sustainability

MDPI

Article

The Impact of Supply Chain Integration on Operational Performance: An Empirical Study

Ra'ed Masa'deh [1,*], Ismail Muheisen [1], Bader Obeidat [1,2] and Ashraf Bany Mohammad [1]

[1] School of Business, The University of Jordan, Amman 11942, Jordan
[2] Faculty of Business and Law, The British University in Dubai, Dubai P.O. Box 345015, United Arab Emirates
* Correspondence: r.masadeh@ju.edu.jo

Abstract: Manufacturing companies nowadays are under constant pressure to deliver high-quality products at the lowest possible prices within the shortest possible time even under the most unpredictable economic situations. Supply chain integration has a critical impact on operational performance. Nevertheless, this impact has not been consistent and showed mixed results throughout the literature. This study aimed to examine the impact of technology management in terms of supply chain integration on operational performance. The research model was empirically validated using 317 valid survey responses from the Jordanian food and beverage industry, which were subjected to quantitative research design and regression analysis. Results showed that supply chain integration had a direct significant impact on operational performance, and all three dimensions of the theoretical model contributed significantly to operational performance. This study suggests the critical need to create and implement proper supply chain integration strategies and technologies, both internally and externally, to enhance their performance and competitive advantage. Moreover, future research needs to extend this work to other industries, cultures, and nations, while investigating the moderating or mediating effects of other key variables along with using alternative sampling strategies.

Keywords: technology management; supply chain integration; operational performance; food and beverage sector; Jordan

Citation: Masa'deh, R.; Muheisen, I.; Obeidat, B.; Bany Mohammad, A. The Impact of Supply Chain Integration on Operational Performance: An Empirical Study. *Sustainability* **2022**, *14*, 16634. https://doi.org/10.3390/su142416634

Academic Editor: Paulo Afonso

Received: 23 October 2022
Accepted: 9 December 2022
Published: 12 December 2022

1. Introduction

Even in the most uncertain economic conditions, manufacturing organizations today are constantly under relentless competition to make high-quality products at the lowest feasible prices in the shortest time. Due to competitive pressures such as cost reduction and better customer service, businesses are always looking for novel strategies to build long-lasting competitive advantage [1,2]. Thus, many industry leaders are constantly searching for new strategies that would enable them to re-invent themselves into agile organizations, as they have become more aware of the growing competition and its vital role in creating a leadership in their industries [3,4]. In order to be more responsive to customer requests, lower costs, and boost performance, businesses need to have robust supply chain strategies and technologies that can streamline operations engaged in both internal and external processes. Establishing integrated cross-functional activities within the company and successfully connecting them externally with business partners, suppliers, and customers using proper supply chain strategies and technologies is vital to enhance firm performance [5,6].

In fact, supply chain integration bringing suppliers and customers into the value creation process will improve performance of the organization [6–8]. In fact, effective organizations are those which link their internal to external processes with the right supply chain strategies and technologies, to be more competitive and agile in the environment [8]. Hence, supply chain integration is a crucial dynamic skill that can produce differentiating performance [9]. One of the major themes that will fundamentally alter how supply

networks operate in the future is supply chain integration [10]. Therefore, efficient supply chain integration management can result in both immediate financial gains and a sustained competitive advantage [6].

The study of supply chain integration's implications on firm performance has attracted a lot of interest from academics and practitioners [11–14]. The common belief that a higher level of integration results in improved company performance was the main motivation behind a major portion of the literature on supply chain integration [15,16]. At the strategic, operational, and technological levels, supply chain integration can assist businesses in responding to business difficulties [14,17].

However, to date, the empirical findings of these studies on the relation between supply chain integration and performance have not been consistent [18]. For instance, some studies did not find clear connection between supply chain integration and performance [12,19,20]. On the contrary, other researchers have revealed a positive linear association between supply chain integration and performance [21–23], whereas others have reported a negative relationship between the two variables [24,25]. Not only this, but recent research has shown that the relationship between supply chain integration and performance has an inverted U shape [26,27]. Although these studies have increased our understanding of the performance implications of creating a sound integrated supply chain network, the mixed results did not show that there is a defined linkage between supply chain integration and performance, leaving us with contradictory conclusions [18]. Thus, this phenomenon represents an important research gap that requires further investigation [12,26,28].

Although there is a wealth of empirical studies demonstrating the simultaneous influence of various supply chain integration aspects on many variables of business success, when considering Supplier Integration (SI) and Customer Integration (CI) independently, many studies have looked at the sole functions of SI or CI in raising performance [27,29,30]. Others simply concentrate on the performance impact of internal integration [31–33]. Consequently, we argue that this represents another reason why this area needs further examination.

In addition, a great deal of the studies conducted about supply chain integration and performance have been conducted primarily in mature market economies [11,15,16], which have considerable variations in political, social, and economic systems [34]. If these conclusions are used in the context of emerging economies, they could not hold true. As a result, there is still a lack of knowledge regarding how supply chain integration affects emerging economies [35].

Therefore, the aim of this study is to fill the research gap that currently exists, by answering two key research questions on what dimensions of supply chain integration affect the operational performance and in which direction they do so.

Helpfully, this study is likely to contribute to the literature and methods used, and examines how internal and external integrations affect operational performance simultaneously. In addition, the researchers expect that the results of this study will offer differentiated strategies for managers, especially in the developing world, on how to adjust their internal and external supply chain integration efforts to improve operational performance, and in turn the competitive advantage.

The rest of this paper is organized as follows: in the next section, we present the literature review though the hypotheses' development that lays the foundation of the theoretical model. Section 3 establishes the research methodology, while Section 4 shows the results of the analysis. Finally, we conclude this paper in Section 5 with discussion, implications, and shed some light on future research prospects.

2. Hypotheses' Development and Theoretical Model

2.1. Supply Chain Integration

A supply chain is simply a network that includes vendors, plants, and distribution centers that support the sequence of activities from sourcing to production to delivery of a product or service [5,8–18,30]. Supply chain management is the practice of integrating

client requirements, internal operations, and upstream supplier performance [36,37]. Thus, supply chain management places an emphasis on how collaboration and information exchange may benefit all partners in the chain overall [38]. In order to manage supply chains, managers typically utilize cutting-edge methods and technologies including total quality management, Just in Time (JIT), enterprise resource planning, and lean production [39]. Supply chain integration has become an important issue for organizations seeking to develop a sustainable value in a dynamic and competitive environment [40,41].

Supply Chain Integration (SCI) is the strategic blending of internal and external organizational activities, and assesses how well supply chain participants cooperate to achieve mutually beneficial outcomes [42]. SCI refers to the formation of networks and technologies comprising all elements of the supply chain including suppliers, customers, and other related stakeholders [43]. In another words, SCI reveals the degree to which an organization strategically cooperates with partners and collaboratively manages inter- and intra-organizational processes [12]. SCI connects an organization with its customers, suppliers, and other channel members by integrating their relationships, activities, functions, technologies, processes, and locations [18]. The ultimate aim of SCI is to move products, services, information, money, and decisions effectively and efficiently through coordinated endeavors and exchange information to provide maximum value to the customer at a low cost without any delay [44,45]. Organizations that do not pay much attention to SCI may face serious problems such as higher inventory costs, delayed procurement, lower product quality, and inaccurate demand forecasting, which may influence both the focal organization and all of its supply chain partners [42]. The strongest and most effective organizations are those that connect their suppliers and consumers into cohesive networks [45].

Four strategies for supply chain integration were introduced by previous researchers [46]. The first tactic focuses on uniformizing and automating internal business procedures across the company's many functional divisions. There is little to no integration with consumers or suppliers at this level. After implementing the first integration strategy, the company may choose to execute the second strategy, which asks for integration with suppliers, or may choose to execute the third strategy, which calls for integration with customers. The second tactic enables businesses to establish strategic relationships with their suppliers and to communicate with them. The third tactic enables the business to create a backward synchronization of data flow from customers to suppliers. Finally, the fourth and ultimate tactic builds an integrated supply and demand in both directions in a comprehensive way [6].

2.2. Operational Performance

Organizational performance is considered as a multidimensional construct, and so an important measurement tool for assessing an organization's success and achievements [47,48]. Organizations should create a wide range of performance measurements because concentrating only on financial performance metrics could negatively affect an organization's long-term viability [49]. In general terms, organizational success can be measured as business performance and/or operational performance. Operational performance shows advancement in an organization's response to a dynamic environment in comparison to its competitors, while business performance relates to an organization's financial performance in terms of profitability and investment return [50,51]. Due to the inherited complexity and dependency of supply chains, choosing the most appropriate performance measure has proven to be hard for certain firms [12].

While financial performance should be the main measure of supply chain performance, some researchers have warned of the limitations of relying on financial performance measures alone [52–54]. Hence, many researchers suggested that SC performance measurement should include operational performance [55]. Thus, this study elected to use operational performance as a measure of performance, and investigated the literature to define and set the base for measuring operational performance. Some see operational performance as "the output or result achieved due to unique operational capabilities" [56] whereas others

indicated that operational performance relates to the ability of an organization to reduce management costs, order time, and lead time, and improve the effectiveness of using raw materials and distribution capacity [57], in an effort to develop production activities and effectiveness leading to increased revenue and profits [58].

Over the years, various metrics have been proposed to gauge operational performance. It is believed that since factories cannot control sales or expenses outside of the plants, subjective data are more suited for gauging operational performance [59]. This subjective approach was widely used in empirical studies [60], and operational performance was often assessed using a set of variables that reflect an organization's internal processes in terms of product, process, quality, efficiency, and productivity [61]. Some studies used the productivity, effectiveness, and efficiency of internal operations to gauge operational performance [62]. However, cost, quality, delivery, and flexibility were the most frequently employed metrics in the literature to measure operational performance [12,60,62]. Accordingly, this study employed these dimensions of cost, quality, delivery, and flexibility to measure operational performance.

2.3. Supply Chain Integration and Operational Performance

The idea of a supply chain partnership goes beyond the operations of a single business unit to the entire supply chain, where relationships are built through increased levels of information sharing between two independent supply channel members (i.e., internal and external), in order to achieve goals and reap benefits in the form of lower costs and inventories. In order to accomplish a win–win situation, a collection of procedures that manage and coordinate the supply chain from raw material suppliers to the final customer [37,63] must be in place. According to many academics, improving performance could be achieved by combining customer and supplier bases and technologies, eliminating redundant processes in the supply chain, accelerating information, technologies, and material flows, and establishing long-term relationships with significant customers and suppliers [37].

In fact, integration of supply chains is of both strategic and operational importance [37,45,64]. This is supported by different views, including the resource-based view, transaction cost theory, and dynamic capabilities view, which all have indicated that SCI enhances cooperative performance. From a firm's resource-based and relational viewpoints, partnerships can help combine resources and create efficient governance structures [65–67]. In such cases, supply chain players can access the whole pool of resources, technologies, and competencies that exist throughout a certain supply chain using coordinated SCI [45,68]. SCI encourages collaborative planning, value creation, and the implementation of cross-firm problem-solving procedures to guarantee the effectiveness of the supply chain [44,65,69]. A rise in the effectiveness of physical material and product flows leads to improvements in communication and information sharing, which boosts performance. A member in a highly linked supply chain may be able to reduce their net costs [70]. This reduction is very advantageous because cost efficiency is a prerequisite for price competition. According to the transaction cost theory, organizations seek efficiency by reducing the total cost of market and vertical integration [71]. In fact, SCI improves the structure of the supply chain to direct behavior and increase supply chain overall efficiency [72], while minimizing their overall operating expenses [24,73]. Additionally, SCI can be a useful tool that supports the organization plans, and helps to maintain competitive advantages [65,74]. According to the dynamic capability perspective, SCI enables businesses to achieve outstanding operational performance benefiting from strategic cross-functional coordination and integration of different supply chain collaborators [44,75].

Effective collaboration between diverse departments (such as R&D, information technology, purchasing, production, and marketing) can assist businesses in promptly responding to shifting consumer expectations, and improve operational performance, including delivery, cost, quality, and flexibility [44,76,77]. Hence, it is no wonder that much prior empirical research has discovered a positive association between internal integration and

operational effectiveness [12,44]. In fact, there is mounting evidence that the operational gains increase with the degree of customer and supplier integration [37,44,45]. Building strategic customer collaboration aids businesses in cutting costs and recognizing demand changes more rapidly [12], and supplier integration improves operational responsiveness and flexibility [44]. Additionally, previous empirical studies have discovered a positive correlation between operational effectiveness and SCI [24,44,45,77].

Hence, SCI, both upstream and downstream integration, presents a significant opportunity and a new frontier to improve business performance, which is something that academics and practitioners are increasingly discovering [12–14,25,27,45,74,78–80]. Hence, this study made the claim that SCI promotes higher operational performance in accordance with the various viewpoints and empirical data in the literature. Accordingly, the following hypotheses were developed and tested:

Hypothesis 0 (H0). *Supply chain integration does not affect the operational performance of Jordanian food and beverage companies.*

Hypothesis 0.1 (H0.1). *Internal integration does not affect the operational performance of Jordanian food and beverage companies.*

Hypothesis 0.2 (H0.2). *Supplier integration does not affect the operational performance of Jordanian food and beverage companies.*

Hypothesis 0.3 (H0.3). *Customer integration does not affect the operational performance of Jordanian food and beverage companies.*

2.4. Operational Definition and Research Model

Integrated supply chains refer to "the degree to which a firm can strategically collaborate with its supply chain partners and collaboratively manage the intra- and inter-organization processes to achieve effective and efficient flows of product and services, information, money and decisions with the objective of providing maximum value to customers at low cost and high speed" [81]. Supply chain integration in this study was measured by the following:

Supplier Integration: The cooperative process that allows for the exchange of information, knowledge, resources, and experiences.

Internal Integration: The process of sustaining intra-organizational cross-functional cooperation and collaboration, with the aim of achieving organizational strategic goals.

Customer Integration: The procedure for establishing and keeping a solid collaboration and interaction with clients. It includes imparting information, experiences, goods, services, and recommendations to clients.

Supply chain integration was determined using 14 items adapted from previous studies, which consist of three factors: internal integration covering 4 items [1,4,12,44], supplier integration covering 5 items [4,12,44], and customer integration covering 5 items [4,12,44,64]. All items are shown in Table 1.

Operational performance measures how well internal operations of a company operate in terms of a variety of performance metrics, such as cost, quality, delivery, and adaptability [61]. Hence, these four conventional operational performance metrics (i.e., flexibility, delivery, quality, and cost) are used in this study to measure operational performance [12,44]. Flexibility was determined using 3 items [12], delivery was determined using 3 items [12,44], quality was determined using 3 items [44], and cost was determined using 3 items [44]. All 12 items of operational performance were derived from [82] as shown in Table 2.

Table 1. Supply Chain Integration Items.

Dimension	Item
Internal Integration	We have high level of responsiveness inside our factory to meet different departments' needs.
	We have an integrated system across functional areas of our factory control.
	Inside our factory, we emphasize information flows between purchasing, inventory, sales, and distribution departments.
	Within our plant, we emphasize physical flows amongst production, packing, warehousing, and transportation departments.
Supplier Integration	We share information with our major suppliers using information technologies.
	We have high level of strategic collaboration with our suppliers.
	We have high level of collaborative planning to obtain rapid response ordering processes (inbound) with suppliers.
	Our suppliers offer information to us about production and procurement processes.
	Our suppliers are engaged in our product development processes.
Customer Integration	We have a high level of information sharing with customers about market information.
	We share information with our customers through information technologies.
	We have a high level of collaborative planning and forecasting with our customers to anticipate demand visibility.
	Our customers offer our company information in the procurement and production processes.
	Our customers are engaged in our product development processes.

Table 2. Operational Performance Items.

Dimension	Item
Flexibility	Our company rapidly modifies products and services to meet our customer's demand.
	Our company rapidly introduces new products and services into the market.
	Our company rapidly responds to market demand changes.
Delivery	Our company has a superior on-time delivery history to our customers.
	Our company provides trustworthy delivery to our customers.
	Our company's lead time for fulfilling customers' orders is short.
Quality	Our company produces high-quality products that meet customer demands.
	Our company produces high-quality products with low deficiencies.
	Our company produces highly reliable products that meet customer demands.
Cost	Our company produces products using lowest possible costs.
	Our company produces products using lowest possible costs.
	Our company offers prices as low as or lower than our competitors.

As we seek in this study to explore the effect of supply chain integration on the operational performance of companies working in the Jordanian food sector, this work uses operational performance as the dependent variable and supply chain integration as the independent variable, to explain the variance in the dependent variable as presented in the research model below, Figure 1.

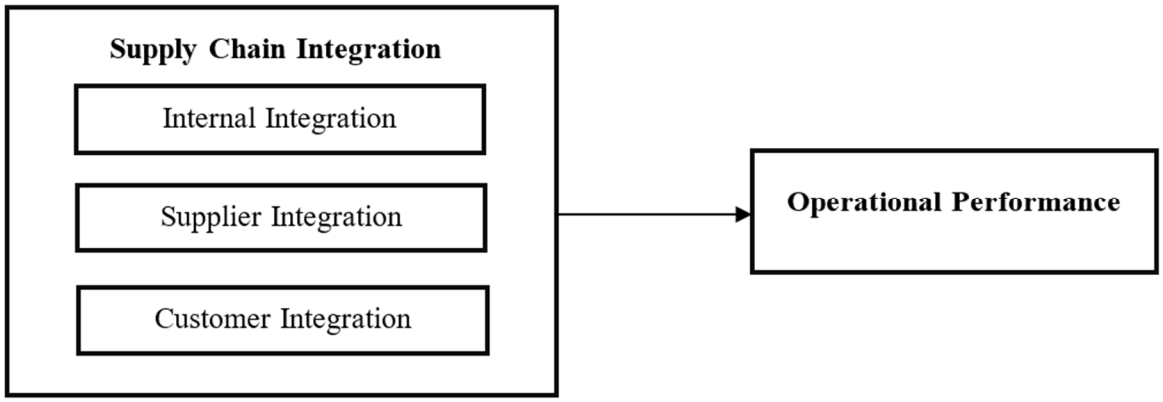

Figure 1. Research Model.

3. Research Methodology

3.1. Research Population and Sample

The population of the study consisted of 2235 business establishments that operate in the Jordanian food and beverage sector. These establishments are mainly located in the middle part of Jordan, close to Amman, and in the north [83]. The respondents in this study are top-level managers and supply chain managers who have sufficient expertise of the operations, procedures, supply chain, and performance of their organizations. Since only a small number of people hold the sought-after information, a judgement sampling approach was chosen since it is the most appropriate sampling method and entails selecting subjects who are in the best position to supply it [84]. Accordingly, the appropriate sample size for the current study given the population size provided earlier is 332 companies [84].

3.2. Data Collection Method

Data collection method is an essential section of research design where the hypothesis for every data is collected and tested [84]. Primary and secondary sources can be used to gather data in research. In this research, the secondary data were collected from an e-library, which was provided by the University of Jordan website. On the other hand, the primary data collection method refers to the data collected by the researcher to achieve the objective of the research study [84]. Primary data in this research were collected using 350 questionnaires, which were distributed to selected mid-level employees and managers working in the supply chain departments in Jordanian companies working in the food and beverage sector. Three hundred and twenty-five questionnaires were returned with only 317 valid for analysis. Using a questionnaire for the collection of data is considered efficient, as it saves time and money, answers are not affected by the researcher, and it is also a convenient method for the respondents. The questionnaire was introduced by a cover letter that pointed out the intentions of the study and guaranteed the anonymity of the information provided. The questionnaire was divided into two parts, one for personal data of the employees, and the second one including questions regarding supply chain integration and operational performance. Other data collection methods would have been difficult to deal with given the large sample size. Thus, a questionnaire was considered as the most suitable method to achieve the goals of this research.

3.3. Research Validity and Reliability

3.3.1. Research Validity

To ensure the validity of the instrument in this study, three types of validity tests were undertaken; namely, face, content, and construct validity. To ensure the face validity of the research instrument, the questionnaire was given in both English and Arabic languages to several faculty members and PhD holders, and field practitioners who have knowledge about the research topic to evaluate and arbitrate the questionnaire content and construction. Later, their comments and feedback were used to improve the questionnaire. To ensure

content validity of the research instrument, the researchers used scales and items that were developed earlier and used by other researchers with comparable interests.

Factor analysis is one popular method for evaluating construct validity as it is used to determine the underlying dimensions of the defined and determined factors [84]. Therefore, the goal of factor analysis is to condense data in a way that makes correlations and patterns simple to be comprehended and evaluated [85]. Exploratory Factor Analysis (EFA) is used to establish construct validity in this study as the researchers wished to understand which variables "go together" [86]. EFA separates factor structures without taking the researcher's theoretical predictions into account [87]. Hence, respondents' answers to the 26 questions used in this study were collected, and the dimensionality of the data was evaluated using principal axis factoring.

The number of factors expected to analyze the data was determined using promax rotation. Raising the loadings to a power of four as part of promax leads to higher correlations between the components and a clear structure [88]. To conduct EFA, three presumptions were upheld: adequate sampling (Kaiser–Meyer–Olkin (KMO) measure >0.5), eigenvalues for each factor should be >1, and a factor loading of 0.30 for each item is chosen as the threshold for item retention [89]. The results show the KMO index is 0.809 for supply chain integration and 0.866 for operational performance, which are above the recommended threshold [89]. In addition, the Bartlett's test of sphericity revealed statistically significant results with p-value < 0.05 for the two variables, suggesting that the correlations are appropriately large for factor analysis [89]. Both the KMO and Bartlett's test of sphericity are qualification tests used to test the fitness of the data for factor analysis [90].

Furthermore, a correlation matrix introduced in the EFA process as a means of displaying the relationships between variables was investigated for correlation coefficients over 0.30. In addition, several correlations existed in this study with values greater than 0.30, which suggests that factor analysis is a proper statistical method to be used. Yet, one key element deciding how many factors will be used to analyze the data is whether a variable is related to more than one factor. Since oblique rotation shows how factors are related to each other, it is a useful test especially in research involving human behaviors [90]. Therefore, the oblique rotation technique was used in this study. Specifically, promax direct oblimin was utilized in this study [88]. All the factors' eigenvalues were greater than 1, and all items' loadings were higher than 0.30. According to the previously indicated assumptions, a three-factor supply chain integration model evolved, which fits the 50–60% range for humanities studies and explains 55.861% of the overall variance [89]. The rotational factor loadings are displayed in the pattern matrix, which is utilized to interpret the dimensions [90]. As shown in Table 3, the components derived match the dimensions employed in this investigation. Items that load on the first dimension imply that it measures customer integration and comprises all five items used to measure it (CI1–CI5), items that load on the second dimension imply that it measures supplier integration and comprises all five items used to measure it (SI1–SI5), and items that load on the third dimension imply that it measures internal integration and comprises all four items used to measure it (II1–II4).

All 12 items were loaded with consideration to operational performance, without any additions or deletions. A four-factor model was able to account for 71.396 percent of the entire variance. As shown in Table 4, the components derived match the dimensions employed in this investigation. Items that load on the first dimension (QUALITY1–QUALITY3) indicate that it exemplifies quality, and includes all 3 items used to measure it. Items loading on the second dimension (COST1–COST3) indicate that it represents cost and includes all 3 items used. Items that load on the third dimension (DELI1–DELI3) indicate that it represents delivery, and items that load on the fourth dimension (FLEX) indicate that it represents flexibility.

3.3.2. Research Reliability

Reliability was assessed using internal consistency. The Cronbach's alpha coefficient (Cronbach's α) is the most often used technique in behavioral sciences for evaluating

internal consistency [91]. Cronbach's alpha calculated values range between 1 (showing perfect internal reliability) and 0 (showing no internal reliability) [92], and a previous research recommendation suggests a minimum of 0.60 or above as a suitable level of Cronbach's alpha [84,89]. Cronbach's alpha values calculated in this work as shown in Table 5 demonstrated that this research's variables' reliability is significantly greater than the level considered to be acceptable [89], demonstrating a great internal consistency of the research tool.

Table 3. Pattern Matrix for Supply Chain Integration.

	Factor		
	1	**2**	**3**
II1			0.431
II2			0.750
II3			0.802
II4			0.824
SI1		0.684	
SI2		0.843	
SI3		0.726	
SI4		0.544	
SI5		0.578	
CI1	0.538		
CI2	0.467		
CI3	0.731		
CI4	0.970		
CI5	0.915		

Extraction Method: Principal Axis Factoring. Rotation Method: Promax with Kaiser Normalization.

Table 4. Pattern Matrix for Operational Performance.

	Factor			
	1	**2**	**3**	**4**
FLEX1				0.360
FLEX2				0.951
FLEX3				0.514
DELI1			0.364	
DELI2			0.936	
DELI3			0.684	
QUALITY1	0.896			
QUALITY2	0.933			
QUALITY3	0.645			
COST1		0.989		
COST2		0.760		
COST3		0.550		

Extraction Method: Principal Axis Factoring. Rotation Method: Promax with Kaiser Normalization.

Table 5. Study Variables' Cronbach's Alpha.

Variable	Cronbach's Alpha	No. of Items
Supply Chain Integration	**0.867**	**14**
Internal Integration	0.742	4
Supplier Integration	0.846	5
Customer Integration	0.850	5
Operational Performance	**0.923**	**12**
Flexibility	0.816	3
Delivery	0.754	3
Quality	0.851	3
Cost	0.920	3

4. Results

4.1. Profile of the Respondents

The demographic variables of this research included gender, age, educational level, and work experience. According to Table 6, men made up most the respondents in this sample (52.7%) while women made up 47.3%. With regard to age, most of the respondents (44.8%) were from the ages of 25 to just under 36 years old. The rest of the sample fell into the following categories: 37.9% under 25 years old, 11% from the ages of 36 to just under 45, 4.7% from 45 to just under 54, and 1.6% over 54 years old. As for the education, most of the respondents (54.6%) possess a bachelor's degree, and the remaining respondents are spread among the other levels with qualifications such as a college diploma or a high school diploma, and degrees such as a master's or PhD, which total 28.1%, 13.6%, 0.9%, and 2.8%, respectively. In terms of experience, 31.5% of the respondents had 3 to just under 6 years of experience, followed by 30.3% with less than 3 years of experience, 24.6% with over 9 years of experience, and 13.6% with 6 to just under 9 years of experience.

Table 6. Respondents' Demographic Profile.

Age	**Frequency**	**Percent**	**Cumulative Percent**
Under 25	120	37.9	37.9
From 25 to just under 36	142	44.8	82.6
From 36 to just under 45	35	11	93.7
From 45 to just under 54	15	4.7	98.4
54 and over	5	1.6	100.0
Total	317	100.0	
Gender	Frequency	Percent	Cumulative Percent
Male	167	52.7	52.7
Female	150	47.3	100.0
Total	317	100.0	
Education	Frequency	Percent	Cumulative Percent
Bachelor's degree	173	54.6	54.6
Higher education diploma	89	28.1	82.6.
Master's degree	43	13.6	96.2
PhD degree	3	0.9	97.2
Other	9	2.8	100.0
Total	317	100.0	
Experience	Frequency	Percent	Cumulative Percent
Less than 3 years	96	30.3	30.3
3 to just under 6 years	100	31.5	61.8
6 to just under 9 years	43	13.6	75.4
9 years and above	78	24.6	100.0
Total	317	100.0	

4.2. Descriptive Statistics

The mean and standard deviation were calculated to understand the respondents' direction and divergence regarding each of the questionnaire's questions. Furthermore, the mean and standard deviation values for each dimension and each variable were used to understand the attitude of respondents toward a particular dimension or a particular variable. The mean provides a broad overview of the data as a measure of central tendency [84]. Consequently, it provides a broad overview of the responses provided by the

respondents for each question, dimension, and variable. As a measure of variation, the standard deviation shows the spread of the data [84], where a collection of data with a low standard deviation are likely near to or around the mean and vice versa. A mean with a small standard deviation is more reliable than a mean with a large standard deviation [93].

Using a five-point Likert scale in this research, the criteria for determining the classification for each item was based on the following formula: (highest point in Likert scale—lowest point in Likert scale)/the number of the levels used = $(5 - 1)/5 = 0.80$, where 1–1.80 indicates "very low", 1.81–2.60 indicates "low", 2.61–3.40 indicates "moderate", 3.41–4.20 indicates "high", and 4.21–5 indicates "very high". Consequently, variables' means and standard deviations were calculated and are listed in Table 7.

Table 7. Descriptive Statistics for the Study's Variables.

Variable	Mean	Std. Deviation	Level of Agreement
Independent Variables			
Supply Chain Integration	**3.39**	**0.446**	**Moderate**
Internal Integration	2.06	0.555	Low
Supplier Integration	4.03	0.529	High
Customer Integration	3.81	0.780	High
Dependent Variable			
Operational Performance	**3.70**	**0.757**	**High**
Flexibility	3.90	0.781	High
Delivery	3.93	0.748	High
Quality	3.50	1.008	High
Cost	3.48	1.040	High

4.3. Analysis of Multicollinearity

Both indicators of Variance Inflation Factor (VIF) and tolerance were utilized in this study to find multicollinearity. According to [94], there should be cause for concern when the VIF is larger than 10. The tolerance statistic, which is the VIF's reciprocal (1/VIF), should also be considered. Common cut off values are a tolerance value of 0.10 and a VIF value of 10, which were employed in this investigation [84].

Table 8 lists the tolerance values as well as the VIF values for the independent variable, which varied from 0.600 to 0.966 and from 1.036 to 1.667, respectively. Given that all VIF values are below 10 and all tolerance values are above 0, we can claim that there is no multicollinearity issue among the dimensions of the independent variables.

Table 8. Multicollinearity of the Study's Independent Variables.

Variable	VIF	Tolerance
Internal Integration	1.036	0.966
Supplier Integration	1.667	0.600
Customer Integration	1.644	0.608

4.4. Hypothesis Testing

Hypothesis testing refers to the process of determining whether a particular hypothesis is a rational statement [95]. Hypothesis testing involves testing the null hypothesis (denoted by H_0), which is initially assumed to be true, but tested for the possibility of rejection [84]. To test the hypotheses developed for this research, simple and multiple regression analyses were conducted using the "linear" procedure of SPSS, version 19. The decision rule used to reject the null hypothesis was if the significance level is less than 0.05. The individual

correlations between independent variables and dependent variables fall into what is called the multiple R or multiple correlation coefficient, while the square of multiple R (R^2) is the amount of variance justified in the dependent variable by the predictors [84]. In other words, if R^2 is close to 1, then most of the variance in the dependent variable can be explained by the regression model and the regression model fits the data well. On the other hand, if R^2 is close to 0, then most of the variance in the dependent variable cannot be explained by the regression model. In testing the research hypotheses, the main hypothesis was tested first to establish a solid ground to prove the sub-hypotheses.

H_0. Supply chain integration does not significantly (at the level $\alpha \leq 0.05$) affect the operational performance of Jordanian food and beverage companies.

To test this main hypothesis, multiple regression was used. Multiple regression refers to the situation in which more than one independent variable is hypothesized to affect one dependent variable [84]. Supply chain integration (internal integration, supplier integration, and customer integration) was entered as the independent variable and operational performance was entered as the dependent variable. Table 9 shows the results of examining the first main hypothesis.

Table 9. Summary of Testing the Main Hypothesis.

	R	R^2	Adj R^2	F-Value	Sig	Standardized Beta	t-Value	Sig
	0.753	0.567	0.563	136.592	0.000			
Internal Integration						0.0760	2.000	0.046
Supplier Integration						0.116	2.420	0.016
Customer Integration						0.673	14.108	0.000

The correlation coefficient R = 0.753 indicates that there is a positive correlation between supply chain integration and operational performance as mentioned above. This demonstrates that both the independent and dependent variables change in the same manner. The goodness of fit of the regression model is shown by the R^2 coefficient of determination [84]. It stands for the proportion of the dependent variable's variance that may be accounted for by the variation in the independent variable [84]. The value of $R^2 = 0.567$ indicates the number of variations in operational performance that is accounted for by the fitted model, and has been explained by supply chain integration. The adjusted R^2 which indicates the generalizability of the model is close to the value of $R^2 = 0.567$, and if the adjusted R^2 is excluded from R^2 the value will be $0.567 - 0.563 = 0.004$. With this amount of reduction, the variance of the result would be reduced by 0.4% if the entire population was part of the study and the model was fitted.

The F-ratio in the ANOVA test was 136.592, and since this value is significant at the level of $p < 0.05$ (sig. = 0.000), there is less than a 5% probability that it would occur by chance alone. The null hypothesis is disregarded at the $p < 0.05$ significance level because the *p*-value is less than the level of significance (0.05). Hence, supply chain integration does significantly affect operational performance.

The coefficient results in Table 9, specifically the t and sig (often referred to as *p*-value) values, provide a rough estimate of the impact of each predictor variable [96]. It is possible that the predictor variable influences the criterion variable because of the big absolute t-value and modest *p*-value. In this study's findings, all aspects of supply chain integration were significantly influential on operational performance (*p*-value < 0.05). Additionally, the standardized beta coefficient measures how much the predictor variable contributed to the criterion variable [96]. A high value denotes that the criterion variable is significantly impacted by a unit change in the predictor variable. In this study, customer integration

showed the most influence on operational performance with a β of 0.673, while supplier integration and internal integration follow with β values of 0.116 and 0.076, respectively. The following conclusions about the sub-hypotheses of the main hypothesis, as shown in Table 10, can be drawn from the results of the multiple regression (Table 9).

Table 10. Sub-Hypotheses' Decisions.

Sub-Hypotheses	Result
$H_{0.1}$ Internal integration does not significantly (at the level $\alpha \leq 0.05$) affect the operational performance Jordanian food and beverage companies.	Rejected
$H_{0.2}$ Supplier integration does not significantly (at the level $\alpha \leq 0.05$) affect the operational performance of Jordanian food and beverage companies.	Rejected
$H_{0.3}$ Customer integration does not significantly (at the level $\alpha \leq 0.05$) affect the operational performance of Jordanian food and beverage companies.	Rejected

5. Discussion and Conclusions

After developing a sound theoretical model that was later tested, this work explored the effect of supply chain integration on operational performance in the Jordanian food and beverage sector. Although supply chain methods have extensively proven the importance of SCI in achieving higher performance [12,38,76,82], this study is one of only a few that has investigated the topic in the Jordanian context. As shown in Table 9, according to the results of this study, supply chain integration has been found to have a significant direct effect on operational performance. Along with coordinating and collaborating with suppliers and customers, SCI employs integrating information, technologies, and logistical activities across functional units inside the company [82], which will enable manufacturers to achieve operational performance [41]. The benefits of cross-functional coordination and integration with partners' supply chains is acknowledged to be an essential factor for operational performance excellence [44,75]. These conclusions are well supported by previous research such as [12,41,44,82], that also found that supply chain integration has a significant effect on operational performance.

In addition, this research studied SCI from both an internal (i.e., internal integration) and external perspective (i.e., supplier and customer integration). The results revealed that internal integration has a direct significant effect on operational performance (t-values of 2, 2.420, and 14.108, respectively); which is consistent with the findings of some key previous studies (see [12,44]). In fact, cooperation through proper technologies and timely information exchange among different functional departments can help firms respond to changing consumer demands and improve operational performance [44,76,77].

As for external integration, this study showed the importance of customer integration which has a direct, considerable impact on operational performance, which was consistent with the findings of many prior research works (see [24,44,45,77]) that also claimed there are operational benefits with higher levels of supplier and customer integration. In fact, having a close association with customers will provide manufacturers the opportunity to improve the accuracy of demand, product design, and production, allowing improved responsiveness to customers' needs. As a result, customer integration creates opportunities for cost reduction, creation of greater value, and discovery of demand changes in less time [12]. Supplier integration was also found to have a direct significant effect on operational performance. Research in [29,97–99] reached similar conclusions regarding supplier integration and operational performance. Strong strategic alliances powered by technology can help suppliers better understand and anticipate the demands of the company, and better meet its shifting needs. Manufacturers can create more precise production schedules and deliver things on time, with appreciation of this interchange of information regarding products, processes, schedules, and capacities. Having the right technologies and strategies

that connect suppliers with manufacturers will eventually help manufacturers provide better customer service. These connections have long been supported by previous scholars such as the authors of [100].

In conclusion, SCI technologies and strategies have key advantages in operational performance, as they promote improvements in the areas of coordinative efficiency and reliable manufacturing. Creating SCI cooperations can help the company pool resources and capacities, increase inter- and intra-firm knowledge sharing, and develop efficient governance structures [65–67]. By doing so, any participant in the supply chain will be able to access this pool of resources and capabilities [45,68]. In addition, SCI technologies and strategies will ensure the efficiency of the supply chain by promoting collaborative planning, greater value creation, and the development of the firm [44,65,69]. Efficiencies in physical material and product flows can be achieved by coordinating and exchanging information, which result in increased performance [18], hence SCI technologies must be in place to support such information sharing. In more specific terms, SCI strategies and technologies will support more coordination routines and cooperative culture, which, in turn, make it a valuable capability that supports business strategy and the creation of sustainable competitive advantage [65,74].

5.1. Contribution of the Research

This research was built on solid grounds of prior research, however, each prior study was carried out in a distinct environment (i.e., country, industry), whereas supply chains function differently. Since few studies analyzed this topic in this particular industry and this particular country, the current study will help other researchers understand the impact of supply chain integration on operational performance in the Jordanian food and beverage sector. Moreover, historically, studies have ignored the significance of both internal and external aspects of SCI at once in favor of analyzing the impact of either internal or external integration on operational success. To add to the body of research, this study went beyond simply looking at the single effect of either internal or external integration, and instead focused on the dual effect of both variables. Hopefully, this addition will contribute to theoretical advancement, and help more researchers consider both activities in all future studies.

Specifically, a number of contributions to the current literature and practices can be expected from this study. First, this study simultaneously analyzes the effects of internal integration and external integration on operational performance. Some studies have included external integration in their analyses which obscures the definition and true effect of supply chain integration. Second, this study extends the supply chain integration–operational performance research by examining their contribution to the food and beverage sector in Jordan. Finally, the results of this study will offer differentiated strategies for managers to adjust their internal and external supply chain integration efforts in order to improve operational performance and in turn competitive advantage.

5.2. Implications of the Findings

This study constructed a research model to examine the direct impact of supply chain integration (strategies and technologies) on operational performance based on relevant previous research. Since very limited relevant studies have been conducted in the Jordanian food and beverage industry, the researchers argue that managers can employ this research output to develop proper SCI strategies and technologies that will boost operational performance. In addition, the results of this work indicate the important link between both internal and external integration and performance, and give preliminary support for the need to incorporate both internal and external integration when planning for SCI. Without internal and external integration, which connects customer integration with supplier integration, businesses cannot fully benefit from their SCI effort.

The findings can also help supply chain managers on the level of integration needed at different points in the supply chain system, allowing them to plan supply chain integration

strategies and technologies. As a result, supply chain integration needs senior management support and a well thought out strategic plan. To fully benefit from integration, food and beverage firms must outline how their internal technologies and processes will relate to those of supply chain participants in their supply chain strategy. In addition, supply chain integration needs carefully planned technologies and implementation strategies that highlight the significance of all connections among various supply chain segments.

5.3. Limitations and Future Research

It is noted that there are several limitations even though the research's findings can have important implications for managers and researchers. First, the small sample size makes it impossible to estimate and analyze the impact of supply chain integration on performance in general terms. In addition, research on the relationships between various supply chain integration characteristics and how they support one another was not employed. Secondly, although the theoretical framework was empirically evaluated using data from a single industry and one nation, it is unclear whether the results of this research will be relevant to other sectors and other countries. Hence, future research should examine the relevance and validity of these findings in various cultural contexts, and should be repeated for more types of supply chains. Thirdly, to obtain a sample of those who are most qualified to provide relevant information, this study used judgement sampling. Adopting judgement sampling limits how broadly the conclusions may be applied to the population. Therefore, it is advised that future studies use different sample methods whenever possible to increase the effectiveness of the sampling design.

Finally, only the direct impact of supply chain integration on operational performance was examined in this study. Depending on the researchers' objectives and the advice of earlier studies, other studies might investigate whether the presence of a third variable, either mediating or moderating, would offer a better explanation of the variation in operational performance. To find the model that best fits the requirements of the specific organization, industry, or nation, researchers are advised to conduct a comparative study using the model created in this study and earlier models related to operational performance.

Author Contributions: Conceptualization, I.M.; B.O.; A.B.M. and R.M.; Methodology, R.M and I.M.; Software, I.M.; Validation, A.B.M.; Formal analysis, I.M. and B.O.; Investigation, R.M. and A.B.M.; Resources, B.O.; Writing—original draft, R.M.; I.M. and B.O.; Writing—review & editing, R.M. and A.B.M.; Supervision, R.M.; Project Administration, B.O. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The data presented in this study are available on request from the corresponding author.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Lassnig, M.; Müller, J.M.; Klieber, K.; Zeisler, A.; Schirl, M. A digital readiness check for the evaluation of supply chain aspects and company size for Industry 4.0. *J. Manuf. Technol. Manag.* **2022**, *33*, 1–18.
2. Salam, M.A. The mediating role of supply chain collaboration on the relationship between technology, trust and operational performance: An empirical investigation. *Benchmarking Int. J.* **2017**, *24*, 298–317.
3. Vern, P.; Miftah, N.; Panghal, A. *Digital Technology: Implementation Challenges and Strategies in Agri-Food Supply Chain*; Mor, R.S., Kumar, D., Singh, A., Eds.; Agri-Food 4.0 (Advanced Series in Management); Emerald Publishing Limited: Bingley, UK, 2022; Volume 27, pp. 17–30.
4. Narasimhan, R.; Kim, S.W. Effect of supply chain integration on the relationship between diversification and performance: Evidence from Japanese and Korean firms. *J. Oper. Manag.* **2002**, *20*, 303–323.
5. Palazzo, M.; Vollero, A. A systematic literature review of food sustainable supply chain management (FSSCM): Building blocks and research trends. *TQM J.* **2022**, *34*, 54–72.

6. Beheshti, H.M.; Oghazi, P.; Mostaghel, R.; Hultman, M. Supply chain integration and firm performance: An empirical study of Swedish manufacturing firms. *Compet. Rev.* **2014**, *24*, 20–31.
7. Tarifa Fernández, J. Dependence and resource commitment as antecedents of supply chain integration. *Bus. Process Manag. J.* **2022**, *28*, 23–47.
8. Tarifa-Fernandez, J.; De Burgos-Jiménez, J. Supply chain integration and performance relationship: A moderating effects review. *Int. J. Logist. Manag.* **2017**, *28*, 1243–1271.
9. Fawcett, S.E.; Fawcett, A.M.; Watson, B.J.; Magnan, G.M. Peeking inside the black box: Toward an understanding of supply chain collaboration dynamics. *J. Supply Chain Manag.* **2012**, *48*, 44–72.
10. Autry, C. Adversarial to collaborative relationships, game changing trends in supply chain. In *Global Supply Chain Institute and Ernst & Young*; University of Tennessee: Knoxville, TN, USA, 2013.
11. Orengo Serra, K.L.; Sanchez-Jauregui, M. Food supply chain resilience model for critical infrastructure collapses due to natural disasters. *Br. Food J.* **2022**, *124*, 14–34.
12. Flynn, B.B.; Huo, B.; Zhao, X. The impact of supply chain integration on performance: A contingency and configuration approach. *J. Oper. Manag.* **2010**, *28*, 58–71.
13. Lee, H.L.; Whang, S. *E-Business and Supply Chain Integration*; Springer: New York, NY, USA, 2004; Volume 62.
14. Frohlich, M.T. E-integration in the supply chain: Barriers and performance. *Decis. Sci.* **2002**, *33*, 537–556.
15. Cannon, J.P.; Doney, P.M.; Mullen, M.R.; Petersen, K.J. Building long-term orientation in buyer-supplier relationships: The moderating role of culture. *J. Oper. Manag.* **2010**, *28*, 506–521.
16. Rosenzweig, E.D. A contingent view of e-collaboration and performance in manufacturing. *J. Oper. Manag.* **2009**, *27*, 462–478.
17. Liu, H.F.; Ke, W.L.; Wei, K.K.; Gu, J.B.; Chen, H.P. The role of institutional pressures and organizational culture in the firm's intention to adopt internet-enabled supply chain management systems. *J. Oper. Manag.* **2010**, *28*, 372–384.
18. Huang, M.-C.; Yen, G.-F.; Liu, T.-C. Reexamining supply chain integration and the supplier's performance relationships under uncertainty. *Supply Chain Manag. Int. J.* **2014**, *19*, 64–78.
19. Sezen, B. Relative effects of design, integration and information sharing on supply chain performance. *Supply Chain Manag. Int. J.* **2008**, *13*, 233–240.
20. Chen, H.; Mattioda, D.D.; Daugherty, P.J. Firmwide integration and firm performance. *Int. J. Logist. Manag.* **2007**, *18*, 5–21.
21. Lee, C.W.; Kwon, I.-W.G.; Severance, D. Relationship between supply chain performance and degree of linkage among supplier, internal integration, and customer. *Supply Chain Manag. Int. J.* **2007**, *12*, 444–452.
22. Mason, R.; Lalwani, C.; Boughton, R. Combining vertical and horizontal collaboration for transport optimization. *Supply Chain Manag. Int. J.* **2007**, *12*, 187–199.
23. Boon-Itt, S.; Paul, H. A study of supply chain integration in Thai automotive industry: A theoretical framework and measurement. *Manag. Res. News* **2006**, *29*, 194–205.
24. Rosenzweig, E.D.; Roth, A.V.; Dean, J.W., Jr. The influence of an integration strategy on competitive capabilities and business performance: An exploratory study of consumer products manufacturers. *J. Oper. Manag.* **2003**, *21*, 437–456.
25. Vickery, S.K.; Jayaram, J.; Droge, C.; Calantone, R. The effects of an integrative supply chain strategy on customer service and financial performance: An analysis of direct versus indirect relationships. *J. Oper. Manag.* **2003**, *21*, 523–539.
26. Terjesen, S.; Patel, P.C.; Sanders, N.R. Managing differentiation-integration duality in supply chain integration. *Decis. Sci.* **2012**, *43*, 303–339.
27. Das, A.; Narasimhan, R.; Talluri, S. Supplier integration-finding an optimal configuration. *J. Oper. Manag.* **2006**, *24*, 563–582.
28. Stock, J.R.; Boyer, S.L.; Harmon, T. Research opportunities in supply chain management. *J. Acad. Mark. Sci.* **2010**, *38*, 32–41.
29. Koufteros, X.A.; Cheng, E.T.C.; Lai, K.H. Black-box' and 'gray-box' supplier integration in product development: Antecedents, consequences and the moderating role of firm size. *J. Oper. Manag.* **2007**, *25*, 847–870.
30. Petersen, K.J.; Handfield, R.B.; Ragatz, G.L. Supplier integration into new product development: Coordinating product, process and supply chain design. *J. Oper. Manag.* **2005**, *23*, 371–388.
31. Swink, M.; Nair, A. Capturing the competitive advantages of AMT: Design-manufacturing integration as a complementary asset. *J. Oper. Manag.* **2007**, *25*, 736–754.
32. Swink, M.; Song, M. Effects of marketing manufacturing integration on new product development time and competitive advantage. *J. Oper. Manag.* **2007**, *25*, 203–217.
33. Pagell, M. Understanding the factors that enable and inhibit the integration of operations, purchasing and logistics. *J. Oper. Manag.* **2004**, *22*, 459–487.
34. Zhao, X.; Flynn, B.B.; Roth, A.V. Decision sciences research in China: Current status, opportunities, and propositions for research in supply chain management, logistics, and quality management. *Decis. Sci.* **2007**, *38*, 39–80.
35. Liu, H.F.; Ke, W.L.; Wei, K.K.; Hua, Z. Effects of supply chain integration and market orientation on firm performance: Evidence from China. *Int. J. Oper. Prod. Manag.* **2013**, *33*, 322–346.
36. Rainero, C.; Modarelli, G. Food tracking and blockchain-induced knowledge: A corporate social responsibility tool for sustainable decision-making. *Br. Food J.* **2021**, *123*, 4284–4308.
37. Zailani, S.; Rajagopal, P. Supply chain integration and performance: US versus East Asian companies. *Supply Chain Manag. Int. J.* **2005**, *10*, 379–393.
38. Yu, W. The effect of IT-enabled supply chain integration on performance. *Prod. Plan. Control.* **2015**, *26*, 945–957.

39. Gunasekaran, A.; Patel, C.; McGaughey, R.E. A framework for supply chain performance measurement. *Int. J. Prod. Econ.* **2004**, *87*, 333–347.
40. Kannan, V.R.; Tan, K.C. Supply chain integration: Cluster analysis of the impact of span of integration. *Supply Chain Manag. Int. J.* **2010**, *14*, 207–215.
41. Feng, M.; Yu, W.; Chavez, R.; Mangan, J.; Zhang, X. Guanxi and operational performance: The mediating role of supply chain integration. *Ind. Manag. Data Syst.* **2017**, *117*, 1650–1668.
42. Seo, Y.-J.; Dinwoodie, J.; Kwak, D.-W. The impact of innovativeness on supply chain performance: Is supply chain integration a missing link? *Supply Chain Manag. Int. J.* **2014**, *19*, 733–746.
43. Tseng, P.H.; Liao, C.H. Supply chain integration, information technology, market orientation and firm performance in container shipping firms. *Int. J. Logist. Manag.* **2015**, *26*, 82–106.
44. Wong, C.Y.; Boon-Itt, S.; Wong, C.W.Y. The contingency effects of environmental uncertainty on the relationship between supply chain integration and operational performance. *J. Oper. Manag.* **2011**, *29*, 604–615.
45. Frohlich, M.T.; Westbrook, R. Arcs of integration: An international study of supply chain strategies. *J. Oper. Manag.* **2001**, *19*, 185–200.
46. Frohlich, M.T.; Westbrook, R. Demand chain management in manufacturing and services: Web-based integration, drivers and performance. *J. Oper. Manag.* **2002**, *20*, 729–745.
47. Pålsson, H.; Sandberg, E. Packaging paradoxes in food supply chains: Exploring characteristics, underlying reasons and management strategies. *Int. J. Phys. Distrib. Logist. Manag.* **2022**, *52*, 25–52.
48. Naser, K.; Karbhari, Y.; Mokhtar, M.Z. Impact of ISO 9000 registration on company performance: Evidence from Malaysia. *Manag. Audit. J.* **2004**, *19*, 509–516.
49. Kafetzopoulos, D.; Psomas, E. The impact of innovation capability on the performance of manufacturing companies: The Greek case. *J. Manuf. Technol. Manag.* **2015**, *26*, 104–130.
50. Abu-Taieh, E.; Alhadid, I.; Masa'deh, R.; Alkhawaldeh, R.; Khwaldeh, S.; Alrowwad, A. Factors influencing YouTube as a learning tool and its influence on academic achievement in a bilingual environment using extended information adoption model (IAM) with ML prediction—Jordan case study. *Appl. Sci.* **2022**, *12*, 5856.
51. Luu, T.T. Ambidextrous leadership, entrepreneurial orientation, and operational performance: Organizational social capital as a moderator. *Leadersh. Organ. Dev. J.* **2017**, *38*, 229–253.
52. Chen, I.J.; Paulraj, A. Towards a theory of supply chain management: The constructs and measurements. *J. Oper. Manag.* **2004**, *22*, 119–150.
53. Eccles, R.G.; Pyburn, P.J. Creating a comprehensive system to measure performance. *Manag. Account.* **1992**, *74*, 41–44.
54. Dixon, J.R.; Nanni, A.J.; Vollmann, T.E. *The New Performance Challenge Measuring Operations for World-Class Competition*; Dow Jones-Irwin: Homewood, IL, USA, 1990.
55. Beamon, B.M. Measuring supply chain performance. *Int. J. Oper. Prod. Manag.* **1999**, *19*, 275–292.
56. Tan, K.; Kannan, V.; Narasimhan, R. The impact of operations capability on firm performance. *Int. J. Prod. Res.* **2007**, *45*, 5135–5156.
57. Heizer, J.H.; Render, B.; Weiss, H.J. *Principles of Operations Management*; Pearson Prentice Hall: Northampton, PA, USA, 2008.
58. Truong, H.Q.; Sameiro, M.; Fernandes, A.C.; Sampaio, P.; Duong, B.A.T.; Duong, H.H.; Vilhenac, E. Supply chain management practices and firms' operational performance. *Int. J. Qual. Reliab. Manag.* **2017**, *34*, 176–193.
59. McKone, K.; Schroeder, R.; Cua, K. The impact of total productive maintenance on manufacturing performance. *J. Oper. Manag.* **2001**, *19*, 39–58.
60. Abdallah, A.B.; Phan, A.C.; Matsui, Y. Investigating the effects of managerial and technological innovations on operational performance and customer satisfaction of manufacturing companies. *Int. J. Bus. Innov. Res.* **2016**, *10*, 153–183.
61. Ketokivi Mikko, A.; Roger, G. Schroeder. Perceptual measures of performance: Fact or fiction? *J. Oper. Manag.* **2004**, *22*, 247–264.
62. Abdallah, A.B.; Obeidat, B.Y.; Aqqad, N.O. The impact of supply chain management practices on supply chain performance in Jordan: The moderating effect of competitive intensity. *Int. Bus. Res.* **2014**, *7*, 13–27.
63. Ganbold, O.; Matsui, Y.; Rotaru, K. Effect of information technology-enabled supply chain integration on firm's operational performance. *J. Enterp. Inf. Manag.* **2021**, *34*, 948–989.
64. Khanuja, A.; Jain, R.K. Supply chain integration: A review of enablers, dimensions and performance. *Benchmarking Int. J.* **2020**, *27*, 264–301.
65. Cao, M.; Zhang, Q. Supply chain collaboration: Impact on collaborative advantage and firm performance. *J. Oper. Manag.* **2011**, *29*, 163–180.
66. Das, T.K.; Teng, B.-S. A resource-based theory of strategic alliances. *J. Manag.* **2000**, *26*, 31–61.
67. Dyer, J.H.; Singh, H. The relational view: Cooperative strategy and sources of inter-organizational competitive advantage. *Acad. Manag. Rev.* **1998**, *23*, 660–679.
68. Li, S.; Ragu-Nathan, B.; Ragu-Nathan, T.S.; Subba Rao, S. The impact of supply chain management practices on competitive advantage and organizational performance. *Omega Int. J. Manag. Sci.* **2006**, *34*, 107–124.
69. Wu, Z.; Choi, T.Y.; Rungtusanatham, M.J. Supplier-supplier relationships in buyer-supplier-supplier triads: Implications for supplier performance. *J. Oper. Manag.* **2010**, *28*, 115–123.
70. Quesada, G.; Rachamadugu, R.; Gonzalez, M.; Martinez, J.L. Linking order winning and external supply chain integration strategies. *Supply Chain Manag. Int. J.* **2008**, *13*, 296–303.

71. Rindfleisch, A. Transaction cost theory: Past, present and future. *AMS Rev.* **2020**, *10*, 85–97.
72. Eisenhardt, K.M.; Furr, N.R.; Bingham, C.B. Microfoundations of performance: Balancing efficiency and flexibility in dynamic environments. *Organ. Sci.* **2010**, *21*, 1263–1273.
73. Um, K.H.; Kim, S.M. The effects of supply chain collaboration on performance and transaction cost advantage: The moderation and nonlinear effects of governance mechanisms. *Int. J. Prod. Econ.* **2019**, *217*, 97–111.
74. Kim, S.W. The effect of supply chain integration on the alignment between corporate competitive capability and supply chain operational capability. *Int. J. Oper. Prod. Manag.* **2006**, *26*, 1084–1107.
75. Prajogo, D.; Olhager, J. Supply chain integration and performance: The effect of long-term relationship, information technology and sharing, and logistics integration. *Int. J. Prod. Econ.* **2012**, *135*, 514–522.
76. Huo, B. The impact of supply chain integration on company performance: An organizational capability perspective. *Supply Chain Manag. Int. J.* **2012**, *17*, 596–610.
77. Droge, C.; Jayaram, J.; Vickery, S.K. The effects of internal versus external integration practices on time-based performance and overall firm performance. *J. Oper. Manag.* **2004**, *22*, 557–573.
78. Da Silveira, G.; Arkader, R. The direct and mediated relationships between supply chain coordination investments and delivery performance. *Int. J. Oper. Prod. Manag.* **2007**, *27*, 140–158.
79. Kulp, S.C.; Lee, H.L.; Ofek, E. Manufacturer benefits from information integration with retail customers. *Manag. Sci.* **2004**, *50*, 431–444.
80. Germain, R.; Claycomb, C.; Dröge, C. Supply chain variability, organizational structure, and performance: The moderating effect of demand unpredictability. *J. Oper. Manag.* **2008**, *26*, 557–570.
81. Zhao, X.; Huo, B.; Flynn, B.B.; Yeung, J. The impact of power and relationship commitment on the integration between manufacturers and customers in a supply chain. *J. Oper. Manag.* **2008**, *26*, 368–388.
82. Yu, W.; Chavez, R.; Feng, M.; Wiengarten, F. Integrated green supply chain management and operational performance. *Supply Chain Manag. Int. J.* **2014**, *19*, 683–696.
83. ILO. *Skills for Trade and Economic Diversification (STED): Food Processing and Beverage Sector Jordan*; ILO Regional Office for Arab States-Beirut: Baabda, Lebanon, 2015.
84. Sekaran, U.; Bougie, R. *Research Methods for Business*, 6th ed.; John Wiley & Sons Ltd.: Chichester, UK, 2013.
85. Yong, A.G.; Pearce, S. A Beginner's guide to factor analysis: Focusing on exploratory factor analysis. *Tutor. Quant. Methods Psychol.* **2013**, *9*, 79–94.
86. DeCoster, J. Overview of Factor Analysis. 1998. Available online: http://www.stat-help.com/notes.html (accessed on 15 January 2018).
87. Thompson, B.; Daniel, L.G. Factor analytic evidence for the construct validity of scores: A historical overview and some guidelines. *Educ. Psychol. Meas.* **1996**, *56*, 197–208.
88. Gorsuch, R.L. *Factor Analysis*, 2nd ed.; Lawrence Erlbaum Associates: Hillside, NJ, USA, 1983.
89. Hair, J.F.; Black, W.C.; Babin, B.J.; Anderson, R.E. *Multivariate Data Analysis*, 7th ed.; Pearson Education, Inc.: Hoboken, NJ, USA, 2010.
90. Williams, B.; Brown, T.; Onsman, A. Exploratory factor analysis: A five-step guide for novices. *Australas. J. Paramed.* **2010**, *8*, 1–13.
91. Drost, E.A. Validity and Reliability in Social Science Research. *Educ. Res. Perspect.* **2011**, *38*, 105–123.
92. Bryman, A.; Bell, E. *Business Research Methods*, 4th ed.; Oxford University Press: Oxford, UK, 2015.
93. Mason, R.D.; Lind, D.A.; Marchal, W.G. *Statistical Techniques in Business and Economics*, 10th ed.; Irwin McGraw-Hill: Boston, MA, USA, 1999.
94. Myers, R. *Classical and Modern Regression with Applications*, 2nd ed.; Duxbury Press: Boston, MA, USA, 1990.
95. Lind, D.A.; Marchal, W.G.; Wathen, S.A. *Statistical Techniques in Business and Economics*, 15th ed.; McGraw-Hill: New York, NY, USA, 2012.
96. Kumar, S.A.; Mani, B.T.; Mahalingam, S.; Vanjikovan, M. Influence of service quality on attitudinal loyalty in private retail banking: An empirical study. *IUP J. Manag. Res.* **2010**, *9*, 21–38.
97. Koufteros, X.A.; Vonderembse, M.; Jayaram, J. Internal and external integration for product development: The contingency effects of uncertainty, equivocality, and platform strategy. *Decis. Sci.* **2005**, *36*, 97–133.
98. Giménez, C.; Ventura, E. Logistics-production, logistics-marketing and external integration: Their impact on performance. *Int. J. Oper. Prod. Manag.* **2005**, *25*, 20–38.
99. Ragatz, G.L.; Handfield, R.B.; Peterson, K.J. Benefits associated with supplier integration into new product development under conditions of technology uncertainty. *J. Bus. Res.* **2002**, *55*, 389–400.
100. Swink, M.; Narasimhan, R.; Wang, C. Managing beyond the factory walls: Effects of four types of strategic integration on manufacturing plant performance. *J. Oper. Manag.* **2007**, *25*, 148–164.