

# The Effect of Supply Chain Integration on Operational Performance: The Case of Chemical Industry in Ethiopia

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## Abstract

The aim of this research is to empirically examine the effect of supply chain integration on operational performance. In order to address the research objective, a quantitative survey approach is used to collect the relevant data from the target population of the study which includes Chemical and Chemical product manufacturing firms in Ethiopia. A questionnaire was administered to target respondents to collect a primary data for the study. To analyze the data this study applied a descriptive and non parametric statistics including Kendall's correlation and Kruskal Wallis test to see the significant relationship between hypothesized variables as well as to measure the direction and strength of the relationship. The result from study shows a significant positive effect of supply chain integration construct on the operational performance of firms. However, this research investigation did not found statistically significant evidence on the effect of internal integration on external integrations.

**Keywords:** Supply Chain, Integration, Manufacturing, chemical product, Ethiopia

## 1. Introduction

The term supply chain refers to the network of organizations that are involved, through upstream and downstream linkages, in the different processes and activities that produce value in the form of products and services in the hands of the ultimate consumer (Christopher, 2005). The essence of supply chain integration is that companies in a supply chain should create a collaborative atmosphere where mutual trust, the sharing of risks and rewards and extensive information sharing, should prevent sub-optimization in the supply chain (Erik Sandberg 2007). In doing so, the highly competitive manufacturing firms are those that have carefully linked their internal process to external business partners within their respective supply chain. An empirical study conducted by Frohlich and Westbrook (2001) concluded that integrative practices and a high level of integration have a positive impact on corporate and supply chain performance. On the other hand; Van der Vaart & Van Donk (2008) disagrees with the assumption that more integration is always better. Based on both theoretical perspective and empirical evidence they show that it is important to understand the influence of business conditions on the level of integration and the type of integrative activities employed. This argument indicates the need for more research to empirically examine how supply chain integration affects business performance in different business scenario. For this reason, this study aimed to examine the effect from the context of developing countries which is surrounded by different market challenges specifically on chemical and chemical product manufacturing firms found in Ethiopian.

## 2. Literature & Conceptual Model

### 2.1 Supply Chain Management

As a contemporary management philosophy the idea of supply chain management was first introduced by Oliver & Webber in 1982. The concept of supply chain management states that the management of supply chain assets and products, information, and fund flows to maximize total supply chain profitability (Chopra 2001). In the supply chain management, integration is defined as a process of interaction and collaboration in which companies in a particular supply chain work together to arrive at mutually acceptable outcomes (Pagell, 2004). Different literatures takes supply chain integration as the collaborative effort in linking functions and supply chain networks in terms of process, information and physical flow (e.g Frohlich and Westbrook, (2001); Mentzer et al. (2001); and Mentzer et al. (2008). Hence, coordination and collaboration in linking business process become the key components of supply chain integration which is the focal point of this study. In order to examine the level of integration and its effect on operational performance the study analyze both internal and external integration aspect of the supply chain from literatures and design hypothesis presented in the following

section.

## 2.2 The Relationship of Internal Integration and External Integration

Different studies indicate that external integration is an extension of internal integration across a firm's boundaries. Some theories have indicated that Internal Integration is a prerequisite for External Integration (Morash and Clinton, 1998). Further, a number of recent studies such as Baofeng Huo, (2012), Das et al., (2006); and Koufteros et al., (2007) have found a positive relationship between internal and external integration. Therefore, it is possible to say without the cooperation of various internal functions within the company, it is difficult to collaborate with partners in the supply chain (both with suppliers and customers). Thus, the researchers propose a hypothesis:

**H1:** Internal integration positively related to Customer Integration.

**H2:** Internal integration positively related to Supplier Integration.

## 2.3 The effect of supply chain integration on performance

Many literatures assured a great importance of supply chain integration for achieving operational performance (Frohlich and Westbrook, 2001). However, some authors found no direct relationship between internal integration and operational performance (Koufteros et al., 2005; Gimenez. C, 2003). Those authors, who identified a positive relationship between Internal Integration and operational performance, indicate the positive effect of internal integration on cost, quality, delivery, flexibility, innovation, process efficiency, time-based performance and logistics service performance. In line with the above, the researchers propose a hypothesis as follows:

**H3:** Internal Integration positively related to operational Performance.

From the conceptual views of the transaction cost theory, external Integration enables firms to decrease an opportunistic behaviour, to minimize production and transaction costs and to enhance their ability to obtain resources. The organizational learning theory also suggests that firms seek to establish a competitive advantage by acquiring external knowledge. According to empirical study results, such as Frohlich and Westbrook (2001) and Lau et al. (2010), external integration results in the operational performance of suppliers and customers. Thus, the researchers propose:

**H4:** Customer integration positively related to Operational performance

**H5:** Supplier integration positively related to Operational performance

Based on the objective of this research study and the theoretical literatures reviewed the above, the researchers able to develop a conceptual framework as depicted below on figure 1:

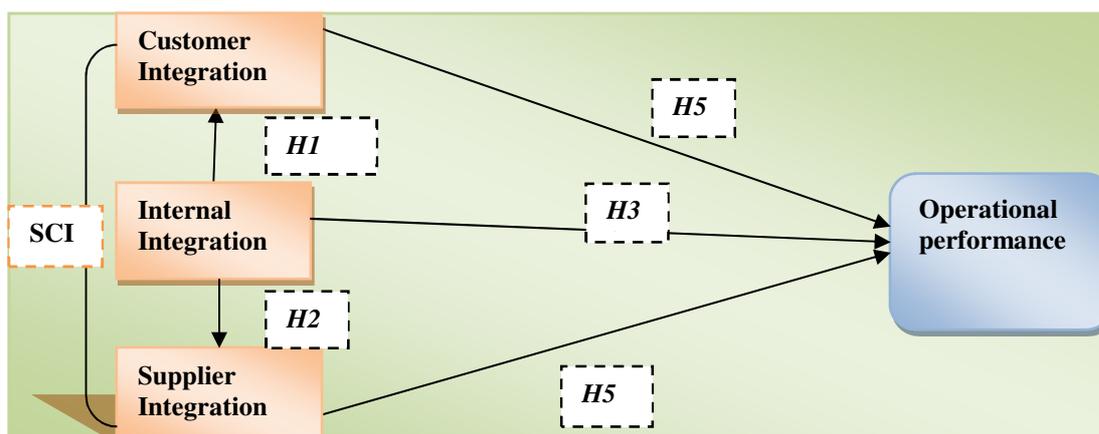


Figure 1. Proposed Conceptual Framework for the Study

## 3. Methodology

In order to address the research objective, a quantitative survey approach is employed. The target population of this study was chemical and chemical product manufacturing firms found in Ethiopia. After selecting 35 target companies a questionnaire was distributed to the respondents, who are considered as key informants with respect to this research objective, such as CEO/president, vice president or director and SC (supply chain)

manager,. As it is mentioned by Bhattacharjee (2012), data related to organizational level variables can come from a variety of sources such as financial records or surveys of Chief Executive Officers (CEO), who are presumed to be representing of their organization. So as to analyze the data that was obtained from respondents' a descriptive and non parametric statistics were used. Specifically, Kendall's correlation and Kruskal Wallis test were used to see the significant relationship between hypothesized variables as well as to measure the direction and strength of the relationships.

#### 4. Result and discussion

As it is shown in the literature review part of this study, in line with the research objectives and the theoretical frameworks reviewed, five hypotheses were formulated. The aim of this empirical data was to either accept or reject the null hypotheses. In this study the supply chain integration dimensions: internal integration, customer integration and supplier integration are independent variables while operational performance is a dependent variable. To test the hypotheses statistical nonparametric Kendall's tau correlation concordance were used to investigate the strength as well as the direction of the relationship between the variables. The rationale behind applying only nonparametric statistical analysis is the fact that the data were ordinal and the sample size was small which failed to fulfill the normality assumption.

**H1o:** Internal integration not positively related with customer Integration

**H1a:** Internal integration positively related with customer Integration

		Internal Integration	Customer Integration
Internal Integration	Correlation Coefficient	1.000	.036
	Sig. (1-tailed)	.	.409
	N	31	31

**Table 1. Kendall's tau Correlations for Internal and Customer Integration**

As it is exhibited in table 1, the statistical p value results which equals 0.409 is above the significance value of ( $p < 0.05$ ). Therefore, there is no evidence to reject the null hypothesis and accept the alternative one. According to the result obtained it is possible to infer that this study doesn't found a statistically significant positive relationship between internal integration and customer integration. The finding is not consistent with previous studies, like Baofeng Huo, (2012), found that companies with a higher degree of internal Integration are more likely to have higher degrees of customer integration and supplier integration. The calculated Kendall's tau correlation coefficient (0.036) also indicates a very weak positive relationship between internal integration and customer integration as correlation coefficients between 0.00 and 0.40 are considered weak. This can lead to an inference that having good internal integration would not guarantee for outstanding integration with downstream supply chain network member (i.e. Customers).

**H2o:** Internal integration not positively related with Supplier Integration

**H2a:** Internal integration positively related to Supplier Integration

Correlations			
		Internal Integration	Supplier Integration
Internal Integration	Correlation Coefficient	1.000	.135
	Sigh. (1-tailed)	.	.177
Supplier Integration	Correlation Coefficient	.135	1.000
	Sig. (1-tailed)	.177	.
N		31	31

**Table 2. Kendall's tau Correlation for Internal Integration and Supplier Integration**

As shown in the table 2, there is no statistically significant positive relationship between internal integration and supplier integration since ( $p > 0.05$ ) 0.177). Therefore, the decision will be to accept the null hypothesis and reject alternative H2a. In addition, the correlation coefficient (0.135) shows there is a weak positive relationship between internal integration and supplier integration. This is also against the previous study findings that Internal Integration is a prerequisite for External integration and there a positive relationship with supplier of customer integration (Morash and Clinton, 1998).

#### Relationship between Supply chain integration and Operational performance

The aim of this part is to investigate and analysis the relationship between supply chain integration construct and operational performance in the case companies. Having the hypotheses derived from literature review the

researchers conducted hypothesis testing using Kendall's correlation to see the direction and degree of relationship between constructs. In addition, the relative effect of each dimension (Internal integration, Supplier integration and customer integration) on the operational performance of firms also tested using Kruskal Wallis' test.

**H3o:** Internal Integration not positively related with operational performance.

**H3a:** Internal Integration positively related to operational performances.

			Operational Performance	Internal Integration
Operational Performance	Correlation Coef		1.000	.449**
	Sig. (1-tailed)		.	.002
	N		31	31
Internal Integration	Correlation Coef		.449**	1.000
	Sig. (1-tailed)		.002	.
	N		31	31

\*. Correlation is significant at the 0.01 level (1-tailed).

**Table 3. Kendall's tau Correlation for Internal Integration and Operational Performance**

As can see from table 3, there is a significant relationship between the independent variable (Internal integration) and dependent variable operational performance. This is because of the fact that the statistical significance value 0.002 is less than 0.01 even at one percent. Therefore, there is a statistically relevant evidence to reject the null hypothesis "Internal Integration not positively related operational performance" and accept the alternative H3. The magnitude of correlation coefficient 0.449 also indicates that there is the good positive relationship between internal integration and operational performance. This finding is supported by previous empirical studies (e.g. (e.g. Das et al., 2006; Koufteros et al.,2007; Petersen et al., 2005), and the resource based view theory.

**H4o:** Customer integration not positively related to Operational performance

**H4a:** Customer integration positively related to Operational performance

			Operational Performance	Customer Integration
Operational Performance	Correlation Coef_		1.000	.511**
	Sig. (1-tailed)		.	.001
	N		31	31
Customer Integration	Correlation Coef_		.511**	1.000
	Sig. (1-tailed)		.001	.
	N		31	31

\*\*.. Correlation is significant at the 0.01 level (1-tailed).

**Table 4. Kendall's tau Correlation for Customer Integration and Operational Performance**

The result, presented on table 4, support hypothesis H4a, since the statistical significance value 0.001 is below one percent ( $p < 0.01$ ). Therefore, there is a statistical evidence to reject the null hypothesis. Moreover, the correlation coefficient (0.511) indicates the existence of strong and positive relationship between customer integration and operational performance. Previous empirical research by Cousins and Menguc (2006); Frohlich and Westbrook (2001); and Lau et al., (2010b) also shows that customer or external Integration results in good operational performance

**H5o:** Supplier integration not positively related with Operational performance

**H5a:** Supplier integration positively related to Operational performance

			Operational Performance	Supplier Integration
Operational Performance	Correlation Coef_		1.000	.569**
	Sig. (1-tailed)		.	.000
	N		31	31
Supplier Integration	Correlation Coef_		.569**	1.000
	Sig. (1-tailed)		.000	.
	N		31	31

\*\*.. Correlation is significant at the 0.01 level (1-tailed).

**Table 5. Kendall's tau correlation for supplier integration and operational performance**

The observed result from table 5, supports the hypothesis H5a "there is a significant positive relationship between Supplier integration and operational performance." This is because of the fact that the statistical significance value equals (0.000) is less than one percent ( $p < 0.01$ ). The calculated correlation coefficient (0.569)

is also indicating the existence of strong and positive relationship between supplier integration and operational performance. Generally, based on the coefficient values obtained in Kendalls' correlation, it is possible to compare the relationship of the variable. Therefore, the variable supplier integration, with a coefficient of 0.57 has a better relationship than other variables with the operational performance of the firms.

	Grouping (Independent) Variables		
	Internal integration	Customer integration	Supplier integration
Chi-Square	10.248	12.547	25.880
Df	4	3	8
Asymp. Sig.	.036	.006	.001

**Table 6. Kruskal Wallis Test the Effect of Supply Chain Integration on organizational performance**

Based on the result presented in table 6, the independent variables internal integration, customer integration and supplier integration experienced in Ethiopian Chemical and Chemical product manufacturing firms has an effect on their operational performance since all variable scored statistically significant value ( $p < 0.05$ ). Different literature ((e.g. Frohlich and Westbrook, 2001; Koufteros et al. , 2007) on supply chain management argues that both internal and external (down and upstream) integrative capabilities are crucial for companies to achieve better operational performance.

### 5. Limitation and Implication to Research and Practice

Like any other study, this study has several limitations. A single respondent in a firm was asked to respond to complex supply chain integration process, including upstream and downstream and internal supply chain relationships. But, in reality, no person in a firm is in charge of the entire supply chain. Data were also collected from Ethiopia Chemical and Chemical product manufacturing firms with a special focus on Paint factory, basic chemical and soap and detergent manufacturers. Therefore, it may not be used to generalize for the whole sectors in Ethiopia Chemical industry. The generalizability of the study is only from the manufacturers' point of view, suppliers and customers were not the focus of the study.

### 6. Conclusion

The results in this research study identify the effect of supply chain integration on a firms' operational performance. Effective supply chain integration (internal, customer and supplier integration) leads directly to a higher operational performance. Some of the results of this study are consistent with the previous studies which were conducted in developed countries. In addition, the findings provide further evidence for the conventional wisdom that 'the more integration the better the performance'. Furthermore, the result further shows that there is no statistically significant evidence on the relationship between internal and external integration (supplier and customer). This lead the researchers to infer that internal integration may not always grant firms eternal integration. Further, the result from this study shows the importance of applying supply chain integration in an industry, because supply chain integration can be a source of competitive advantage leading to superior performance through enhancing firms' operational performance. Therefore, managers of Ethiopia Chemical and Chemical product manufacturing firms expected to consider supply chain integration as a one corporate objective in order to excel their operational performance through providing quality customer service, quality product, reduction of cost and meet market demand in a flexible manner. They are also recommended to strengthen their supply chain integration; internally with all functional departments and externally with their supply chain partners.

### 7. Implication to future research

For this research, data was collected only from Ethiopia Chemical and Chemical product manufacturing firms. Therefore, it may not be used to generalize for the whole sectors in Ethiopia Chemical industry, thus the study can only make an inference and generalization to the manufacturers. The suppliers and customers were not the focus of the study. Hence, it is highly recommended in the future research to consider it to incorporate customers and suppliers. Due to the small size of respondents undertaken in this study sophisticated regression analysis has not been made, which might be used to show the magnitude of effect that independent variables have over the dependent. The researchers had to ask respondents to evaluate operational performance of their respective firm subjectively. The subjective evaluation may increase measurement error due to low reliability. The researchers had also took only operational performance yet failed to address the effect on financial performance. It's recommended for further research to consider it.

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