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SUSTAINABLE SUPPLY CHAIN MANAGEMENT PRACTICES AND SUSTAINABILITY PERFORMANCE IN THE FOOD INDUSTRY

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Sustainable development has recently been identified as a challenge for many countries and has become a vital issue for food-related industries. This study of sustainable supply chain management practices and sustainability performance in the food industry was conducted at food companies in Iran. Data were gathered from 120 companies by means of a questionnaire; confirmatory factor analysis (CFA) was used to test the questionnaire's validity. Hypotheses were tested by path analysis. The results of Structural Equation Modeling (SEM) indicate that sustainable supply chain management practices impact on the environmental, economic, and social dimensions of sustainability. Based on these findings, there is a need to improve sustainable supplier management practices, sustainable operations management practices and sustainable customer management practices in order to advance sustainability performance in the supply chain.

Keywords: Supplier management, Operations management, Sustainability performance, Sustainable development

Belum lama ini, pembangunan berkelanjutan telah diidentifikasi sebagai tantangan bagi banyak negara dan telah menjadi isu penting bagi industri-industri yang terkait dengan makanan. Studi ini tentang praktik manajemen rantai pasokan yang berkelanjutan dan kinerja keberlanjutan dalam industri makanan dilakukan terhadap perusahaan makanan di Iran. Data dikumpulkan dari 120 perusahaan dengan menggunakan kuesioner; Confirmatory Factory Analysis (CFA) digunakan untuk menguji validitas kuesioner. Hipotesis diuji dengan analisis jalur. Hasil Structural Equation Modeling (SEM) menunjukkan bahwa praktik manajemen rantai pasokan yang berkelanjutan berdampak pada dimensi keberlanjutan lingkungan, ekonomi, dan sosial. Berdasarkan temuan ini, ada kebutuhan untuk meningkatkan praktik manajemen pemasok yang berkelanjutan, praktik manajemen operasi yang berkelanjutan dan praktik manajemen pelanggan yang berkelanjutan untuk memajukan kinerja keberlanjutan dalam rantai pasokan.

Kata kunci: Manajemen pemasok, Manajemen operasi, Kinerja keberlanjutan, Pembangunan berkelanjutan

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Abstract

Abstrak

In recent years, corporate supply chain sustainability has emerged as an issue for competitive advantage in the constantly changing global environment. The term *sustainability* has also been institutionalized in most community structures, and the issue has been suggested by governments, universities and educational institutions, commercial organizations, cooperatives, corporate supply chains and local organizations. According to Emamisaleh and Rahmani (2017), sustainability can be defined as a development process that addresses all current needs without compromising the ability of future generations to meet their own needs. According to many scholars (e.g., Emamisaleh & Rahmani, 2017), the concept of sustainability is moving beyond the technology context, with increasing emphasis on sustainable environments.

As the food industry in Iran develops, food manufacturing companies have found it necessary to establish a proper link between farmers, producers, and customers. Food company production processes involve large volumes of agricultural, livestock, and fishery products. According to a report published by the Statistical Centre of Iran (SCI) in 2008, the food industry ranks first in Iran in terms of workforce recruitment and third in terms of added value, confirming the industry's significant contribution to the country's economic development (Afrooz et al, 2011).

According to the Food and Agricultural Organization (FAO) (2015), food industry production in Iran increased dramatically between 1990 and 2014. During this period, all indices of production have increased across all sec-

tors of the country's food industry. Additionally, Iran's food industry has been able to create significant added value, reflecting the importance of the food industry supply chain. According to a report from the Danish Agriculture and Food Council (2017), Iran's rate of food consumption is increasing, and monitoring of sustainability and health in the food industry has become a necessity. The food industry is also among the most important industries because of its direct effects on public health. If the issue of sustainability is neglected through incorrect use of resources, society's sustainability can be seriously threatened (Emamisaleh & Rahmani, 2017).

The importance of sustainability and sustainable development in societies, especially in the food industry, has become obvious to everyone. Over the last 30 years, attention to this issue among customers and manufacturing companies has grown to the point where it is now considered a basically issue within the corporate supply chain (Delmas & Pekovic, 2015). Many studies have addressed the issue of sustainable performance and influencing factors in economic, social and environmental contexts. Most such studies have identified supply chain drivers, strategies, and management practices as dimensions that affect sustainable performance (Wijethilake, 2017; Esfahbodi, Zhang, Watson, & Zhang, 2017; Beske, Land, & Seuring, 2014; Gandhi, Shaikh, & Sheorey, 2017).

Laari, Töyli, Solakivi, and Ojala (2016) assessed supply chain environmental performance in terms of management practices and found that management

practices in relation to environmental monitoring of suppliers and customers and environmental collaboration with customers had an impact on the organization's performance. Esfahbodi et al. (2017) examined the economic and environmental aspects of supply chain sustainability in terms of both drivers and management practices. Wijethilake (2017) examined sustainability strategy and reported that supply chain control systems can be effective in improving sustainability. In a study of 52 articles published in on the topic of sustainable food supply chains, Beske et al. (2014) showed that the needs and expectations of consumers of food products are changing rapidly, and that management practices in this industry must be properly addressed in the interests of competitive advantage and sustainable performance.

For present purposes, sustainability in the food supply chain was examined from the perspective of management practices to assess the impact of sustainable supply chain management practices on sustainability performance in the food industry. These practices are analyzed in terms of three dimensions: sustainable supplier management practices, sustainable operations management practices, and sustainable customer management practices. The central question informing this research is how supply chain practices can help to improve sustainable performance in the food industry.

It is worth mentioning Sustainability Indicators as one important requirement for breaking into new food product markets. Iran was chosen as a setting for the present study because, in recent years, many Iranian companies

have recognized the importance of Sustainability Indicators. For this reason, the study is likely to prove useful in advancing the sustainability of Iranian food companies.

LITERATURE REVIEW

This section outlines the concepts underlying the research variables, which include Sustainable Supplier Management Practices, Sustainable Operations Management Practices and Sustainable Customer Management Practices. These are summarized in Table 1.

Conceptual model and hypotheses

On the resource-based view, organizations should manage their most valuable assets and resources in order to achieve a competitive edge, and this idea should inform the management practices of organizations in the supply chain. At the same time, environmental changes and resource restrictions mean that management of supply chain components has become increasingly important in recent years. To manage resources efficiently, organizations must move toward sustainability. Resource dependency theory states that organizations seek to reduce their dependence on other organizations by minimizing resource consumption through appropriate management of operational components. Organizations also try to make other organizations dependent on them for resources by efficient management of their operational components through the supply chain (Morali & Searcy, 2013).

It seems, then, that sustainable supply chain management practices relate directly to sustainability performance, and this is the focus of the present

Table 1. Literature Review

| Concept | Component | Description |
|--|--|--|
| Sustainable Supplier Management Practices | Supplier | Evaluating or monitoring suppliers' sustainable performance throughout the supply chain. This evaluation can help to improve sustainable practices (Luthra et al., 2014). |
| | Evaluation (SEV) | |
| | Supplier Development (SDV) | Company actions taken to improve supplier capabilities or performance in relation to sustainability. One example of such partnerships is the transfer of knowledge about sustainability from one company to another (Yang et al., 2010). |
| Sustainable Operations Management Practices | Information Sharing with Suppliers (INF) | This exchange of information typically involves the transfer of important and exclusive information between supply chain members (Das, 2017). |
| | Quality Management (QM) | Quality management relates to upgrading the quality of products and processes, maintaining equipment and productivity levels, and optimizing the production processes of supply chain companies (Beatriz et al., 2015). |
| | Corporate Environmental Management (CEM) | Implementation of a set of plans and programs to improve environmental performance within the supply chain (Liang & Liu, 2017) |
| Sustainable Customer Management Practices | Corporate Social Responsibility (CSR) | Improving employees' overall health, safety and salary by reporting quantitative and qualitative information about the company's sustainable performance and humanitarian commitments to social groups (Agan et al., 2016). |
| | Customer Management (CMA) | Management of consumers to enhance their overall satisfaction with regard to sustainability and the environment (Pekovic et al., 2016). |
| | Information Sharing with Customers (INS) | Information sharing with customers in the supply chain to inform manufacturing companies about customers' perceptions of sustainability (Pekovic et al., 2016). |
| Sustainability Performance | Environmental Performance (ENP) | Companies' efforts to reduce environmental and water pollution, greenhouse gases, and threats posed by waste generated in the industrial environment throughout the supply chain (Esfahbodi et al., 2017). |
| | Economic Performance (ECP) | Improving the organization's finance and marketing performance (Kristal et al., 2010). |
| | Social Performance (SOP) | Efforts made by supply chain companies to participate in social activities, to take account of employee safety and health, to pay equitable salaries, and to perform humanitarian work (Esfahbodi et al., 2017). |

study. Figure 1 presents a conceptual model of the research.

Sustainable Supplier Management Practices and Sustainability Performance

Sustainable supplier management practices have been examined in many previous studies. In a recent study of 255 organizations, Das (2017) examined the dimensions of the supply

chain and how these relate to organization performance. The findings showed that operational components, supply chain coherence, attention to employees, and social and environmental indicators are sustainable management dimensions of the supply chain that can help to improve different aspects of the organization's performance in relation to sustainability. Wu, Lv, Liang, and Hu (2017) found that sustainable manufacturing practices are

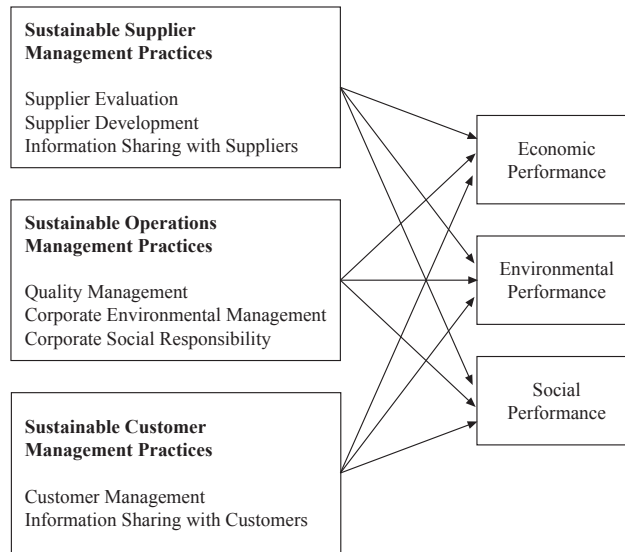


Figure 1. Initial Research Model

linked to the organization’s sustainability, which can lead to improved organization performance. Hong, Zhang, and Ding (2017) showed that sustainable supply chain management practices and organization capacities affect the economic, social, and environmental performance of organizations in the supply chain. Seuring and Müller (2008) also showed that appropriate management of materials and information throughout the supply chain could be effective in improving sustainability performance. In a study of five organizations in different dimensions, Hasan (2013) showed that sustainable supplier management practices can affect an organization’s environmental and operational performance. Based on the evidence from these studies, the following hypotheses were advanced.

- H1: Sustainable supplier management practices have a positive influence on economic performance.
- H2: Sustainable supplier management practices have a positive influence on environmental performance.
- H3: Sustainable supplier management

practices have a positive influence on social performance.

Sustainable Operations Management Practices and Sustainability Performance

Previous studies have examined sustainable operations management practices in relation to quality management, corporate environmental management, and corporate social responsibility, as well as the impact of these dimensions on sustainability. For example, Abdul-Rashid, Sakundarini, Raja Ghazilla, and Thurasamy (2017) showed that environmental, social and economic performance in the supply chain can be improved through sustainable thinking in relation to product design and development, production processes and quality, supply chain management, and environmental conditions and product life cycle. King and Lenox (2001) reported that attention to environmental standards in manufacturing operations impacts on a company’s environmental performance. Yang, Hong, and Modi (2011) noted that energy consumption

standards and quality management can affect an organization's financial performance. Zailani, Jeyaraman, Vengadasan, and Premkumar (2012) noted the importance of appropriate and environmentally friendly packaging, recycling during production, and sustainability-based production attitudes for environmental performance. Examining the role of quality management standards and their application, de Sousa Jabbour, Jabbour, Latan, Teixeira, and de Oliveira (2015) demonstrated the need for total quality management standards and ISO 1400 in the supply chain to improve environmental performance. Pereira-Moliner, Claver-Cortés, Molina-Azorín, and Tarí (2012) noted the role of QM in reducing waste in the supply chain, improving environmental performance and sustainability. Ağan, Kuzey, Acar, and Açıkgöz (2016) observed that a socially responsible attitude helps to improve sustainability in the supply chain. On the basis of the evidence presented in this section, the following hypotheses were advanced.

- H4: Sustainable operations management practices have a positive influence on economic performance.
- H5: Sustainable operations management practices have a positive influence on environmental performance.
- H6: Sustainable operations management practices have a positive influence on social performance.

Sustainable Customer Management Practices and Sustainability Performance

Customers play an important role in moving organizations toward sustainable performance. Through their be-

havior, customers confirm the need for sustainability in organizations. In particular, applying environmental standards to production across the supply chain can encourage customers to buy green products (Grolleau, Mzoughi, & Pekovic, 2007).

Pekovic, Rolland, and Gatignon (2016) showed that customer information about production of sustainable products and responding to community needs and values can improve an organization's management and environmental performance. Yalabik and Fairchild (2011) identified customer conduct as the most important driver of organizational sustainability improvements, as customer attitudes force companies to invest in sustainability by relying on innovation. According to Brik, Rettab, and Mellahi (2011), social responsibility causes organizations to move toward sustainability and sustainable performance by providing their customers and suppliers with information about sustainability. Clearly, then, meeting customer needs and achieving customer satisfaction through sustainability is crucial for contemporary organizations, as for example through sustainable product design. On that basis, the following hypotheses were advanced.

- H7: Sustainable customer management practices have a positive influence on economic performance.
- H8: Sustainable customer management practices have a positive influence on environmental performance.
- H9: Sustainable customer management practices have a positive influence on social performance.

Table 2. Sample characteristics

| Firm activities | Selected firms | Selected managers |
|--|----------------|-------------------|
| Cereals (flour, peas, wheat, corn, lentils, etc.) | 20 | 100 |
| Dairy products (milk and its by-products) | 20 | 100 |
| Meat industry (livestock, poultry, seafood, eggs, cans) | 40 | 200 |
| Sugar and carbohydrates (sweets, chocolate, concentrates, sugar beverages) | 40 | 200 |
| Total | 120 | 600 |

Table 3. Respondent characteristics

| Demographic variable | Description |
|-------------------------|---|
| Average work experience | 8 years |
| Gender | Male = 63% Female = 37% |
| Age | Range: 33–52 years Mean: 36 years |

RESEARCH METHOD

Sample and procedure

The study population was all managers in Iran’s food industry. By searching the databases of Iranian food companies, it became clear that the country’s food industry is divided into four parts: cereals (flour, peas, wheat, corn, lentils, etc.); dairy products (milk and its by-products); meat (livestock, poultry, sea food, eggs, cans); and sugar and carbohydrates (sweets, chocolate, concentrates, sugar beverages). According to information obtained, many food industry companies may be inactive, or their activities may not be sufficient to warrant inclusion in this study. As the research focuses on how active food companies in Iran can affect processes in the food industry, only companies attending Iranian food industry exhibitions for two successive years and actively marketing their products were selected for the study. The sustainability factors in the selected companies have been studied.

The companies selected for this study have ISO 9000, ISO 14000, and ISO 26000 certificates of social responsibility, indicating that they have been

active in the field of sustainability. Table 2 details the number of active food companies participating in the study by category. In total, the sample comprised 600 top and middle managers from 120 companies—an average of five respondents from each company, as indicated in Table 2.

The study was based on a questionnaire, which was distributed electronically to the participating managers via social networks. The Food Industry Exhibitions Manual was used to identify potential participants, and the questionnaires were sent to the address found there. According to the Manual, the participants are familiar with sustainability issues in the supply chain. Questionnaires were collected over a period of 3 months. Respondents’ characteristics are shown in Table 3.

Measurement

The questionnaire used to measure the research variables was based on previous studies and employed a five-point Likert scale. The questionnaire’s validity was tested using a measurement model and structural equation modeling. The questionnaire items are shown in Table 4. Having referred to

Table 4. Description of variables and measurement items

| Constructs and items | Factor loading | Composite reliability | AVE | Alpha |
|---|----------------|-----------------------|----------|-------|
| Supplier Evaluation (SEV) | | 0.83004273 | 0.554525 | 0.752 |
| Our company has a performance appraisal system for environmental assessment of suppliers. | 0.68 | | | |
| Our company evaluates suppliers' quality standards (e.g., ISO 9000). | 0.60 | | | |
| Our company evaluates suppliers' environmental standards (e.g., ISO 14000). | 0.86 | | | |
| Our company assesses the quality of suppliers' social responsibility. | 0.81 | | | |
| Supplier Development (SDV) | | 0.806237505 | 0.5154 | 0.729 |
| Our company trains suppliers on occasion to improve the quality of staff performance. | 0.86 | | | |
| Our company provides consultancy on pollution control for suppliers. | 0.76 | | | |
| Our company teaches social responsibility to suppliers. | 0.60 | | | |
| Our company visits supplier sites and helps them to improve their environmental performance. | 0.62 | | | |
| Information Sharing with Suppliers (INF) | | 0.907448543 | 0.525025 | 0.834 |
| Major suppliers share a product delivery plan with us. | 0.82 | | | |
| Main suppliers share production order status with us. | 0.88 | | | |
| Main suppliers share information on environmental laws with us. | 0.85 | | | |
| Main suppliers share information on environmentally friendly materials with us. | 0.82 | | | |
| Quality Management (QM) | | 0.842141954 | 0.575425 | 0.843 |
| Our company plans to continuously improve quality. | 0.88 | | | |
| Our company has ISO certifications and other quality assurance certificates. | 0.81 | | | |
| Our company uses statistical quality control systems and other techniques to improve the quality control process. | 0.66 | | | |
| Our company works to improve productivity and to maintain equipment and machinery. | 0.66 | | | |
| Corporate Environmental Management (CEM) | | 0.830310267 | 0.55235 | 0.793 |
| Our products are designed to be recyclable and returned to the natural cycle. | 0.85 | | | |
| One part of our company is accountable for processes related to environmental standards. | 0.73 | | | |
| The company's performance regarding environmental conditions and pollution can be reported. | 0.66 | | | |
| Internal processes are based on sustainability and environmental regulations. | 0.72 | | | |
| Corporate Social Responsibility (CSR) | | 0.803522684 | 0.50695 | 0.884 |
| Our company pays particular attention to staff health and safety. | 0.62 | | | |
| Our company has clear reports on resource efficiency and utilization in the organization. | 0.76 | | | |
| Our organization contributes to social activities. | 0.73 | | | |
| The company respects the rights of its staff. | 0.73 | | | |
| Customer Management (CMA) | | 0.805084746 | 0.508375 | 0.816 |
| Our company provides consultancy for customers on product exploitation according to ecosystem cycle. | 0.71 | | | |
| Our company investigates customer complaints about product quality. | 0.74 | | | |

| | | | |
|---|------|-------------|----------------|
| Through our customers, the company evaluates observance of social responsibility requirements. | 0.67 | | |
| Our company takes feedback from our customers about our products' environmental features. | 0.73 | | |
| Information Sharing with Customers (INS) | | 0.845851105 | 0.57895 0.835 |
| Customers provide us with useful information about their purchases. | 0.82 | | |
| Customers provide our company with their shopping plan. | 0.76 | | |
| Customers inform us about rules governing the environment. | 0.73 | | |
| Our customers provide information about designing products that meet environmental conditions. | 0.73 | | |
| Social Performance (SOP) | | 0.812157365 | 0.523725 0.844 |
| Our company is committed to improving the quality of our staff. | 0.86 | | |
| Our company is dedicated to improving the health and safety of our staff. | 0.73 | | |
| Our company contributes to community-related affairs of state. | 0.60 | | |
| Our company has close relations with the general public and local people in the surrounding area. | 0.68 | | |
| Economic Performance (ECP) | | 0.855782152 | 0.602925 |
| The company's market share has risen at a reasonable rate over the past year. | 0.88 | | |
| The status of our company's market share is appropriate. | 0.89 | | |
| The company's rate of return is appropriate. | 0.66 | | |
| Our products accord with customer requirements in terms of quality. | 0.64 | | |
| Environmental Performance (ENP) | | 0.854707631 | 0.59685 |
| The company's performance in reducing water pollution has been appropriate. | 0.79 | | |
| The company's performance in reducing solid waste production has been good. | 0.86 | | |
| The company's performance in recycling waste materials has been appropriate. | 0.74 | | |
| The company's performance in efficient use of energy has been appropriate. | 0.69 | | |

earlier studies to select the questionnaire items, a group of experts and specialists in the supply chain were asked to pretest the concepts and questions in relation to the variables, and the questionnaire was revised and reviewed accordingly. Measures of sustainable supplier management practices and their dimensions were based on the earlier work of Seuring and Muller (2008) and Bai and Sarkis (2010). Items related to sustainable operations management practice were based on the work of Yang et al. (2011). Measures of sustainable customer management practices drew on the study by Pekovic et al. (2016), and measures of

sustainability performance were based on the study by Kristal et al. (2010).

Analyses

The constructs were analyzed using confirmatory factor analysis (CFA) and Cronbach's alpha. Structural equation modeling (SEM) was used to test the hypotheses and validate the model, taking account of the measurement model and the structural model. The data were analyzed using partial least squares (PLS) and linear structural relations (LISREL). The LISREL software is recommended for analyzing second-order variables and to test

Table 5. Factor correlation matrix with square root of AVE

| | SEV | SDV | INF | QM | CEM | CMA | INS | ECP | CSR | ENP | SOP | AVE |
|-----|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|-----|-------|
| SEV | 1 | | | | | | | | | | | 0.554 |
| SDV | 0.502** | 1 | | | | | | | | | | 0.515 |
| INF | 0.411** | 0.435** | 1 | | | | | | | | | 0.525 |
| QM | 0.482** | 0.467** | 0.490** | 1 | | | | | | | | 0.575 |
| CEM | 0.298** | 0.197** | 0.306** | 0.195** | 1 | | | | | | | 0.552 |
| CMA | 0.298** | 0.197** | 0.306** | 0.195** | 0.433** | 1 | | | | | | 0.508 |
| INS | 0.271** | 0.199** | 0.364** | 0.207** | 0.308** | 0.408** | 1 | | | | | 0.578 |
| ECP | 0.237** | 0.171** | 0.317** | 0.227** | 0.493** | 0.493** | 0.463** | 1 | | | | 0.602 |
| CSR | 0.271** | 0.199** | 0.364** | 0.207** | 0.408** | 0.307** | 0.402** | 0.463** | 1 | | | 0.506 |
| ENP | 0.483** | 0.200** | 0.345** | 0.270** | 0.385** | 0.285** | 0.241** | 0.514** | 0.541** | 1 | | 0.596 |
| SOP | 0.263** | 0.154** | 0.294** | 0.224** | 0.449** | 0.349** | 0.433** | 0.440** | 0.333** | 0.394** | 1 | 0.523 |

** . Correlation is significant at 0.01 level (2-tailed).

Table 6. Overall fit indices of the CFA model

| Fit index | Scores | Recommended cut-off value |
|-------------|--------|---------------------------|
| χ^2/df | 2.65 | < 2, < 5 |
| GFI | 0.84 | > 0.90, > 0.80 |
| RMSEA | 0.07 | < 0.08, < 0.1 |
| CFI | 0.92 | > 0.90 |

research hypotheses, and the PLS software employs path analysis.

Measurement model

Table 6 details the absolute indices of the measurement model, which show the model’s characteristics and its fitness (Hair, Anderson, Tatham, & Black, 2005). As shown in Table 4, the Average Variance Extracted (AVE) is greater than 0.5, as recommended by Meyers, Gamst, and Guarino (2006). The Composite Reliability (CR) of the measurement model (as shown in Table 4) is above 0.7 as recommended by Hair et al. (2005). The AVE and CR values confirm that the model has adequate convergent validity. Discriminant validity was verified by comparing the square root of the AVE for each construct and correlation level involving the constructs (Hair et al., 2005). Table 5 shows that the square root of the AVE for each construct is larger than the correlation level involving the constructs, so confirming discriminant validity. Measurement model fit was assessed by evaluating: absolute fit

measures including observed normed (χ^2/df), goodness of fit index (GFI), root mean square error of approximation (RMSEA), and comparative fit index (CFI). As shown in Table 6, all fit indices achieved satisfactory levels.

For the purpose of analyzing the measurement model, sustainable supplier management practices, sustainable customer management practices, and sustainable operations management practices were also examined as a second-order structure. The results presented in Tables 7, 8 and 9 show that fitness indicators are in the standard range.

Structural model

After validating the measurement model, the structural model is used to test hypotheses. In this study, one structural model was investigated using PLS software. Sustainable supplier management (SSM), sustainable operations management (SOM), and sustainable customer management (SCM) were investigated as second-

Table 7. Second-order confirmatory factor analysis of sustainable supplier management practices

| First-order construct | Indicator | First-order | | Second-order | |
|------------------------------------|-----------|-------------|---------|--------------|---------|
| | | Loading | t-value | Loading | t-value |
| Supplier Evaluation | SEV1 | 0.68 | | 0.73 | 12.21 |
| | SEV2 | 0.60 | 11.48 | | |
| | SEV3 | 0.86 | 15.57 | | |
| | SEV4 | 0.81 | 14.92 | | |
| Supplier Development | SDV1 | 0.36 | | 0.98 | 8.03 |
| | SDV2 | 0.75 | 7.76 | | |
| | SDV3 | 0.60 | 7.3 | | |
| | SDV4 | 0.62 | 7.36 | | |
| Information Sharing with Suppliers | INF1 | 0.62 | | 0.90 | 12.81 |
| | INF2 | 0.88 | 14.24 | | |
| | INF3 | 0.40 | 7.70 | | |
| | INF4 | 0.42 | 8.06 | | |

Table 8. Second-order confirmatory factor analysis of sustainable operations management practices

| First-order construct | Indicator | First-order | | Second-order | |
|------------------------------------|-----------|-------------|---------|--------------|---------|
| | | Loading | t-value | Loading | t-value |
| QM | QM1 | 0.61 | | 0.26 | 4.61 |
| | QM2 | 0.59 | 10.20 | | |
| | QM3 | 0.73 | 11.80 | | |
| | QM4 | 0.87 | 12.37 | | |
| Corporate Environmental Management | CEM1 | 0.60 | | 0.92 | 9.89 |
| | CEM2 | 0.81 | 13.16 | | |
| | CEM3 | 0.84 | 13.44 | | |
| | CEM4 | 0.69 | 11.83 | | |
| Corporate Social Responsibility | CSR1 | 0.58 | | 0.91 | 9.93 |
| | CSR2 | 0.91 | 13.59 | | |
| | CSR3 | 0.84 | 13.05 | | |
| | CSR4 | 0.88 | 13.40 | | |

Table 9. Second-order confirmatory factor analysis of sustainable customer management practices

| First-order construct | Indicator | First-order | | Second-order | |
|------------------------------------|-----------|-------------|---------|--------------|---------|
| | | Loading | t-value | Loading | t-value |
| Customer Management | CMA1 | 0.51 | | 0.29 | 4.98 |
| | CMA2 | 0.69 | 9.20 | | |
| | CMA3 | 0.83 | 13.8 | | |
| | CMA4 | 0.77 | 11.37 | | |
| Information Sharing with Customers | INS1 | 0.60 | | 0.93 | 10.01 |
| | INS2 | 0.71 | 11.16 | | |
| | INS3 | 0.64 | 12.44 | | |
| | INS4 | 0.59 | 11.83 | | |

order structures, and the effect of these structures on economic performance (ECP), SOP, and ENP was analyzed. The results indicate that SSM practices do not affect ECP ($t < 1.96$), which means that H1 was rejected. However, as the analysis showed that the effect

of SCM on SOP and ENP was significant and positive ($t > 1.96$), the findings failed to reject H2 and H3.

Furthermore, as the effect of SOM on SOP, ENP and ECP was positive and significant, H7, H8 and H9 were

Table 10. Structural parameter estimates

| Path | Hypothesis | Estimate | t-value | Result |
|-----------|------------|----------|---------|---------------|
| SSM->ECP | H1 | 0.015 | 0.4220 | not supported |
| SSM->ENP | H2 | 0.072 | 2.8038 | supported |
| SSM->SOP | H3 | 0.072 | 2.7549 | supported |
| SOM ->ECP | H4 | 0.555 | 2.9937 | supported |
| SOM ->ENP | H5 | 0.458 | 4.1033 | supported |
| SOM ->SOP | H6 | 0.406 | 4.1629 | supported |
| SCM ->ECP | H7 | 0.420 | 2.3414 | supported |
| SCM ->ENP | H8 | 0.569 | 5.3300 | supported |
| SCM ->SOP | H9 | 0.622 | 6.7523 | supported |

not rejected ($t > 1.96$). The results of hypothesis testing are summarized in Table 10.

RESULTS AND DISCUSSION

The results show that SSM has no positive effect on ECP in the supply chain. As we found that supplier development through information sharing and supplier evaluation had no effect on ECP, it seems that sustainable economic performance cannot be attained through supplier development or accurate assessment based on sustainability indicators and knowledge improvement throughout the supply chain. This may be due to the costs associated with supplier evaluation and management. Supplier development apparently requires the allocation of considerable financial resources, and most companies in Iran have financial problems, especially in recent years. The weakness of Iran's IT infrastructure, especially in the agricultural sector, makes knowledge sharing and creation of an integrated network among suppliers and companies in the work chain difficult and costly. Focusing on the role of supply chain management and organizational performance, Hong et al. (2017) showed that sustainable supply chain management could be effective in attracting resources to the organization. They also reported that sustainable supply chain management

enhanced sustainability performance on economic, social, and environmental dimensions. However, they noted that acquiring organizational resources such as knowledge sharing, marketing capabilities, and innovation would incur costs and might undermine the organization's financial and economic performance.

The results show that SSM has a positive effect on ENP in the supply chain, which seems logical. It seems that environmental performance can be acquired through the development and accurate assessment of suppliers, based on sustainability indicators and improving knowledge and information across the supply chain. Hong et al. (2017) showed that sustainable supply chain management practices and organizational capacities affect the economic, social, and environmental performance of organizations in the supply chain, which aligns with previous researches. The results also indicate that SSM has a positive effect on SOP in the supply chain, and SSM dimensions in the supply chain can be exploited to improve social performance. Studying five organizations in different dimensions, Hasan (2013) showed that sustainable supplier management practices affect an organization's environmental and operational performance. Again, the finding that

SOM has a positive effect on ECP is consistent with previous research. This suggests that the quality management, internal management, and social responsibility dimensions of sustainable operational management affect sustainable economic performance in the supply chain. Examining the impact of sustainable supply chain components on economic, social and environmental dimensions of sustainability, Baumann and Genoulaz (2014) showed that these components play a role in triple sustainability performance. Esfahbodi et al. (2017) demonstrated that sustainable operational management on dimensions such as sustainable distribution, sustainable processes, sustainable and high-quality design, and sustainable inventory control enhances economic and environmental performance. Martínez-Jurado and Moyano-Fuentes (2014) showed that concepts such as supply chain management and sustainable supply chain performance are related through the dimensions of sustainable operational management and lean production. They also noted that quality management with lean thinking correlates positively with economic, social, and environmental performance in the supply chain.

In general, the results obtained here are acceptable, indicating that SOM has a positive impact on ENP. Braam et al. (2016) showed that by focusing on the data and sustainability information, internal management and environmental management can enhance sustainable environmental performance in the supply chain. Adebanjo, Teh, and Ahmed (2016) showed that the operational components management of the organization improves production performance in the sustainable supply chain,

leading in turn to the desired environmental performance. The reviewed studies indicate that the results of this research are reliable.

SOM was also found to have a positive effect on SOP, as quality management, internal environment management, and social responsibility can affect an organization's concern for staff and community. Relying on internal management, one can implement the idea of justice for staff, and through quality management, products can be supplied to the community to meet social needs. As shown by Hörisch et al (2015), activities such as material flow analysis, product design, sustainability reports, and communication with suppliers play an important role in organizational sustainability in the social, economic, and environmental fields. It seems, then, that the results based on Hörisch et al. (2015) can be confirmed.

We found that sustainable customer management has a positive impact on sustainable economic performance in terms of customer management and information and knowledge sharing with customers. By collecting customer information and sharing knowledge with them to meet their needs, customer management can lead to sustainable economic performance in the supply chain. Pekovic et al. (2016) showed that collecting customer information and engaging with customer values and requirements can enhance sustainable performance by reference to environmental indicators. In addition, the results indicate that SCM has a positive effect on ENP. In this case, it seems that customers' expectations in relation to environmental factors such as pollution control and use of

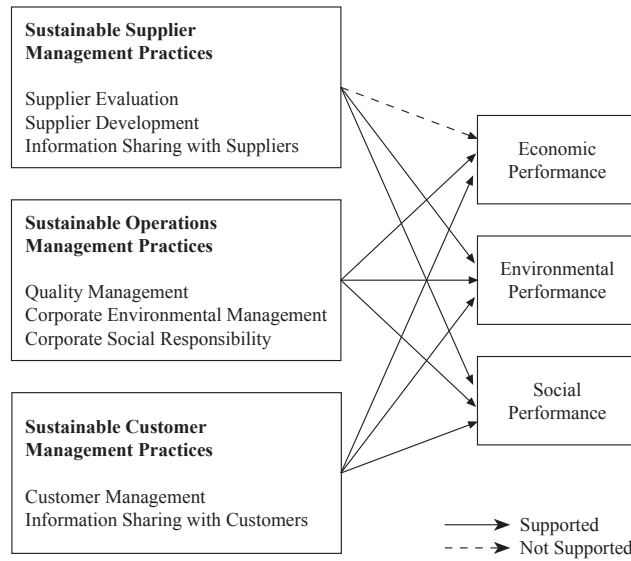


Figure 2. Results

environmental resources can be met by gathering and managing customer information to plan and design products with due regard to environmental factors.

SCM has a positive impact on SOP, and social information from consumers about how to treat employees and relationships with local communities help to clarify supply chain activities and enhance social performance. As Chen and Lin (2015) reported, access to customer information and experiences can lead to value creation that will satisfy customers. Additionally, they showed that sustainable social communication and sustainable social performance follow from customer satisfaction. Here again, the obtained results seem logical.

CONCLUSION

The present study examined sustainable supply chain management practices and sustainability performance in the food industry. Focusing on SSM, SOM, and SCM as sustainable supply chain management practices, the re-

sults confirm the impact of sustainable supply chain management practices on sustainable performance. To achieve sustainable performance in the supply chain, it is essential to take account of the sustainability dimensions of supply chain management. Drawing on both the resource-based view and resource dependence theory to construct the conceptual model, this represents a novel approach to supply chain performance. In addition, each aspect of sustainable supply chain management practices was analyzed as a second-order structure based on the literature, embodying a different approach to supply chain dimensions not fully evaluated in previous research. The results are summarized in Figure 2. On the basis of these findings, the following suggestions are offered as a means of improving sustainability performance in the supply chain.

- Pay attention to the issue of product quality by observing sustainability indicators and creating a sustainable consumption attitude among customers through advertising and consumer social awareness.

- Increase social responsibility among supply chain staff and managers in relation to product offerings.
- Improve internal management processes by implementing sustainability-related standards such as ISO 26000, ISO 9000 quality, and ISO 14000 environment in supply chain organizations.
- Develop communication channels with customers in order to understand their needs and expectations and to drive customer attitudes toward sustainable consumption.
- Share knowledge, standards, and attitudes in relation to supply chain companies with customers to inform them about the company's sustainable activities.

Limitations and future research

As this research was conducted in the context of the food industry supply chain in Iran, it could be extended to a larger study area. The study could also be conducted as a comparison of food industry supply chains in several countries, and this seems a fruitful direction for future research. Data analysis used the SEM method, which could be replaced in future research by other approaches such as mathematical mod-

els and dynamic systems. The present study also focused on the operational components of the supply chain, excluding any coherent modeling of factors such as environmental capabilities and incentives, which should be addressed in future research.

Implications

In this investigation of sustainability performance in the food supply chain, these functions are analyzed from the perspective of operational components. The findings can be used by companies active in the food industry to enable managers to plan for sustainable supply chain performance improvement, relying on components such as sustainable supplier management practices, sustainable operations management practices and sustainable customer management practices as explored here. Additionally, the dimensions of supply chain sustainability performance as outlined here provide managers and policy makers in the food industry with a framework for evaluating sustainable performance. These dimensions will also be of use to other researchers exploring supply chain sustainability and can be further developed in future studies.

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