FACTORS EFFECTING DECISION MAKING ON ELECTRONICS INDUSTRY SUPPLY CHAIN REDESIGN WITHIN ASEAN ECONOMIC COMMUNITY

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Abstract
Upon the ASEAN Economic Community where labor, material, investment can freely flow within ASEAN countries, supply chain will be redesigned. Of interest is the electronic industry which is one of the key production industries of ASEAN countries. The research, developing model and questionnaire, focusing on identifying key factors that affect the decision making should the supply chain redesign. Further investigation is also conducted to reflect the industry supply chain redesign in terms of low-end and high-end perspectives. For both high-end and low-end electronic industries, labor, material and government are among the most significant factors. In low-end case, infrastructure is also of interest.

1. Introduction

ASEAN or Association of South East Asia Nations is the collaboration of Brunei Darussalam, the Kingdom of Cambodia, the Republic of Indonesia, the Lao People's Democratic Republic, Malaysia, the Union of Myanmar, the Republic of the Philippines, the Republic of Singapore, the Kingdom of Thailand and the Socialist Republic of Viet Nam (see Figure 1). With the goals of stable, prosperous, and highly competitive region with equitable economic development, and reduced poverty and socio-economic disparities, ASEAN countries agreed to establish ASEAN Economic Community (AEC) to jointly realise the end goal of economic integration by deepening and broadening economic integration through existing and new initiatives. [1]

Figure 1: ASEAN Countries

The AEC envisages the key characteristics as a single market and production base which comprise of 5 core elements as (i) free flow of goods; (ii) free flow of services; (iii) free flow of investment; (iv) free flow of capital; and (v) free flow of skilled labour. [1]

This collaboration is based on the plentiful resource, to potentially support any economic development per AEC goals. Table 1 summarise some key economic data of 10 ASEAN countries. It can be seen that the total of the population is nearly 600 million, accounting of 8.6% of global population. However, the GDP per capita of ASEAN is very low in comparison to global average (approximately 1/3 of the average). Yet, the GDP is growing very quickly at 5.8%, whilst global GDP growth is only at 3-4%.

Moreover, ASEAN countries mostly rely export, where more than 56% of ASEAN GDP is based on export.

Country	Population (in million)	GDP (billion USD)	GDP Growth (%)	GDP per capita (USD)	Export (billion USD)
Indonesia	242.3	846.7	6.5	3,511	203.6
Thailand	69.5	346.1	4	5,117	226.4
Malaysia	28.9	288.1	5.1	9,949	227.1
Singapore	5.2	260	4.9	46,241	409.5
Philippines	94.9	224.8	3.9	2,346	48.3
Viet Nam	88.8	123.6	5.9	1,375	96.9
Myanmar	48.3	51.9	10.4	857	0.1
Brunei	0.4	16.4	2.2	38,715	12.4
Cambodia	14.3	12.9	6.9	909	5.3
Lao	6.3	8.1	8	1,281	1.9
Total/ Average*	**599**	**2,179**	**5.8***	**3,638**	**1,231**

Table 1: Key Economic Data of ASEAN Countries
Source: [2]

2. Electronic Industry in Thailand and ASEAN

2.1 Electronic Industry in Thailand

Electronic industry is one of Thailand key industries. Thailand has exported electronic components and parts, including electric appliances more than 2,507.32 billion THB (approx. 83 billion USD), bywhich 17% is exported to China, 17% to EU, 16% to USA, 15% to ASEAN and 12% to Japan. This figures accounted for more than 30% of Thailand's export revenues in each year. [3] Main exports are hard disk drives (HDD) and integrated circuits (IC), accounting for more than 75% of total electronic exports

In the past 10 years, world-class/ multinational manufacturers are the main players in this sector, including Fujitsu from Japan, Seagate from the USA, Philips Electronics from the Netherlands, and LG Electronics from Korea and many more. The industry involves hiring of more than 370,000 skilled people in several hundred factories across Thailand. [4]

2.2 Electronic Industry in ASEAN

Apart from Thailand, Malaysia and Singapore are playing an important role in global electronic economics (see Table 2). Moreover, Viet Nam', Indonesia' and the Philippines' electronic industry are also growing very quick for the past few years. [4]

Country	Electronic Export (million USD)
Malaysia	273,598,875
Singapore	91,526,468
Viet Nam	8,798,457
Indonesia	5,813,936
Philippines	14,444,865
Myanmar	271,398
Lao	645,941
Cambodia	44,092
Brunei	3,852

Table 2: Export Figures of Electronic Industry of ASEAN
Source: [4]

Therefore, in this study, the data collection will conduct on Thailand, Malaysia, Singapore, Indonesia, the Philippines and Viet Nam as the main player of electronic industry of ASEAN. Table 3 summarise key impact to economy and main products of these countries.

Country	*Impact to Economy*	*Main Products*
The Philippines	*2/3 of total export and increasing* *40,000 engineers* *3/4 of companies are foreign owned* *1/3 exports to US and EU and 2/3 to Japan, China and other parts of Asia*	*semiconductor manufacturing services, electronics manufacturing services*
Malaysia	*57% of total export*	*semiconductor, room air- conditioners, telecommunications equipment, computers, computer peripherals*
Singapore	*40 semiconductor companies and 160 supporting organizations operating at all levels of the value chain*	*wafer fabrication, semiconductor, production equipment and material*
Thailand	*24% of total export and increasing*	*data processing*
Indonesia	*N/A*	*N/A*
Viet Nam	*N/A*	*transformers, printers, computer and mobile telephone parts, circuit boards*

Table 3: Key Characteristics of Electronic Industry in ASEAN Countries
Source: [5]

2.3 Industry Classification

The study classify electronic industry into 2 class, i.e., high-end and low-end. Where high-end electronic industry are mostly the finished product or main components for assembly, low-end are generally parts, components or basic/principle material. It is understood that low-end products involve with labor intensive activity and mostly low technology machine and process. Oppositely, high-end products are mostly machine-based or high-technology. Within the data collection 36% of industry surveyed are high-end, the rest are low-end. Whilst the nature of both class are different, the decision making shall be so.

3. Model Development on Key Factors Affecting Decision Making in Electronic Industry

3.1 Model Development

Of interest are the key factors affecting decision making in electronic industry. Such decision making is whatif the industry shall expand their business, relocate, resize, recruit and reorganize. Here, the term “Supply Chain Redesign” is used in the research question. Therefore, the model is developed to address those factors. Per literature, this case of supply chain redesign can be established based on the problem of site relocation or selection and related topics. [6][7][8][9]

Here, the factors related to the redesign are grouped and constructed of 8 main factors, i.e., (1) labor, (2) supply, (3) logistics, (4) economics, (5) government, (6) infrastructure, (7) risk, and (8) location. Moreover, each main factor are described and constructed by sub-factors, in total of 58 sub-factors. Figure 4 summarise the model.

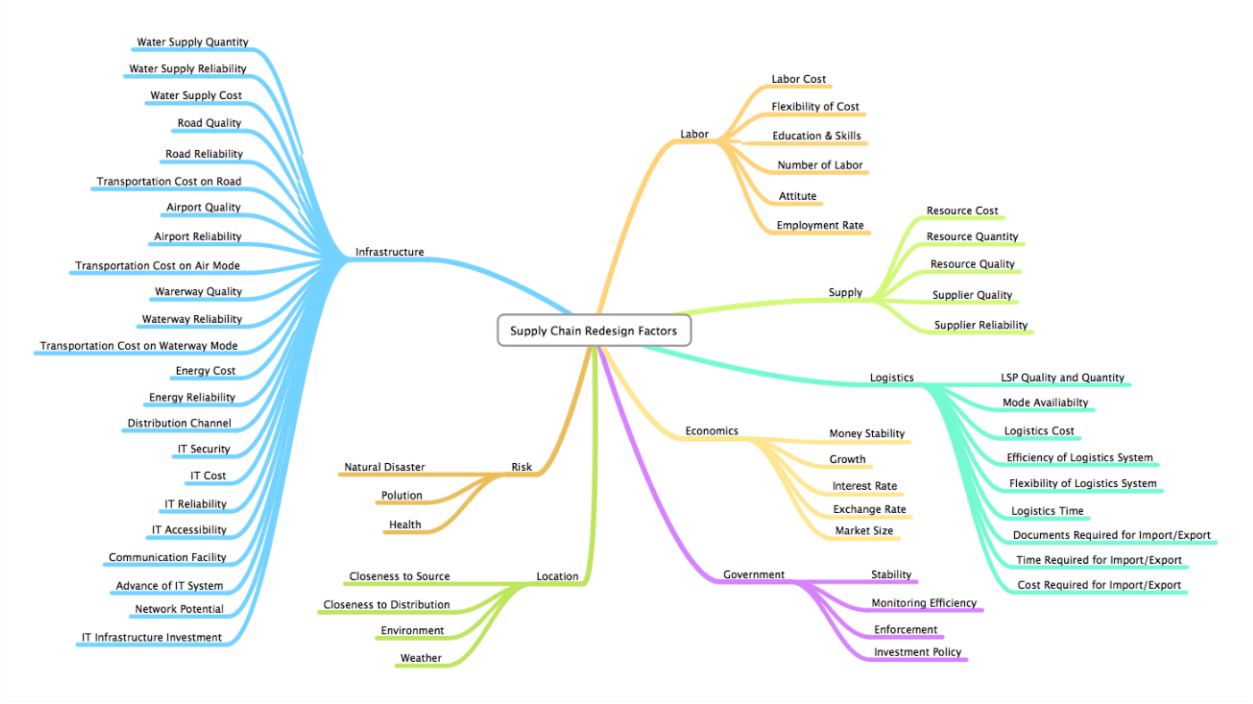

Figure 4: Supply Chain Redesign Model

3.2 Questionnaire Development and Distribution

The questionnaire is developed on top of the model described earlier. Here, to simplify the understanding of the questionnaire answerer, 8 main factors are asked to be ranked by their importance and 58 sub-factors are to be scaled, 1-5. Then to calculate the significance of each factor and sub-factor, weight-form rank is used. Therefore, only few sub-factors will be identify as the key sub-factors.

It shall be noted that there is a limited resource of the research. Therefore, only 88 questionnaires were returned and the distribution is mostly concentrate to Thailand (which is the main interest of the research). The return rate and acceptance rate are less than 10%. Figure 5 summarise the distribution of returned survey.

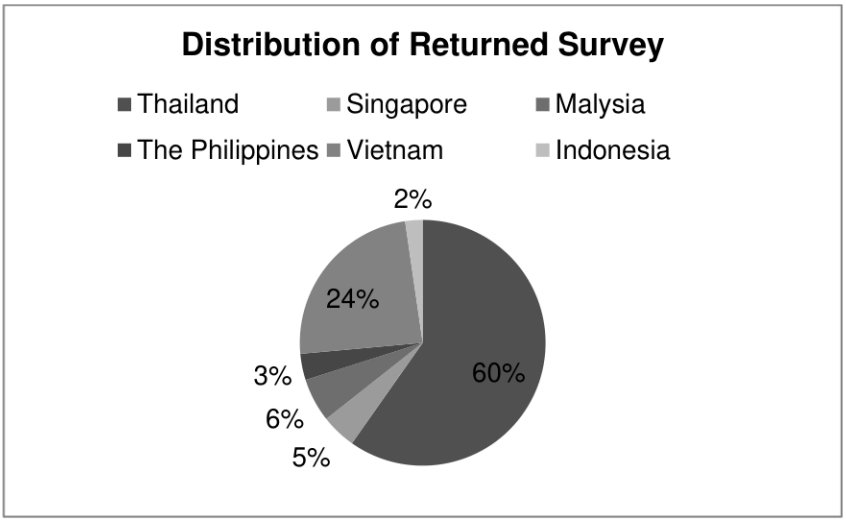

Figure 5: Distribution of Returned Survey

4. Results

After calculation, Figure 6 and Table 4 summarise key sub-factors and their weight of interest.

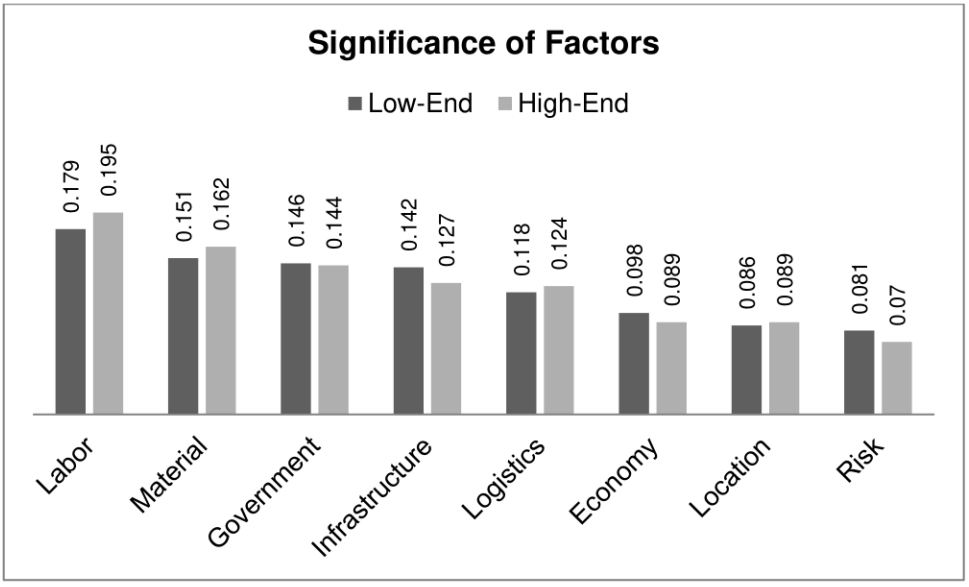

Figure 6: Significance of Factors – Low-End vs High-End

Here, it can be seen that for the high-end, labor, material and government are among the most significant factors. For the low-end, again, labor, material and government are among the most significant factors, like-wise the high-end. However, infrastructure are appears to be more-or-less significant.

Factor	Low-End Key Sub-Factor	High-End Key Sub-Factor
Labor	Employment attitude	Employment attitude
	Labor skill	Labor skill
	Labor availability	Labor availability
	Labor cost	Labor cost
Material	Material quality	Material cost
	Supplier quality	Material availability
Government	Government security	Government security
	Funding for infrastructure project	Law enforcement
Infrastructure	Connectivity	Connectivity
	Availability of air transport	Cost of air transport
	Reliability of air transport	Availability of latest technology
	Quality and reliability of information technology	Reliability of air transport
	Reliability of energy resource	Distributional infrastructure
	Availability of energy resource	Availability of water resource
	Cost of energy resource	Availability of air transport
	Distributional infrastructure	Quality and reliability of information technology
Logistics	Transport performance	Transport performance
	Transportation cost	Availability of 3PLs
Economy	Exchange rate	Inflation rate
	Inflation rate	Exchange rate
Location	Accessibility to supplier	Accessibility to supplier
	Working environment	Working environment
Risk	Risk of natural disaster	Pollution problem
	Disease problem	Disease problem

Table 4: Key Sub-Factors – Low-End vs High-End

Focusing on the sub-factors, for material factor, the main difference between high-end and low-end appears that the high-end is interested in material cost and availability, where the low-end is interested in material and supplier quality. This may be because the high-end is levelled up to the cost reduction level where material cost and availability are the main interest. On the other hand, the low-end is focusing on the quality to address the high need of the customer.

On government factor, the difference is where the high-end is interested in law enforcement, the low-end is, on the other hand, interested in the funding for infrastructure project. The infrastructure's sub-factors are also the main difference between this two classes. Where the low-end shows concern on this factors, the high-end is not so.

5. Conclusion

The study identifies the factors of interest of high-end and low-end electronic industry. Where labor, material and government are among the most significant factors for both high-end and low-end, for the low-end, infrastructure is also of interest. The difference between this two classes are also identifies on the key sub-factors. Where the nature of the industry is difference, the key sub-factors are so. The study is based on real needs and requirement. Therefore, if any country should aim to induce investment, benefit from supply chain redesign, in the electronic industry, these sub-factors are area of the focus.

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