rubber & plastic products (8.7%);
- ***Tourism Services: tourism services (39.4%);*** IT services (13.3%); business services (11.5%); transportation services (5.5%); finance services (5.5%); and food processing (5.5%);
- ***Telecommunication & Courier Services:*** telecommunication & courier services (30%); business services (16.7%); transportation services (13.3%); transport equipment (10%); wholesale & retail (10%); and finance services (6.7%);
- ***Health Services: health services (34.4%);*** IT services (13.1%); business services (9.8%); finance services (6.6%); and tourism services (6.6%);
- ***IT Services:*** IT services (45.5%); business services (18.2%); telecommunication & courier services (13.6%); finance service (9.1%); electrical & electronics (6.1)%;
- ***Business Services***: business services (19%); construction (10.7%); IT services (7.5%) and finance services (7.1%);
- ***Wholesale & Retail:*** wholesale & retail (14.5%); automotive (9.7%) and machinery & instruments (5.6%);
- ***Construction:*** construction (28.6); machinery & instruments (9.7%) and business services (7.4%).

The knowledge flow analysis between source and recipients indicate that the following industries are important knowledge enablers for the economy at large: IT Services; Business Services; Education Services; Financial Services; Transportation Services; Electrical and Electronics; Machinery and Instrumentation; and Chemical, Petroleum and Pharmaceutical. The enabling industries are a foundational base and must be strong in order to drive the development of inter-linked industries.

23.3 Knowledge Ecosystems of Malaysia and Advanced Countries

Comparing the knowledge ecosystems of advanced countries to that of Malaysia draws out interesting insights on Malaysia's relative position of strength or weakness. **Figure 23.3** shows the knowledge ecosystem of advanced countries based on extensive survey of research literature. Based on the data obtained from Department of Statistics, the knowledge ecosystem for Malaysia is shown in **Figure 23.4**. A summary of the flows between the knowledge enablers and dynamic capabilities is presented in **Table 23.2**. The flows between dynamic capabilities to economic outcomes are summarised in **Table 23.4.**

Figure 23.2: A Developed Country's Knowledge Ecosystem

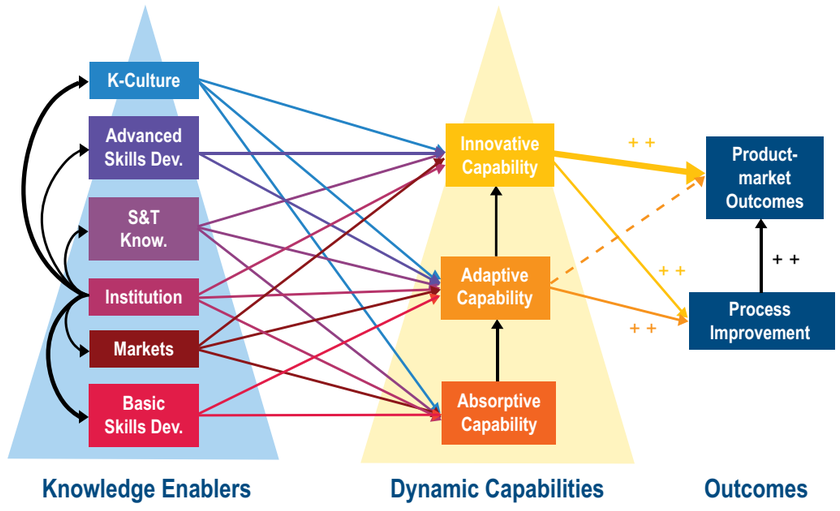


Figure 23.3: Malaysia's Knowledge Ecosystem

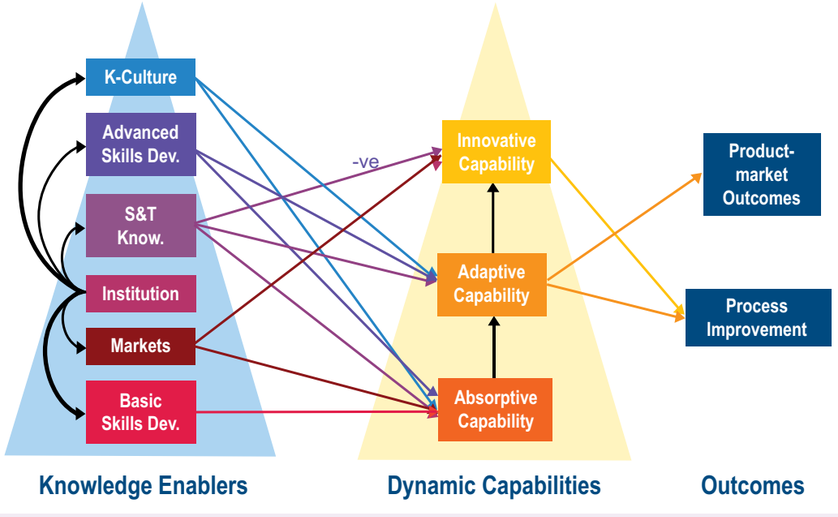


Table 23.3: Knowledge Enablers and Dynamic Capabilities (Overall Economy)

Advanced Countries – Overall Economy	Malaysia – Overall Economy
Basic Skills have a **strong and positive impact** on absorptive and adaptive capability.	Basic Skills have a strong and positive impact on absorptive capability only.
Market Intelligence has a **strong impact** on all three dynamic capability components.	Market Intelligence has a **strong and positive impact** on innovative and adaptive capabilities.
Institutions are **strong enablers** of the knowledge ecosystem and have **direct strong and positive impact** on all three dynamic capability components.	Institutions are **strong enablers** of the knowledge ecosystem. But, institutions **do not impact** the three dynamic capability components directly.
Science and Technological knowledge has a **strong and positive impact** on all three dynamic capability components.	Science and Technological knowledge has a **strong and positive impact** on absorptive and adaptive capabilities. However, Science and Technological knowledge has **a strong and negative impact** on innovative capability. The latter results suggest that S&T knowledge has a **high opportunity** cost on the innovative capability of the country.
Advanced Skills have a **strong and positive impact** on both innovative capability and adaptive capabilities.	Advanced Skills have **strong and positive impact** on adaptive and absorptive capabilities.
Knowledge culture a **strong and positive impact** on all three dynamic capability components.	Knowledge culture has **strong and positive impact** on adaptive and absorptive capabilities only. Knowledge culture **does not impact** innovative capability.
The continuum from absorptive capability to adaptive capability to innovative capability is **present and strong.**	The continuum from absorptive capability to adaptive capability to innovative capability is **present.**

The comparative analysis shows that the knowledge ecosystem of Malaysia is relatively weaker than that of more advanced countries. In particular, knowledge enablers of Malaysia are unable to provide sufficient support for the strong development of adaptive and innovative capabilities among Malaysian firms. As in advanced countries, institutions (government agencies, trade associations and universities) in Malaysia are important enablers of the national knowledge ecosystem. However, in contrast to advanced countries, Malaysian institutions do not play a direct role in influencing the three components of dynamic capability. In advanced countries, institutions play a dual role in nurturing a vibrant knowledge ecosystem as well as exerting strong direct influence in the nurturance of the three dynamic capability components.

The flow from absorptive capability to adaptive capability and innovative capability is present in both advanced countries and in Malaysia. This suggests a hierarchical building blocks structure in the three dynamic capability components. Each one supports and reinforces the effect of the other in a mutually intertwined and dependent manner. Any weakness in one component has an effect on the others. The connections suggest that foundational knowledge in the form of absorptive and adaptive capabilities set the base that helps spur incremental innovations. Further, incremental innovations are, per se, a pathway for driving more advanced innovation.

The interconnected impact of the three dynamic capability components ultimately leads to innovation and economic outcomes. These are summarised in **Table 23.3** for advanced countries and Malaysia.

The analysis in **Table 23.4** shows that Malaysia's knowledge ecosystems primarily generates process outcomes and lower levels of product outcomes compared to more advanced countries. This result is not surprising as the key enablers of Malaysia's knowledge ecosystem primarily contribute to absorptive and to some extent adaptive capabilities, and feature at a much smaller level in the development of innovative capability.

Table 23.4: Dynamic Capabilities and Economic Outcomes (Overall Economy)

Advanced Countries – Overall Economy	Malaysia – Overall Economy
Adaptive capability has a **positive and very strong impact** on process improvement. Adaptive capability also has a **positive and strong impact** on product market outcomes.	Adaptive capability has a **positive and strong impact** on process improvement and a **positive impact** on product market outcomes.
Innovative capability has a **very strong positive impact** on process improvement and product market outcomes.	Innovative capability has a strong **positive impact** on process improvement only.
Process improvement has a **positive and strong impact** on product market outcomes.	Process improvement has **no impact** on product market outcomes.

The comparative analysis shows that the overall knowledge ecosystem of Malaysia is able to generate all three dynamic capabilities at a level such that they are able to achieve process innovation and product development in narrow and niche areas. The analysis of the 21 industries also highlights that Malaysia possesses knowledge intensive and high-tech industries that have the potential to move the economy up the innovation value chain. To ensure that the economy transforms into a knowledge intensive high income economy, five major strategic thrusts require attention. These five strategic thrusts are outlined in brief below.

Strategic Thrust 1: A holistic talent development strategy for a knowledge-intensive economy

The global economy and industrial structure is undergoing rapid transformation due to converging technological platforms. Consequently, industries that exist today may not be around in the next 5 to 10 years. Some of the key global change drivers include the following[9]:

- Demographic Shifts;
- Economic Turbulence;
- Complex Geopolitics – issues of security, environment, and trade liberalisation;
- Business Agenda 3.0 – managing the 'triple bottom line': people, planet and profits;
- Industry 4.0;
- Talent Poaching;
- Disruptive Technologies & Business Models, Networks and Partnerships;
- Science and Technology becoming pervasive in the competitiveness of nations; and
- Natural Resources limitations.

The key question is whether our educational institutions who are training the next generation talent themselves possess the skills to tackle the global challenges; and are in a fit position to power the next generation industries. Or is it the case that our education institutions are simply churning out skills for tomorrows 'sun-set' industries?

To ensure that students and future graduates are capable of transforming Malaysian industry into a knowledge intensive and globally competitive marketplace, there needs to be concerted efforts among all parties to foresight changes taking place in the domestic, regional and global economy. These changes will define the types of jobs that will be created and disappear; and the joint collaborative efforts that will be needed between institutions of learning, industry, industry associations, government agencies and community associations in designing the curriculum at all levels – pre-school to post-doctoral training to meet the creative talent needs of the country.

Mechanisms and institutional infrastructure need to be put in place to facilitate continuous review and refinement of the education and training resource requirement, such that it is closely aligned with industry's future needs. This requires a broad strategy of fostering creativity, agility and mobility of talent such that it is able to bridge current industry needs with prospective future industry needs.

[9]Refer to Talwar and Hancock (2010) and World Economic Forum (2016) on the changing global industrial structure and employment market.

Strategic Thrust 2: Focus and Invest in R&D frontier technologies to enable Malaysian industries to 'leap-frog' to higher innovation value chain

The R&D focus areas in most of Malaysian industries are relatively narrow and uncoordinated. Increasingly converging technological platforms and knowledge systems require inter-disciplinary and inter-industrial collaboration. To move up the innovation value chain, innovation agencies in partnership with relevant ministries, industry associations and other key stakeholders must map key frontier R&D and technologies and the developmental pathways that Malaysia should invest into over the next 10 years to transform its key industries to become globally competitive.

Prioritisation of R&D across all the industrial sectors will be essential for the long-term sustainability of the industries. Concerted effort is needed to identify the state of play of the current ecosystems, gaps and the types of resources required to transform them into vibrant and effective ecosystems. These frontier R&D and technologies should be monitored on a regular basis and refinements should be made to R&D plans to ensure industries are at the fore-front of development.

Strategic Thrust 3: Nurture next-generation leaders to power Malaysia's knowledge economy

As part of the talent development strategy, industry associations in partnership with industries and government agencies must invest in nurturing the next-generation leaders to transform industries to be innovative and globally competitive. One of the best practices in Malaysia in terms of leadership development comes from the Finance sector, where a number of institutes have been specifically established to help the industry become regionally competitive and globally innovative in niche areas, such as Islamic banking and finance.

The strength of the Finance industry best practice originates from the richness of its knowledge ecosystem to develop robust leadership in the niche area of Islamic banking and finance. A number of key agents come into play, and include among them the *Malaysian Insurance Institute (MII), the Institute of Bankers Malaysia (IBBM), Islamic Banking and Finance Institute Malaysia (IBFIM), International Centre for Leadership in Finance (ICLIF), International Centre for Education in Islamic Finance (INCIEF), Financial Sector Talent Enrichment Programme (FSTEP), International Shariah Research Academy for Islamic Finance (ISRA), Financial Institutions Directors' Education Programme (FIDE), and Asian Institute of Finance (AIF).* These institutions were established to ensure the continuous development of talent and leadership in the industry. Strong and visionary leaders will be key drivers for transforming laggard industries into pace-setter industries.

The best practices from the finance industry are an invaluable reminder to other industries of what can be achieved with a systematic approach and when the community of leaders are able to make decisions for the common good of the broader industry and economy instead of focusing solely on short-term spikes in revenue or shareholder value. Leaders of tomorrow need to possess leadership styles that are ambidextrous to balance between short-term needs and long-term sustainability, have high emotional intelligence, and foster a practical wisdom through which they can mentors others to success. Leaders, at all levels, are a vital component in the task of creating a vibrant innovation ecosystem.

Strategic Thrust 4: Strengthen 'quadruple-helix' to create multiplier effect

Strong partnership and a shared common vision among stakeholders (industry, industry associations, government, institutions of learning and community organisations) in an industrial ecosystem are critical factors for raising the dynamic capability and competitiveness of industries. In many advanced countries the lead orchestrators of a cohesive and competitive industrial cluster are government (lead ministry or government agency) and industry players themselves and their associations. All parties dovetail and work in synergy to maximise the outcomes from their resource outlays.

For the 21 industry clusters to enhance their dynamic capabilities and economic outcomes, a high level industry panel consisting of key representatives should be established to develop an industry roadmap that charts out a five-year plan to enhance the innovative capacity of the industry. The plan should give attention to the following:

- Current state of play of the industry;
- Identify key R&D priority areas;
- Identify lead players (institutions) in the cluster;
- Resources (fiscal and non-fiscal incentives) needed to develop enhance translational research and industry take-up of the innovations from the R&D endeavours;
- Identify key inter- and intra-industrial knowledge flows that will enhance the multiplier-effect; and
- Establish key performance indicators (KPIs) and tracking mechanisms. A clear framework (dashboard) should be in place to regularly monitor progress and undertake refinements to ensure the industry is progressing as envisioned in the roadmap.

Strategic Thrust 5: Nurture a business friendly knowledge ecosystem

Advanced countries typically have very effective support systems that ensure firms have access to the necessary resources, accurate information and advanced knowledge sources to allow them to make strategic decisions relatively quickly. To ensure the support environment is conducive in meeting needs of firms, the industry panel should provide oversight to the resources and support systems to be knowledge-intensive and globally competitive. The support systems must assure non-duplication and flexibility of processes to ensure industry is nimble and accurate in its strategic decision making.

Key resources and support systems that require attention include the following: ensure testing and proto-tying facilities are available for firms; certification approvals are simplified and streamlined so as to reduce the turnaround time; enhance the capability of Global Business Services; ensure adequate funding is available for SMEs and start-ups; assistance for firms to internationalise their operations; high use of technology; availability of R&D funding and technical support; availability of knowledge and resources for marketing, branding and positioning; provision of services to help SMEs obtain resources for business development; a robust and sound patenting ecosystem; a sound regulatory and legal system; and other business friendly services that reduce cost, improve efficiency, increase financial investment and enhance knowledge transfer.

23.4 Concluding Remarks

The MYKE III (Phase 1) study provides valuable information on the knowledge ecosystems for the 21 industries in Malaysia. Using survey method, interviews and focus group studies, strengths and challenges in the knowledge ecosystems were identified. The information on the strengths and gaps of the ecosystems coupled with feedback from captains of industry and stakeholders provided insights on key policies and strategies to strengthen the ecosystems to move up the knowledge value chain.

While the study provided valuable insights for policy formulation, the study is not without limitations. There are four major caveats for the results obtained from this study. First, use of a purposive sampling frame means the results obtained may not be generalisable to the 21 industries in the country. Second, some of the instruments used from MYKE I and MYKE II, which had to be utilised in MYKE III (Phase 1), do not accurately represent the constructs for knowledge in the conceptual model. Hence, the framework used may not capture the knowledge ecosystem accurately. Third, the data used does not capture the diversity in sub-sectors in each of the 21 industries. As a consequence of this, the empirical results for the ecosystems may suffer from an over-aggregation bias. Fourth, the original questionnaire was adopted from MYKE-II,, so that comparative analysis could be conducted between the current study and previous MYKE studies. The original questionnaire was found to be lengthy and for a number of questions respondents were unable to or unwilling to provide accurate answers. Finally, even though the sample was segmented into 21 industries it is important to note that for a number of industries the subsamples were susceptible to a 'small-sample bias problem', making them insufficiently representative of the population they represent. To overcome the 'small sample bias problem' in the data, industries were classified into four categories (Laggards, Imitators, Adapter and Pace-setters). The knowledge ecosystems for these four groupings were measured and inferences for each of the industries were made based on the four groupings. The knowledge ecosystems models based on these classifications may not fully capture the knowledge ecosystems for each of the industries individually.

Despite the limitations, the empirical analysis from the MYKE III (Phase 1) study provides valuable insights into the strengths and weaknesses of the knowledge ecosystem for the 21 industries in Malaysia. Future studies should use a probability based sampling method as opposed to convenient sampling to more accurately capture the underlying knowledge ecosystems for the 21 industries and Malaysia. This will lead to a more accurate picture on which to base policies and strategies to strengthen the knowledge ecosystems for the 21 industries.

Reference

1. Talwar, R. and Hancock, T. (2010). *The Shape of Jobs to Come*: Possible New Careers Emerging from Advances in Science and Technology (2010-2030), Fast Future. Retrieved from www.fastfuture.com.

2. World Economic Forum. (2016). *The Future of Jobs: Employment, Skills and Workforce Strategy for Fourth Industrial Revolution,* Global Challenge Insight Report, WEF. Retrieved from http://reports.weforum.org/future-of-jobs-2016/

Appendices

Appendix I: Focus Group Discussion Guide

Basic Focus: How to improve innovation performance (competitiveness) and productivity of companies (efficiency of the Industry sector).

Warm Up & Introduction

- Consent forms, inform respondents of recording and note taking.
- Introduce self and then ask each participant to introduce themselves.

A. Industry Sector Characteristics

1. General characteristics of the industry sector in Malaysia
2. What opportunities do companies in your sector have? How are these taken advantage of?
3. What challenges do companies face in your sector? How are these addressed?
4. Industry sector life cycle? Is it declining/mature/growing? How is this conclusion reached?
5. International competitors and how Malaysia fare in international markets?
6. What can we learn from international competitors?

B. Capability

1. How capable are Malaysian companies of competing in this sector?
2. What are our (Malaysian industry) areas of strength?
3. Who should help us to improve our capability to compete (Innovate, improve productivity)? How? Discuss and probe: University, industry bodies and government

C. Learning and Improvement

1. How does your company learn (improve its capability)?
2. Where would you go to build necessary skills to improve your company performance?
3. How do companies in your sector plan for the future? What strategies are used in your sector?
4. How do you build human capability? Who helps you build human capability?

D. Building Blocks

1. What do you think is most important necessary building block for improving productivity/innovation in your sector? How important are these?

Close:

- Is there anything else you would like to add?

Thank the participants

Appendix II: Questionnaire in English

DEPARTMENT OF STATISTICS, MALAYSIA
www.statistics.gov.my

Please make a copy for your record

Confidential when filled with data

MALAYSIAN KNOWLEDGE CONTENT SURVEY 2015
(FOR REFERENCE YEAR 2014)

Name of estant and postal address

Please amend if there are any changes in the above postal address

For enquiries, please contact:

Tel. No.: _____

Fax. No.: _____

Email: _____

OFFICE USE

Serial Number

DECLARATION

Name:

Designation:

Telephone:

Fax. No.:

Email:

I hereby declare that the information given in this return is complete and correct to the best of my knowledge and belief.

Singature:

Date:

GENERAL INFORMATION

a. The Department of Statistics, Malaysia is conducting the Malaysian Knowledge Content Survey 2015 (for reference year 2014).

b. The main objective is to provide assessment of knowledge content and practices in key economic sectors to formulate policies, strategies and action plans in promoting greater application of knowledge and technology.

c. The information is gathered under the provisions of the Statistics Act 1965 (Revised - 1989). Section 5 of this Act requires all establishments operating in Malaysia to provide actual information or best estimates to the Department. The Act stipulates that the contents of the individual returns are CONFIDENTIAL and will not be divulged to any person or institution outside this Department. Meanwhile, Section 7 under the same Act provides the penalty to the respondent that could not comply with the survey undertaken.

d. You are requested to provide information related to your establishment as stated above and return the completed questionnaire to the Department.

DATUK DR. HJ. ABDUL RAHMAN HASAN
CHIEF STATISTICIAN, MALAYSIA

Date:

Your co-operation in ensuring the success of this survey is very much appreciated

Lampiran II: Borang soal selidik dalam Bahasa Malaysia

JABATAN PERANGKAAN MALAYSIA
www.statistics.gov.my

Sulit selepas data diisi

Sila buat satu salinan untuk rekod tua

PENYIASATAN KANDUNGAN PENGETAHUAN MALAYSIA 2014
(BAGI TAHUN RUJUKAN 2013)

Nama pertubuhan dan alamat pos

Sila pinda jika ada perubahan pada alamat pos di atas

Bagi sebarang pertanyaan, sila hubungi:

No. Tel : _____

No. Faks. : _____

E-mel : _____

KEGUNAAN PEJABAT

Nombor Siri

PENGAKUAN

Nama:

Jawatan:

Telefon:

No. Faks.:

E-mel:

Dengan ini saya mengesahkan bahawa maklumat yang diberi adalah lengkap dan betul sepanjang pengetahuan dan kepercayaan saya.

Tandatangan:

Tarikh:

MAKLUMAN AM

a. Jabatan Perangkaan Malaysia sedang melaksanakan Penyiasatan Kandungan Pengetahuan Malaysia 2014 (bagi tahun rujukan 2013).

b. Tujuan utama ialah untuk menyediakan penilaian kandungan pengetahuan dan amalannya dalam sektor utama ekonomi bagi membentuk polisi, strategi dan pelan tindakan dalam menggalakkan lagi penggunaan pengetahuan dan teknologi.

c. Maklumat yang dikumpul adalah mengikut peruntukan di bawah Akta Perangkaan 1965 (Disemak - 1989). Seksyen 5 di bawah Akta ini menghendaki mana-mana pertubuhan yang beroperasi di Malaysia untuk memberikan maklumat sebenar atau anggaran terbaik kepada Jabatan. Mengikut Akta ini, kandungan soal selidik pertubuhan yang diterima adalah SULIT dan tidak boleh dihebahkan kepada sesiapa atau mana-mana institusi di luar Jabatan ini. Sementara itu, Seksyen 7 di bawah Akta yang sama memperuntukkan denda kepada responden yang gagal memberi kerjasama kepada penyiasatan yang dijalankan.

d. Tuan diminta melaporkan butir-butir yang berkaitan dengan pertubuhan tuan seperti tercatat di atas dan mengembalikan soal selidik yang lengkap ke Jabatan ini.

DATUK DR. HJ. ABDUL RAHMAN HASAN
KETUA PERANGKAWAN MALAYSIA

Tarikh:

Kerjasama tuan/puan dalam menjayakan penyiasatan ini sangatlah dihargai

End of Final Report

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