Factors Affecting Buyer-Supplier Collaboration in Thai Public and Private Hospitals*

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Abstract

The objectives of this study were: 1) to search for the main factors related to buyer-supplier collaboration (BSC) in Thai public and private hospitals; and 2) to test a proposed research model to explain the relationships between the main factors and BSC in Thai public and private hospitals. This study collected data from 309 public hospitals and 107 private hospitals. The unit of analysis was at the organizational level. The causal model of factors affecting BSC in Thai public and private hospitals fit the empirical data (Chi-square/df = 1.970, p =.080, GFI =.994, AGFI =.958, CFI =.996, RMSEA =.048, RMR =.023).

The findings were the following: 1) Trust positively influenced BSC; 2) External support positively influenced BSC; 3) Management support positively influenced BSC; 4) Capability positively influenced inventory management; 5) Management support positively influenced capability; 6) External support positively influenced capability; 7) External support positively influenced commitment; and 8) Trust positively influenced commitment. This research suggests that these factors should be emphasized in increasing BSC in Thai public and private hospitals.

Keywords: Buyer-supplier collaboration, public and private hospitals

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ปัจจัยที่มีผลกระทบต่อความร่วมมือระหว่างผู้ซื้อและผู้จัดจำหน่าย ในโรงพยาบาลภาครัฐและภาคเอกชนของไทย*

ณัฐวุฒิ จารุเมฆิน**

บทคัดย่อ

การวิจัยนี้มีวัตถุประสงค์เพื่อ 1) ศึกษาปัจจัยหลักที่มีผลกระทบต่อความร่วมมือระหว่างผู้ซื้อและผู้จัดจำหน่ายในโรงพยาบาลรัฐและเอกชนของไทย และ 2) ตรวจสอบความสอดคล้องของโมเดล การวิจัยนี้เก็บข้อมูลจากโรงพยาบาลรัฐ 309 แห่ง และโรงพยาบาลเอกชน 107 แห่ง โดยโมเดลเชิงสาเหตุมีความสอดคล้องกับข้อมูลเชิงประจักษ์ (Chi-square/ df = 1.970, p = .080, GFI = .994, AGFI = .958, CFI =.996, RMSEA =.048, RMR =.023)

ผลการวิจัยพบว่า 1) ความเชื่อมั่นมีอิทธิพลเชิงบวกต่อความร่วมมือฯ 2) การสนับสนุนจากองค์การภายนอกมีอิทธิพลเชิงบวกต่อความร่วมมือฯ 3) การสนับสนุนจากผู้บริหารมีอิทธิพลเชิงบวกต่อความร่วมมือฯ 4) ความสามารถของผู้ซื้อมีอิทธิพลเชิงบวกต่อการจัดการสินค้าคงคลัง 5) การสนับสนุนจากผู้บริหารมีอิทธิพลเชิงบวกต่อความสามารถของผู้ซื้อ 6) การสนับสนุนจากองค์การภายนอกมีอิทธิพลเชิงบวกต่อความสามารถของผู้ซื้อ 7) การสนับสนุนจากองค์การภายนอกมีอิทธิพลเชิงบวกต่อความมุ่งมั่นฯ และ 8) ความเชื่อมั่นมีอิทธิพลทางตรงเชิงบวกต่อความมุ่งมั่นฯ ประโยชน์ของงานวิจัยนี้บ่งบอกถึงการให้ความสำคัญต่อปัจจัยเหล่านี้ที่จะช่วยเพิ่มความร่วมมือระหว่างผู้ซื้อและผู้จัดจำหน่ายในโรงพยาบาลรัฐและเอกชนของไทย

คำสำคัญ: ความร่วมมือระหว่างผู้ซื้อและผู้จัดจำหน่าย โรงพยาบาลรัฐและเอกชน

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Introduction

In the healthcare service chain, the hospital is one of the important key actors playing many roles, and one of them is the buyer role. The hospital needs to buy several products and services from the supplier in order to support its service activities. The objectives of public and private hospitals are different. The public hospital aims to provide standard healthcare services to patients with limited resources supported by the government. Some public hospitals have more objectives than others to develop research and to educate the healthcare professionals and students, like medical schools. Private hospitals aim to provide more privileged healthcare services to any patients that can afford the service charge. Like other businesses, the private hospital has to ensure that it will continuously improve the services to generate more income, make a profit, increase productivity, and ensure business growth. Nowadays, healthcare service costs have been gradually increasing and hospitals need to provide high-quality care without passing on the cost burden to the patient. The attention has significantly shifted towards cost containment through supply networks and network relationship management. Hospitals have been facing high service cost burdens and a difficult time providing high-quality care at the same time (Chakraborty, Bhattacharya & Dobrzykowski, 2014).

In recent years, several management concepts have been introduced to increase competitive advantage in business aspect; one of the most recognized one is supply chain management (SCM). Several studies have confirmed that SCM can help organizations gain a greater competitive advantage, improve performance, reduce costs, shorten lead time, and increase speed-to-market to cope with the changes in market competition and requirements. In order to achieve effective collaboration with suppliers, an organization needs to integrate the supply chain process between itself and its partners; and in order to have effective supply chain integration, collaboration among buyers and suppliers, who share information, simplify core processes, align their operations and reduce total supply chain costs, is recommended (Lee & Whang, 2001).

Kritcharnchai (2012) indicated that SCM has become one of the most famous competitive tools in several industries in Thailand. The supply chain perspective has allowed any organization and its partners to have a clear picture of the process of integration from upstream to downstream. Although the SCM concept was introduced in Thailand in many years ago, its implementation is still limited. For implementing SCM in any organization, collaboration has to be established at beginning (Thitisomboon et al., 2009). The healthcare SCM concept has only just been introduced and implemented to hospitals in Thailand, and inter-organizational cooperation among buyers and suppliers are still limited. This concept of healthcare services in Thailand is at the beginning stage (Kritcharnchai, 2012).

Although there have been several studies that have examined BSC in many Thai manufacturing and service businesses, BSC in Thai public and private hospitals has not been examined yet. High-performing BSC in Thai public and private hospitals is critical to an organization's success in the face of rising healthcare cost pressures and more expectations for elevating the quality of healthcare. Therefore, it was considered a significant aspect of this study to determine the main factors affecting BSC in the context of Thai public and private hospitals and their relationships.

Research Questions

1) What are the main factors affecting BSC in Thai public and private hospitals?

2) What are the relationships between the main factors and BSC in Thai public and private hospitals?

Research Objectives

1) To search for the main factors related to BSC in Thai public and private hospitals

2) To test a proposed research model to explain the relationships between the main factors and buyer-supplier collaboration from the viewpoint of executives working in Thai public and private hospitals.

Scope of the Study

The population of this study consisted of 1,348 public and private hospitals operating in Thailand. The sample for the quantitative research included a total of 416 Thai public and private hospitals. The unit of analysis was at the organizational level. The scope of this study focused on the structural relationships between one dependent variable and seven independent variables by using a structural equation modeling technique with the AMOS program.

Literature Review

Thai Public and Private Hospitals

In Thailand, the hospital is the place where healthcare service is delivered to the patient. Its objectives are to promote the wellness of the patient, prevent disease, treat illness, and rehabilitate the patient. The hospital is defined as accepting patient admissions (Ministry of Public Health (MOPH), 2014). Most public hospitals are formally operated by the MOPH. Other government units and public organizations also operate public hospitals such as universities, the military, and local governments. Provincial hospitals operated by the MOPH Office of the Permanent Secretary are officially categorized as follows: 1) regional hospitals are located in province centers, have a capacity of at least 500 beds, and have a comprehensive set of specialists on the medical staff;

2) general hospitals are located in major districts and have a capacity of 200 to 500 beds. They can normally provide primary and secondary care; and 3) community hospitals are located at the district level and have a capacity of fewer than 200 beds. They can only provide primary care.

Private hospitals are officially regulated by the Medical Registration Division under the MOPH's Department of Health Service Support following Sanatorium Act, B.E.2541. The general private hospitals refer to hospitals that commonly provide non-specialized care. Private hospitals with less than 30 beds are formally named as health centers (MOPH, 2014). As of 2014, there were 1,020 public hospitals and 328 private hospitals operating in Thailand.

Buyer-Supplier Collaboration

In healthcare service industry, SCM is the activity that involves the collaboration, cooperation, and integration within the organizations and with key partners. Compared with other service industries, SCM in the healthcare service industry has more complex and different characteristics. The healthcare service industry has less awareness of SCM than other production and service industries. The supply chain process improvement has been a low priority in this industry. Therefore, new sophisticated and hi-end technology improvement has been mostly focused on providing the highest quality service of care and reducing service costs (Stock et al., 1998; Smith, 2011; Piboonrungroj, 2012; Smith et al., 2012).

Kritchanchai (2012) has stated that the SCM concept enables process visibility and transparency so that all key players, including buyers and suppliers, can notice what is happening throughout the chain. All key players are seeking how to gain clearer visibility of their operations in order to improve the quality of care, lower costs, gain marginal benefits, and increase total revenues. They are also trying to increase their supply chain performance by aligning business strategies with supply chain strategies. Moreover, the collaboration within an organization can lead to risk management, performance improvement and meaningful cost containment (Farney, 2003; Langabeer, 2005; Smith, 2011; Ebel et al., 2012; Niemsakul et al., 2014).

In the healthcare service industry, information sharing and collaboration are quite difficult since there is high level of information complexity, uncertainty, and fragmentation. As a result, raw data and crucial information are not fully circulated across buyers and suppliers whereby pharmaceutical information is actually acknowledged as significant and important information to improve patient safety (Muangchoo & Singkarin, 2012). Moreover, there are many manual activities and regulatory pressures using raw data stored and maintained in the fragmented IT systems of each service provider. As a consequence, each service provider is facing big challenges in terms of the track and traceability of the information along the process, high standard quality of care, operational efficiency, and customer

satisfaction. As a result, there is a significant need to improve the information sharing across buyers and suppliers (Muangchoo & Kritchanchai, 2011).

In summary, there are many different types of BSC approaches, such as information sharing, resource sharing, collaborative communication, and joint teams and goal congruence. BSC can be classified using different criteria such as mutual benefits, information sharing, an integrated supply chain process, resource sharing, and incentive alignment (Simatupang & Sridharan, 2005), sharing information, goal congruence, collaborative communication, and decision synchronization (Cao & Zhang, 2011), information sharing, joint teamwork, joint planning, and resource sharing (Ramanathan & Gunasekaran, 2011), synchronization of objectives, frequent and open dialogue, joint costs, innovation and synchronized decision (Wilding & Humphries, 2006), resource-dedicated investment, collaborative communication, and supply chain decision making (Sheu et al., 2006).

Main Factors Affecting Buyer-Supplier Collaboration

External support (EXS) refers to promotions, campaigns, and support from government organizations, NGOs, and associations or private organizations. In Thailand, there are many organizations that promote and support the knowledge of SCM and awareness of the importance of BSC. These public and private organizations help emphasize the top management of the organization in order to have greater understanding, knowledge, and awareness of the manufacturing and service industries in Thailand.

Market competition (MAC) refers to the force exerted by the global economy and competitors in the market. This also includes customer's pressure on the organization to build collaboration among partners (Phong-arjarn & Jeenanunta, 2013). Kedia (1997) explained that market competition affects the design of the organization's governance structure. Top management strategically commit to actions that seize benefits and the most preferable responses from market competitors.

Management support (MAS) refers to top management vision and support. This also means the top management's potential to express its vision and mission of the organization and to lead others to achieve the organization's goals. This support also includes the policy and strategy of organization to ensure that the needs and requirements of each customer will be continuously fulfilled over time, commitment to establishing collaboration with partners and budgets for building collaboration (McKone-Sweet et al., 2005; Bhakoo & Chan, 2011).

Inventory management (INM) refers to the process to manage the suitable inventory holding level of products such as medicines, medical supplies, or medical devices in order to serve the demand of hospital personnel and to support the activities in the hospital. For increasing the effectiveness throughout the supply chain, buyer and supplier jointly administer both logistics and inventory management in the supply chain (Min & Mentzer, 2004).

Capability (CAP) refers to the understanding, awareness, experience, and competency of buyers such as negotiation, presentations, systematic costing, etc. It also refers to understanding SCM and awareness of the importance of BSC. One of the main obstacles is the lack of the buyer's capability concerning SCM knowledge and BSC awareness among top management and healthcare professionals (McKone-Sweet et al., 2005; Bhakoo & Chan, 2011).

Commitment (COM) refers to concentration, empathy, carefulness, facilitation, service mind, and problem solving before and after the sales services of the supplier provided to the buyer. It also refers to the desire of the supplier to continuously build a relationship because of the positive effect of good partnerships (Nyaga et al., 2010; Gundlach et al., 1995, Piboonrungroj, 2012). Commitment plays a significant role in collaboration. A increase of commitment can result in many organizational outcomes (Piboonrungroj, 2012).

Trust (TRU) refers to the confidence, beliefs, credence, and reliance of the buyer presented to the supplier. It is also refers to trust and honesty, goodwill and intimate relationships between the buyer and supplier, regular and intimate coordination, the partners' intention and willingness to build collaboration, and communication efficiency. Buyers perceive suppliers as beneficent and credible (Nyaga et al., 2010). Doney and Cannon (1997) determined the cognitive processes through which buyers can build trust with suppliers. These processes provide a theoretical framework used to identify the antecedents of trust.

Proposed Research Model

The proposed research model of this study is illustrated in figure 1.

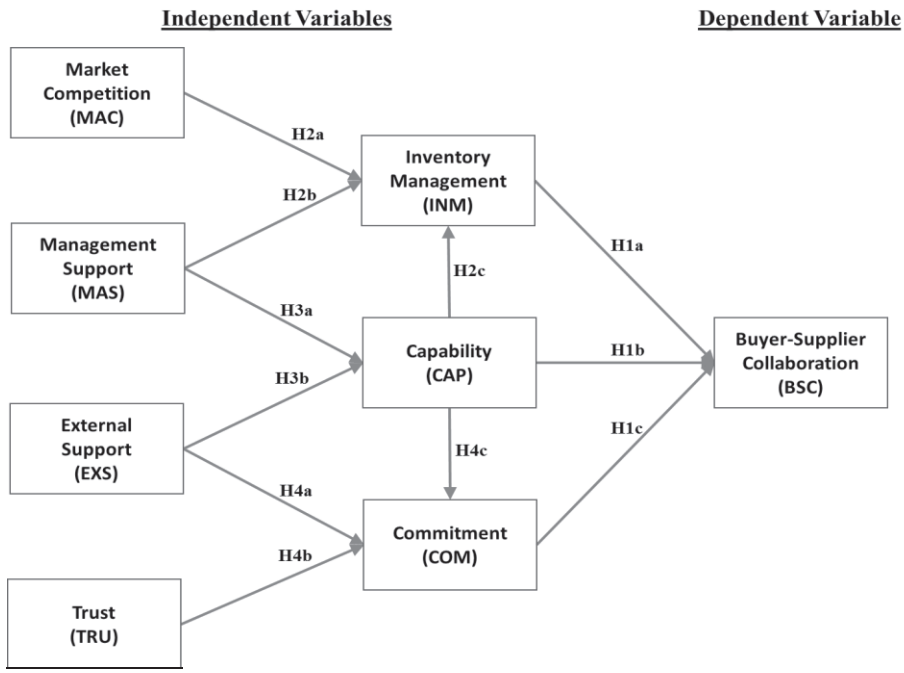

Figure 1. Proposed research model.

Summary of Hypotheses

There is a total of 11 hypotheses in the present study: 1) H1a: INM had a positive impact on BSC; 2) H1b: CAP had a positive impact on BSC; 3) H1C: COM had a positive impact on BSC; 4) H2a: MAC had a positive impact on INM; 5) H2b: MAS had a positive impact on INM; 6) H2c: CAP had a positive impact on INM; 7) H3a: MAS had a positive impact on CAP; 8) H3b: EXS had a positive impact on CAP; 9) H4a: EXS had a positive impact on COM; 10) H4b: TRU had a positive impact on COM; and 11) H4c: CAP had a positive impact on COM.

Methodology

The main objective of this quantitative research was to demonstrate the impact of the main factors on BSC in Thai public and private hospitals. For collecting the data from the large sample, a survey questionnaire was developed from the related concepts, theories, and studies in order to gather reliable and valid evidence of the relationships that could be generalized. The unit of analysis was at the organizational level. As an organizational representative, the hospital executive or top management was selected from the director, head of the division, department manager, supervisor or other management team members, including the executives in charge of hospital administration, procurement, and operations and services. Thus, these executives were considered good respondents for the data collection, which could be generalized at the organizational level.

Population and Sample Size

The population (N) consisted of a total of 1,348 organizations including 1,020 public hospitals and 328 private hospitals. In order to avoid the issue of a low return rate, which often occurs in data collection through a mailed and an emailed survey questionnaire, the survey questionnaires were distributed to 700 hospitals (about 125 percent over than the minimum required number of samples) by using the stratified sampling technique. They were stratified by kind of hospital so that the samples could be good representatives of the target population in Thai public and private hospitals.

Research Instrument

A survey questionnaire was used as the research instrument in order to obtain the empirical data. It included ten parts: 1) personal details, 2) hospital details, 3) BSC, 4) INM, 5) CAP, 6) COM, 7) MAC, 8) EXS, 9) MAS, and 10) TRU. Ten questions were checklists and fifty-four questions were placed on 10-point rating scales.

The survey questionnaire development for the present study adopted some of the questions from previous research and studies. The measurement for each variable was developed according to its operational definitions and was examined to determine its validity and reliability. For the index of item-objective congruence (IOC), the questionnaire was then examined by five content experts, taking account of language accuracy and content validity. The overall results of the index of the IOC for each item were accepted. After that, the survey questionnaire was revised according to the suggestions of the content experts. Then, the survey questionnaire was pre-tested with a sample of 30 hospitals in order to examine the reliability by using Cronbach's alpha coefficient calculation. The overall results were also accepted. All of them were higher than the acceptable score, which was 0.700 or above.

Data Analysis

Basic Statistical Analysis of the Variables in this Study

Basic information about the samples was analyzed in order to understand the characteristics of both the executives and the hospitals. Using SPSS, the statistical values involved frequency and percentages. In addition, the basic statistical values of all the variables were analyzed in order to understand the distribution and variation of each variable.

Analysis of Data to Satisfy the Study's Objectives

Using SPSS, the statistical values consisted of mean, standard deviation, and coefficient of variation. In addition, Pearson's product moment correlation coefficient was used in order to understand

the relationship among the variables, which was a linear or a nonlinear relationship, and the portion and trend of relationships among the variables. The relationship number should not be greater than 0.80.

Structural Equation Modeling

Confirmatory factor analysis was carried out using the AMOS program. The validation and reliability of the independent variables on the dependent variable were examined. The relationships between the variables were analyzed in SEM in order to investigate the direct and indirect impact of the variables—whether they were consistent with the empirical data or not. The regression coefficient of the structural equation should be higher than 0.50.

Findings and Results

General information about the survey questionnaire respondents: Questionnaires were distributed to 525 public and 175 private hospitals. The respondents in each hospital included top management or executives. Only 416 sampled hospitals returned the questionnaires, which accounted for a 59.43 percent return rate. The details of the general information about the sampled hospitals are shown in table 1.

Table 1. General information about the sampled hospitals (n=416)

	General information	Frequency	Percentage
Kind of hospital	Public	309	74.28
	Private	107	25.72
Level of care	Primary	76	18.27
	Secondary	212	50.96
	Tertiary	104	25.00
	Excellence Center	24	5.77
Number of beds	Less than 90 beds	197	47.36
	90 – 120 beds	58	13.94
	121 – 250 beds	60	14.42
	251 – 500 beds	72	17.31
	Over than 500 beds	29	6.97
Number of service years	Less than 10 years	19	4.57
	11 - 20 years	56	13.46
	21 - 30 years	93	22.36
	31 - 40 years	115	27.64
	Over than 40 years	133	31.97
Hospital Accreditation (HA)	Already certified	365	87.74
	In certification process	12	2.88
	Has not started	39	9.38

Correlation Matrix and Descriptive Statistics of Independent Variables

The correlation coefficients analysis among the variables were investigated. Especially the independent variable aimed to verify whether any multicollinearity issue existed. Table 2 illustrates the correlation between the independent and dependent variables at the moderate level. All of the correlation coefficients were significant at the level of .001, an indication of the strong convergent validity of the subscales in assessing each construct. In addition, a sample correlation coefficient value over +.70 or less than -.70 for the two independent variables was a warning of a potential issue caused by high multicollinearity. All of the sample correlation coefficient values among the independent variables were within the limit (-.70 to +.70). It can be claimed then that these values in the matrix were recognized at an acceptable value, and therefore the multicollinearity issue did not exist. Consequently, these values did not harm further multiple regression analysis.

Table 2. Correlation matrix, eigenvalue, mean, and standard deviation of dependent and independent variables. (n=416)

Variable	EXS	MAS	TRU	CAP	MAC	COM	INM	BSC
EXS	1.000							
MAS	.588	1.000						
TRU	.522	.534	1.000					
CAP	.491	.356	.660	1.000				
MAC	.149	.086	.093	.039	1.000			
COM	.484	.449	.641	.478	.080	1.000		
INM	.265	.222	.374	.516	.042	.363	1.000	
BSC	.467	.463	.614	.400	.142	.455	.251	1.000
Eigenvalue	3.807	1.043	.903	.614	.521	.494	.395	.223
Mean	7.835	7.934	8.203	8.344	7.507	8.229	8.638	8.339
Standard Deviation	.850	.950	.748	.791	.911	.765	.767	.736

Note: 1) All variables were significance at .000 (2-tailed).

2) No high multicollinearity.

Final Step (Refined Model)

The modified conceptual model (1st refined model) was tested with the purpose of assessing the structural relationships. In order to verify structural relationship pathway, structural relationship coefficients were shown in figure 2.

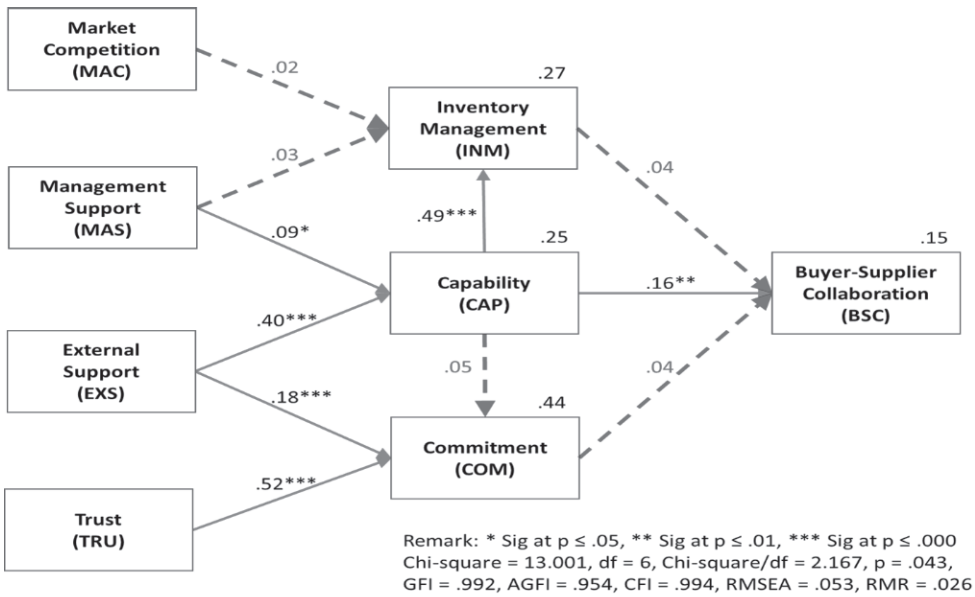

Figure 2. 1st Refined structural equation model.

Note: Relationship pathway with statistical significance ——→

Relationship pathway with no statistical significance - - - →

Even though the researcher refined the model, the result of p = .043 indicated that the model data fit was not appropriate yet. The researcher tried to refine the model again by adding four structural relationships. These four additional hypotheses were: 1) H1d: MAC had a positive impact on BSC; 2) H1e: MAS had a positive impact on BSC; 3) H1f: EXS had a positive impact on BSC; and 4) H1g: TRU had a positive impact on BSC. Anyway, there is no any study mentioned about these four structural relationships.

Then, AMOS was re-loaded with the sample data containing the total seven independent variables and one dependent variable. The newly-modified conceptual model (2nd refined model) was tested for the purpose of assessing the structural relationships. In order to verify the structural relationships between the independent and dependent variables, structural relationship coefficients were shown in figure 3.

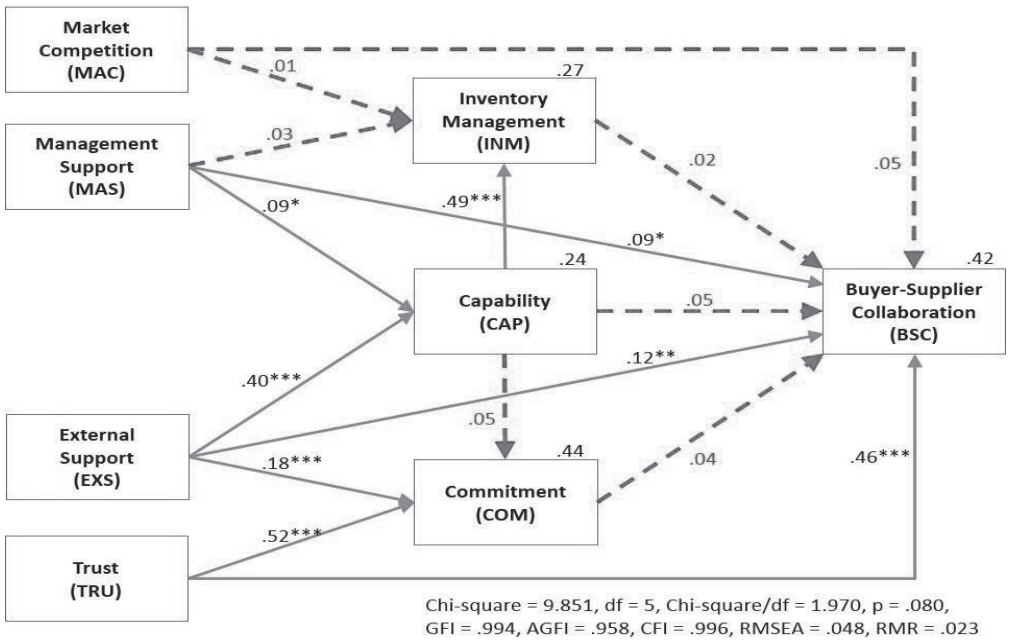

Figure 3. 2nd Refined structural equation model (Final model)

Note: Relationship pathway with statistical significance ——→

Relationship pathway with no statistical significance - - - →

The final-step structural relationship coefficients between the variables as well as their individual t-values and the estimates of the structural coefficients are shown in table 3. Each of these coefficients can be viewed as an unstandardized regression coefficient.

Table 3. AMOS structural relationship coefficients: 2nd Refined model (Final model).

	INM	CAP	COM	MAC	EXS	MAS	TRU
BSC	.020 (t = .468)	.054 (t = 1.042)	.044 (t = .894)	.052 (t = 1.696)	.124** (t = 2.794)	.091* (t = 2.386)	.464*** (t = 7.830)
INM		.491*** (t = 10.443)		.014 (t = .402)		.027 (t = .730)	
CAP					.396*** (t = 8.085)	.088* (t = 2.009)	
COM		.046 (t = .948)			.175*** (t = 4.420)		.519*** (t = 9.928)

Note: * Significant at the p ≤ .05 level,

** Significant at the p ≤ .01 level,

*** Significant at the p ≤ .000 level, and

t = t-value

A summary of the goodness-of-fit statistics is presented in table 4, where the results indicated that the model fit well with the exploratory data. Although the overall chi-square test of the model was statistically significant. P-value = .043 and RMSEA = .048 indicated that the model data fit was appropriate. All of the ad hoc fit indices were above .900 (GFI = .994, AGFI = .958, CFI = .996) indicating adequate model data fit.

Table 4. Goodness-of-fit statistics: 1st and 2nd refined models.

Measurement	Abbreviation	Value		Comment
		1st refined	2nd refined	
Chi-square	CMIN	13.001	9.851	This showed quite a good fit
p-value	P	.043	.080	
Degree of freedom	DF	6	5	
Chi-square/df	CMIN/DF	2.167	1.970	This showed quite a good fit
Root mean square residual	RMR	.026	.023	This showed quite a good fit
Root mean square error of approx.	RMSEA	.053	.048	This showed quite a good fit
Goodness-of-fit index	GFI	.992	.994	This showed quite a good fit
Adjusted goodness-of-fit	AGFI	.954	.958	This showed quite a good fit
Comparative fit index	CFI	.994	.996	This showed quite a good fit

Last, the researcher finally reviewed the squared multiple correlation (SMC). For the 2nd refined model (final model), the SMC value of buyer-supplier collaboration was 41.6 percent, the SMC value of inventory management was 26.7 percent, the SMC value of capability was 24.4 percent and the SMC value of commitment was 44.1 percent.

Causal Relationship among Variables

From the multiple regression results, by using path analysis, the causal relations among the variables were computed. These causal relationships were explained as direct and indirect effects. The direct and indirect effects of the seven independent variables affecting capability, commitment, inventory management, and buyer-supplier collaboration were computed and are summarized in table 5, as shown in the following.

Table 5. Direct, indirect, and total causal effects of independent and dependent variables: 2nd Refined model (Final model).

	Source of Causation																				
	EXS			MAS			TRU			CAP			MAC			COM			INM		
	DE	IE	TE	DE	IE	TE	DE	IE	TE	DE	IE	TE	DE	IE	TE	DE	IE	TE	DE	IE	TE
CAP	.396	-	**.396**	.088	-	**.088**	-	-	**-**	-	-	**-**	-	-	**-**	-	-	**-**	-	-	**-**
COM	.175	.018	**.194**	-	.004	**.004**	.519	-	**.519**	.046	-	**.046**	-	-	**-**	-	-	**-**	-	-	**-**
INM	-	.194	**.194**	.027	.043	**.070**	-	-	**-**	.491	-	**.491**	.014	-	**.014**	-	-	**-**	-	-	**-**
BSC	.124	-.009	**.114**	.091	-.003	**.088**	.464	.023	**.487**	-.054	.012	**-.042**	.052	-	**.052**	.044	-	**.044**	.020	-	**.020**
Total	**.695**	**.203**	**.898**	**.206**	**.044**	**.250**	**.983**	**.023**	**1.006**	**.483**	**.012**	**.495**	**.066**	**-**	**.066**	**.044**	**-**	**.044**	**.020**	**-**	**.020**

Note: DE = Direct effect
IE = Indirect effect
TE = Total effect

Direct, Indirect and Total Effects

As mentioned previously, that inventory management, capability, commitment, market competition, management support, external support, and trust had a direct effect on buyer-supplier collaboration. First, trust had the highest effect on buyer-supplier collaboration in direct, indirect, and total effects (.464, .023, and .487 respectively). Secondly, external support had the second highest effect on buyer-supplier collaboration in direct effect, indirect effect, and total effects (.124, -.009, and .114 respectively). Then, management support had the third highest effect on buyer-supplier collaboration in direct, indirect, and total effects (.091, -.003, and .088 respectively). Market competition had an effect on buyer-supplier collaboration with a direct effect (.052) only. Commitment had an effect on buyer-supplier collaboration as a direct effect (.044) only. Inventory management had an effect on buyer-supplier collaboration with a direct effect (.020) only. Lastly, capability had an effect on buyer-supplier collaboration as a direct, indirect, and total effects (-.054, .012, and -.042 respectively).

Moreover, capability, management support, external support and trust also were seen to have an indirect effect on buyer-supplier collaboration. Firstly, trust had an indirect effect on buyer-supplier collaboration through commitment (.023). Secondly, capability had an indirect effect on buyer-supplier collaboration through inventory management and commitment (.012). Then, management support had an indirect effect on buyer-supplier collaboration through inventory management and capability (-.003). Lastly, external support had an indirect effect on buyer-supplier collaboration through capability and commitment (-.009).

For the main factors affecting buyer-supplier collaboration in the Thai public and private hospital model, the total direct effects (.795) of trust, external support, management support, market competition, commitment, inventory management, and capability were shown to have a higher value than the total indirect effects (.023) of trust, capability, management support, and external support on buyer-supplier collaboration. In summary, there were seven independent variables that had a direct effect on buyer-supplier collaboration and four independent variables that had an indirect effect on buyer-supplier collaboration. These factors should be emphasized in increasing BSC in Thai public and private hospitals (see more details in figure 4).

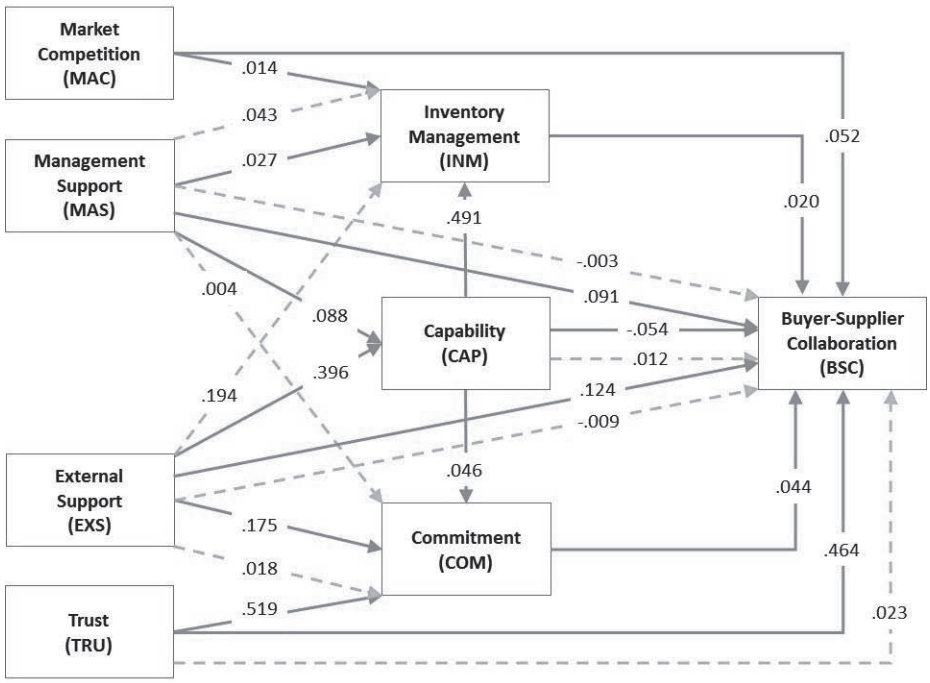

Figure 4. Direct and indirect effects of the main factors affecting buyer-supplier collaboration in Thai public and private hospitals.

Note: Direct effect ——→ Indirect effect - - - - →

Research Conclusion

Quantitative research was applied to collect data from 309 public hospitals and 107 private hospitals in Thailand. The descriptive statistics were presented to describe general information about the respondents and the sampled hospitals. Inferential statistics were used in the SEM analysis to test the hypothesis showing the influences of the variables. The results were synthesized in order to answer the research objectives.

By using AMOS, the sample data were used to analyze the quantitative techniques. The relationship among the independent and dependent variables was investigated and eleven research hypotheses were tested. Once all of the hypotheses were statistically proved, it was found that there were seven relationships that showed a significant effect: 1) Capability was significantly correlated with buyer-supplier collaboration; 2) Commitment was significantly correlated with buyer-supplier collaboration; 3) Capability was significantly correlated with inventory management; 4) Management support was significantly correlated with capability; 5) External support was significantly correlated with capability; 6) External support was significantly correlated with commitment; and 7) Trust was significantly correlated with commitment.

For investigating causal relationships, path analysis was statistically used to analyze the variance exhibited among the variables, when input into the regression model using a sequence derived from eleven research hypothesis. Eleven research hypotheses with fifty-four questions (measurement items) were tested and analyzed to investigate the influence of each independent variable on BSC.

In summary, there were seven independent variables that had a direct effect on BSC and four independent variables that had a indirect effect on BSC. All of the causal variables could describe BSC in Thai public and private hospitals at $R^2 = 0.416$.

Research Discussion

Discussion of the Research Questions and Hypothesis Testing

Research Questions No. 1: What are the main factors affecting BSC in Thai public and private hospitals?

By using AMOS, the sample data collected from the survey questionnaires were analyzed using the quantitative technique. The relationship among the independent and dependent variables was investigated and the eleven research hypotheses were tested. Moreover, a path analysis was also used to explore the direct and indirect relationships among the independent and dependent variables. The final model with significant paths is shown in figure 3.

For the final model, there were eight structural relationships, which were: 1) the relationship between management support and BSC was shown to be significant statistically; 2) the relationship between external support and BSC was shown to be significant statistically; 3) the relationship between trust and BSC was shown to be significant statistically; 4) the relationship between capability and inventory management was shown to be significant statistically; 5) the relationship between management support and capability was shown to be significant statistically; 6) the relationship between external support and capability was shown to be significant statistically; 7) the relationship between external support and commitment was shown to be significant statistically; and lastly 8) the relationship between trust and commitment was shown to be significant statistically. The practical model is illustrated in figure 5.

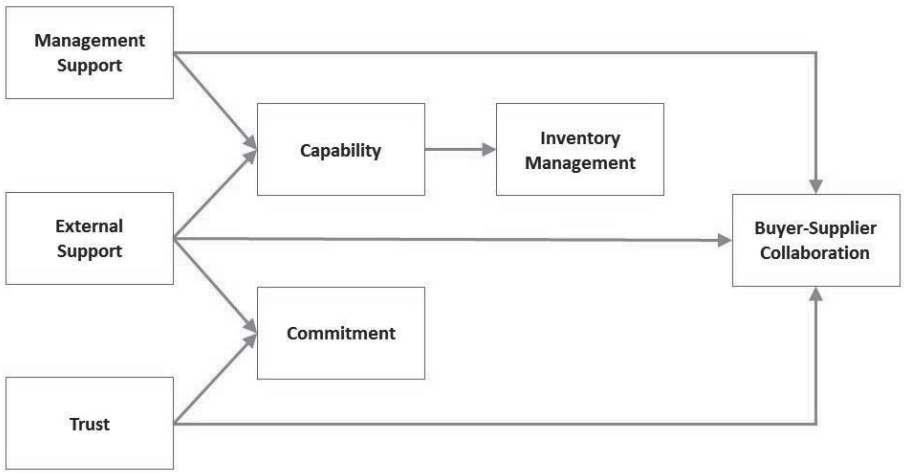

Figure 5. Practical model for the main factors affecting buyer-supplier collaboration in Thai public and private hospitals.

Research Questions No. 2: What are the relationships between the main factors and BSC in Thai public and private hospitals?

External support had a direct effect on capability, commitment, and BSC. Moreover, external support also had an indirect effect on commitment, inventory management, and BSC. Capability was the variable that had the highest direct effect on external support. Commitment came second highest in direct and indirect effects on external support. Then, external support had only an indirect effect on inventory management. Lastly, external support had direct and indirect effects on BSC.

Management support had a direct effect on capability, inventory management, and BSC. Moreover, management support also had an indirect effect on commitment, inventory management and BSC. Capability was the variable that had the highest direct effect on management support. Inventory management came second highest in direct and indirect effects on management support. Lastly, management support had direct and indirect effects on BSC.

Trust had a direct effect on commitment and BSC. Moreover, trust also had an indirect effect on BSC. Commitment was the variable that had only a direct effect on trust. Lastly, trust had direct and indirect effects on BSC.

Capability had a direct effect on inventory management, commitment, and BSC. Moreover, capability also had an indirect effect on BSC. Inventory management was the variable that had the highest direct effect on capability, and commitment was the variable that had only a direct effect on capability. Lastly, capability has direct and indirect effects on BSC.

Market competition had a direct effect on inventory management and BSC. Inventory management was the variable that had only a direct effect on market competition. Lastly, market competition had only a direct effect on BSC.

Commitment had a direct effect on BSC only. Moreover, commitment did not have an indirect effect on inventory management, capability, or BSC. Lastly, commitment had only a direct effect on BSC.

Inventory management had a direct effect on BSC only. Moreover, inventory management did not have an indirect effect on capability, commitment, or BSC. Lastly, inventory management had only a direct effect on BSC.

For the direct and indirect effects of the main factors affecting BSC, all seven independent variables were seen to have a direct effect on BSC. Moreover, there were four independent variables—MAS, CAP, EXS and TRU—that also had an indirect effect on BSC. These factors should be emphasized in increasing BSC in Thai public and private hospitals.

Research Contributions

The research contributions of this study are divided into two parts, academic and practical contributions. The details are as follows.

Academic Contributions

The research model proposed in this study created valuable contributions to the research topic. Moreover, the findings and results are expected to yield greater understanding of the external, organizational, and personal factors that will be important for building more knowledge of this research topic. Even though this study mainly focused on Thai public and private hospitals, other types of service organizations can gain benefit from the findings and results.

For the measurement items of each variable, this study presented evidence of reliability and validity which provided a foundation for further study in this research area. Fifty-four measurement items measured each variable in the survey questionnaire. The results presented evidence of all variables' internal consistency and construct reliability and validity. Both the independent and dependent variables developed can be a useful tool for any researchers to investigate the typical characteristics of BSC and its main factors. Therefore, the study can be of benefit to any reader or organization that is related to the healthcare business environment.

Finally, SEM was seen to be a suitable method for investigating the relationships among the main factors and BSC in Thai public and private hospitals. The research findings and results provided useful contribution, especially in terms of the knowledge gained from the mechanisms connecting the relationship between the main factors and BSC.

Practical Contributions

First, management support and external support should be continuously monitored and emphasized. This support not only comes from hospital executives, but also from external organizations. Moreover, the support not only regards financial matters, but also non-financial matters such as consultancy, knowledge, and experience sharing. Nowadays, this is an area of research that has been neglected. As a result, this study makes a contribution by formulating and testing a proposed research model that explains the direct and indirect relationships of the independent variable on BSC. The results demonstrated that the proposed research model had statistical validity, and provided empirical evidence for the importance of BSC.

Then, this study provided a survey questionnaire as the research instrument that could be of benefit to any reader. The findings and results also help any reader to gain more understanding of the relationships among the variables and the practical model can be applied to other services. These findings and results can be used as guidelines to enhance BSC. It also benefits any executive to realize what factors can be more utilized for building BSC. The government offices related to healthcare system policy and regulations can use the information and findings elaborated from this study to formulate precise healthcare spending policies and support to improve Thai healthcare services as a whole.

Limitations of the Research

With the time limits, all of the data used in this research were obtained from respondents worked as buyers in Thai public and private hospitals only. The findings and results may be different, if the data are obtained from respondents worked as suppliers.

Recommendations for the Future Research

The results emphasize the need for conducting more research on this topic. Even though evidence of the reliability and validity of the instrument was presented, the instrument still needs to be fully developed in the future. Further research will be necessary to explore the measurement scale with other types of service organizations. In order to prove and affirm the utility and validity of the instrument, it needs to be cross-validated with more studies by comparing different types of service organizations. Future research needs to be developed on more reliable and valid operational

definitions for the newly-proposed constructs. Further, more complicated interactions between new constructs need to be tested and proven. The hypotheses should be tested in organizations from various types of service industries and results compared to those to determine if BSC and the main factors react differently.

Furthermore, more in-depth interviews should be conducted with executives working in different types of service organizations to obtain more useful information and deep insight into using this research model in practice. Lastly, the influence of internal and external factors and environments should be carefully investigated in order to explore whether they statistically affect BSC in the organization or not. In summary, further research should be conducted on the measurement of the main factors and BSC.

References

Bhakoo, V. & Chan, C. (2011). Collaborative implementation of e-business processes within the health-care supply chain: The monash pharmacy project. *Supply Chain Management: An International Journal, 16*(3), 184-193.

Cao, M., & Zhang, Q. (2011). Supply chain collaboration: Impact on collaborative advantage and firm performance. *Journal of Operations Management, 29*(3), 163-180.

Chakraborty, S., Bhattacharya, S., & Dobrzykowski, D. D. (2014). Impact of supply chain collaboration on value co-creation and firm performance: A healthcare service sector perspective. *Procedia Economics and Finance, 11*(2014), 676-694.

Doney, P. M., & Cannon, J. P. (1997). An examination of the nature of trust in buyer-seller relationships. *Journal of Marketing, 61*(2), 35-51.

Ebel, T., George, K., Larsen, E., Neal, E., Shan, K., & Shi, D. (2012). *Building New Strengths in the Healthcare Supply Chain: Pharmaceuticals and Medical Products Operations.* McKinsey & Company.

Farney, S. (2003). Metrics drive supply chain collaboration. *Inside Supply Management, 14*(7), 21.

Gundlach, G. T., Achrol, R. S., & Mentzer J. T. (1995). The structure of commitment in exchange. *Journal of Marketing, 59*(1), 78-92.

Kedia, S. (1997). *Product Market Competition and Top Management Compensation*. Retrieved from https://papers.ssrn.com/sol3/papers.cfm?abstract_id=10977.

Kritchanchai, D. (2012). A framework for healthcare supply chain improvement in Thailand. *Operations and Supply Chain Management, 5*(2), 103-113.

Langabeer, J. (2005). The evolving role of supply chain technology in healthcare. *Journal of Healthcare Information Management, 19*(2), 27-33.

Lee, H. L., & Whang, S. (2001). *E-Business and Supply Chain Integration.* Stamford, CT: SGSCMF- W2-2001.

Ramanathan, U., & Gunasekaran, A. (2011). Supply chain collaboration performance metrics: A conceptual framework. *Benchmarking: An International Journal, 18*(6), 856-872.

McKone-Sweet, K. E., Hamilton, P., & Willis, S. P. (2005). The ailing healthcare supply chain: A prescription for change. *Journal of Supply Chain Management, 41*(1), 4-17.

Min, S., & Mentzer, J. T. (2004). Developing and measuring supply chain concept. *Journal of Business Logistics, 25*(1), 63-99.

Ministry of Public Health. (2014). *General Information for Hospital in Thailand*. Bureau of Policy and Strategy website. Bureau of Policy and Strategy, Office of the Permanent Secretary, Ministry of Public Health. Retrieved November 11, 2014.

Muangchoo, S., & Kritchanchai, D. (2011). *Standard Drug Codes: Use of Drug Information Database for Patient Safety in Thailand*. Proceedings of the 6th International Congress on Logistics and SCM Systems. Kaohsiung, Taiwan.

Muangchoo, S., & Singkarin, D. K. (2012). *Building National Drug Information Sharing in Healthcare Service through Metadata-based Solutions in Thailand*. Proceedings of Asia Pacific Industrial Engineering & Management Systems Conference. Phuket, Thailand

Niemsakul, J., Singkarin, D., & Somboonwiwat, T. (2014). *Cost Benefit Sharing in Healthcare Supply Chain Collaboration.* Proceedings of the 2014 International Conference on Industrial Engineering and Engineering Management IEEM. Selangor, Malaysia.

Nyaga, G. N., Whipple, J. M., & Lynch, D. F. (2010). Examining supply chain relationships: Do buyer and supplier perspectives on collaborative relationships differ? *Journal of Operations Management*, *28*(2), 101-114.

Phong-arjarn, E., & Jeenanunta, C. (2013). Exploring supply chain collaboration in Thai major industries. *Naresuan University Journal: Science and Technology, 19*(3), 22-34.

Piboonrungroj, P. (2012). *Supply Chain Collaboration: Impacts and Mediation on Firm Performance*. PhD Thesis, Cardiff University.

Sheu, C., Yen, H. R., & Chae, B. (2006). Determinants of supplier-retailer collaboration: Evidence from an international study. *International Journal of Operations & Production Management, 26*(1), 24-49.

Simatupang, T. M., & Sridharan, R. (2005). An integrative framework for supply chain collaboration. *The International Journal of Logistics Management, 16*(2), 257-274.

Smith, B. K. (2011). *An Empirical Investigation of Supply Chain Excellence in Healthcare*. Ph.D. dissertation. Industrial Engineering Program. University of Arkansas. U.S.A.

Smith, B. K., Nachtmann, H., & Pohl, E. A. (2012). *Progress towards Data Standards Adoption in Healthcare.* Proceedings of the 33rd American Society of Engineering Management. Virginia Beach, Virginia, United States of America.

Smith, D. (2011). Strategies for healthcare supply chain collaboration: Improving operations, reducing costs. *Becker's Hospital Review*. Retrieved from https://www.beckershospitalreview.com/news-analysis/strategies-for-healthcare-supply-chain-collaboration-improving-operations-reducing-costs.html.

Stock, G. N., Greis, N. P., & Kasarda, J. D. (1998). Logistics, strategy and structure: A conceptual framework. *International Journal of Operations & Production Management, 18*(1), 37-52.

Thitisomboon, T., Visanvetchakij, T., Chalermchutidet, C., Phong-arjarn, E., & Jeenanunta, C. (2009). *Supply Chain Collaboration in Automotive Industry: A Case Study of Toyota (Thailand).* The 2009 Academy of International Business South East Asia Regional Conference.

Wilding, R., & Humphries, A. S. (2006). Understanding collaborative supply chain relationships through the application of the organizational failure framework. *International Journal of Physical Distribution & Logistics Management, 36*(4), 309-329.