MODELING THE MACRO- ENVIRONMENTAL FACTORS OF INTERNATIONAL DISTRIBUTION

Supachart Iamratanakul
Kasetsart University, Thailand
supachart9@gmail.com

Abstract:
The study is intended to find the relationship of macro-environmental factors relating to international distribution especially in South East Asia. We are also attempted to develop a hierarchical model, which can interpret the relationship between the factors. The study applied a comprehensive discussion with expert panel and "Bibliometrics" methodology to identify six environmental factors of international distribution. Ultimately, the macro-environmental factors refer to the uncontrollable forces and conditions influencing an organization. Later, the interpretive structural modelling (ISM) was employed to study the relationship among those factors to distinguish which factors are the most challenges for the international distribution. MICMAC analysis was finally employed to set the level of driving and dependence power among the factors. The results of the study provide the systematic model that explains the relationship among six environmental factors of international distribution. The contexts on the model leverage the understanding of macro-environmental influences on international distribution. The six influences also provide significant challenges for international distribution. The analysis shows that the political, economic, and cultural influences become the most challenge that international trade specialists should be concerned vigilantly. The other three influences can set lower priority from top management due to their dependency on the top three challenges. The study limits its focus on the international distribution that activities are performed across national boundaries. Managers can use the study to create context-specific framework for solving their environmental influences on international distribution. In this research, there are some factors having higher driving power in the ISM, which need more consideration from trading specialists because there are a few other dependent variables being affected by them. Variables emerging with high dependence contribute to productivity and performance of international distribution.

Keywords: international distribution, macro-environmental factors, interpretive structural modelling, MICMAC analysis, bibliometrics, expert panel, South East Asian, market, Supply Chain Management

1. INTRODUCTION

The increasing in global trade during the twenty-first century becomes the signal for researchers to pay attention on International distribution (Brewer, Button, & Hensher, 2001). The value of world trade grew from approximately $6.2 trillion in 2000 to $16.2 trillion in 2008 according to the international trade statistics from the world trade organization[1]. As such, the ratio of the gross domestic product (GDP) of all countries grew from approximately 14 percent in 2000 to 26 percent in 2008[2]. The improving GDP create many opportunities for logistics (Long, 2003). The opportunities include more manufacturing alternatives and offer a wider range of resource advantages. Such advantages can gain from economies of scale in some regions that have lower wages and from flexibility from other regions that have expertise (Anderson, 1985).

In this study, six environmental factors have been chosen for analysis. This was done on the basis of literature review and citation analysis, often known as 'Bibliometrics methods (Iamratanakul & Sukhotu, 2012).' The opinion of expert panel from both industry and academia also took into account for choosing the environmental factors that influence International distribution and developing the relationship matrix in the interpretive model (Iamratanakul et al., 2012).

The main objectives of this paper are:
- To identify the macro-environmental factors in the International distribution
- To establish relationships among the factors, and
- To discuss the managerial implications of this research

The remainder of this paper is organized in the following. The next section discusses the identification of macro-environmental factors. This is followed by the explanation of the methodology. The results of this research are followed by a discussion and conclusion.

2. MACRO-ENVIRONMENTAL INFLUENCES ON INTERNATIONAL DISTRIBUTION

Global economy creates many opportunities for logistics (Long, 2003). The market expansion and increasing manufacturing alternative are an example of such opportunities. The firms that operate globally usually know as multi-national corporations (MNCs) (Wood, 2002). MNCs develop their global capabilities to obtain the lowest cost of operation by outsourcing their manufacturing to lower wage regions. Globalization is an important role in the world economy to provide significant economies of scale or significant flexibility (Rushton & Walker, 2007). The reasons for MNCs connecting to globalization are expected to increase revenue, reduce direct cost, achieve economies of scale and enhance sustainability (Robeson, 1994).

International distribution deals with different aspects of globalization (Davies, 1987). Many global issues differ to domestic environment (Christopher, Peck, & Towill, 2006). Culture is one of an example that can change from a country to another country (Mentzer, 2001). As such, it has become increasingly important to understand the macro-environmental influences on International distribution (Chistopher and Towill 2002). Usually, six environmental factors influence International distribution (Murphy & Wood, 2010). Those factors are political, economic, cultural, demographic, technical, and natural factors (Brewer et al., 2001; Coyle, Bardi, & Langley, 2006; Long, 2003; Murphy & Wood, 2010; Robeson, 1994; Rushton & Walker, 2007; Wood, 2002).

2.1. Political factors

Any company doing logistics outside its home country should carefully study the political system in the target country and analyze the sensitive issues pertaining to the political environment (Fawcett, Stanley, & Smith, 1997). For example, an issue relating to restrictions on international trade can prevent many companies to ship their products to certain nations. The United States does not allow certain types of military equipment to ship outside their homeland due to enforcing on their national security. Currency outflow is restricted for some nations because their economy will be slowdown if their exports more than their imports for a longer period of time. As such, the goods coming to the

---

[1] World Trade Organization, International Trade Statistics, 2001 and 2009.
[2] The CIA World Factbook, 2001 and 2009.

nations are subjected to approve from the government officers (Mentzer, DeWitt, et al., 2001; Mentzer, Flint, & Hult, 2001).

Political restrictions on trade can also be classified as nontariff barriers, which mostly deal with an import quota. The import quota controls the amount of product moving from other countries to their homeland. The nontariff barriers can save the health and safety of a country's population from infected by plant and animal diseases (Rao & Young, 1994). The goods and material are inspected to make sure that they are not infested and they should be cleaned before entering the country (Rushton & Walker, 2007).

2.2. Economic factors

The economic environment is a major determinant of global logistics potential and opportunity (Christopher & R.Towill, 2002). In today's global economy, capital movements are the driving force in which production is uncoupled by employment (Daugherty, Stank, & Rogers, 1996). Basically, the economic factors that influence global logistics include currency fluctuations, market size, income, infrastructure, and economic integration (Rao & Young, 1994). Currency fluctuations can be subject to devaluation or revaluation as a result of actions taken by a country's central banker. Currency trading by international speculators can also lead to devaluation. When a country's economy is strong or when demand for its goods is high, its currency tends to appreciate in value. When currency values fluctuate, global firms face various types of economic exposure. Firms can manage exchange rate exposure by hedging.

Market size is usually measured by population while income is determined by gross domestic product (GDP). From a population perspective, a large populous country might be potentially attractive markets because of its absolute and relative size (Klaus, 2011). GDP per capita figures have potential implications in terms of the products that are available in particular countries. The transportation infrastructures can impact international distribution. The differences in the transportation infrastructures have important implications for cross-border commerce. Economic integration varies from a free trade area such as NAFTA to an economic union such as EU. The implications of economic integration on international distribution include reduced documentation requirements, reduced tariffs, and the redesign of distribution networks.

2.3. Cultural factors

Culture, a society's "programming of the mind," has both a pervasive and changing influence on each national logistics environment (Stank & Maltz, 1996). Global logisticians must recognize the influence of culture and be prepared to either respond to it or change it. Human behavior is a function of a person's own unique personality and that person's interaction with the collective forces of the particular society and culture in which he or she has lived. In particular, attitudes, values, and beliefs can vary significantly from country to country.

Practically, cultural factors that have their potential implications for international distribution include language, national holiday, and time orientation (Chopra & Meindl, 2003). For example, cargo handlers may not be able to read and understand the language of the exporting country. National holiday can vary from a country to another country. Considering New Year holiday, the Chinese New Year does not take place on January 1 as many of you are familiar with. Moreover, most of Chinese businesses shut down during that period, which affects shipments within, into, and out of China.

2.4. Demographic factors

Demographic factors explain the importance to logistic managers of current demographic trends (Klaus, 2011). By definition, demography is the study of people's vital statistics, such as their age, race and ethnicity, and location. Usually, demographic characteristics are strongly related to consumer buyer behavior. Current demographic trends characterize into four aging groups: a). tweens, b). generation Y, c). generation X, and d). baby boom. Each cohort has its own needs, values, and consumption patterns that logistic managers should be aware (Rushton & Walker, 2007).

Tweens are a group of pre- and early adolescents with ages between 9 to 14 years old. Logistics manager should understand that the Tweens group is growing importance. A customer of Logistics

Company designated by demographics as Generation Y was born between 1979 and 1994. The characteristics of generation Y are a). impatient, b). family-oriented, c). inquisitive, d). opinionated, and e). diverse.

2.5. Technical factors

Technical factors look at what the impacts of technology on a firm are. New technology can reduce inflation and recession (Heaver, 2002). International distribution companies use both basic and applied research to develop new technology. Basic research attempts to create a new body of knowledge while applied research develops new or improved products. Technology in logistics transfers to the bottom line through innovation. Innovation generates a lot of profit for logistics companies. The past study shows that the 25 most innovative firms achieve an average profit margin growth of 3.4 percent per year.

2.6. Natural environment factors

International distribution corporations recognize the need to integrate natural environmental issues to their operations plans (Christopher et al., 2006). Logistics companies often work with different kinds of equipment and machinery with chemical-producing products. As such, a business' day-to-day operations can pose an ongoing threat to the natural environment. To reduce the likelihood of damage to the environment, government regulations require business consider certain natural environmental factors in their overall operations plans (Rao & Young, 1994).

3. METHODOLOGY

We utilized the bibliometrics to analyze the content of literature in conjunction with the opinion of experts for identifying factors (Sage, 1977). Later, the technique known as interpretative structural modeling (ISM) was applied to study a relationship among factors (Malone, 1975). Basically, the bibliometrics are the approach to measure scientific and analyze the content (Warfield, 1977). The large amount of textual information can systematically identify the factors for this study.

The interpretative structural modeling (ISM) technique starts with comparing factors based on expert opinions (Gorardin, 1979). Each expert gave his/her opinion on the relationship of factors through the well-defined variables (Warfield, 1974a). For example, a variable named "M" implies that a factor "A" will influence a factor "B." A variable named "L" implies that a factor "A" will be influenced by a factor "B." A structural self-interaction matrix (SSIM) was then developed for factors, which indicates pair-wise relationship among factors of the international distribution (Warfield, 1974b).

The interpretative structural modeling (ISM) technique starts with comparing factors based on expert opinions (Mohammed, Shankar, & Banwet, 2008). Each expert gave his/her opinion on the relationship of factors through the well-defined variables (Kumar, Shankar, & Yadav, 2008). For example, a variable named "M" implies that a factor "A" will influence a factor "B." A variable named "L" implies that a factor "A" will be influenced by a factor "B." A structural self-interaction matrix (SSIM) was then developed for factors, which indicates pair-wise relationship among factors of the international distribution.

The MICMAC analysis is then used to analyze the driver and dependency power of factors. The factors are classified into four clusters (Agarwal & Shankar, 2002). The first cluster is the "autonomous factors" having weak driver and dependence power. The second cluster is the "dependent factors" having weak driver power, but strong dependence. The third cluster is the "linkage factors" having strong driver and dependence power. Finally, the fourth cluster is the "independent factors" having strong driver power, but weak dependence (Hasan, Shankar, & Sarkis, 2009).

4. RESULTS

The analysis described in the methodology can finally draw a directed graph representing an ISM for macro-environment factors of the international distribution. The directed graph (an ISM model) is shown in figure 1.

Figure 1: The hierarchy model representing the macro-environmental factors of international distribution
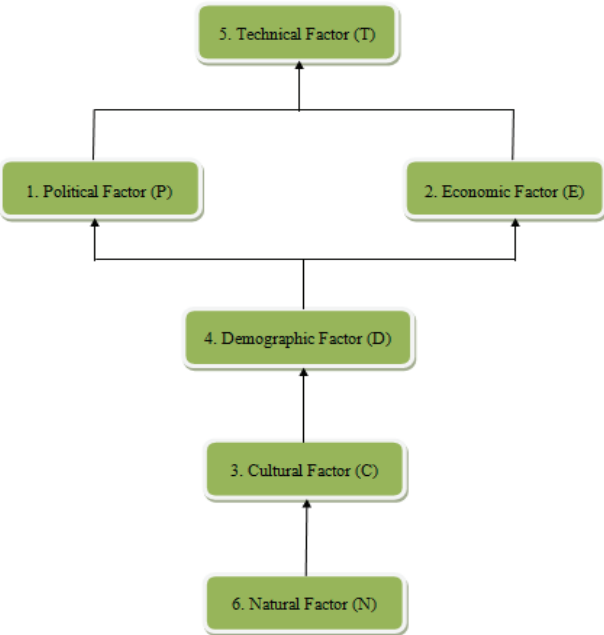
The MICMAC analysis that presents driving and dependent factors is shown in figure 2.

Figure 2: Driving and dependent power diagram for the macro-environmental factors of international distribution
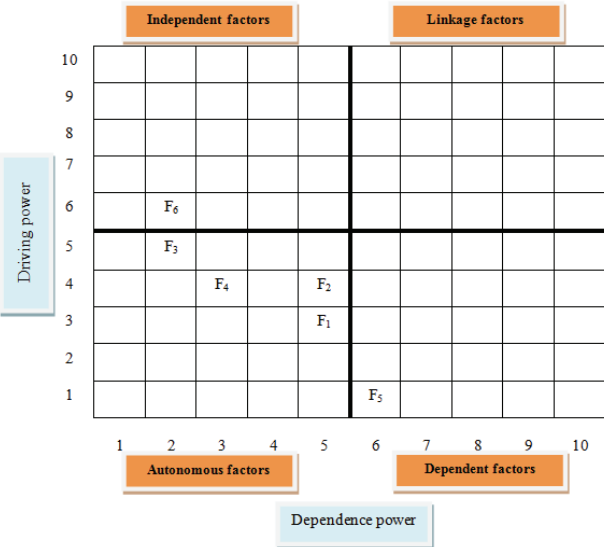
5. DISCUSSION

The ISM simplifies the complex problems under study into a diagraph model with word explanations. The ISM becomes a tool to structure and direct the factors in any complex systems. The factors in this study are the macro-environmental factors are given the top level in the model hierarchy when the results of intersection between the factors in reachability and the antecedent set are the same as the factors in the reachability set. The top and high level in the model hierarchy would not help to achieve any other factors under their levels.

After the top level of the model hierarchy is identified, the factors in the level will be removed from other remaining factors and next level of the model hierarchy is selected. The interactive procedure

continues until all factors are selected in different levels. The diagraph model is built by factors in each level from the interactive procedure, which finally turn into the final model of ISM.

6. CONCLUSION

ISM technique is useful to develop the decision hierarchy model for management to understand the relationship of macro-environmental factors influencing international distribution. To interpret the decision making process, executives are advised to divide the hierarchy of the model into three groups and represent each group based on workers associated in the group. For example, the levels of factors in an ISM model can divide to strategic level, tactic level, and operation level. The strategic level is performed by top management, the tactic level is attempted by middle management, and operational level is executed by lower management.

Different factors drive other factors. Management of strategic factors helps to manage tactical factors; management of tactical factors enhances operational factors and effectively makes an organization fit for deployment of international distribution. In addition, the ISM is able to provide a pictorial shape to the relationship among the factors, which are able to form hierarchy among the factors. The findings of research are insightful for practicing managers and leverage chances for success of managing international distribution.

REFERENCE LIST

1. Agarwal, A., & Shankar, R. (2002). Analyzing alternatives for improvement in supply chain performance. *Work Study, 51*(1), 32 - 37.
2. Anderson, D. L. (1985). International Logistics Strategies for the 1980s. *International Journal of Physical Distribution & Logistics Management, 15*(4), 5-19.
3. Brewer, A., Button, K. J., & Hensher, D. A. (2001). *Handbook of Logistics and Supply-Chain Management*: Emerald Group Publishing.
4. Chopra, S., & Meindl, P. (2003). *Supply Chain Management* (2 ed.): Prentice Hall College Div.
5. Christopher, M., Peck, H., & Towill, D. (2006). A taxonomy for selecting global supply chain strategies. *International Journal of Logistics Management, 17*(2), 277-287.
6. Christopher, M., & R.Towill, D. (2002). Developing Market Specific Supply Chain Strategies. *International Journal of Logistics Management, 13*(1), 1-14.
7. Coyle, Bardi, & Langley. (2006). *The Management of Business Logistics*: Thomson South-Western.
8. Daugherty, P. J., Stank, T. P., & Rogers, D. S. (1996). Third-Party Logistics Service Providers: Purchasers' Perceptions. *Journal of Supply Chain Management, 32*(2), 23-29.
9. Davies, G. J. (1987). The International Logistics Concept. *International Journal of Physical Distribution & Logistics Management, 17*(2), 20-27.
10. Fawcett, S. E., Stanley, L. L., & Smith, S. R. (1997). Developing a logistics capability to improve the performance of international operations. *Journal of Business Logistics, 18*(2), 101-127.
11. Gorardin, L. A. (1979). Structural modeling, including temporal dimensions as an aid to study complex system governabilities and to foresee unforecastable alternative futures. *Technological Forecasting and Social Change, 14*(4), 367-385. doi: doi: DOI: 10.1016/0040-1625(79)90035-0
12. Hasan, M. A., Shankar, R., & Sarkis, J. (2009). A study of enablers of agile manufacturing. *International Journal of Industrial and Systems Engineering, 4*(4), 407-430.
13. Heaver, T. D. (2002). The Evolving Roles of Shipping Lines in International Logistics. *International Journal of Maritime Economics, 4*(3), 210-230.
14. Iamratanakul, S., Rassameethes, B., Sukhotu, V., Siengthai, S., Kachitvichyanukul, V., & Shankar, R. (2012). *Modeling the Macro-environmental Influences: An International Logistics View.* Paper presented at the the 2012 IEEE International Conference on Industrial Engineering and Engineering Management, Hong Kong.
15. Iamratanakul, S., & Sukhotu, V. (2012). *Inventory and Demand Forecasting at non-profit Retailer Industries.* Paper presented at the Thai Consortium of Value Chain Management and Logistics, Pataya, Thailand.
16. Klaus, P. (2011). The assessment of competitive intensity in logistics markets. *Logistics Research, 3*(1), 49-65.

17. Kumar, P., Shankar, R., & Yadav, S. S. (2008). Flexibility in global supply chain: modeling the enablers. *Journal of Modelling in Management, 3*(3), 277 - 297.
18. Long, D. C. (2003). *International Logistics: Global Supply Chain Management*: Springer.
19. Malone, D. W. (1975). An introduction to the application of interpretive structural modeling. *Proceedings of the IEEE, 63*(3), 397-404.
20. Mentzer, J. T., DeWitt, W., Keebler, J. S., Min, S., Nix, N. W., Smith, C. D., & Zacharia, Z. G. (2001). Defining supply chain management. *Journal of Business Logistics, 22*(2), 1-25.
21. Mentzer, J. T., Flint, D. J., & Hult, G. T. M. (2001). Logistics Service Quality as a Segment-Customized Process. *Journal of Marketing, 65*(4), 82-104.
22. Mohammed, I. R., Shankar, R., & Banwet, D. K. (2008). Creating flex-lean-agile value chain by outsourcing: An ISM-based interventional roadmap. *Business Process Management Journal, 14*(3), 338 - 389.
23. Murphy, P. R., & Wood, D. (2010). *Contemporary Logistics* (10th ed.): Prentice Hall.
24. Rao, K., & Young, R. R. (1994). Global Supply Chains: Factors Influencing Outsourcing of Logistics Functions. *International Journal of Physical Distribution & Logistics Management, 24*(6), 11-19.
25. Robeson, J. F. (1994). *The Logistics Handbook*: Simon and Schuster.
26. Rushton, A., & Walker, S. (2007). *International Logistics And Supply Chain Outsourcing: From Local to Global*: Kogan Page Publishers.
27. Sage, A. P. (1977). *Methodology for large-scale systems*: McGraw-Hill (New York).
28. Stank, T. P., & Maltz, A. B. (1996). Some Propositions on Third Party Choice: Domestic Vs. International Logistics Providers. *Journal of Marketing Theory and Practice, 4*(2), 45-54.
29. Warfield, J. N. (1974a). Developing Interconnection Matrices in Structural Modeling. *IEEE Transactions on Systems, Man and Cybernetics, SMC-4*(1), 81-87. doi: 10.1109/TSMC.1974.5408524
30. Warfield, J. N. (1974b). Toward Interpretation of Complex Structural Models. *Systems, Man and Cybernetics, IEEE Transactions on, 4*(5), 405-417.
31. Warfield, J. N. (1977). Crossing Theory and Hierarchy Mapping. *IEEE Transactions on Systems, Man and Cybernetics, 7*(7), 505-523.
32. Wood, D. F. (2002). *International Logistics*: Book News, Inc.