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Manpower Requirements for Selected Services Subsectors in Malaysia: An Input-Output Analysis

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ABSTRACT

The importance of Manpower planning in the industry or sector is considered as one of the ways to create sustainable growth and development. This study aims to present a comprehensive review of the projecting Manpower requirements in chosen service's sectors in Malaysia and suggesting the direction in the development of a human resource that indicates different categories of employment for the year 2020. The Manpower Requirement Approach (MRA) is used in selected service's sub-sectors for 2020, utilizing the Malaysian Input-Output tables for the year 2005 and 2010, composed of skilled, medium-skilled and low-skilled labour categories. The results show the higher need for Manpower in the skilled labour, in line with the ideology in targeting active labour-intensive participation of localized Manpower and liberalize the service's sector in Malaysia. This study fully benefits labour economics and encourages the participation of local Manpower in the services' sector in Malaysia.

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INTRODUCTION

In terms of economics and social outcomes, almost all developing countries are formulating medium to long-term evolvement plans. It varied to its importance in terms of meeting the requirements of development planning (Adam et al., 1992). The prestige of the planning can be gained by the success and commitments in gathering the required information and regulate the economic life of the chosen country. In terms of the planning context mentioned by Richter (1986), those planning concerned with securing the correct number of people with the precise qualifications for accurate jobs at the right time. Adding on, the most common approach begins with a conditional projection of Manpower needs to give sectorial output forecasts or plan targets (Abegaz, 1994), which defines by Ismail (2002) that time, place and capability to use the workforce effectively are equally important essential in Manpower planning.

This article presents an exhaustive review upon Malaysia that is facing various issues in the labour market, specifically unemployment and labour mismatch (Mohd-Rahim et al., 2016; GIZ and ILO, 2015). Undeniable that the increase in demand for labour is an alarming challenge in Malaysia (Palel et al., 2016) and enough Manpower is needed (Mohamed and Bjorn Nillsson, 2014). However, this evidence explained by World Bank (2018) can be observed in terms of the short, medium and long run. To get a job among graduates is very competitive as uncertainty occurs in Malaysia's labour market (Migration Survey Report Malaysia, 2016). The summary of Malaysia's labour force according to the Labour Force Survey (LFS) in 2015, the number of unemployed persons increased by 39,200 people to 450,300 people. The unemployment rate shows an increase from 2.9% in 2014 to 3.1 % in 2015. Therefore, the labour supply in service's sub-sectors has always been available in the future, (Nambiar, 2011) if the proper Manpower planning implemented, accordingly. There is little research about unemployment and Manpower planning in Malaysia, especially focusing on a sector. Realizing the gap in the extant literature, lack of information on the labour demand is a barrier for the policymakers in Manpower projection and determining the required employee in the Malaysian labour market.

This paper will focus on an account of the Manpower requirements of four levels of workers for the service's sub-sectors. Alluding to the Malaysian Standard Classification of Occupation (MASCO) 2008, which are based on the International Standard Classification of Occupations (ISCO-08) is documented in ILO (2012). There are four major groups in occupation been chosen and tabulated, namely (i) managerial, professional and executive, (ii) technical, associate professionals and supervisory (iii) clerical workers (iv) service, sales, craft and related trade workers, plant and machine operators, assemblers and elementary workers in this study. Accordingly, the research tended to focus on four sub-sectors, which are the professional business, education, health, and Information and Communications Technology (ICT), initially been introduced in Economic Transformation Plan (EPT) under Tenth Malaysia Plan. Furthermore, the mentioned four sub-sectors are included in the National Key Economic Areas (NKEA).

LITERATURE REVIEWS

In order to avoid the imbalance skills in the labour market, forecasting manpower requirements have been used for economic planners, policymakers, and training providers. The analysis of Hillebrandt and Meike (1985), Kao and Lee (1998) stressed out that the shortage in any category can be defined as 'bottleneck' in output and reduce productivity. Adding on, Ahmad and Blaug (1973) advocate that the interest in the Manpower forecasting can be formulated in various expansions, despite the concerns on the growing economy. Forecasting skills of labour are important for a rapidly growing economy (Giesecke et al., 2015) like Malaysia. However, criticism has been arising from Ahmad and Blaug (1973), Colclough (1990) and Psacharopoulos (1991) were, mentioned forecasting activities had been notable in developing and economically stabled countries, but not an ideal or sophisticated method in aids to policymakers in labour markets. The authors trace on the estimates in methodology and plausible assumption's accurate number of workers with the exact skills. However, the literature of Manpower forecasting and planning methodologies are quite narrowed (Safarishahrbijari, 2018) and incongruent (Bryant et al., 1973; Smith and Bartholomew, 1988; Debauvais and Psacharopoulos ,1985; Psacharopoulos, 1991; Campbell, 1997 and Weber and Zika, 2016). It appears from the investigations that numerous investigations been conducted in most previous studies, and it is difficult to obtain the performance enhancement. Generally, manpower requirement forecasting needs a lot of ways of improvement in recognizing the skills of labour in need (Mengistu and Mahesh, 2019)

Nevertheless, Tin et al. (2011), Ismail (2012), Ismail et al. (2007), Spalletti (2009) and Nymoen and Rodseth (2003) have discussed and posted a comprehensive review that labour productivity driven the efficiency and

effectiveness of every labour to produce the appropriate output. Thus, in conjunction with the economic growth, the increase in labour productivity is an essential (Santric Milicevic et al., 2018), equivalent to a synonym in forecasting manpower requirement. Apart from the research that focuses only on Manpower requirement, there is some given attention by researchers in motivating this study in diversity. Ross and Zimmermann (1993) analysed the labour demand elasticity for high-level occupation based on selected service's sub-sectors. The forecasts for this study show that the category of occupations is highly dependent on the output growth of the service's sector. The contribution of the study by Klump and de La Grandville (2000) in labour demand elasticity with highlighting the Manpower requirement, shows that a higher elasticity of substitution between labour and capital could possibly result in a higher level of labour productivity in the steady situation. Anticipating in Manpower planning, Bartholomew et al. (1991) modelled that future development in Manpower forecasting are inevitably linked to developments in information technology, and such will make this planning and forecast more accessible and accurate at every level of society. However, due to the limitations of analyzing the study in this field of Manpower planning and forecasting (Chia-nan and Nhu, 2013), further discussions are quite challenging yet refreshing. Besides, the most popular approach begins with the projection of Manpower needs in line with the output given for forecasting (Weber and Zika, 2016).

Highlighting to this study, the Input-Output model is further used in the MRA approach. Perhaps most countries use this approach in developing a more rigorous understanding of policy making to achieve the targeted economic growth (Holub and Tappeiner, 1989) as the right decisions constructed terms of training and education from the forecasts (Flaschel et al., 2013). In multisectoral employment, the demand is forecasted around a Leontief Input-Output table (Maier et al., 2015). Adding on, employment projections that figures by industry are rare, therefore future skills are important in policy issues, especially in industrialised economies (Maier et al., 2015 and Ramarao et al., 2014).

METHODOLOGY

Sources of data

Data of four selected sub-sectors for the year 2010 were collected from the Department of Statistics. Malaysia (DOS) engaged in the service's sector categorized by Malaysian Standard Industrial Classification (MISC) at the five-digit level. According to the DOS, two assumptions are used to construct an Input-Output table, which is a commodity in technology assumption that commodity was produced using the identical input structure, irrespective of the industry where it is issued. Meanwhile, the assumption of industry technology also mainly that a commodity produced the same input structure. To project the study, other data that were used in this study are Malaysia's Input-Output Table for the year 2005 and 2010 by the DOS. The following table has been aggregated to nine times nine dimensions, covering the four sub-sectors in the service's sectors. These four sub-sectors are identified in the 12 areas of NKEA (National Key Economic Areas) in the year 2010, clearly portrayed in Figure 1 and Table (a). Moreover, NKEA sub-sectors are introduced under the Economic Transformation Plan (ETP) that been projected as the goal for a high income economical within the introduction of the New Economic Model (NEM). Those subsectors are professional's business, education, health and Information and Communications Technology (ICT) and single sectors represented by the agriculture, mining and quarrying, construction and manufacturing.

Notably, these four subsectors that have been selected for this study showed real implications for the key sources in the NKEA. To emphasize, this study shall reveal the potential of the four selected services sub-sectors to enumerate the growth rate, productivity and the projected Manpower requirements, in terms of ensuring the high economic goals.

Table 1 Detailed Review of 12 National Key Economics Areas

	NKEA	Incremental Gross National Income Contribution (billion RM)	Numbers of Job Generated (People)
1	Greater Kuala Lumpur/Klang Valley	190	300,000-320,000
2	Oil, gas and energy	131.4	523,000
3	Palm oil and rubber	230.9	41,600
4	Wholesale and retail	38.2-55.4	364,686 - 454,190
5	Financial Services	121.5-180.2	275,400
6	Tourism	66.7	497,000
7	Electronics and Electrical	53.4	157,000
8	Business Services	78.7	245,000
9	Communication, content and infrastructure	35.7	43,162
10	Education	31.8 - 61.6	319,550 - 535,000
11	Agriculture	28.9	74,600 - 109,335
12	Healthcare	35.0-35.3	181,000

Source: Department of Statistics Malaysia (DOSM), 2010

Input-Output Methodology

Input-output (Leontief, 1986) models share the practice of translating production targets into implied manpower needs using relatively rigid input-output coefficients (Abegaz, 1994).

Based on the Input-Output approach, the balance equation is written:

$$X = AX + F \tag{1}$$

Where F is the vector of final demand X is the vector of sectoral output and A is the technical coefficient matrix. Solving the balance equation for X, we obtain:

$$X = (I\text{-}A)^{-1} F \tag{2}$$

Let $Z = (I - A)^{-1}$, where Z stands for the number of workers per sector classified.

From equation (1),

$$X = ZF \tag{3}$$

By deriving a row vector of *n* labour coefficients, ℓ_i (each element of which depicts the number of workers required to produce a unit of industry *i*'s output), where ($i = 1, \ldots, n$).

Therefore, the labour coefficient for each industry is calculated as follows:

$$\ell_i = L_i / X_i$$

Where L_i = level of labour in the industry *i*, X_i = total output of industry *i* and ℓ_i = row vector of labour coefficient ($i = 1, 2, 3, \ldots, n$).

Then, $\ell_i = (\ell 1, \ell 2, \ell 3 \ldots \ell n)$. By summing the products of labour coefficients and total outputs of all industries throughout the economy, thus the expression for total industrial employment can be derived as follows:

$$L_T = \sum_{i=1}^{n} \boldsymbol{\ell i\, Xi} \tag{4}$$

where L_T represent total industrial employment in the economy.

Thus, the labour requirement equation of an Input-Output production system of *n* sector is,

$$L = \ell\,(I\text{-}A)^{-1} F \tag{5}$$

Perhaps, the replacement of labour vector coefficient (ℓ) with manpower coefficient matrix (*H*) yields the equation is shown below:

$$L = H\,(I\text{-}A)^{-1} F \tag{6}$$

where $H = \begin{pmatrix} h11\ h12 & \cdots h1n \\ h21\ h22 & \cdots h2n \\ hn1\ hn2 & \cdots\ hn\ n \end{pmatrix}$, L is a total manpower requirement in column vector by occupations *m* x 1, measured in workers, *H* is a manpower coefficient matrix by occupation and by sector *m* x *n* with the coefficients calculated in terms of workers required per unit output, F is a final demand vector *n* x 1 measured in value terms, A is a technical coefficient matrix *n* x *n*, which measures the input requirements per unit output in value terms and I is an identity matrix *n* x *n*.

Input-Output model is the assumption of a single type of labour per sector where labour is homogenous. Labour row vector coefficient ℓ_i must be extended, certainly important is the structural differential based on the different qualifications of the labour.

The compilation of data qualification, the labour requirement of labour, L must be extended to *m* x *n* matrix H which shows the manpower coefficient, where m is the types of skills and n is the type of sectors.

$$H = m \times n \tag{7}$$
$$L = sm \bullet H \tag{8}$$

where sm is a summarized row vector with *m* elements.

Meanwhile, by denoting the column vector of sectoral (*i*), where Z represents the interindustry sales by all the sectors where W is the labour coefficient and h is the level of skills with production of the sector (i) and total demand of sector (j).

Indicating, Z as the number of workers per sector classified into *m* qualifications. It has been written in the single element of that *m* x *n* matrix Z.

$$Z_{ij} = \frac{w_{ij}}{h_j} \tag{9}$$

Correspondingly, the model is restricted exclusively to the effects of changes in sectoral final demand measuring the corresponding variables. In this case, the reformulations of final demand are aggregated in the column vector of the sector by premultiplying the *m* x *n* final demand matrix F and summarized the *m* x 1 column vector.

$$F = H \bullet sm \tag{10}$$

By premultiplying final demand matrix F with summarizing row vector sn', 1 x m row vector Fm' which indicates the final demand aggregated by components:

$$Fm' = sn' \bullet F \tag{11}$$

The structural composition of the final demand, represented by an *n* x *m* matrix f, resulting,

$$f = F \bullet \hat{E}m^{-1} \tag{12}$$

Continuous Exponential Growth Rate of Labour

The continuous growth rate of final demand for the year 2005 and 2010 was used to obtain the growth rate of final demand for the forecasted year of 2020.

For growth rates from the year 2005 to 2010 (5 years):

$$\begin{aligned} F_{jm\ 2010} &= F_{jm\ 2005}\ e^{rt} \\ e^{rt} &= \left(\frac{F_{jm\ 2010}}{F_{jm\ 2005}}\right) \\ r\ t\ \ln e &= \ln\left(\frac{F_{jm\ 2010}}{F_{jm\ 2005}}\right) \\ r &= \frac{1}{5}\ \ln\left(\frac{F_{jm\ 2010}}{F_{jm\ 2005}}\right) \end{aligned} \tag{13}$$

Following projected growth rates of final demand from the year 2010 until 2020 (10 years), equation (6) is substituted into equation (7) to obtain the projected final demand for the year 2020.

$$\mathbf{F}_{jm\ 2020} = \mathbf{F}_{jm\ 2010}\, e^{r(10)} \tag{14}$$

where F_{jm} = Final demand in sector *j* by the subsector *m* for the year *t*, *e* = Exponent and r = Annual growth rate.

The model introduced by Psacharopoulos (1973) as shown:

$$L_T = H\,(\boldsymbol{I} - \boldsymbol{A})^{-1}(F_T) \tag{15}$$

where L_T = Projections of manpower for the sector (number of employees), H = manpower coefficient matrix by occupation and by sector *m* x *n* with the coefficients calculated in terms of workers required per unit output, $(\boldsymbol{I} - \boldsymbol{A})^{-1}$ = Leontief inverse matrix for the base year, (FT) = Forecast of a diagonal matrix of final demand and T = Targeted year (2020).

Noted that H matrix is the element that reflecting the change of labour productivity on the number of labour requirements.

RESULTS AND DISCUSSION

In the production process, which more complicated, each industry has different business fundamentals often interact with each other. Input-Output techniques can show this relationship stems from the purchase of inputs in production up to sales of the products to other sectors. Changes in the domestic demand for a sector not only involve changes in the sector alone but all the sectors of the economy, however, also depends on the strength of the relationship exists. This is the uniqueness of Input-Output analysis, which involves direct effects and indirect effects on the environment of an economy.

Referring to the total employment for the year 2020, the employment share for the economic sectors which illustrates in Table 1 portrayed the overall main economic sectors and services subsectors to get an overview. The manufacturing, construction and agriculture showed a larger share of employment, which are 17.83%, 12.55% and 9.60% respectively. However, the mining sector has shown a smaller share of employment compared to another sector, which is only 0.09%. These figures demonstrate that the manufacturing sector could contribute to the largest number of employees with 2,862, 607 workers. Meanwhile, construction and agriculture have the potential of 2,014,343 and 1,542,189 labours respectively. As mentioned earlier, the mining sector could contribute the least, estimate at 14, 949 workers, as the mining sector are decreasing in production in Malaysia lately (New Economic Model, 2010). The discussion of the projections begins with the total manpower requirement of the subsectors of the selected service for 2020 is about 1,908,976 labours, as forecasted in Table 2 compared to 930,998 labours recorded in the year 2010. The manpower requirement in services subsectors indicating 31.04% of employment share out of total employment for the year 2020. The most striking result to emerge from the data is that the four subsectors of the services sectors show a smaller share of employment compared to other sectors. However, Table 2 illustrated that highest share of employment in the selected services sector is professional business indicates 5.43%, followed by Information and Communication Technology, ICT (4.00%), health (1.34%) and education (1.12%). However, these four subsectors of the services sector reflect larger employment projected for the year 2020, which indicating 872,061 labours for professional business, 641,984 workers for ICT, 214,432 and 180,499 workers respectively for health and education. By extending the inclusion to the incorporation of more labour in services subsectors have led for preparing qualified labour in human resource development (Ismail et al., 2012).

The compounded yearly growth rate based on the final demand for the subsectors of the selected service has been calculated for the forecasted year of 2020, including the compounded growth rate of the year 2010 which been clearly plotted Appendix 1: Figure 1. The annual growth of 2005 till 2010 is computed. The annual growth rate shows the highest in ICT which induced to be projected highest for the year 2020 at 9%. The ICT industry is identified as one of the key drivers to lead the Fourth Industrial Revolution (4IR). This is debatable and justified in the Mid Review of the Eleventh Malaysia Plan (2016-2020) projects that make best through Big Data development. Thus, this paper seeks to address and estimate the manpower by considering direct and indirect technical change and

changes in final demand structure that influence future manpower requirements. To demonstrate the potential of this approach, the result in manpower requirement forecasting conducted with the number of labour employed by selected categories of occupation for the year 2020. Referring to Table 1, projections for manpower requirement using Manpower Requirement Approach (MRA) been addressed for the year 2020. It is projected that the manpower requirement increases to 53.88 % over the period 2010 to 2020. The present forecast is based on Table 1, the total manpower requirement projection in the economy for the year 2020 is recorded as 9,330,761 labours, while in 2010, it was 6,063,794 labours respectively.

With the extension, the labour coefficient could be defined as the quantity of labour per unit of output and calculated by dividing the amount due to labour by its output (Zakariah and Yew, 1997). This postulated the labour has been contributed directly by the final demand of each sector. Moreover, labour productivity is an essential instrument in identifying the progress of labour market' performances (Thangavelu, 2017). In detail, Appendix 3: Figure 2 has shown a clear picture of the productivity projected for the year 2020 showing an increase in the medium-skilled and low skilled in the sectors involved in this study.

As illustrated in Table 3, the manpower projection of the subsectors of the selected service for the year 2020 shows that all mentioned subsectors expanded for all types of occupations. This is highlighted by the ratio of labour by skills occupation types that were recorded. For selected services subsectors, total labour is 1,908,976. The detailed manpower requirements of occupational types are presented in Table 4. It appears from the mentioned table that, subsectors of education show the largest share of employment projected by 58.70% for skilled labour, however least for medium-skilled and low-skilled labour at 7.77% and 33.53%, respectively. The second largest share is ICT which registering 40.15% for skilled occupation, 19.26% for labour in medium-skilled occupation and 35.37 for the low-skilled labour. Subsectors for health records 32.32%, 9.65%, 58.05% for skilled, medium-skilled and low-skilled, respectively. Finally, a subsector of professional business projects 24.66% for skilled labour, 19.06% for medium-skilled labour and 56.27% for low-skilled workers.

Based on the manpower projection for the year 2020, Malaysia has a big potential to increase domestic demand and export to other countries, which could liberalise the subsectors of the service corresponding to the focus of transformation and liberalisation of the services sector in the Eleventh Malaysia Plan. Considerably, skilled, medium-skilled and low-skilled labour needed highly in the year of 2020, which in line with the objectives of this study of manpower requirement in the subsectors of the service. Ismail and Sulaiman (2010) provide an in-depth analysis of the work in reviewing the manpower requirement in the services sector (despite the sectors in this study) in Malaysia. In their research, clearly showed that the services sector is the largest contribution to the Gross Domestic Product of Malaysia until the year now. The enlargement and transformations in this sector need more skilled and semi-skilled labour which proven in our current study's analysis.

The large growth detected in the ICT sector from the year 2005-2010, by analysing the annual growth in the final demand, especially in high skilled. Thus, ICT has a great future in enhancing the high skilled and potential plan on growing the nation, Malaysia by moving towards a developed and high-income country. Therefore, access to skilled labour is a key determinant of production performances (Mertzanis and Said, 2019). The productivity is influenced by the types of skills (Lim, 2018) whereby the productivity of Professional Business decreases in the projection but there is a peak increase in Health, Education and certainly ICT. According to the productivity response, labour skill will influence the performance of sectors through the impact and capabilities in meeting demand (Fakih and Ghazalian, 2015). Moreover, the impact of labour skills believes to affect in terms of dispersion of on firm's demand and production (Mahy et al., 2015).

Table 1 Number of employment projected and share of employment for the year 2020*

No	Sector/Subsector	Total Employment 2010	Total Employment 2020*	Total Final Demand 2010 (RM million)	The share of Employment 2010 (%)	Total Final Demand 2020* (RM million)	The share of Employment 2020* (%)
1	Agriculture, forestry and fishing	1,614,900	1,542,189	36,076	28.95	221,305	9.60
2	Mining and quarrying	57,200	14,949	42,932	1.03	30,247	0.09
3	Manufacturing	2,108,500	2,862,607	58,946	37.79	842,042	17.83
4	Construction	1,082,700	2,014,343	70,817	19.41	257,381	12.55
5	Professional Business	343,797	872,061	20,853	2.58	83,809	5.43
6	Health	179,427	214,432	28,746	1.42	67,207	1.34
7	Education	193,788	180,499	55,617	1.68	103,043	1.12
8	ICT	213,986	641,984	69,915	2.31	270,675	4.00
9	Others (Services)	269,496	987,697	367,526	4.83	962,689	6.15
Total Employment (overall sectors)		6,063,794	9,330,761				

Source: Labour Force Survey & * Projected figure (Input-Output Table)

Table 2 Number of employment projected and share of employment in the subsectors of the selected service for the year 2020*

No	Sector/ Subsector	Total Employment 2010	Total Employment 2020*	Total Final Demand 2010 (RM million)	The share of Employment 2010 (%)	Total Final Demand 2020*	The share of Employment 2010 (%)
1	Professional Business	343,797	872,061	20,853	2.58	83,809	5.43
2	Health	179,427	214,432	28,746	1.42	67,207	1.34
3	Education	193,788	180,499	55,617	1.68	103,043	1.12
4	ICT	213,986	641,984	69,915	2.31	270,675	4.00
	Total Employment	930,998	1,908,976				

Source: Labour Force Survey & *Projected figures (Input-Output Table)

Table 3 Projected manpower requirements of the subsectors of the selected service for the year 2020*

No	Sector/ Subsector	Employment Categories (per person)				Total Employment of the subsectors of the selected service
		(i)	(ii)	(iii)	(iv)	
1	Professional Business	215,091	166,253	180,017	310,700	872,061
2	Health	69,301	20,682	57,259	67,190	214,432
3	Education	105,950	14,029	25,114	35,407	180,499
4	ICT	260,588	154,337	103,398	123,662	641,984
Total Employment of the selected services subsectors		650,930	355,301	365,788	536,959	1,908,976

Note: (i) Managerial, professional and executive, (ii) Technical, associate professionals and supervisors, (iii) Clerical workers (iv) Service, sales, craft and related traded workers, plant and machine operators, assemblers and elementary workers.
Source: *Projected figures (Input-Output Table)

Table 4 Share of employment projected of the services subsectors and economic sectors for the Year 2020*

Sector/ Subsector	**Employment Categories (%)**			
	(i)	(ii)	(iii)	(iv)
Agriculture, forestry and fishing	6.09	5.00	6.57	82.35
Mining and quarrying	9.02	7.67	8.27	75.04
Manufacturing	12.78	9.39	7.37	74.24
Construction	4.90	5.05	4.83	85.22
Professional Business	24.66	19.06	20.64	35.63
Health	32.32	9.65	26.70	31.33
Education	58.70	7.77	13.91	19.62
ICT	40.59	24.04	16.11	19.26
Others (Services)	23.49	17.27	16.55	42.69

Note: (i) Managerial, professional and Executive, (ii) Technical, associate professionals and supervisory, (iii) Clerical workers, (iv) Service, sales, craft and related traded workers, plant and machine operators, assemblers and elementary workers.
Source: *Projected figures (Input-Output Table)

CONCLUSIONS

Applied with the method of Manpower Requirement Approach (MRA), this study was undertaken with forecasting the Manpower requirement in the service's sub-sectors that strongly deal with labour demand. The input-output analysis enables analysts to see the economy in general equilibrium that exists due to the impact of a policy change. A general equilibrium can study by economics, analysts with the view of the industrial chained relationship with each other in an input-output table. Manpower inventory and analysis provided valuable information pertaining to presenting, and future labour needed in anyskills, which been highlighted in the Mid Review of Eleventh Malaysia Plan (2016-2020). The urgent requirement for skilled labour is emphasized especially in the service's sector to increase capacity and productivity. However, the forecast may not be completely accurate, but it is essential as it provides as tools of aid in terms of recruitment, selection and training processes.

A summary of the main findings and of the principal issues have arisen in this discussion. The results of the Manpower requirement in service's sub-sectors for the year 2020 revealed that higher demand needed in professional and low-skilled labour, especially in the trained business subsector. By referring to Appendix 5: Table (c), ICT also shows the rising need for skilled and medium-skilled Manpower. The relevance of labour productivity on the number of Manpower requirement clearly supports the forecasted Input-Output analysis.

As mentioned, sub-sectors of professional and ICT in the service's sector showed the largest decrease in labour productivity and applied adequate conclusion that the Manpower requirements for these sub-sectors are larger compared to health and education sub-sectors in services. However, in this study, all the selected four sub-sectors of the service's sector reveal the decrease in the change of labour productivity in line with the increase in the Manpower requirements for the forecasted year of 2020, which will lead to falls in the economic growth.

Meanwhile, Malaysia still faces a host of issues in the battle to maintain recent growth, ranging from brain drain to inadequate skills level of graduates, unfortunately, these awkward position faces through tough adjustment in the labour market and must outsource in the services' sector, especially to the low-skilled labour. As Malaysia's economy is converting to higher-value-added and knowledge-intensive activities (Tin et.al, 2011), the four services subsectors that have been forecasted in this study are equally important as Malaysia has transformed from agriculture to one of that is service's sector and being the largest contributor to the GDP (EPU, 2015). To endure high skill, more policies prone to higher innovation are needed in terms of industrial growth. The results presented in Appendix 1: Figure 1 and in Appendix 5: Table (c) depicted. In the selected, services subsector; professional business shows a potential growth for the year 2020. As illustrated in Appendix 5: Table (c), medium-skilled and low-skilled labour is a need in high numbers for the professional business sub-sectors, compared to the other subsector in services. Perhaps, in contrast, experienced workers are highly demanded in the ICT subsector for the year 2020. One of the more relevant findings to emerge from this study is that, on average, skilled and medium-skilled workers are going to enhance the development of service's sub-sectors as forecasted for the year 2020. It is noteworthy that more educated, and skilful Manpower is required to assist in the growing services' sectors in Malaysia for the year 2020.

More research is required as this study has limitations due to the projection of Manpower is solely based on the final demand. Meanwhile, the study could be better if the research could undertake in wider projection as data constraint occurs only represents Malaysia. However, the relevance of adopting the Manpower requirement in the service's sub-sectors is clearly supported by the current data using an Input-Output table. Correspondingly, substitution effect across the occupational types is not adequately dealt with in this study. The rationale of using this method by linking the Manpower requirements with the output by sectoral is assumed that the growth of the sectors will be proportional to the growths of the demand of each occupation within the sectors (Willems, 1998).

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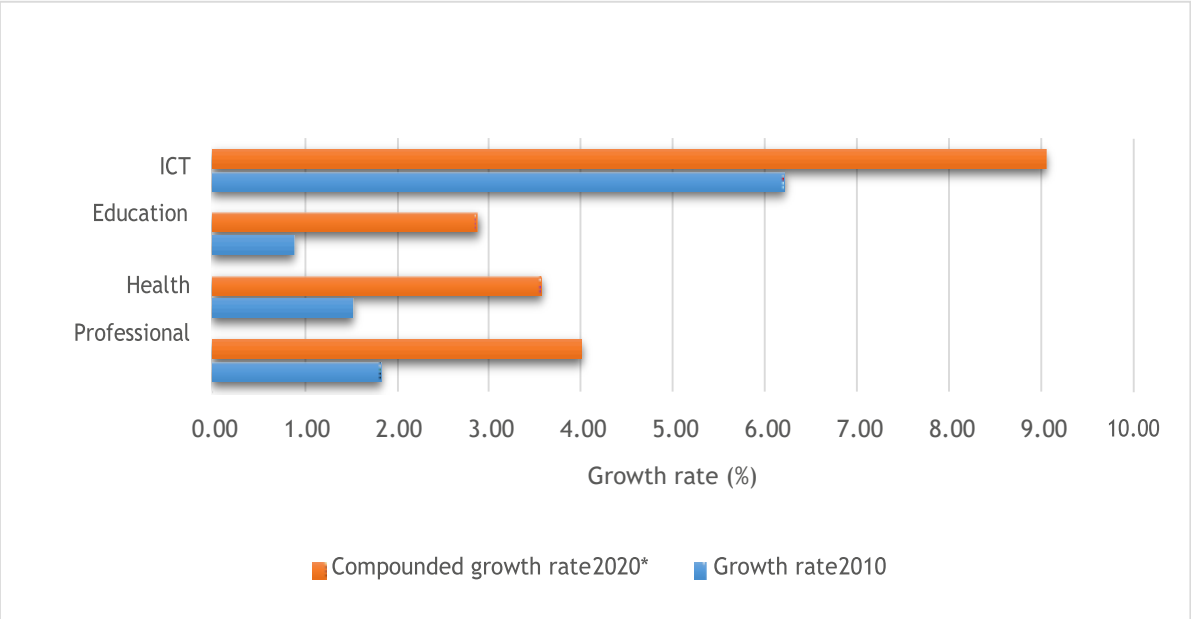
APPENDIX

APPENDIX 1



Source: *Projected figures (Input-Output Table)

Figure 1 The Compounded growth rate for the year 2020*

APPENDIX 2

Table (a) Computed Final Demand for the year 2010 and 2020

Sectors	Final demand 2015	Final demand 2020
Agriculture	89,351,716	221,304,986
Mining	36,035,149	30,246,580
Manufacturing	704,521,252	842,041,863
Construction	135,007,371	257,381,443
Professional Business	19,051,989	25,784,047
Health	35,494,442	27,207,276
Education	60,580,971	53,042,939
ICT	124,488,762	40,444,115
Others (Services)	564,000,053	888,841,251

Source: *Projected figures (Input-Output Table)

APPENDIX 3

Note: (i) Managerial, professional and executive, (ii) Technical, associate professionals and supervisory, (iii) Clerical workers, (iv) Service, sales, craft and related traded workers, plant and machine operators, assemblers and elementary workers.

Figure 2 Productivity in the selected sectors in Malaysia, in the year 2020

APPENDIX 4

Table (b) Total employment in overall sectors in Malaysia for the year 2010

No	Sector/ Subsector	Employment Category				Total employment 2010
		(i)	(ii)	(iii)	(iv)	
1	Agriculture	90,676	73,614	102,272	1,348,338	1,614,900
2	Mining	2,860	2,288	3,432	48,620	57,200
3	Manufacturing	177,860	223,175	134,729	1,572,735	2,108,500
4	Construction	41,439	44,713	44,718	951,830	1,082,700
5	Professional Business	41,735	135,561	46,801	119,700	343,797
6	Health	33,292	16,309	118,072	11,754	179,427
7	Education	85,701	26,050	43,363	38,674	193,788
8	ICT	61,545	60,542	42,637	49,262	213,986
9	Others (Services)	102,003	70,376	68,749	28,368	269,496
Total Employment		1,258,287	497,628	464,773	3,999,281	6,063,794

Note: (i) Managerial, professional and executive, (ii) Technical, associate professionals and supervisory, (iii) Clerical workers, (iv) Service, sales, craft and related traded workers, plant and machine operators, assemblers and elementary workers

Source: Labour Force Survey

APPENDIX 5

Table (c) Projected manpower requirements of the subsectors of the selected service for the year 2020*

Employment categories / **Selected Subsectors**	**skilled**		**medium-skilled**		**low-skilled**	
	2010	2020	2010	2020	2010	2020
Professional business	41735	215091	182362	346270	119700	310700
Health	33292	69301	134381	177941	11754	67190
Education	85701	105950	69413	79143	38674	45407
ICT	61545	260588	103179	257735	49262	123662

Source: *Projected figures (Input-Output Table)

APPENDIX 6

Table (d): Input-Output Table

	INTERMEDIATE CONSUMPTION			**FINAL DEMAND**					
Consuming sectors	1…..j….n	Total Intermediate Demand	Private Consumption	Government Consumption	Gross Fixed Capital Formation	Changes in Inventories	Total net export	Total Final Demand	Total output
Producing Sectors	X_{11}	S_1	C_1	G_1	I_1	V_1	X_1	F_1	Y_1
1	.								
.	.								
.	$X_{i1}…X_{ij}…..X_{in}$	S_i	C_i	G_i	I_i	V_i	X_i	F_i	Y_i
i	.								
.	.								
.	X_{n1}	S_n	C_n	G_n	I_n	V_n	X_n	F_n	Y_n
n									
Total intermediate input	$\mathbf{X_{sum}}$	$\mathbf{S_{sum}}$	$\mathbf{C_{sum}}$	$\mathbf{G_{sum}}$	$\mathbf{I_{sum}}$	$\mathbf{V_{sum}}$	$\mathbf{X_{sum}}$	$\mathbf{F_{sum}}$	$\mathbf{Y_{sum}}$
Total input	$E_{1…}$ $E_{J…}$ E_n	E = S							
Value added	$D_{1…}$ $D_{j…}$,D_n		D_C	D_G	D_I	D_V	D_X	D	
Total Output	$Y_{1…}$ $Y_{j…..}Y_n$		C	G	I	V	X	F	Y

Source: Leontief, W. (1986), Input-Output Economics, Oxford University Press, New York