Role of Control Mechanisms in Internal SCM and Quality Performance: Risk Management in Supply Chain Management

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Abstract- **The current study aims to assess the role of control mechanism in supply chain management and quality performance of the firms. For this purpose, the current study examines the impact of two control mechanisms named as "formal control" and "social control" on the internal supply chain management (SCM) of the firm. Furthermore, the current study investigates the influence caused by internal SCM on quality performance of the firm. To accomplish the objectives of the current study. The data was collected from 294 manufacturers of Thailand through questionnaire based survey study. The quantitative research methods was used to collect data about the formal control, social control, internal SCM and quality performance of the firm and the collected data was then put into analysis through SPSS and AMOS in which different key tests were applied to reach the acceptance or rejection of hypotheses. It is found through current study that control mechanisms have positive influence on internal SCM because the social control and formal control showed significant positive influence on internal SCM. It is further found in the current study that internal SCM has significant positive influence on quality performance so, the improved and effective internal SCM tends to enhance the quality performance of the firm. The current study has important implications in literature and practice due to its significant contributions.**

Keywords: *Internal supply chain management, formal control, social control, quality performance, Thailand*

1. Introduction

The market conditions and business environment in modern era are fluctuating consistently due to which firms and their different operations really need to be modified according to those changes. In other words, the chances of risk have increased with increased fluctuations in the market and business environment so; there is need for proper risk management in different functions of the firm. The supply chain management is an important function of the business which has to face several fluctuations and uncertainties in the market therefore, there should be proper control mechanism in the firm through which the risks in supply chain management can be managed and monitored properly so the quality performance can be accomplished in the firm [1-4]. There are different external factors as well as internal risks that can affect the working of SCM including internal SCM because the purchasing, production and distribution of the firm are much influenced due to such uncertainties. The firms adopt different control mechanisms to monitor these uncertainties among which the formal control and social control are two important control mechanisms through which the firm addresses the quality issues raised in their supply chain [5, 6]. The quality performance is an issue existing in most of the modern businesses due to inefficiencies in their SCM and risk management of supply chain. Therefore, there is a strong need identified for such mechanisms and methods in SCM that can be effectively adopted to overcome the uncertainties and quality issues raised in supply chain of firms [7-9].

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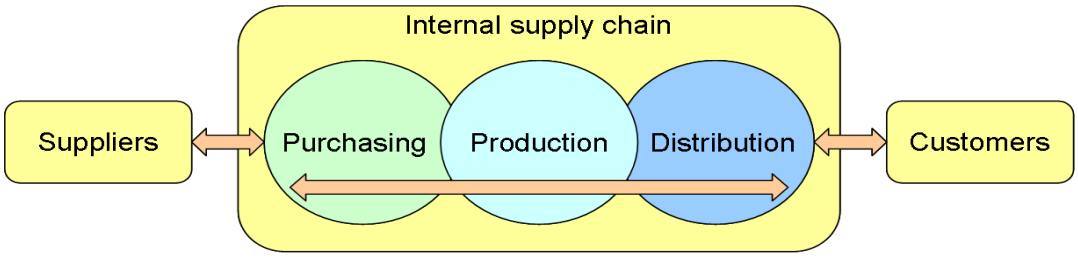

Figure 1. Internal Supply Chain of firms

However, the literature provides limited knowledge and guidance about the mechanisms and tools that can be incorporated in SCM to effectively achieve risk management and quality performance. It is strongly needed that researchers should perform studies in which they should identify and analyze different predictors of effective internal SCM and quality performance of the firm that can contribute in SCM by overcoming and monitoring the uncertainties through different controls [10-12]. The current study responds to this need by examining the role of control mechanisms in enhancing internal SCM as the first objective of the present research is to analyze the impact of social control and formal control on internal SCM. This objective of the current study is much aligned with the intensive need for research in literature of SCM and its risk management because the risk management and different practices to manage risk properly are crucial for the survival and maintenance of the firm and its internal SCM in the market. Furthermore, the proper risk management is also crucially needed to enhance the quality performance by avoiding the defective and uncertain products delivery to the customers [13, 14]. Therefore, the second objective of the current study is to analyze the influence caused by internal SCM on quality performance because the effective internal SCM will make sure that the best quality is offered to customers by monitoring uncertainties in the supply chain. Hence, the current study responds to the existing need of practitioners as well as of literature. The remaining part of this paper has been designed in four main section including literature review, methodology, results, discussion and conclusion in which the whole study has been structured.

2. Literature Review

Since, the current study examines the social control and formal control as significant predictors of internal SCM and investigates the internal SCM as important determinant of quality performance so, there is need to individual describe each variable. The social control and formal control have been previously discussed and studied by few researchers in terms of their role in risk management [15-17]. However, the particular evidences about the role of these control mechanisms in risk management and effectiveness of internal SCM are unclear and insufficient. Formal control refers to the control mechanism that are applied formally in supply chain in which the duties and responsibilities of each party are specified formally through explicit contract [18]. IT is suggested that strategic flexibility is less in formal control because such control mechanisms follow rigid and designed polices and obligations [19-21]. The social control refers to the control mechanisms that are based on norms, social structures and rules. It is suggested that social control provides the firm and supply chain with more flexible control mechanisms based on shared norms, rules and trust as compared to formal control. The increased flexibility offered by social control tends to diminish the transactional costs of supply chain [1, 2, 5, 22]. The internal SCM refers to the managerial practices and functions adopted to maintain and monitor the three internal supply chain functions of the firm including purchasing, production and distribution. The internal SCM effectiveness is very important for the overall proper functioning of SCM because internal SCM ensures the effective as well as quality production and distribution of products to the customers so, its contribution in quality performance is also incredible [9, 23, 24]. The quality performance refers to the degree to which the firm is able to reduce the defects from its products and the degree to which the firm ensures the delivery of products without defects to the customers. The role of internal SCM in this quality performance is crucial because the internal SCM is the key function that is involved in production and final distribution of the product to its customers so, the internal SCM bodies must have to ensure that no product with defects and infections should be produced and distributed to the customers [22, 23, 25].

2.1. Formal Control and internal SCM

The formal control in the supply chain enables the manufacturer to maintain the trajectory of the documents and statistical procedures for each task related to supply chain and manufacturing because maintaining the control of each manufacturing task is one of the important aspects of formal control [22, 26]. The formal control leads the manufacture to proceed the manufacturing and supply chain in a systematic and formal way so, the ultimate target is always at the core of formal control. The rules, procedures and obligations are decided according to that ultimate target. There are many suggestions of past researchers that an ultimate defined target is always needed to direct the duties and programs in a right direction so, the formal control is in line with those suggestion [27, 28]. It is suggested that when each party or member has clear vision of its role and ultimate target then he/she is more likely to perform in appropriate direction without any distraction. The obligations and requirements of each party are made clear to them so they know, what they have to do to accomplish the target goals [29, 30]. In formal control mechanisms, the risk management can be performed in such a way that manufacturer can align the goal with goals of suppliers so the risk is distributed between them and thus, the risk is reduced for each party. Similarly, the formal connections, policies and rules are formulated for each supply chain task in order to enhance the overall effectiveness of supply chain [31-33]. Hence, the activities of supply chain are programmed and structured in formal control mechanism so that the desired outcomes can be accomplished. All parties in supply chain know the defined ways and requirements according to which they have to proceed. However, the formal control mechanisms are only appropriate for the activities with enough clarity and unambiguousness so, the structured templates are developed for those activities and functions that provide the details about the appropriate managerial actions and policies that should be followed while performing those activities [8, 22]. These templates enable the parties to put more efforts on performing tasks without sticking with useless activities and unplanned tasks. Ultimately, the overall SCM is directed in a systematic way and all activities are structured and aligned with clear target. Therefore, it is suggested that control mechanisms based on formal rules and requirements have the potential to ensure proper handling of internal SCM as the purchasing, manufacturing and distribution under such control mechanisms are programmed and structured that ultimately enhance the effectiveness of internal SCM [22, 34, 35]. Therefore, the current study proposes its first hypothesis about formal control which is:

H1: "The formal control has a significant positive influence on internal supply chain management."

2.2. Social Control and internal SCM

Although, the formal control is an important control mechanism through which the activities of SCM can be directed in an efficient and programmed manner however, there are several activities in SCM that are ambiguous and more uncertain than other activities so, they cannot be programmed through formal control. Such activities are hard to be structured because they involve such outcomes that cannot be targeted or estimated properly for instance, the target level of quality or risk moderation are ambiguous for many activities due to the lack of knowledge about them [36]. For instance, the quality risk of defects in products purchased cannot be reduced through programming or standardizing the task because such risk is not defined or calculated. Therefore, such tasks are difficult to be programmed and to be proceeded systematically so, the formal control does not work appropriately for such tasks and activities [22]. Ultimately, the social control is needed to monitor such activities where the systematic and programmed mechanism does not work and where the values, goals and beliefs are needed to be governed. The tasks where social norms, rules and social structure are involved are mostly unclear so, they are very hard to be governed through formal control mechanisms. For example, Tse, et al. [22] states that, "the SC mechanism is useful to control the behaviors of downstream partners, as the existence of common beliefs and goals of product recall management can motivate the partner firms to perform well in the inter-firm product recall activities." It means that the tasks or activities that have the involvement of such uncertainties and social factors are difficult to be handled with formal mechanism so they are proceeded with social control mechanisms in which the flexibility is the key element which is mostly absent in formal control mechanism [37-40]. This flexibility in social control mechanisms enable the supply chain to cope with environmental fluctuations in better way by making modifications and desired changes according to the uncertainties and environmental modifications. Therefore, the internal activities of SCM i.e. purchasing, manufacturing and distribution are aligned with environmental changes in order to enhance their effectiveness [41] and ultimately the internal SCM enhances. Hence, the second hypothesis of the current study is:

H2: "The social control has a significant positive impact on internal supply chain management."

2.3. Internal SCM and Quality Performance

The role of internal SCM in enhancing the quality performance of the firm is also very important from theoretical as well as practical perspectives because the effectiveness in internal SCM practices leads the firm to manufacture as well as distribute the quality products to its customers. It is suggested through different studies that SCM has the potential role in determining the quality performance of the firm [42-44]. It means when the internal SCM practices and functions of the firm improve then, the firm comes in better position to maintain its quality standards and to ensure the quality production as well as distribution of products to the customers. The firm becomes more able to avoid and monitors the defects and uncertainties in its internal SCM and so, the quality performance increased. It is embraced by past scholars that SCM plays significant role in determining the performance of the firm e.g. [22, 44-46]. They suggested that effectiveness of SCM practices enhances the firm's performance and functioning. However, the studies on the impact of internal SCM on quality performance are scarce in existing literature. It has not been sufficiently and clearly researched that what contribution the internal SCM can provide to the firm in quality perspective. To overcome this gap in existing literature, the current study has aimed to study the role of internal SCM in quality performance therefore, it is hypothesized based on theoretical backgrounds that [52]:

H3: "The internal supply chain management has a significant positive impact on Quality performance."

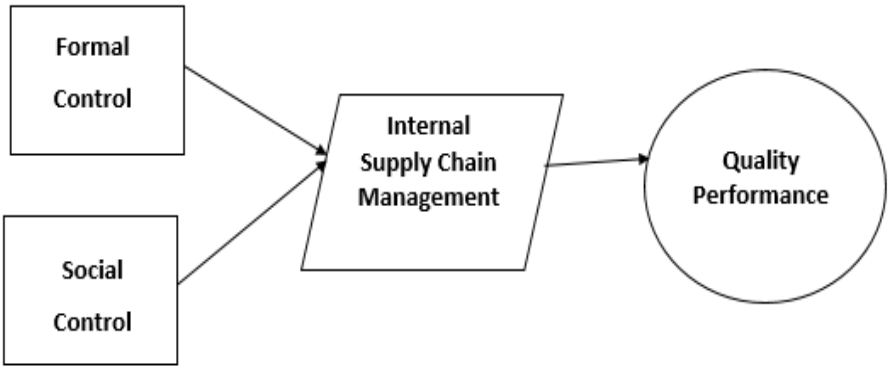

Figure 2. Research Model

3. Methodology

3.1. Population, Sample, and instrument of the study

The current study has been conducted in context of Thailand so, the population of the current study was the manufacturers of Thailand from which the sample was extracted through purposive sampling technique. The sample was 250 manufacturers of Thailand and the data collection strategy was survey study in which the instrument of structured questionnaire was used to gather data from sample. The current study used quantitative research method because this method was aligned with the purpose of the current study which was to check relationships. The questionnaires were sent to manufacturers in order to collect data and then analysis was run to test hypotheses (LeRoy, 2018).

3.2. Definition and Measures of Variables

The current study has four key variables under examination among which two are independents named as "formal control" and "social control". There is one dependent variable in the current study which is "quality performance" and one mediating variable named as "internal SCM". These variables have been measured in the current study by using scales of previous researchers. The variables of formal control and social control mechanism were measured using scale of past studies Li, et al. [47] and Li, et al. [48]. These scales have also been used by [22]. The dependent variable of quality performance was measured using scale of Koufteros, et al. [49] which has been previously used by Tse, et al. [22] as well. The mediator of internal SCM was measured using scale of Wang and Dai [50]. Hence, the current study used previous scales to develop questionnaire for data collection.

3. Research Findings

From 294 respondent's data was collected and analyzed by using SPSS and AMOS, the results of demographical findings show that, there are 119 male and 175 females were participating in this study. Mostly respondent falling in the range of 21-30 years of age and 243 respondents have graduation degree, 118 have master's degree and remaining have other degrees.

4. Reliability Test

The researcher used KMO and Kaiser-Meyer-Olkin (KMO) "to measure reliability of data for factor analysis and then run Rotated Component Matrix· KMO. KMO returns values between 0 and 1. A **rule of thumb** for interpreting the statistic." The results of KMO test indicated our data is suitable for factor analysis and factor analysis also good fit. See table 2 for KMO and 3 for rotated component metrics.

Table 2. KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.805
Bartlett's Test of Sphericity	Approx. Chi-Square	2237.125
	df	120
	Sig.	.000

Table 2. Rotated Component Matrix[a]

	Component			
	1	2	3	4
FC1			.748	
FC2			.756	
FC3			.777	
FC4			.700	
SC1				.764
SC2				.848
SC3				.857
ISCM1		.781		
ISCM2		.803		
ISCM3		.795		
ISCM4		.795		
QP1	.869			
QP2	.893			
QP3	.882			
QP4	.899			
QP5	.876			

5. Discriminant and Convergent Validity

Discriminant validity is "the degree in which the variable is in fact differing from each other experimentally. On the other hand, Convergent validity is the extant of assurance a researcher has that a characteristic is well evaluated by its measures" [51].

Table 3. Discriminant and Convergent Validity

	CR	**AVE**	**MSV**	**FQ**	**ISCM**	**QP**	**SC**
FQ	0.757	0.439	0.165	**0.663**			
ISCM	0.812	0.520	0.069	0.262	**0.721**		
QP	0.930	0.728	0.000	-0.009	-0.011	**0.853**	
SC	0.798	0.571	0.165	0.406	0.212	-0.003	**0.755**

Results prove the convergent and discriminant validity of the data, because every contract discriminate from each other, and value of AVE for all variables are greater than MSV.

6. Confirmatory Factor Analysis

The confirmatory factor analysis (CFA) is "a multivariate arithmetic process which is utilized in order to examine how good the studied constructs signify the figure of variables." Following table shows the findings;

Table 4. Nested Confirmatory Factor Analysis

	Model Fit Indices		**Threshold Range**	**Observed Values**
Nested Model	χ^2			202.727
	Df			98
	χ^2 / *df*		Lesser than 3	2.069
	GFI		≤ .80	.922
	IFI		≤ .90	.952
	CFI		≤ .90	.952
	RMSEA		≥ .08	.060

Above table shows the threshold range and observed value. The model above displayed the GFI=0.922; IFI=0.95; CFI=0.95 and RMSEA=.06. Above stated all indicators prove the CFA of the study.

7. Structural Equation Modeling

By using AMOS structural equation modeling test was performed in order to test the hypothesis of this study, this test at the same time provide the direct and indirect results of regression;

Table 5. Structural Model Results

Effects	Hypothesized Path	B	S. E	P value	Conclusion
Linear Effects					
Hypothesis 1 (+)	FC→ QP	.220	.109	.000	Accepted
Hypothesis 2 (+)	SC→ QP	-.071	.075	.225	Rejected
Mediation Effect					
Hypothesis 3 (+)	FC→ ISCM→QP	.057	.027	.010	Accepted
Hypothesis 4 (+)	SC→ ISCM→ QP	.032	.016	.010	Accepted

Above mentioned table 5 shows the structural modeling results and finding indicated that formal control has 22% positive impact on quality performance, which mean that if one unit of formal control increased it will bring 22% positive impact on quality performance. Same as social control has insignificant impact on quality performance. Hypothesis 3 and 4 shows the indirect effect formal and social control on quality performance via internal supply chain management. The finding of the hypothesis 3 indicated that ISCM has 5.7% mediating effect between formal control and quality performance whereas it has 3.2% mediating effect between social control and quality performance. The following figure below is a screenshot of structural equation modeling while running in SEM in AMOS and shows the standardized regression weights between the variables.

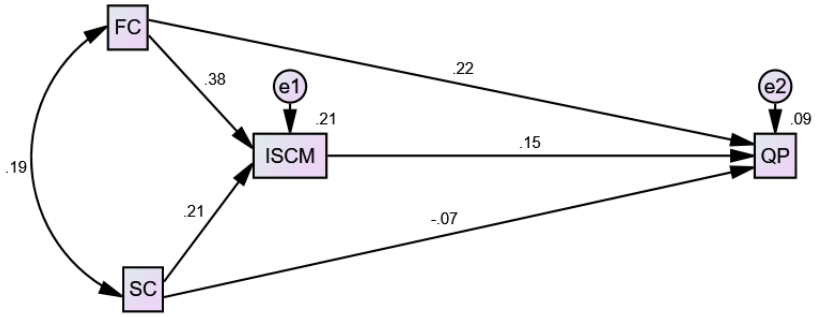

Figure 1. SEM

8. Discussion of Results

The current study was about the influence of formal as well as social control mechanisms on the internal SCM of the firm which is the ultimate predictor of quality performance. The data collected through questionnaires from manufacturers of Thailand was subjected to analysis which revealed that all hypotheses of the current study are accepted. In response to the first hypothesis, the findings revealed that formal control mechanism has significant determining role in the effectiveness of internal SCM. It means that the practice of formal control mechanism in supply chain enhances the internal SCM practices of the firm due to aligning with standards, requirements and programmed tasks. These findings are in line with previous findings as well because the positive role of formal control in internal SCM has also been embraced by past researchers e.g. [27-29, 31, 33]. Furthermore, the findings are also in line with studied of [22, 34, 35]. In response to the second hypothesis of the current study, it was found that the flexibility and benefits offered by social control mechanism have the potential to enhance internal SCM so, this hypotheses of the current study was also accepted. These findings also find sufficient support from existing literature because these results are in line with previous researches e.g. [33, 36, 47, 48]. The third hypothesis of the current study is also accepted because it has been found through results that the internal SCM has the significant predicting role in quality performance. It is found that enhanced internal SCM and improved practices of internal SCM potentially enhance the ability of the firm to maintain and increase its quality performance. These findings find sufficient support from previous researches because these findings are in line with discussion and findings of [22, 44-46].

9. Conclusion

The purpose of the current study was to analyze the role of formal and social control in the internal SCM and to assess the determining role of internal SCM in quality performance in manufacturing sector of Thailand. The data collected from 250 manufacturers of Thailand revealed that all hypotheses of the current study are true. It is found that social and formal control mechanisms have positive determining role in internal SCM and the internal SCM has the ultimate positive impact on quality performance. The current study and findings have significant contributions in theory and practice because the literature regarding risk management in SCM will be significantly enhanced through current study. The empirical evidence will be added to the literature about the relationship of control mechanisms with internal SCM and quality performance through current findings. Practically, the current study will provide the useful guidance and suggestions to strategy makers of manufacturing firms that how they can achieve quality performance and effective internal SCM through proper control mechanisms and how they can perform effective risk management in SCM. The limitations of the current study revolve around the restrictions of the current findings to manufacturers only and the examination of two control mechanisms only. Therefore, the future researchers are suggested to conduct such research on different sectors and are directed to add some other control mechanism as well in the study.

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