

INTEGRATION OF INFORMATION IN THE ERP SYSTEM AFFECTING THE EFFICIENCY OF THE SUPPLY CHAIN PERFORMANCE OF THE FROZEN FOOD INDUSTRY IN THAILAND

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ABSTRACT

The purpose of this research was to examine the relationship of information integration in the enterprise resource planning system (ERP), an independent variable, which directly affects the efficiency of the supply chain performance (SCP), while the information integration is a mediator, which also has an indirect relationship with the efficiency of the supply chain performance. The data was analyzed, using the Structural Equation Model (SEM) for model testing and models editing by combining confirmation of suitability and presenting statistical significance as well as important meanings of theoretical models. The samples were taken from 234 small, medium, and large companies in the frozen food industry in Thailand. The results indicated that the organization should pay more attention to the integration of information contained in the enterprise resource planning system in order to enhance the efficiency of the supply chain by up to 24% in order to create competitiveness for the Thai frozen food industry. The findings supported the concepts proposed by a number of researchers that the integration of data from a process into the ERP system increases flexibility, improves processes, and promotes relationship among supply chains, resulting in organizational efficiency and competitive advantage.

KEYWORDS: Enterprise Resource Planning, Information Integration, Supply Chain Performance

1. Introduction

The frozen food industry in Thailand must facilitate the processes within the supply chain by collecting data of work processes in various departments and improving organizational resource planning for greater efficiency. The information can be used as an important database for decision-making by executives for more efficient operation to maximize quality of the supply chain. Thus, all departments concerned must consider extracting the information and promoting information integration to increase the value of chain and competitive advantages in Thai frozen food industry. Such notion supported the research conducted by Ince et al [1] that the information in an enterprise resource planning system can be integrated and improved to enable internal information linkage with business partners in the supply chain in order to solidify the performance of the firm, which supports the value-added in the value chain [2, 3]

2. Research Objective

- 1) To study the supply chain performance which results from enterprise resource planning system (ERP).
- 2) To confirm the information in ERP System and Information Integration, which will improve and facilitate supply chain performance of the frozen food processing industry in Thailand.

3. Research Framework and Hypothesis

This purpose of this study is to analyze the interrelationship of the mediating of information integration in ERP System to improve the supply chain performance. To analyse the effects of latent variables on supply chain performance, the following hypotheses have been proposed

H1: ERP system has a positive effect on Information Integration

H2: Information Integration has a positive effect on Supply chain performance

H3: ERP system has a positive effect on Supply chain performance

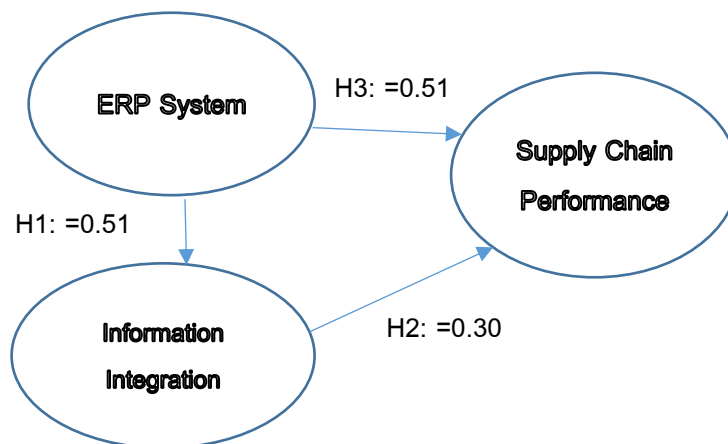


Figure 1 The research framework

4. Theory

4.1 Enterprise Resource Planning System (ERP System)

Enterprise resource planning (ERP) is a system for managing work processes within an organization. By using the concept of managing the use of resources of the organization that exists in each step to maximize benefits with the collection of information contained in business processes such as Accounting and financial systems, Human resource production, and Sales production management system, including distribution systems to integrate efficient planning and manage the resources available within the organization. Kelle et al [2] as well as Themistocleous et al [3] stated that Enterprise Resource Planning refers to the overall resource planning of an enterprise to utilize the organization's resources to achieve maximum benefits. Furthermore, ERP is a relational system which can create continual connections on the same database. Sharing knowledge among sections departments in an organization is an important factor of using the ERP system [4].

4.2 Information Integration

The collection of data available in all departments of the organization will lead to application in all forms of operations. Each department of the organization must pay attention and cannot be overlooked because it affects the balance and the demand of the market which increases or decreases in each situation [5]. This affects the balance of the amount of raw materials used for production which must be ready to respond to different demand

and supply [3, 6]. The complexity of data in the demand and supply system will fluctuate the efficiency of the consumer supply chain [7, 8].

4.3 Supply Chain Performance

Supply chain management is the ability of an organization to develop and improve an organization. This beginning with searching for raw materials from upstream increases forwarding production departments or product partners that will lead to downstream strategies, which mainly involves customers (downstream), which are internal quality resources of the supply chain processes, which the entrepreneurs must create a competitive advantage both at the national and global levels. Supply chain management that requires a competitive advantage must be able to improve the efficiency of the supply chain caused by collaboration and the ability to manage business process management [9]. Furthermore, from upstream to downstream, raw materials rely on suppliers' systems for operations in every industry and from raw material search. Production process and forwarding to consumers will follow these steps. Information technology must be used to add value to products and services, but the scope of the supply chain system must cover the management process of the entire industrial system [10]. This means that the connection as a value chain will follow the production standards within the organization; therefore, leading to the conceptual framework of the research as follows.

5. Research Methodology

5.1 Population and Sample

The study focuses on the food industry, divided into 10 groups, based on the guidelines of industrial clustering provided by the Federation of Thai Industries. The sample size was calculated according to the rule of structural equation model [11], The minimum of data is computed from formula $p(p+1)/2$; where p is indicator in model. The return of 234 from 800 questionnaires can reverse the equation, thus $(p+1)$ equal 23, indicates that the indicator of a model should not be more than 23.

5.2 Research Tools

The questionnaire was constructed from reviews of the literature. The questionnaire comprises three parts: ERP System, Information Integration and Supply Chain Performance.

5.3 Validity and Reliability

- Content Validity Testing

The content validity was used to assess the accuracy of the questionnaire by using Index of Item-Objective Congruence (IOC) method to evaluate content validity of the items used in the questionnaire. The results from the assessment were used to adjust and improve the accuracy of a question.

- Reliability Testing

The measurement scale of questionnaire set into 7 point by Likert scales ranging from 1 to 7, and used for each scale, with 1 = strongly disagree, 2= disagree, 3= somewhat disagree, 4 = neither, 5 = somewhat agree, 6 = agree, and 7 = strongly agree. After the return of questionnaire, reliability testing was used to measure the reliability in the qualification of measurement scale. Data were prepared to measure the relationship between individual items and statistic tested in the scale of cronbach's alpha coefficients. If the result of the Cronbach's alpha testing showed scores higher or equal to 0.7, it means the answer has conformity [12].

This research is designed to test reliability on two separate occasions. First before sampling, the 30 questionnaires were tried out to test and adjust the term if the score was less than 0.7. Second, reliability testing would be repeated when all sampling data collection was complete.

6. Research Results

6.1 Convergent Validity

The convergent validity had been tested prior to the evaluation with SEM. The researchers measured Convergent Validity with Confirm Factor Analysis. If the research model converges, the value of factor loading should be greater than 0.6 [13], while the average variance extracted (AVE) should be higher than .5.

The table 1 shows the construct model for Convergent Validity testing.

Table 1 Factor loading of all latent variables

Variable	Factor Loading	AVE
ERP System		0.746
ERPOrg1	0.81	
ERPOrg2	0.88	
ERPOrg3	0.90	
Information Integration		0.759
IIStd1	0.91	
IIStd2	0.80	
IICross	0.90	
Supply Chain Performance		0.635
SCPReli1	0.83	
SCPReli2	0.88	
SCPFlex1	0.73	
SCPFlex2	0.74	

6.2 Discriminate Validity

The assessment of discriminant validity was evaluated by comparing the Average Variance Extracted (AVE) value with squared correlation between variables. Fornell and Larcker [14] suggested that the values of squared root AVE should be higher than square correlation values as mentioned to support the discriminant validity.

6.3 Multicollinearity Testing

The assumption of regression analysis has a limit that each variable should not highly correlate with each other. The Tolerance and Variance Inflation Factor (VIF) measurement was used for testing. The Tolerance should be more than 0.1 or VIF should be less than 10 ($VIF = 1 / \text{Tolerance}$) to accept that they have no multicollinearity problem.

6.4 The Construct Model

This model was constructed to measure that ERP system has a positive effect on Supply chain performance and then to measure that ERP system has a positive effect on Supply chain performance through Information integration.

The finding shows that ERP system affects Supply chain performance through Information integration.

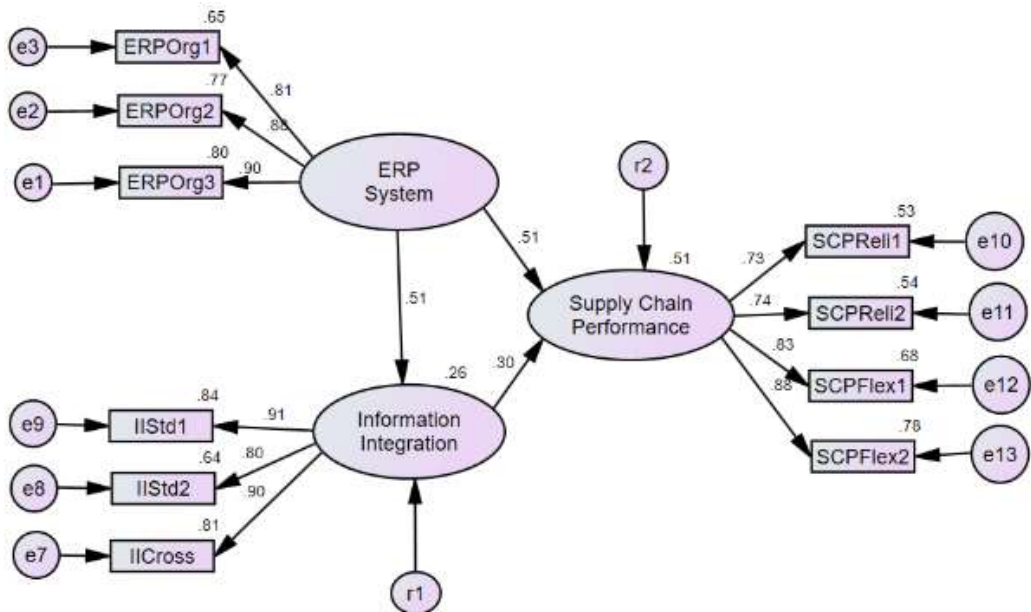


Figure 2 Construct Model

Figure 2 presents the results of the construct model tested. The measurement model for the three latent constructs was assessed by confirmatory factor analysis. In this research, the goodness of fit is shown as follows: Chi-Square = 81.825, Degree of freedom (df) = 28, CMIN/DF = 2.922, The Goodness of Fit (GFI) = 0.938, Adjusted Goodness of Fit (AGFI) = 0.877, The Normed Fit Index (NFI) = 0.951, Comparative Fit Index (CFI) = 0.967, Root Mean Square Residual (RMR) = 0.080, Root Means Square Error of Approximation (RMSEA) = 0.091 (PCLOSE = 0.002), and Hoelter = 138 (0.01).

6.5 Hypothesis Testing

The results of hypothesis testing are as follows:

H1: ERP System has a positive effect on Information integration. This hypothesis was supported with standard regression weight of 0.51 ($p < 0.5$).

H2: Information integration has a positive effect on Supply chain performance. This hypothesis was supported with standard regression weight of 0.30 ($p < 0.5$).

H3: ERP System has a positive effect on Supply chain performance. This hypothesis was supported with standard regression weight of 0.51 ($p < 0.5$).

7. Conclusions

This study aimed to test the factors from the Supply chain performance through Information integration based on the hypotheses established in H1, H2, and H3 by examining 234 small, medium, and large size companies in the food industry in Thailand. From the statistical testing results shown in figure 2, it was found that the operational factors of the supply chain must take into consideration the Information integration of supply as well. The findings indicated that Information integration depends on the cooperation in planning and sharing of the information among all departments in the organization. The information integration can be achieved through sharing consumer information and refilling stock from the supply in order to improve operating performance, reveal growth path, minimize operating cost, and enhance capacity planning in use [15]. Therefore, the success of a business depends on the frequency of information integration in each industry, which enhances the supply chain performance. As a result, the findings of this study can improve the supply chain performance of each department in the organization to develop detailed information and improve the overall operating performance of the organization, the result of which will increase the efficiency of the supply chain of the frozen food industry in Thailand more than 24%.

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