Supply Chain Risk Factors and Corporate Repute in Pharma Industry of Thailand

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ABSTRACT

Dealing with the risk factors has got much attention specifically in the health and pharmaceutical industry. However, due to complex nature, several risk both financial and non-financial in nature are associated with the title of supply chain in pharmaceutical industry. The purpose of this research is to analyze the various risk factors which are linked with the supply chain in the pharma sector of Thailand to predict the trends in corporate repute. For this purpose, supply side risk factors, demand side risk factors, financial risk factors, and operational risk factors were selected from the existing literature of supply chain. Besides, reputational trends through five sub items were observed through set of these risk factors. To examine the relationship between the variables, a questionnaire was developed for the data collection in the economy of Thailand with a sample of 169 respondents. The results show that supply chain risk factors like lack of information sharing, lack of captain category supplier, interest rate risk, exchange rate risk, machine or equipment failure, quality risk are significantly and adversely impacting on the different dimensions of corporate repute in pharma sector of

Thailand. Besides, detailed review of the literature has demonstrated that this research is among the initial contribution for discussing the relationship between supply chain risk factors and their influence on the corporate repute in pharmaceutical sector of Thailand. for this reason, various stakeholders would get the benefit from the study findings in compiling the future studies on the similar topic. However, research limitations like expanding the sample size, considering cross country analysis, and implication of structural modelling approaches may provide some interesting and different results in coming time.

Keywords: Supply chain risk, pharmaceutical industry.

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INTRODUCTION AND LITERATURE

In business world, risk contains several perspective both in financial and non-financial terms. More specifically it shows the uneven situation, losses and financial burdens which can significantly impacting on the corporate growth, performance and repute factors as well. The existence of risk is everywhere, hence both manufacturing and service organization are compelled to deal with variety of risk factors. However, risk factors as associated with the supply chain are of core interest of the researcher, yet gets little attention. In this regard, research work of the following authors have provided a fundamental understanding while covering both theoretical and empirical perspective of risk factors in the supply chain and their role in the business [1-6].

Supply chain management is primarily dealing with the transfer and movement of goods and services along with the money and information between different partners whose aim is to satisfy the ending customer or the consumer. For this reason, supply chain covers various producers, suppliers, transportation means, retail service providers and number of other individuals who are working at different units or regions. However, in pharma industry, supply chain management is somehow different due to various reasons. For example, in pharma industry it is very significant to deliver the physical products, machines or equipment on urgent basis with complete safety measures too [7-10]. Some authors have cleared that supply chain in the field of pharma industry has covered the development and distribution of the products through a set of activities and facilitates.

The management of the risk factors in the process of supply chain may result in better financial performance, more market growth and higher customer satisfaction. However, for the proper identification of the risk factors in the supply chain is also very important and for this reason, following a

formal structure may provide some good results [11-16]. The research work conducted by [17] have analyzed and examined set of risk factors in supply chain for the pharmaceutical industry. These factors are further divided into sixteen sub-categories with more description through supply side, demand side, financial and operational risk factors. Our study has selected these risk factors are core indicators of supply chain risk dynamics.

The title of organizational success always describe through its repute in the marketplace [18, 19]. The good repute of a firm indicates that business is performing in a decent direction where different stakeholders are getting their share. Different dynamics of corporate repute are identified and discussed in the literature which are entitled through brand monitoring and conversation analysis [20, 21], working on the corporate social responsibility [22], vision and leadership [23], emotional appeal, satisfying customer's wants and needs [24], creating a positive work-place environment and many others. Based on the discussion of above literature, our study has analyzed the empirical relationship between supply chain risk factors and corporate repute in the pharmaceutical industry of Thailand.

METHODOLOGY

A survey questionnaire was developed and distributed at different pharmacies in the local market of Thailand. The title of questionnaire has covered the basic information about the topic, key research objectives and variable titles. Meanwhile, study variables are divided into two major categories, supply chain risk factors and corporate repute. Both of the stated variables are further divided into different sub items (discussed as footnote under each of the Table below). An overall five point scaling approach was adopted where 1 indicates strongly agree and 5 as strongly disagree. Approximately, one month was consumed to collect the data from the different pharmacies. A sample of 185

questionnaire was collected. However, individual review of these questionnaire have shown that 16 questionnaire were not filled properly, therefore, excluded from the total sample. A final sample of 169 (although not very much sufficient for the primary data) was found valid for the study analysis. Three type of analyses (descriptive, correlational and regression) were applied in our study.

VARIABLES, FINDINGS AND DISCUSSION

Risk factor in supply chain management of pharmaceutical industry are reflected with sub items under descriptive statistics. The first factor is entitled as supply side related risk or SSR, covering the sub items of SSR1 and SSR4. These items have a mean score of 2.94, 3.053,3.065, and 2.822. The next items are presented for the operational risk factors

ranging from OR1 to OR4 and their relative mean score is 2.94, 3.15, 2.83 and 3.00. financial risk factors are entitled with FR1 to FR3 where the average values are 2.87, 2.905, and 3.089. the demand side risk factors are reflected with the d1 to d4 and their related average response is 2.78, 2.89, 3.08, and 3.041. for the corporate repute CR, factors are entitled with CR1, CR2, CR3, CR4, and CR5. However, only the factors like CR1 and CR2 are showing the average score of above 3 while remaining three items are providing an average value of below three. The standard deviation is highest for SSR3 which is 1.46 and lowest is .370 as presented by FR1 in Table of descriptive statistics. Figure B of descriptive results have shown the overall athematic mean and deviation tendencies based on the data sets.

TABLE 1: Descriptive Statistics

Variable	Total Observations	A. Mean	Deviation	Lowest	Highest
ssr1	169	2.947	.453	1	5
ssr2	169	3.053	1.449	1	5
ssr3	169	3.065	1.464	1	5
ssr4	169	2.822	1.363	1	5
or1	169	2.941	.370	1	5
or2	169	3.154	.464	1	5
or3	169	2.834	.413	1	5
or4	169	3.00	1.41	1	5
fr1	169	2.87	.374	1	5
fr2	169	2.905	.385	1	5
fr3	169	3.089	1.418	1	5
d1	169	2.787	1.394	1	5
d2	169	2.893	.376	1	5
d3	169	3.089	.384	1	5
d4	169	3.041	1.309	1	5
cr1	169	3.065	.448	1	5
cr2	169	2.882	1.447	1	5
cr3	169	2.828	1.431	1	5
cr4	169	2.746	1.427	1	5
cr5	169	2.988	1.376	1	5

SSR1: Variation in the arrival of imports, SSR2: low/lack of information sharing, SSR3: failure of captain-category supplier, SSR4: material Non-availability in the marks, OR1: machine or equipment failure, OR2: quality risk, OR3: Contamination risk for storage, OR4: Failure of power, FR1: Higher Freight Charges, FR2: variation in exchange rate, FR3: variation in the interest rate, FR4: several financial restrictions, D1: errors in forecasting the demand, D2: Market uncertainty, D3: Bullwhip effect, D4: competition risk from the market. CR1: provision of quality products to customers, CR2: builds quality in stakeholder's relationship, CR3: builds high level of integrity with its stakeholders, CR4: It is a company where people deeply trust, CR5: deliver customer's satisfaction and gets good feedback in return
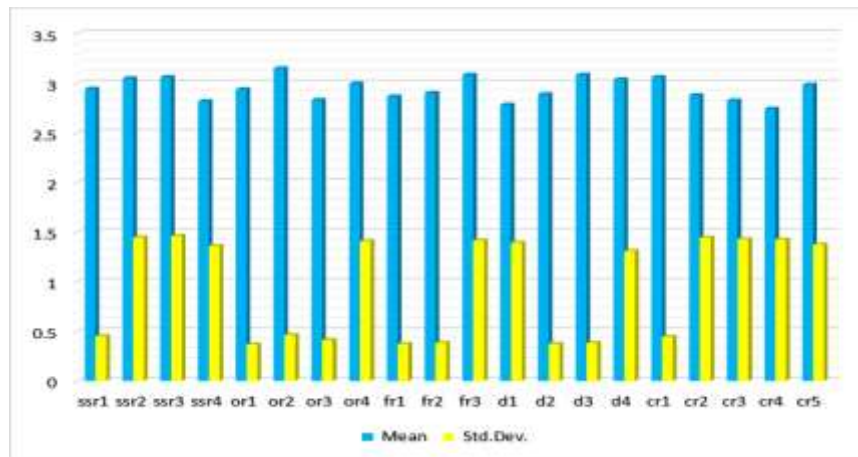
FIGURE A: Descriptive Measure: Mean and Standard Deviation

After descriptive results, correlation matrix between risk factors of supply chain management in pharmaceutical industry of Thailand is presented in Table 2. For analyzing the significant level, p-values below the correlation coefficient for each of the two item of supply chain risk factors. The correlation between SSR3 and SSR4 is -.218 which is significant at 5 percent. It is expressing that there is weak, negative and significant relationship between SSR3 and SSR4 in pharmaceutical industry of Thailand. The correlation between SSR2 and FR3 is -.170 showing a significant weak and negative relationship at 5 percent. The relationship between OR1 and FR2 is .220 presenting a positive, weak and significant association between the both. It means that there is a significant and positive but weak interdependency between them. The relationship between OR2 and FR2 is -.1667 which is significant but negatively low. In the end, our study has observed a significant, positive but low correlation between D1 and FR3 which is observed with the value of .184. The remaining items of risk factors of supply chain are found as insignificant with different trends of correlation, hence not found statistically significant to discuss here.

Table III has depicted the influence of supply chain risk factors on CR1. The results are providing the evidence for the adverse impact on CR1 by most of the supply chain risk factors, yet only four are found as significant. Various earlier studies have provided their support for examining the risk management of the supply chain [25-32]. For instance, the impact of SSR2 on CR1 is 0.094 showing a positive and highly significant impact. On the other hand, the impact of SSR3 on CR1 is -0.104 which is also significant at 1 percent. It is expressing that one unit in SSR3 is putting a negative impact on the corporate repute as measured through provision of quality products to customers. Similarly, operational risk 4th factor is showing an adverse and significant, meaning that failure of power is putting a negative impression on CR1. Similar influence is recorded through variation in the interest rate; the third measure of financial risk.

TABLE 2: Correlation Matrix with relative P-values

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
(1) ssr1	1.000														
(2) ssr2	-0.018	1.000													
	0.812														
(3) ssr3	0.049	-0.024	1.000												
	0.525	0.756													
(4) ssr4	0.037	-0.101	-0.218*	1.000											
	0.630	0.192	0.004												
(5) or1	-0.040	0.002	0.100	0.167*	1.000										
	0.601	0.984	0.197	0.030											
(6) or2	-0.125	-0.125	0.067	-0.004	0.049	1.000									
	0.106	0.107	0.383	0.957	0.526										
(7) or3	-0.019	-0.031	0.054	-0.028	-0.103	-0.037	1.000								
	0.808	0.693	0.484	0.720	0.181	0.637									
(8) or4	-0.078	0.035	-0.115	0.040	0.006	-0.029	0.033	1.000							
	0.311	0.652	0.135	0.602	0.937	0.710	0.671								
(9) fr1	-0.060	-0.020	0.016	0.039	-0.131	0.167*	0.157*	0.058	1.000						
	0.437	0.792	0.836	0.619	0.091	0.030	0.041	0.451							
(10) fr2	-0.115	-0.057	0.103	0.029	0.220*	0.072	-0.166*	-0.021	0.031	1.000					

	0.137	0.463	0.184	0.709	0.004	0.354	0.031	0.783	0.689						
(11) fr3	-0.058	-0.170*	0.060	-0.047	0.024	0.002	-0.049	-0.048	0.021	0.129	1.000				
	0.451	0.027	0.436	0.541	0.755	0.980	0.526	0.538	0.784	0.096					
(12) d1	0.047	0.065	0.007	0.008	-0.047	0.034	-0.060	-0.076	-0.058	0.045	0.184*	1.000			
	0.542	0.404	0.930	0.916	0.543	0.664	0.436	0.328	0.453	0.561	0.016				
(13) d2	0.125	-0.057	0.080	-0.001	-0.044	-0.098	0.077	-0.028	-0.048	-0.040	0.048	-0.024	1.000		
	0.105	0.463	0.300	0.994	0.566	0.204	0.322	0.722	0.533	0.609	0.539	0.754			
(14) d3	-0.030	0.007	-0.003	-0.102	0.040	0.067	0.035	-0.027	0.059	-0.101	0.060	-0.027	0.052	1.000	
	0.697	0.933	0.970	0.186	0.601	0.389	0.652	0.723	0.443	0.191	0.441	0.726	0.503		
(15) d4	0.039	0.114	-0.069	-0.072	-0.042	0.023	0.004	-0.085	-0.072	0.058	-0.062	0.023	0.136	0.109	1.000
	0.611	0.139	0.376	0.355	0.584	0.765	0.964	0.272	0.353	0.456	0.421	0.766	0.078	0.157	

SSR1: Variation in the arrival of imports, SSR2: low/lack of information sharing, SSR3: failure of captain-category supplier, SSR4: material Non-availability in the marks, OR1: machine or equipment failure, OR2: quality risk, OR3: Contamination risk for storage, OR4: Failure of power, FR1: Higher Freight Charges, FR2: variation in exchange rate, FR3: variation in the interest rate, FR4: several financial restrictions, D1: errors in forecasting the demand, D2: Market uncertainty, D3: Bullwhip effect, D4: competition risk from the market, * shows significance at the .05 level

TABLE 3: Supply chain Risk and CR1

cr1	Coef.	t-value	p-value	Sig	.
ssr1	0.254	0.254	0.998		
ssr2	0.094	4.15	0.000	***	
ssr3	-0.104	-5.27	0.000	***	
ssr4	-0.113	-1.27	0.204		
or1	-0.010	-0.11	0.911		
or2	-0.011	-0.13	0.896		
or3	-0.207	-2.49	0.014		
or4	-0.050	--2.53	0.001	***	
fr1	0.039	0.45	0.650		
fr2	-0.040	-0.45	0.652		
fr3	-0.524	-6.32	0.000	***	
d1	0.041	0.49	0.623		
d2	-0.039	-0.46	0.646		
d3	0.063	0.76	0.451		
d4	-0.016	-0.19	0.847		
_cons	4.653	4.92	0.000		
R-squared	0.374		Respondents.		169
F-test	5.815		Prob > F		0.000***

SSR1: Variation in the arrival of imports, SSR2: low/lack of information sharing, SSR3: failure of captain-category supplier, SSR4: material Non-availability in the marks, OR1: machine or equipment failure, OR2: quality risk, OR3: Contamination risk for storage, OR4: Failure of power, FR1: Higher Freight Charges, FR2: variation in exchange rate, FR3: variation in the interest rate, FR4: several financial restrictions, D1: errors in forecasting the demand, D2: Market uncertainty, D3: Bullwhip effect, D4: competition risk from the market, CR1: provision of quality products to customers,*** p<0.01, ** p<0.05, * p<0.1

Table IV has reflected the impact of supply chain risk factors on CR2 and observed that SSR4 is negatively determining the building of quality based stakeholder's relationship by the pharma industry of Thailand. Similar impression is reflected by the first factor of operational risk measured as failure of machine or equipment. It means that with the higher such failure pharma industry fails to develop a good relationship with its range of stakeholders. Through first factor of financial risk; higher freight charges a negative impact on CR2 is observed, significant at 10 percent. Similarly, D4: competition risk from the market has provided an adverse effect of -0.008 on CR2 with the unit change.

TABLE 4: Supply chain Risk and CR2

cr2	Coef.	t-value	p-value	Sig.	
ssr1	0.098	1.23	0.221		
ssr2	0.065	0.81	0.421		

ssr3	0.056		0.68		0.496		
ssr4	-0.037		5.302		0.000	***	
or1	-0.028		3.30		0.000	***	
or2	0.041		0.51		0.613		
or3	-0.016		-0.19		0.851		
or4	-0.115		-1.43		0.156		
fr1	-0.159		-1.85		0.066	*	
fr2	0.057		0.65		0.516		
fr3	-0.058		-0.70		0.484		
d1	0.054		0.65		0.515		
d2	0.002		0.03		0.979		
d3	-0.008		7.028		0.000	***	
d4	0.087		1.04		0.301		
_cons	2.747		2.93		0.004	***	
R-squared		0.186		Respondents		169	
F-test		6.957		Prob > F		0.000***	

SSR1: Variation in the arrival of imports, SSR2: low/lack of information sharing, SSR3: failure of captain-category supplier, SSR4: material Non-availability in the marks, OR1: machine or equipment failure, OR2: quality risk, OR3: Contamination risk for storage, OR4: Failure of power, FR1: Higher Freight Charges, FR2: variation in exchange rate, FR3: variation in the interest rate, FR4: several financial restrictions, D1: errors in forecasting the demand, D2: Market uncertainty, D3: Bullwhip effect, D4: competition risk from the market, , CR2: builds quality in stakeholder's relationship,*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 5 has reflected the results for the influence of supply chain risk factors on corporate repute as measured through building higher level of integrity with the stakeholders. Through OR2 and OR4, it is found that there is a negative and significant impact of -0.632 and -0.025 on CR3 with the results are generated through full sample. It means that quality risk and failure of power are the negative indicator for the CR3 in the Thai pharma industry. Through demand side risk factors, D2 is showing a coefficient of 0.146 indicating a positive and significant impact at 10 percent.

TABLE 5: Supply chain Risk and CR3

cr3	Coef.	t-value	p-value	Sig.	
ssr1	0.005	0.07	0.947		
ssr2	-0.083	-1.03	0.306		
ssr3	-0.029	-0.35	0.726		
ssr4	0.032	0.37	0.713		
or1	-0.030	-0.34	0.736		
or2	-0.632	6.325	0.000	***	
or3	0.096	1.16	0.248		
or4	-0.025	3.96	0.000	***	
fr1	0.032	0.37	0.709		
fr2	-0.028	-0.32	0.748		
fr3	-0.062	-0.75	0.455		
d1	0.056	0.68	0.499		
d2	0.146	1.74	0.085	*	
d3	-0.099	-1.19	0.234		
d4	0.053	0.63	0.528		
_cons	2.618	2.79	0.006	***	
R-squared		0.397	Respondents		169.000
F-test		6.250	Prob > F		0.000***

SSR1: Variation in the arrival of imports, SSR2: low/lack of information sharing, SSR3: failure of captain-category supplier, SSR4: material Non-availability in the marks, OR1: machine or equipment failure, OR2: quality risk, OR3: Contamination risk for storage, OR4: Failure of power, FR1: Higher Freight Charges, FR2: variation in exchange rate, FR3: variation in the interest rate, FR4: several financial restrictions, D1: errors in forecasting the demand, D2: Market uncertainty, D3: Bullwhip effect, D4: competition risk from the market, , CR3: builds high level of integrity with its stakeholders,*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table VI has shown the effect of supply chain risk factors on CR4 which indicates the trust of the people who are working in different pharma firms. As per the results OR3 is positively significant, while OR4 is adversely impacting on CR4. Meanwhile, the rest of the variables are found as significant determinants of CR4. However, model fitness is proved at 5 percent with the F-score of 12.05 and overall R2 of 21.7 percent as explained by supply chain risk factors in the region of Thailand.

TABLE 6: Supply chain Risk and CR4

cr4	Coef.	t-value	p-value	Sig.	
ssr1	0.033	0.41	0.681		
ssr2	-0.008	-0.10	0.919		
ssr3	0.046	0.57	0.568		
ssr4	0.120	1.38	0.171		
or1	0.001	0.01	0.994		
or2	0.052	0.65	0.517		
or3	0.161	1.97	0.051	*	
or4	-0.006	-3.082	0.000	***	
fr1	-0.130	-1.53	0.129		
fr2	0.088	1.02	0.308		
fr3	0.003	0.04	0.972		
d1	-0.098	-1.19	0.238		
d2	-0.109	-1.30	0.196		
d3	-0.061	-0.74	0.460		
d4	0.027	0.32	0.747		
_cons	2.394	2.57	0.011	**	
R-squared	0.217		Respondents		169
F-test	12.05		Prob > F		0.000***

SSR1: Variation in the arrival of imports, SSR2: low/lack of information sharing, SSR3: failure of captain-category supplier, SSR4: material Non-availability in the marks, OR1: machine or equipment failure, OR2: quality risk, OR3: Contamination risk for storage, OR4: Failure of power, FR1: Higher Freight Charges, FR2: variation in exchange rate, FR3: variation in the interest rate, FR4: several financial restrictions, D1: errors in forecasting the demand, D2: Market uncertainty, D3: Bullwhip effect, D4: competition risk from the market, CR4: It is a company where people deeply trust,*** $p<0.01$, ** $p<0.05$, * $p<0.1$

In the end, supply chain risk factors and their impact on CR5 was examined and presented under Table VII. It is reflected that OR1 is the only significant determinant of CR5 which specifies that higher operational risk like failure of equipment or machine. On the other hand, D2 or market uncertainty is also reflecting its adverse influence on getting positive feedback from the customers in terms of their satisfaction. The rest of the variables are found as insignificant determinant of corporate repute.

TABLE VII: Supply chain Risk and CR5

cr5	Coef.	t-value	p-value	Sig.	
ssr1	-0.028	-0.37	0.710		
ssr2	-0.055	-0.73	0.469		
ssr3	-0.026	-0.34	0.736		
ssr4	-0.115	-1.39	0.167		
or1	-0.228	2.76	0.007	***	
or2	-0.002	-0.02	0.981		
or3	0.067	0.87	0.386		
or4	-0.036	-0.47	0.641		
fr1	0.126	1.55	0.123		
fr2	-0.024	-0.29	0.772		
fr3	0.014	0.18	0.857		
d1	0.077	0.98	0.328		
d2	0.186	2.35	0.020	**	
d3	0.016	0.20	0.843		
d4	-0.016	-0.20	0.840		

_cons	1.807	2.05	0.042	**	
R-squared	0.104	Respondents		169.000	
F-test	3.254	Prob > F		0.000***	

SSR1: Variation in the arrival of imports, SSR2: low/lack of information sharing, SSR3: failure of captain-category supplier, SSR4: material Non-availability in the marks, OR1: machine or equipment failure, OR2: quality risk, OR3: Contamination risk for storage, OR4: Failure of power, FR1: Higher Freight Charges, FR2: variation in exchange rate, FR3: variation in the interest rate, FR4: several financial restrictions, D1: errors in forecasting the demand, D2: Market uncertainty, D3: Bullwhip effect, D4: competition risk from the market, CR5: deliver customer's satisfaction and gets good feedback in return,*** p<0.01, ** p<0.05, * p<0.1

CONCLUSION AND FUTURE DIRECTIONS

in any region or a country, providing the supply of medicine and health related product is a strategic decision both by the market and the business firms who are directly or indirectly dealing with it. In overall supply chain process, pharmaceutical firms are playing their major role along with their major and minor suppliers. However, one of the significant issue which needs much attention from the researchers in the present environment is the risk factors under the shadow of supply chain which are impacting on the corporate repute. This study has observed several supply chain related risk factors which are entitled as supply side risk factors, financial risk factors, demand related risk factors, and operational risk factors impacting on the corporate repute of pharma firms in Thailand economy. Different sub items for these risk factors were selected with the support from the existing literature and regressed for examining their influence on five dimensions of corporate repute. Through regression approach, some significant results are found, stating that it is very essential to tackle the adverse impression from some supply side risk factors, financial risk factors, demand side risk factors and the operational failure in the form of equipment or machine, quality risk and failure of power. However, no significant and adverse influence of contamination risk for storage was found in describing the repute of pharma firms in Thailand. However, this study has carried some limitations as well. For examine, first, there are only four risk factors of supply chain which are entitled in this research. However, a range of other risk factors which are both financial and non-financial in nature are missing in this study. Second, only the regression analysis are found as a significant contribution in examining the individual influence of selected items of the risk factors for corporate repute. Third, study has one of the core limitation is regional context which only describe its implication in the local market of Thailand where different pharma firms are working at present. For contributing more towards the future studies, our research is recommended to various authors, researchers and other focus groups to overcome these limitations through:

- Adding more risk factors
- Applying the structural equation modelling approach
- Conducting cross region/cultural analysis

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