LEVEL OF INFORMATION TECHNOLOGY USAGE IN MANAGING LOGISTICS AND SUPPLY CHAIN OF THAI INDUSTRY

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Introduction

Thailand is an industrialized, developing economy. As the world's 21th strongest economy with GDP of 437.8 USD billion, Thailand is now trying to overcome the middle-income trap. Thailand is positioning toward a value-added economy, following the national policy of Thailand 4.0, with key agendas of creativity, innovation and digitalization. Of interest of this paper is the information and Information Technology (IT) usage in managing logistics and supply chain of Thai industry. Bywhich are the critical keys of these transformation [1,2].

It shall be highlighted at first that the level of Information Technology (IT) usage in managing logistics and supply chain of Thai industry is still questionable. Whilst each industry shall require different objectives of logistics and supply chain management, e.g., cost, responsiveness, agility, level of IT usage can be varied. In addition, as many as 96% of Thai enterprise are small and medium (SMEs), their investment can be low, and the level of technology sophistication and IT usage can be such conditional [3]. However, without data, information and IT, it is so difficult to create anything. Therefore, it can be a big obstacle for any industry if their level of IT usage is limited [4, 5].

In overview, Thailand logistics system is debatably improving [6]. Thailand's logistics performance dropped from 35th rank in 2014 to 45th rank in 2016 out of 160 countries based on World Bank LPI report [7]. In terms of IT, Thailand is ranked low at 78 out of 176 countries on ITU's ICT Development Index (IDI) 2017 [8]. Thailand is also ranked 62 out of 139 countries on the World Economic Forum's (WEF's) Networked Readiness Index (NRI) 2016 [9]. These are only some reflections to the logistics of Thai industry and their IT ecosystem.

The paper is therefore exploring the level of IT usage of Thai industries, based on database of Logistics/ Supply Chain Scorecard (LSC) by Ministry of Industry.

Survey on Logistics Potential of Thai Industry

Ministry of Industry of Thailand by Division of Logistics is the main responsible for industrial logistics improvement of Thai industry. For years, thousands of industries in Thailand have been supported to increase their capability and competitiveness [10]. The survey on logistics potential of Thai industry was also a highlight project aims at exploring and understanding the logistics potential of Thai industry. The survey uses Logistics/ Supply Chain Scorecard (LSC) as an assessment tool to identify the potential of the participating company.

Logistics/ Supply Chain Scorecard (LSC)

LSC is a self-assessment tool for industry to review their logistics potential. LSC allows participated company to compare their logistics potential against the peers in the database collection. The scorecard is based on original work by Tokyo Institute of Technology in collaboration with the Japan Institute of Logistics System (JILS) [11, 12] and further developed by Ministry of Industry of Thailand in order to assess and support Thai industry [13].

LSC is constructed of 5 areas and 23 items. Each item was defined and each five level for the assessment is described to quantify the potential of interest. This is to reduce the biasness of the assessor. In general, the 5th level (score 5) indicates as the best practice. On the other hand, the 1st level (score 1) indicates the least preferable practice in terms of logistics and supply chain management.

5 areas of LSC includes (Area 1) Corporate strategy and inter-organization alignment, (Area 2) Planning and execution capability, (Area 3) Logistics performance, (Area 4) IT methods and implementation and (Area 5) External collaboration. This paper focuses on Area 4 which encompasses 3 items, i.e., (1) data interchange coverage, (2) open standards and unique identification codes and (3) logistics and supply chain IT capacity building.

Whereas these items are identified, and their level is defined as shown in Tables 1-3.

Table 1: Description of Index: Item 1 Data interchange coverage

Level 1	Company is not electronically linked to any customer or supplier.
Level 2	EDI links are set up with some customers or suppliers at their request.
Level 3	EDI is used with over 50% of customers or suppliers. Proprietary EDI standards are used in most cases.
Level 4	In addition to Level 3, EDI is integrated with the company's internal systems so that manual re-entry of data is not necessary in most cases.
Level 5	EDI is used for nearly all transactions and is integrated with internal systems. Open standards for EDI are adopted or in-process of adoption.

Table 2: Description of Index: Item 2 Open standards and unique identification codes

Level 1	Company has no awareness of open standards and unique identification codes.
Level 2	Company understands the importance of open standards and unique identification codes for improving the efficiency of logistics processes.
Level 3	To exploit the potential of IT, unique identification codes are used within the company and process simplification is also carried out.
Level 4	In addition to Level 3, usage of unique identifiers is extended to suppliers and/or customers. Open standards for EDI and other IT applications are adopted or under consideration.
Level 5	In addition to Level 4, unique identification codes are extended to both suppliers and customers. Company is actively working towards adoption of open standards for EDI and other IT applications

Table 3: Description of Index: Item 3 Logistics and supply chain IT capacity building

Level 1	Company has no awareness of logistics and supply chain IT capacity building
Level 2	Company understands the importance of logistics and supply chain IT capacity building
Level 3	In addition to Level 2, there are human resource management plan, such as training
Level 4	In addition to Level 3, the activities are delivered as plan partially
Level 5	In addition to Level 4, the activities are delivered as plan. The plan is evaluated continuously.

Database of LSC

In 2017, 100 companies in Thailand have been participated in the logistics potential survey project. Only 9 ISIC [14] have greater than 5 samples and therefore are used in this consideration. There are ISIC 10 Manufacture of food products, ISIC 15 Manufacture of leather and related products, ISIC 20 Manufacture of chemicals and chemical products, ISIC 21 Manufacture of pharmaceuticals, medicinal chemical and botanical products, ISIC 22 Manufacture of rubber and plastics products, ISIC 25 Manufacture of fabricated metal products, except machinery and equipment, ISIC 27 Manufacture of electrical equipment, ISIC 28 Manufacture of machinery and equipment n.e.c. and ISIC 29 Manufacture of motor vehicles, trailers and semi-trailer.

It shall be highlighted here that the database is small. Therefore, the discussion in this paper will not be statistically conclusive. It is only the preliminary reflection of the findings.

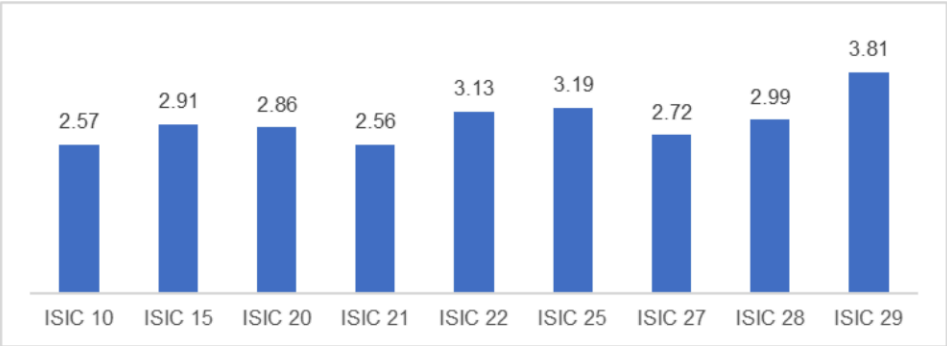

Figure 1: Average LSC Score of 9 ISIC

Before investigating the IT area, Figure 1 illustrates the overview logistics potential of all 9 industry types. It can be seen that ISIC29 is outstanding at the average score of 3.81. Whereas, ISIC

10 and 21 are, on the other hand, possessing as low score as 2.5x. This is only the observation prior to the IT usage investigation as follow.

Result Presentation

Focusing on Information Technology (IT) usage in managing logistics and supply chain of Thai industry, 3 items are of interest. The area comprises of (1) data interchange coverage, (2) open standards and unique identification codes and (3) logistics and supply chain IT capacity building.

Item 1 Data Interchage coverage

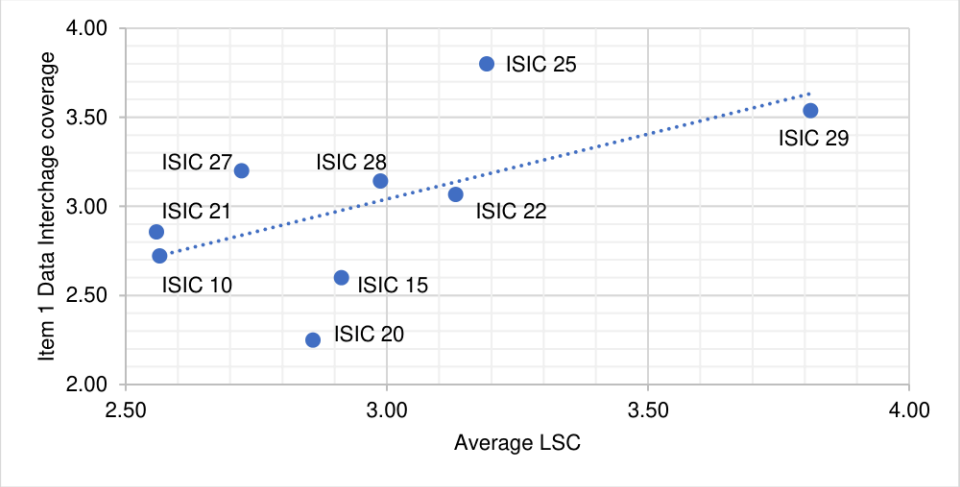

Figure 2: Item 1 Data Interchage coverage vs average LSC

Out of the assessment, ISIC 29 is the most advanced in term of data interchange coverage. ISIC 29 scores at 3.80 which means EDI is used and almost integrated within the company's internal systems. On the other hand, other ISIC mostly lies at levels 2-3. This means that EDI are implemented within their supply chains. Yet, it is partially used in most cases.

Anyhow, it is not fair to directly compare each ISIC by its absolute score as each ISIC possesses their poteltial differently as seen and discussed in Figure 1. Therefore, in order to reflect their logistics potential, here, the score in each item (items 1-3) is crossed with average LSC score. Linear (dot) line in Figure 2 represents average trend line of Item 1 versuses average LSC score.

Here, it can be seen that ISIC 21, 25, 27 and 28 are above trend line. ISIC 25 is at the most preferrable position. Whilst its LSC score suggest that its item 1 score of ISIC 25 shall lies at 3.2x, its score is up to 3.80. This is satisfiable. On the other hand, ISIC 15, 20, 22 and 29 are below its suggested score. ISIC 20 is somehow much below than what it should be. Moreover, data interchange coverage of ISIC 29, which is before discusses as the most advaced, is then questionable.

Item 2 Open standards and unique identification codes

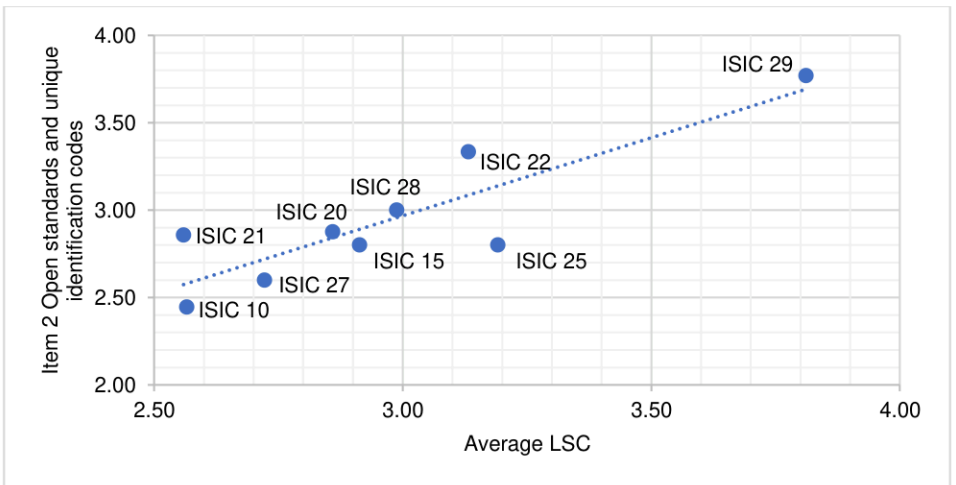

Figure 3: Item 2 Open standards and unique identification codes vs average LSC

From Figure 3, it is again suggestive that ISIC29 is the most advanced with the score of 3.77. It is indicated that most of ISIC29 companies uses unique identification code within the company and partially extended to its supply chains. However, it is somehow slightly above the average trend line. It is also the cases with ISIC 20 and 28 that are marginally above the trend line. ISIC 21 and 22 are somehow possessing better potential. ISIC 10, 15, 25 and 27 on the other hand are considerably lower than expectation, especially ISIC 25.

Item 3 Logistics and supply chain IT capacity building

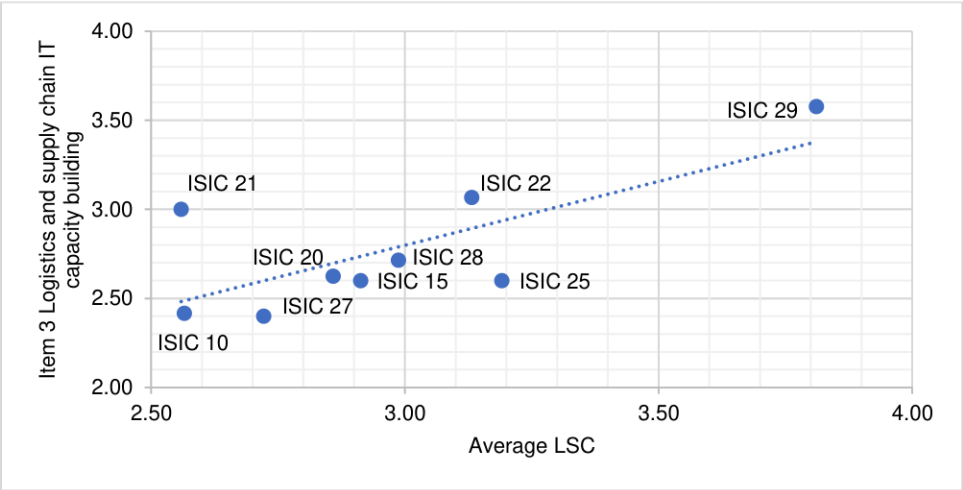

Figure 4: Item 3 Logistics and supply chain IT capacity building vs average LSC

In terms of logistics and supply chain IT capacity building (Item 3), ISIC 29 is again outperforming. Their IT personnel are developed through human resource management program and some activities are implemented as plan. However, the rest of the companies in other ISIC are below 3.50 bar. This means they do not pay much attention in IT capacity building as they should.

Figure 4 is suggestive that only ISIC 20, 21, 22 and 29 are above average. ISIC 21 is by far the most advanced in term of margin to the average trend line. It scores at 3.0 which is 0.5 higher than expectation. On the other hand, ISIC 10, 15, 20, 25, 27 and 28 are below what is expected.

Conclusion and Discussion

The paper focusing on potential of Thai industry based on 3 IT perspectives of Logistics/ Supply Chain Scorecard (LSC) database of Thai industry, i.e., (1) data interchange coverage, (2) open standards and unique identification codes and (3) logistics and supply chain IT capacity building. The data from LSC database is rather small. Therefore, the result is not conclusive, however suggestive in terms of basic understanding.

The investigation uses not only score from direct assessment on 3 items of interest but also crossing with the average LSC to reflect the potential if they are above or below what is expectation, indicated by the linear average line.

The result is suggestive that ISIC 29 Manufacture of motor vehicles, trailers and semi-trailer, which is generally the most advanced ISIC in terms of logistics potential, is somehow questionable in terms of data interchange coverage. ISIC 10 Manufacture of food products and 21 Manufacture of pharmaceuticals, medicinal chemical and botanical products, which are the two lowest potential industries in LSC, are somehow not as bad. For example, ISIC 21 possesses better potential in terms of open standard and unique identification codes and logistics and supply chain IT capacity building.

Many points are also suggestive from the investigation. For example, ISIC 22 Manufacture of rubber and plastics products is also better than expectation in terms of open standard and unique identification codes and logistics and supply chain IT capacity building. ISIC 15 Manufacture of leather and related products and ISIC 20 Manufacture of chemicals and chemical products have room of improvement in data interchange coverage. ISIC 25 Manufacture of fabricated metal products, except machinery and equipment is satisfiable in data interchange coverage but need improvement in open standards and unique identification codes.

The information here is suggestive for the policy makers as well as the industries themselves if any measurement must be delivered to improve logistics potential of Thai industry as a whole or to any company in specific.

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