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STUDYING THE INFLUENTIAL FACTORS ON THE SUPPLY CHAIN IN TRANSPORTING PRODUCTS (CASE STUDY: KERMANSHAH'S FOOD INDUSTRIES)

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ABSTRACT

Management is the transportation of goods (as parts, raw materials, requisites, equipment) from the original points (suppliers) to producers through tracks, airways, railways, waterways, pipelines for transporting materials, or a combination of these cases: storage of raw material: storage of raw material as a part of material management activity, including the activities of reception, storage, ordering and sorting of goods in warehouses. Regarding the objectives this paper is a practical research and based on the data collection method it can be categorized as a descriptive survey. Regarding the implementation process it is qualitative, and regarding the implementation time it is cross sectional. The statistical population of this study involves the food industries of Kermanshah. With regard to the subject of this paper, the experts and executives of the internal sections, production control and planning sections and the computer sections of food companies in Kermanshah which are directly influential on the supply chain process in the transportation industry are known as the statistical population whose total number includes 165 individuals; to evaluate the sample size, 95 individuals have randomly been chosen as the sample. The data collection method of the research involves the close ended questionnaires (100-0). In this study in the section of descriptive statistics, the frequency charts and diagrams and also indicators of central tendency and distribution will be used to describe the findings. In the section of inferential statistics used in this paper, we will also apply SPSS software which includes the followings: Kolmogorov-Smirnov test – correlation test- Friedman test- regression test; the Kolmogorov-Smirnov test will be used to study the normality of observations; in order to evaluate the relationships between the dependent and independent variables and to study the research hypotheses using the software SPSS22, the Pearson's correlation coefficient will be used as well.

Keywords: *Supply Chain, Transportation Management, Supply Chain Performance, Food Companies of Kermanshah*

INTRODUCTION

The supply chain is related not only to the manufacturers and suppliers, but it encompasses the transportation, warehouses, retailers, and even the customers and their related information also (Rosenzweig, 2008). Managing the supply chain is the evolutionary result of the storage management (Mirwaisi, 2008). The influential factors on the supply chain are the ability of an organization to understand the environmental changes in general and then to meet the requisites of those changes in a quick and effective manner. This environmental change can involve the technological and working changes or the changes in customer demands. The word "transportation" defines the speed and power of responsiveness to the requirements in facing the internal and external events in an organization. Innovation is the requirement for human beings' survival and promotion; so the creativity and innovation are regarded as the basic principle of survival and the innovation is the most important competitive resource. The organizations can succeed in such a situation only if they enjoy the creative and innovative work force in managing the logistics of the supply chain (Levy *et al.*, 2009).

Statement of Problem

Managing the supply chain is the evolutionary result of the storage management. In the 1960, studying the internal relationship between the storage and transportation and their integrity, the experts could reduce their own inventory, the result of which is called distribution management (Angeles, 2009).

Research Article

Designing the transportation system in order to deliver the goods to customers with the minimum cost, no matter the strategy of supply chain is accountability or efficiency, is one of the important issues that should be considered in designing and controlling the supply chain (Amouzadehmahdiraji, 2012).

There are always two sides in each supply chain and in any transportation area (Amid *et al.*, 2008). The first side is an applicant or one in need of the transportation system for receiving or sending goods or services, and the second side is the transporter or the one in responsibility of transportation (Amouzadehmahdiraji, 2012). Supplying the materials, parts, systems and services in due time is the most important factor in supporting the current productions and assembly lines that may satisfy and fulfill the warranty obligations of a company (Agarwal *et al.*, 2007). The integrity of influential factors in the supply chain means the ability to share the relevant information, involving the data on sales records and predicting the demands, production capacity, and advertising and transportation schedules, among the companies in the supply chain (Slakter, 2009).

Objectives of Research

Main Objective

1- Identification of the effects of the supply chain performance on the transportation management in the food industries of Kermanshah.

Secondary Objectives

1- Identification of the effects of storage management on the supply chain performance in the food industries of Kermanshah.

2- Identification of the effects of operation planning on the supply chain performance in the food industries of Kermanshah.

3- Identification of the effects of integrity of intraorganizational information system on the supply chain performance in the food industries of Kermanshah.

4- Identification of the effects of flexibility on the supply chain performance in the food industries of Kermanshah.

5- Identification of the effects of reliability on the supply chain performance in the food industries of Kermanshah.

6- Identification of the effects of the distribution continuum on the supply chain performance in the food industries of Kermanshah.

7- Identification of the effects of cost increase of fuel on the supply chain performance in the food industries of Kermanshah.

Research Hypotheses

Main Hypothesis

1- Supply chain performance has a positive and significant effect on the transportation management in the food industries of Kermanshah.

Secondary Hypotheses

1- Storage management has a positive and significant effect on the supply chain performance in the food industries of Kermanshah.

2- Planning the operations has a positive and significant effect on the supply chain performance in the food industries of Kermanshah.

3- Integrity of the intraorganizational information system has a positive and significant effect on the supply chain performance in the food industries of Kermanshah.

4- Inflexibility has a positive and significant effect on the supply chain performance in the food industries of Kermanshah.

5- Reliability has a positive and significant effect on the supply chain performance in the food industries of Kermanshah.

6- Distribution continuum has a positive and significant effect on the supply chain performance in the food industries of Kermanshah.

7- Increasing the fuel cost has a positive and significant effect on the supply chain performance in the food industries of Kermanshah.

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The Research Conceptual Model

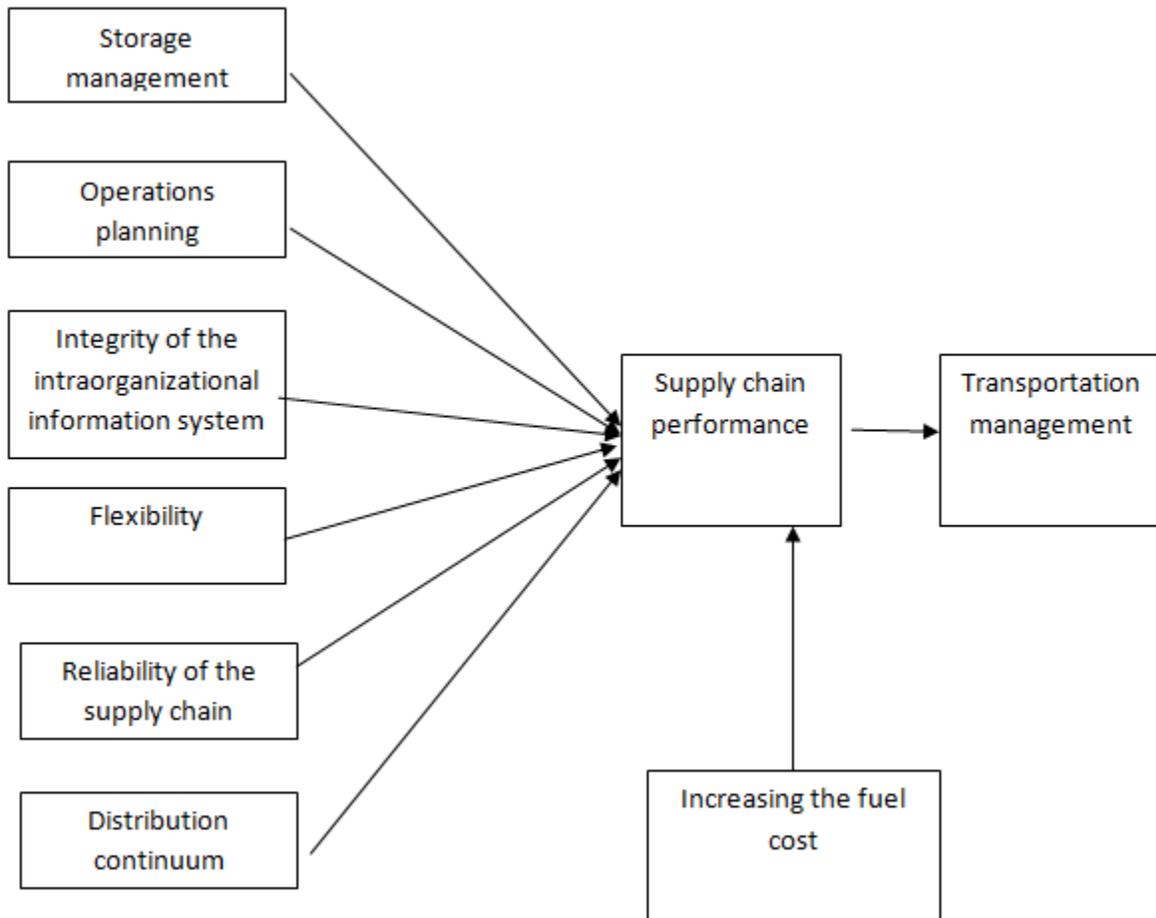


Figure 1-1: The conceptual model of research: source (Rajesh and Magarat, 2012; Danyel *et al.*, 2012)

Literature Review of the Research

Review of the Domestic Studies

After various investigations, Mirwaisi (2008) presented three features of the supply chain Operations for agility, the research method was a correlation type: 1- management and taking advantage of fluctuations and deviations; 2- quick responsiveness; 3- united accountability and in small size. Soofaroad (2006), in his dissertation presented a framework for agility of the supply chain based on the flexibility, and stated that agility is extremely affected by flexibility in various sections of the supply chain involving the development of new products, procurement and finding sources, production and distribution.

Amid *et al.*, (2008) dealt with studying the effects of firm size on the relationship between the acceptability levels of information technology and three levels of operational, strategic and financial performances. The survey was descriptive and the results showed that the firm size was an important moderating variable in the operational efficiency. In other words, by effective usage of information technology in relationship with the upstream and downstream partners in the supply chain, the large firms can reduce the lag time and as a result, increase the operational efficiency.

Rajabzadeh *et al.*, (2010) evaluated the impact of information technology on the supply chain and on the performance of the commercial firms. This investigation made use of regression and the results showed that three factors of the technical quality of IT unit, the efficiency of IT programs and the support of the senior management from the information technology have a positive and significant effect on the supply

Research Article

chain, so it might have a positive and meaningful relationship with the financial performance of the company.

Review of the Overseas Studies

Agarwal (2007) studied the acceptability of information technology in managing the supply chain. His aim in that study was to explain the usage of information technology in the supply chain and the use of internet by the firms. This research made use of the comparative method, and the results showed that the majority of firms utilized the information technology in the supply chain to 53%, 18 percent of which is related to the access to the customer needs and improving services, 12 percent of the firms mentioned the quick access to data and improvement of the informational integrity and the competitive advantages and maintaining them as the most important causes of using information technology in the supply chain. The results also showed that the majority of firms with internet sites had made use of internet to communicate with their customers through emails, for sales advertisements and public communications and also the product information provided in the visual and verbal forms.

Similar studies have been mainly conducted by the foreign researchers. The most important points of the literature review related to the indicators of agility evaluation in the supply chain are mentioned below:

Braunscheidel (2009) recognized the operations of the agile supply chain to involve the following matters: cooperation with competitors, the long term cooperation with customers and suppliers, leveraging the impacts of the basic resources through forming networks with other companies, the difficult operational situations which necessitate the collaboration of other companies, coalition with business partners, integration of information with other companies which enjoy the computerized systems, granting higher privileges to coalitions comparing to the market penetration. Soofaroard *et al.*, (2006) recognized the agility capabilities with a similar method as follows: accountability, competence, flexibility, and speed. Using the literature review of the research and holding brain storm sessions, Agarwal *et al.*, could present a series of 15 variables for agility.

These variables are: sensitivity to market, speed, data accuracy, introducing new products, cooperative planning, integration of processes, utilizing the technology as a tool, reducing latency, improving the services, cost minimization, customer satisfaction, quality improvement, uncertainty minimization, extension of trust, reducing the resistance to change. The most important criteria in evaluating the agility based on the reference model of the supply chain operation are: accountability and flexibility. These two criteria are evaluated through some indexes as increasing the flexibility of supplies, increasing the flexibility of structures, increasing the flexibility of distribution, the excessive return flexibility to suppliers, increasing the adaptability of supplies, increasing the adaptability of structure, increasing the adaptability of distribution, decreasing the adaptability of supplies, decreasing the adaptability of structure and decreasing the adaptability of distribution.

Slakter (2009) dealt with studying the relationship between investments in the information technology and the operational efficiency in purchasing. The correlation method is used in this research; the analysis of data showed that investments in the IT would positively affect the operational efficiency of purchasing. The basic performance and promotion of some of the developed purchasing activities as cooperation with suppliers, evaluating the suppliers, engaging the suppliers in developing and designing the productions and also the logistic integration, and accepting the information technology in the supply chain are essential.

Angelis (2009) in a study evaluated the impacts of information technology on the supply chain capabilities and on the corporate performances too. The method used for research is regression; the results showed that putting information technology in the communication system of the supply chain may lead to creating better opportunities in the supply chain.

Sizen (2010) studied the relative impacts of designing, integrating and sharing information on the efficiency of the supply chain empirically. The research was a descriptive case study, the evaluation of data also showed that integrating and sharing information are certain ways for increasing efficiency in the supply chain. Designing a supply chain has an important role in achieving the desired levels of efficiency too.

Research Article

MATERIALS AND METHODS

Methodology of Research

The method used in conducting this research is a kind of hypothesis testing which is a kind of field study. In such field studies, the hypotheses are tested using the data derived from the sample group. Based on the objectives, this research is practical, while based on the data collection method it is categorized as a descriptive survey. Regarding the implementation style the research is qualitative and regarding the time it is conducted in the cross-sectional form. The present research was conducted using the descriptive method with an inductive approach. This paper is also categorized as a correlation study.

The Statistical Population of Research, Sampling Method, and the Sample Size

The population of the research involves the food industries of Kermanshah. Considering the research title, the experts and managers of the internal sections, production planning and control sections, computer sections of the food companies of Kermanshah which are directly influential on the supply chain process in the transportation industry, have been recognized as the statistical population, the whole number of which is 165 people; 95 people were chosen through Cochran formula and using the simple random method as the statistical samples to calculate the sample size. For that aim, a preliminary sample size of 30 was chosen: $N = 165$, $d = 0.05$ and $Z_{\alpha/2} = 1.96$. Therefore the sample size that had to be chosen from the statistical population equals.

$$n = \frac{\frac{1.96^2 \times .7 \times .3}{.05^2}}{1 + \frac{1}{165} \left[\frac{1.96^2 \times .7 \times .3}{0.05^2} \right]} \cong 95.4 = 95$$

Research Tools and Data Collection Method

The most important method of data collection in this research is as follows:

- Library studies: in this section we used library resources, note taking, the required books and also the World Wide Web information.
- Fieldworks: in this part, the questionnaires were used for data collection and information analysis. The data collection method in this study is based on using close-ended questionnaires (100-0), the questions of which are categorized in 9 sections that show the relationship between questions and each of the variables of the research.

Validity and Reliability of the Research Tools

- Validity Test

The validity would confirm to what extent the provided tool would measure the specific concept considered. Not being aware of the reliability of the measuring tool, you cannot trust the accuracy of the data derived from that (Sarmad *et al.*, 2007). In order to measure the validity, in addition to using the theoretical principles, the comments of supervisors and advisors and a few of the experts on the concepts, dimensions and components of the data collection tools were obtained, and after these studies and their proposed amendments, it was found that the considered indices had been chosen correctly.

- Reliability Test

Reliability is one the technical specialties of the measuring tools. The mentioned concept deals with the fact that how the measuring tool gives the same results at the same conditions (Sarmad *et al.*, 2007). The present paper used Cronbach's alpha coefficient to measure the reliability. This method is used to calculate the internal consistency of the measuring tool involving questionnaires or the tests that measure various traits. This alpha would express the fact that the questions were congruence, and that the respondents answered the questions accurately. The closer the number gets to one, the more the reliability of the questionnaires would be.

In this questionnaire, the overall Cronbach's alpha equals 0.889. Now we can calculate the Cronbach's alpha for each variable separately.

Research Article

Table 1: The values of Cronbach's alpha for each component

Components	Cronbach's alpha
Storage management	0.909
Planning the operations	0.891
Integrity of the intraorganizational information system	0.883
Flexibility	0.897
Reliability of the supply chain	0.874
Distribution continuum	0.880
Performance of the supply chain	0.871
Increasing the fuel costs	0.703
Transportation management	0.926
Total	0.889

Methods and Tools of Data Analysis

In this study, the tables and frequency charts and also measures of central tendency and dispersion will be utilized in the section of descriptive statistics. In the section of inferential statistics used in this research, SPSS is used, it involves the following cases:

- Kolmogorov-Smirnov test
- Correlation test
- Friedman test
- Regression test

Kolmogorov-Smirnov test is used for evaluating the normalization of observations; in this study the descriptive studies are also used for studying the features of the statistical population, and then it deals with testing the hypotheses depicting the path analysis diagram, to study the relationship between the dependent and independent variables and the research hypotheses using the software SPSS22, the Pearson correlation coefficient or Spearman tests will be used.

For that aim, the statistical tests, as T student test, are used to study the significance of the correlation coefficients; the analysis of variance and multiple comparisons or their non-parametric equivalents are used regarding the results of the Kolmogorov-Smirnov test. For testing the set of causal relationships between variables influential on the supply chain and also on the studied components using software Amos, the structural equivalents of the relationships will be created among the variables.

Evaluating the Status of Variables of Research

To study the status of each variable with the one-sample T test, the hypotheses H_0 and H_1 are introduced as follows:

To write the hypotheses, the 5-point Likert scale was used just like the direction of measuring the variables.

The average standard variable for the sample was regarded 3, the median of the scale, and to test the status of each variable the average of that variable in the statistical sample was compared to the median of that 5-point scale, that is the hypothetical value of 3.

H_0 Null hypothesis: the average status of variables (storage management, planning the operations, integrity of the intraorganizational information system, flexibility, reliability, distribution continuum, supply chain performance, transportation management, increasing fuel cost) equals 3.

Alternative-hypothesis: the average status of variables (storage management, planning the operations, integrity of the intraorganizational information system, flexibility, reliability, distribution continuum, supply chain performance, transportation management, increasing fuel cost) does not equal 3.

Research Article

Table 2: Descriptive statistics

Variable	Sample size	Average	Standard deviation	Standard error
storage management	95	3.03	0.88	0.09
planning the operations	95	3.21	1.04	0.10
integrity of IS	95	3.17	0.87	0.09
flexibility	95	2.89	0.80	0.08
reliability	95	3.13	0.70	0.07
continuum	95	2.97	0.74	0.07
performance	95	3.10	0.73	0.07
transportation management	95	3.17	0.74	0.07
increasing fuel cost	95	3.27	0.90	0.09

Table 3: T test

Variable	Test value	Value of the statistical test	Degree of Freedom	Significance level	The mean difference	Confidence distance of the average from 95 percent confidence	
						Upper limit	Lower limit
storage management	0.37		94	0.7	0.03	0.21	-0.14
planning the operations	2.02		94	0.04	0.21	0.43	0.004
integrity of IS	1.98		94	0.051	0.17	0.35	-0.001
flexibility	-1.33		94	0.18	-0.11	0.05	-0.27
Reliability	1.89		94	0.06	0.13	0.28	-0.006
Continuum	-0.33		94	0.74	-0.03	0.12	-0.17
Performance	1.38		94	0.17	0.10	0.25	-0.04
Transportation management	2.20		94	0.03	0.17	0.32	0.01
Increasing fuel cost	2.97		94	0.00	0.27	0.45	0.09

According to table 3, the values of statistical test for the variables of storage management, flexibility, reliability, continuum and performance are less than 1.96, the upper and lower limits of the average possess different (minus and plus) signs and the significance level is more than 0.05, consequently regarding these evidences we can say that the null hypothesis is confirmed and the alternative hypothesis is rejected in all the ratios. The significance level is bigger than 3, it means that the average score of these

Research Article

variables equals 3 from the view point of the statistical sample. Also the alternative-hypothesis is confirmed for the variable of intraorganizational information systems because its significance level is over 0.05, the average equals 3; the values of the statistical test for the variables of operation planning, reliability, transportation management, and increasing fuel cost are bigger than 1.96, the upper and lower limits of the average have the same sign and the significance level is less than 0.05, as a result of these evidences we can say that the null hypothesis is declined and the alternative-hypothesis will be confirmed. It means that the average score of the variables from the viewpoint of statistical sample is significantly different from 3. Table 3 introduces the mean views for all the variables.

Results of Testing the Research Hypotheses

Main hypothesis: the performance of the supply chain has a positive and significant effect on the transportation management in the food industries of Kermanshah.

Null hypothesis: the performance of the supply chain does not have a positive and significant effect on the transportation management in the food industries of Kermanshah.

Research hypothesis: the performance of the supply chain has a positive and significant effect on the transportation management in the food industries of Kermanshah.

Considering the output of the software Amos in table 3 about the effect of the supply chain performance on the transportation management, the significance level is 0.000 and it is less than 0.05, we can say that the null hypothesis based on the non-affectivity of the supply chain on the storage management is rejected and the research hypothesis stating the effect of the supply chain performance on the transportation management is supported. It means that from the statistical sample viewpoint the supply chain performance is influential on the transportation management in the food industries of Kermanshah. The coefficient of this effect was calculated to be 74 percent which is high.

Secondary Hypotheses

Hypothesis 1: the storage management has a positive and significant effect on the supply chain performance in the food industries of Kermanshah.

Null hypothesis: the storage management does not have a positive and significant effect on the supply chain performance in the food industries of Kermanshah.

Research hypothesis: the storage management has a positive and significant effect on the supply chain performance in the food industries of Kermanshah.

Considering the output of the software Amos in table 3 about the effect of the storage management on the supply chain performance in the food industries of Kermanshah, since the significance level equals 0.42 and it is more than 0.05, we can say that the null hypothesis is confirmed and the research hypothesis stating the effect of the storage management on the supply chain performance in the food industries of Kermanshah is rejected.

Hypothesis 2: the operation planning has a positive and significant effect on the supply chain performance in the food industries of Kermanshah.

Null hypothesis: the operation planning does not have a positive and significant effect on the supply chain performance in the food industries of Kermanshah.

Research hypothesis: the operation planning has a positive and significant effect on the supply chain performance in the food industries of Kermanshah.

Considering the output of the software Amos in table 3 about the effect of the operation planning on the supply chain performance, the significance level was calculated 0.001 and it was less than 0.05, so it can be said that the null hypothesis stating the non-influence of the operation planning on the performance of the organizational supply chain is rejected and the research hypothesis stating the effect of the operation planning on the supply chain performance is confirmed. It means that from the view point of the statistical sample the operation planning is influential on the supply chain performance in the food industries of Kermanshah. The coefficient of that effect has been calculated 24 percent which is low.

Hypothesis 3: the integrity of the intraorganizational information system has a positive and significant effect on the supply chain performance in the food industries of Kermanshah.

Research Article

Null hypothesis: the integrity of the intraorganizational information system does not have a positive and significant effect on the supply chain performance in the food industries of Kermanshah.

Research hypothesis: the integrity of the intraorganizational information system has a positive and significant effect on the supply chain performance in the food industries of Kermanshah.

Considering the output of software Amos in table 3 about the effect of the integrity of the intraorganizational information system on the supply chain performance, the significance level was calculated to be 0.002 and fewer than 0.05, so it can be said that the null hypothesis stating that the integrity of intraorganizational information system is not influential on the supply chain performance is rejected and the research hypothesis stating the effect of the integrity of the intraorganizational information system on the supply chain performance is confirmed. It means that from the viewpoint of the statistical sample, the integrity of the intraorganizational information system is influential on the supply chain performance in the food industries of Kermanshah.

The coefficient of that impact is calculated as much as 25 percent that is low.

Hypothesis 4: the flexibility has a positive and significant effect on the supply chain performance in the food industries of Kermanshah.

Null hypothesis: the flexibility does not have a positive and significant effect on the supply chain performance in the food industries of Kermanshah.

Research hypothesis: the flexibility has a positive and significant effect on the supply chain performance in the food industries of Kermanshah.

Regarding the output of the software Amos in table 3 about the effect of flexibility on the supply chain performance in the food industries of Kermanshah, since the significance level equals 0.30 and it is more than 0.05, we may come to this conclusion that the null hypothesis of the research is confirmed and the research hypothesis stating the effect of flexibility on the supply chain performance in the food industries of Kermanshah is rejected.

Hypothesis 5: reliability has a positive and significant effect on the supply chain performance in the food industries of Kermanshah.

Null hypothesis: reliability does not have a positive and significant effect on the supply chain performance in the food industries of Kermanshah.

Research hypothesis: reliability has a positive and significant effect on the supply chain performance in the food industries of Kermanshah.

Regarding the output of the software Amos in table 3 about the effect of reliability on the supply chain performance in the food industries of Kermanshah, since the significance level equals 0.97 and it is more than 0.05, we may come to this conclusion that the null hypothesis of the research is confirmed and the research hypothesis stating the impact of reliability on the supply chain performance in the food industries of Kermanshah is rejected.

Hypothesis 6: the distribution continuum has a positive and significant effect on the supply chain performance in the food industries of Kermanshah.

Null hypothesis: the distribution continuum does not have a positive and significant effect on the supply chain performance of the food industries of Kermanshah.

Research hypothesis: the distribution continuum has a positive and significant effect on the supply chain performance of the food industries of Kermanshah.

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Research Article

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