CHAPTER V
DISCUSSION

In this chapter, the results from the last chapter will be discussed in this chapter. In this chapter, it consists of two sections that are a performance framework for the healthcare supply chain with a case study of a pharmaceutical supply chain in section 5.1. The efficient modified Delphi method will be presented in section 5.2. In section 5.3, it will be present about limitations.

5.1 The efficient modified Delphi tool

From the modified Delphi study, a total of 18 eligible participants were contacted and all 18 agreed to participate in the modified Delphi study. The IQR and median was used to measure the level of agreement. When the IQR was low (less than or equal to 1.50 [33]), there was more agreement on the item than when the IQR was high (more than 1.50 [33]) and median when the median was more than 3.50 up (meaning agree among respondents) as Table 3.3 [33]. On 22 items or 64.71 percent, participants' ratings converged between Round one and Round two as measured by the change in IQR (the IQR decreased). On 12 items or 35.29 percent the IQRs stayed the same, indicating that participants were changing their rating between rounds, presumably due to reading other participants' justifications. A final list of 31 sub-criteria was presented. These were categorized as quality, cost, time, flexibility, innovativeness, and collaboration as Table 4.1.

An example of sub-criteria in which the rating where high (meaning that it was perceived as a significant sub-criteria) and the IQR was zero (meaning there was significant agreement) were the goal of "delivery accuracy, on-time delivery, and responsiveness to urgent deliveries". In addition, these stayed the same on both round one and round two as zero (meaning that it was perceived as significant sub-criteria). An example of a goal in which the rating where low and there was significant

disagreement (as measured by the larger IQR) were the goal “driver reliability, transaction cost, and administrative cost”.

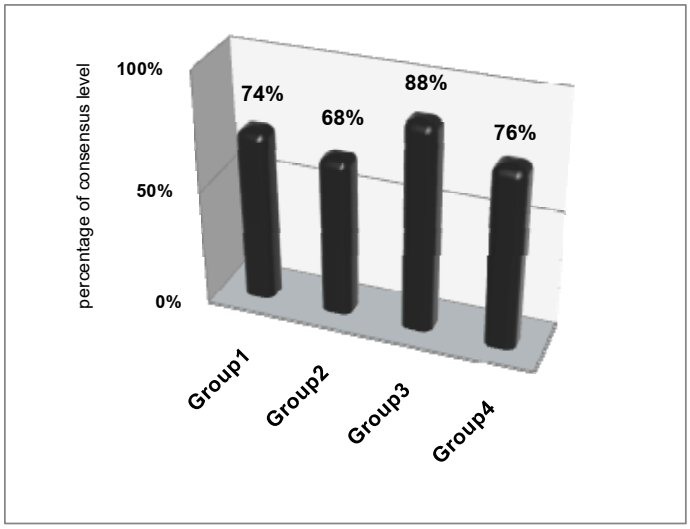

Figure 5.1 The percentage of consensus level (the overall mode group minus to the individual mode group).

In Fig. 2, group 2 (Hopital and GPO or distributor executives) has only 68% of consensus level, presumably due to working on their main responsibilities or intendancy such as defining vision, mission, strategies, orientation and policies of organization. Thus, those executives have usually faced with problems and the question that “What is really causes? and How they must be solved first?”, but these executives do not know. By the way, these executives can give a big picture and push on organizations’ strategies to get their dreams. On the other hand, in operational level such group 3 and 4, there are who work as daily work and they must have more problem solving skills enough to able for facing problems well. There is the highest consensus among all groups that is group 3. In Group 3, there is who are usually in the midst of supply chain and their job can reach them to be well-known thoroughly the healthcare supply chain.

The modified Delphi approach, as applied in this study, was a useful tool of identifying appropriate criteria and sub criteria for healthcare supply chain performance. A final list of important 31 sub-criteria was presented for healthcare supply chain performance. These were selected through the modified Delphi method

processes. In processes, all participants or panelists who attended in this research have participated all rounds, more reliable, relevant healthcare supply chain and well-knowledge in this area also. Thus, the outcome is more reliable and it can be represented the healthcare supply chain performance. By applying the modified Delphi method, the experts can have a more thorough thinking. These identified sub-criteria provide a performance measurement model for a case study of healthcare supply chain performance in the future research.

5.2 Application of framework to a pharmaceutical supply chain

Pharmaceutical supply chain is so different from others is that social responsibility that pharmaceutical industry has got to ensure 100 % product availability at the right time, at the right cost, in good condition to right customers. The key drivers for the pharmaceutical supply chain excellences consist of speed, flexibility, visibility, responsiveness, costs and safety. To ensure the product availability at optimal costs in today environment, the forecasting and collaborating planning with supply chain partners (contract manufactures and third party service providers), Outsourcing, earlier involvement of vendor in product designing, technology integration and continuous improvements through supply chain metrics are the key strategies for the pharmaceutical supply chain (Nilay Shah, 2004).

This study presents a performance measurement framework for healthcare supply chain with a case study of a pharmaceutical supply chain. The appropriate performance criteria are selected through reviewing relevant literatures and gathering the opinions by healthcare supply chain experts based on the modified Delphi processes. The framework consists of six main criteria that are quality, cost, time, flexibility, innovativeness, and collaboration. Through the modified Delphi processes, these main criteria come out with suitable sub-criteria.

Due to high competition among many businesses, supply chain management has become an important role as a principle or a way in improving businesses to be more successful. In multi-criteria analysis problem, the Analytic Network Process method (ANP) is a popular method. ANP can consider both qualitative and quantitative criteria in the decision analysis. In this research, it has

integrated the modified Delphi method to reach the appropriate criteria for the healthcare performance measurement framework. Hence, the supply chain members' evaluation from this thesis will give more explanations on the performance of a supply chain.

This study presented the performance signaling system. To assist managers in monitoring the overall supply chain performance, this studies presents a signaling system that divides the outcomes of the performance framework into four colored lights: green, yellow, orange, and red as Yang et al. (2009)'s study (Table 5.1.) In Table 5.2, shows the supply chain performance signaling system of a pharmaceutical supply chain. The performance of the pharmaceutical supply chain indicated the quality, time and innovativeness criterion by a green light, which indicates that the supply chain performance is excellent while the cost, flexibility and collaboration criterion are good indicating by yellow light. The cost, flexibility and collaboration criterion performance are good, but are still lacking and each criterion must be improved performance.

Table 5.1 Supply chain performance signaling system

Score	Signal	Statements
4.01-5.00	Green	Supply chain performance is excellent
3.01-4.00	Yellow	Supply chain performance is good
2.01-3.00	Orange	Supply chain performance is not good enough
0.00-2.00	Red	Supply chain performance is bad

Table 5.2 The results of supply chain performance signaling system

	Quality	Cost	Time	Flexibility	Innovativeness	Collaboration
A	Green	Yellow	Green	Green	Green	Yellow

This supply chain has the best performance for all criteria, particularly for quality, time, and innovativeness as shown in Figure 5.1.

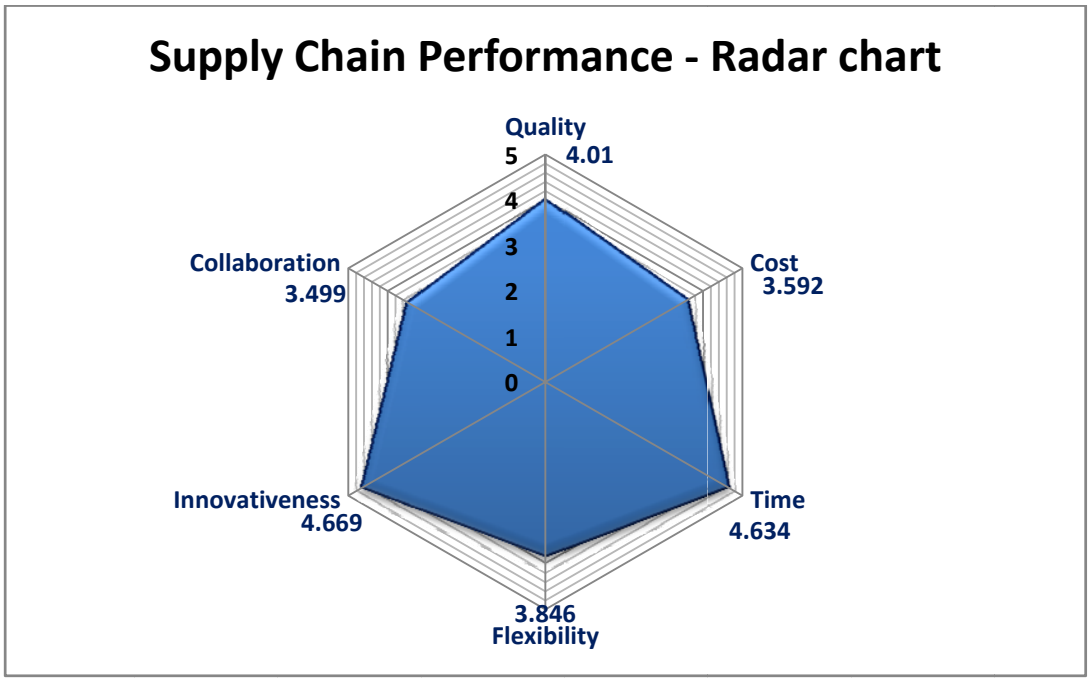

Figure 5.2 The pharmaceutical supply chain performance.

For the “Collaboration”, it is the weakest area for this supply chain, and this may be due to other criteria such as low incentive alignment, etc. However, the overall performance of pharmaceutical supply chain has a good performance; it is about 3.958 as Table 4.25. From the matrix evaluation of important criteria as Table 4.25, it indicates the most criterion of the healthcare supply chain performance that it is necessary to improve. For the radar chart in the Figure 5.1, it represents the criterion performance each such as the “collaboration” criterion with the lowest weight score of 3.499, etc. Thus, the collaboration should be improved its performance immediately to align with the important collaboration role for supply chain performance today. In all cases, the director of the pharmacy and key members of the pharmacy staff, including clinical staff and business and purchasing managers, should collaborate with the pharmacy and therapeutics committee and other stakeholders to develop the most thoughtful and accurate forecasts for this part of the budget (Wolper, 2011). In larger integrated healthcare systems with multiple hospitals, specialty services in ambulatory care, retail pharmacies, home care, or those that include HMO or other insurance or health benefit programs, it is desirable to have senior corporate pharmacy leadership to identify and leverage internal pharmacy resources across the system, including

manpower, information technology, medication use policies, and supply chain activities. The core of the drug distribution system is the complete pharmacy information system. Pharmacy information systems are designed to support numerous functions, but a primary purpose is to support accurate, safe, timely, cost-effective medication distribution. In the acute care environment, patient condition, therapeutic needs, and medication orders change rapidly. A computerized information system provides the most accurate current description of each patient's medication needs. It also supports correct entry of medication orders and checking for errors in prescribing and dosing, and for drug allergies and interactions. Pharmacy information systems support both manual and automated unit dose distribution systems. The complexity of the medication use process have changed the pharmacy's focus to include the multidisciplinary nature of medication use including collaborative efforts with physicians, nurses, and with information technology to meet these goals (Wolper, 2011). As a research of Nachtmann and Pohl (2009) found that manufacturers, distributors, GPOs, and providers having no visibility into the end-to-end performance of their business processes and it is one of their top three challenges influencing the collaboration issues. Nowadays, there is the fact revealed that the healthcare GPO becomes an essential role in driving collaboration issues among suppliers, distributors and providers.

For the "cost" criterion with the weight score of 3.592, it is a good, but it is not excellence. It has aligned to the real situation that the expenditures for drugs vary widely in healthcare systems. Most systems devote less than 20% of their total expenditures to drug therapies, but many organizations with large specialty treatment populations, such as AIDS or oncology patients, may experience higher expenses. All organizations are experiencing growth in expenditures related to new drugs and therapies and, to a lesser extent, increased patient demand. The annual budget is an important part of the pharmacy manager's financial responsibility ASHP practice standards and guidelines refer to the budget and financial leadership responsibilities of pharmacists and identify key roles and responsibilities related to financial management of a pharmacy service. The pharmacy executive manages the health system pharmacy's financial performance within the context of the broader health system. The overwhelming majority of pharmacy supply expense is drugs. A will-documented drug

budget is critical for the pharmacy's and the hospital's success and has a material impact on the hospital's finances. Forecasting drug and other supply expense is a combination of price inflation, drug utilization, drug product mix, and a blend of utilization and mix representing expensive, innovative medication (Wolper, 2011).

For the "innovativeness" criterion with the weight score of 4.669, aligns with the fact that the development and implementation of new technology can help to support medication ordering, dispensing, administration, and monitoring causing from continuing changes in pharmacy services in hospitals and organized delivery system (Wolper, 2011). From the interviewing, the integration of information technology to healthcare system can help the real-time communication in supporting the medication processes.

For the "time", this supply chain is a highly sensitive supply chain where anything less than 100 percent of customer service level is unacceptable as it impacts the health and safety directly; this issue aligns with the interviewing context. The way that many pharmaceutical industries adopt is to carry a huge inventory in the supply chain to ensure close to 100 percent fill rate.

Moreover, the results align with the previous study that the key drivers for the pharmaceutical supply chain excellences consist of speed, flexibility, visibility, responsiveness, costs and safety. In ensuring the product availability at optimal costs in today environment, the forecasting and collaborating planning with supply chain partners (contract manufactures and third party service providers), Outsourcing, earlier involvement of vendor in product designing, technology integration and continuous improvements through supply chain metrics are the key strategies for the pharmaceutical supply chain (Shah, 2004).

5.3 Limitation

This study has certain limitations, which are as follow:

1. The study did not consider the fierce competition from the similar SC members from a global perspective;

2. The study did not consider the management structures of collaborative procurement initiative as a result of cultural differences from a global perspective;

3. This research, the criteria (second level) and sub-criteria (third level) are identified as a strict hierarchical structure. Healthcare supply chain performance is affected by numerous factors, and the interdependence between these criteria is complex. The effect and relationships between sub-criteria of the healthcare supply chain performance should be focused in next future research.

4. It is proposed to use a multi-disciplinary group of decision makers to reduce the subjective bias of one decision maker. The consistency of the judgments should also be checked.

5. The framework will help management of the healthcare supply chain to enable a quick analysis regarding various criteria.