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Considering the consumer in the design of a supply chain of perishables

Special issue: Responsible innovation in the agri-food sector

RESEARCH ARTICLE

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Abstract

Customer satisfaction, contrary to a manufacturer based approach, is considered a key factor in the business strategy of many companies and in supply chain management. However, focusing on the consumer requires an analysis of the preference structure, which is something that conditions supply chain strategy. In this work we carry out a customer segmentation of a perishable product in order to identify different profiles, depending on their needs and preferences, which may allow the study of differentiated supply chain strategy. Thus, taking consumer satisfaction, we propose a differentiated supply chain approach depending on the segment which the company intends to address. In parallel and from a theoretical point of view, this approach represents a first step toward introducing the concept of responsible innovation in the study of supply chain management.

Keywords: strategic alignment, customer orientation, preferences analysis, segmentation, responsible innovation, vegetables, cooperatives

JEL code: M10, O39, Q11, Q13

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1. Introduction

There is a recognition that businesses must be ‘customer-centric’ not only in their marketing strategy but also in the way they go to market, which is changing the perspective and the professional identity of supply chain managers (Christopher and Ryals, 2014). Customers are the key to success, and businesses should therefore focus on maximizing the value created for their customers, since there is a significant positive relationship between superior logistics customer service and better firm performance (Leuschner *et al.*, 2013).

Nowadays, customer orientation plays an important role in supply chain strategy (Jeong and Hong, 2007; Maull *et al.*, 2012), and, therefore, a good understanding of customer needs builds a solid base for fruitful cooperation between customers and suppliers, increasing supply chain efficiency and customer satisfaction (Heikkilä, 2002).

In a sustainable world the supply chain needs to be designed from the customer backwards (demand pull) instead of from the factory outwards (supply push), as indicated by Christopher and Ryals (2014), making it responsive to customer demands while reducing waste and returns.

There is one problem, however, with this perspective. After having conducted a practical analysis of various supply chains, it becomes clear that there is always one firm or several which are the dominant actors, or the so-called hub firms (Rossetti and Choi, 2005). As a result, other members of the supply chain are prevented from maintaining a direct relationship with customers. Ultimately, the dominant firms ‘translate’ the needs of customers according to their own convenience (Hingley, 2005). This type of situation fundamentally stems from imbalances in negotiation power but also from inactivity on the part of the weakest members in the chain due to a lack of knowledge regarding customer needs. In fact, as suggested by Pimentel and Oliveira (2010), the procurement of information downstream, coming from wholesalers, distributors or retailers, improves collaboration within the chain, whereas the scenario of confrontation among actors competing against each other for profits in the chain is completely inefficient. In this context, this study proposes a simple method for analyzing customer needs which helps to balance commercial relationships within the chain, making the latter more efficient.

The present paper develops an analysis following the strategic alignment school theoretical framework (Gattorna *et al.*, 1991; Hjort *et al.* 2013). This approach postulated that customer orientation must prevail in supply chain management (SCM), taking into account their buying behavior, in contrast with the traditional model focused on the product (Figure 1). In addition, an attempt will also be made to apply this approach to SCM of highly-perishable products, namely vegetables marketed from southeast Spain. The chain analyzed is said region is made up of several layers of producer-marketers (mainly cooperatives), intermediaries, and large-scale distributors (retailers such as Lidl, Carrefour, Tesco, Aldi, etc.). The main customer of firms in this region is Germany (with nearly 35% of purchases). For this reason, an analysis will be carried out on the consumer preferences of this country in order to subsequently define SCM according to its needs.

In this way, by taking into account the processes that are detailed in the strategic alignment presented at theoretical level by Hjort *et al.* (2013), the goal of the present work is to make new empirical contributions which support the utility of segmentation to establish differentiated supply chain strategies when there is a customer orientation. To do so, we will conduct a final customer segmentation based on consumer preferences and then perform a correlation between customer profiles and segmentation resulting from the different strategies proposed for SCM, following the classification proposed by Christopher and Gattorna (2005).

The rest of the paper is structured as follows. In the second section, we discuss the importance that customer orientation has on the SCM, and we describe the differentiated strategies that have been proposed in the literature. In the third section, we describe the methodology of the study and the characteristics of the customer samples used for this analysis. In the fourth part, we present the results of the study and we establish the interrelationship between the different customer profiles depending on segmentation and the strategies

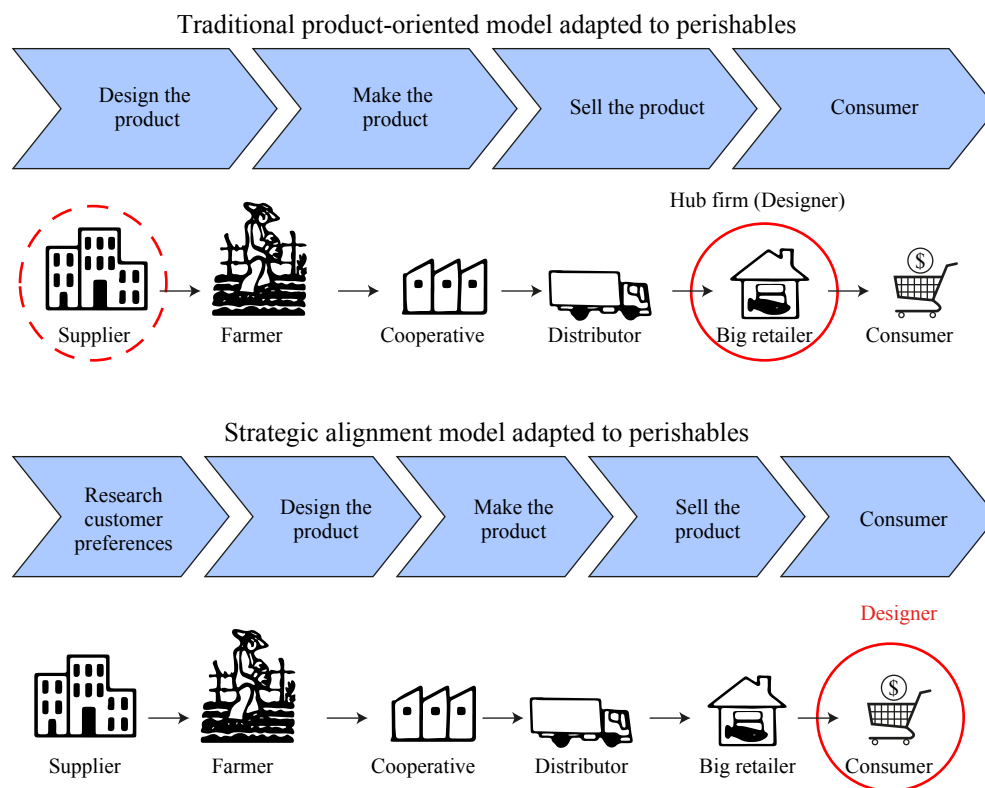


Figure 1. Typology of strategies in supply chain management.

described previously. In the fifth section, we analyze the implications of the perishable products supply chain, ending this study with a section of conclusions.

2. Design of a supply chain of perishables

Perishable products supply chains possess a series of features that differ from other food supply chains (Hewett, 2003): consumer requirements (freshness, origin, etc.), the high number of actors (e.g. many small producers) and the difficulties to obtain downstream information on collaborative buyer-supplier relationships. These supply chains are frequently characterized by a dominating effect (hub) exerted by the retailer, which imposes an upstream system. This occurs in such a way that the supplier considers the retailer its final customer and not the consumer. The retailer establishes how the chain will function according to its needs, considering those of the consumer or not, depending on its own interests (Pérez-Mesa and Galdeano, 2015). In some cases retailers make agreements with suppliers (packaging, seeds, etc.) so that, together, they can impose the use of their services to growers and cooperatives (Pérez-Mesa and Galdeano, 2011). However, this traditional design (Figure 1) is inefficient from the perspective of the suppliers and society as a whole. At present, the companies with the least power in the chain (cooperatives) have an opportunity to focus their actions on the customer and, thereby, avoid being overpowered. This is possible due to the existence of strong social trends among customers towards knowing the origin, quality and production methods of the products they consume (Pérez-Mesa *et al.*, 2016). This situation is also in keeping with new corporate trends which recognize the need for transparency.

In this sense, Blok *et al.* (2015) consider that it is necessary to involve stakeholders in business decisions by introducing the concept of Responsible Innovation (RI)¹. Therefore, SCM focused on the customer can be

¹ Is a relatively old-new term (Stilgoe *et al.*, 2013) that means to take into account the impact of innovations on individuals, societies and ecosystems (Blok and Lemmens, 2015).

understood as a mechanism of RI that includes the consumer, and therefore society, as a point of reference for design and improvement in all processes, always within a setting of sustainability (environmental, social and economic). Consumer involvement fulfills the four basic dimensions which compose RI (Stilgoe *et al.*, 2013): (1) anticipation and reflexivity, in that there is an upstream public engagement, making it necessary to question and respond to the impact of a defective product on the citizen; (2) inclusion and responsiveness, inasmuch as it requires gathering consumer preferences in a broad, open and transparent way.

In summary, we believe that strategic alignment represents a simple approach that allows the introduction of RI in SCM analysis. Through the practice of operation ‘transparency’ RI favors balance within the supply chain by eliminating the traditional relationships of control.

Upon analysis of the supply chain of perishables (Figure 1), precisely as in the traditional system, it is observed that power is controlled by basically two types of companies: on one hand, the suppliers (predominantly of seeds, fertilizers and biotechnology²), and, on the other hand, but to a greater extent, large-scale retailers. An example of this power is the fact that these companies impose their own packaging model (standardization), which often does not provide information on origin or production methods. For cooperatives, this disrupts the communication of their know-how to the final consumer and, of course, it distorts customer feedback as consumers are ultimately unaware of cooperatives’ efforts to improve their products. In other cases, the retailer can opt for selling organic produce in its stores following completely opaque strategies by finding the cheapest product possible and impeding customers from differentiating it from that of any of their other suppliers. The alternative perspective (strategic alignment model), which aims to align supply chain with customers to create more value, would implicate the introduction of RI, giving power to the customer and, consequently, providing greater transparency within the chain. Change will only take place in both systems if cooperatives endeavor to procure information on consumer preferences and eliminate the information asymmetry in supplier-buyer negotiation. In fact, this stronger stakeholder engagement approach could favor the ability to recognize entrepreneurial opportunities (Scholten and Van der Duin, 2015) and, at the same time, transaction costs can be reduced, for example, by developing new products adapted to the consumer.

In general, this study addresses the hypothesis that even by following a customer orientation approach when designing a chain for perishables, the final customer relinquishes their power to the retailer. This ultimately means that the consumer neither dictates the design of the SC strategy nor drives its inclusion of RI.

3. Strategies in customer-oriented supply chain management

3.1 Customer orientation in supply chain management

Rindfleisch and Moorman (2003) defined customer orientation as the set of behaviors and beliefs that place priority on customer interests and continuously create superior customer value. It is, as Slater states (1995), a culture that accentuates the creation of customer value.

Although customer orientation is considered a key element in supply chain, as indicated by Conduit and Mavondo (2001), and is an important characteristic of SCM philosophy (Mentzer *et al.*, 2001), responsiveness to customer needs has usually been a critical issue from the point of view of chain management (Martin and Grbac, 2003). However, the implementation of both concepts can offer products and services of high value.

One of the main problems affecting the food sector at present is the issue of whether the supply chain has completely addressed the risks to consumers and the externalities that it generates. To be more specific, there is doubt as to whether SCM takes into account the basic principles of RI. *A priori*, customer orientation could

² In recent years, this sector has seen a growing concentration of businesses, for example, the purchase of Syngenta by ChemChina, and Monsanto by Bayer.

serve as a tool in this regard; although one inevitably wonders if the final customer is truly 'responsible' or not, essentially posing the question of whether they consider the global impact of their actions as consumers.

In practical terms, and pertaining to agricultural produce, the problem described above has been solved by implementing private quality standards (Global Gap, QS, Nurture, etc.), which are frequently managed by the retailer itself. The question now becomes whether these standards actually include consumer requirements. In our opinion, the quality standards imposed on suppliers by retailers are deficient in this regard. For example, these standards imply that responsibility regarding food safety falls mainly on the producer, primarily due to incorrect application of regulations. Proper RI application in the chain implies collective and systemic responsibility (Pellé and Reber, 2015). This situation is especially delicate when food crises occur in which the objective of the retailer is to diminish its apparent responsibility so as to minimize damages, for example, by avoiding handling of products at points of sale.

According to Jeong and Hong (2007), customer orientation in the supply chain is defined as the degree to which a supply chain focuses on customers and recognizes their desires, placing priority on meeting their needs with superior products or services through collaboration with other supply chain partners. According to Maull *et al.* (2012), SCM from the perspective of the customer provides insights into how managers can establish and manage supply chains to deliver better value for customers, improve relationships, and create partnerships with them. Indeed, the literature consistently associates management skills with the highest levels of customer satisfaction (e.g. Green *et al.*, 2006; Tracey *et al.*, 2005). However, customer orientation must not only meet the needs of customers simply to save their time but it also requires companies to maintain this contact while adapting changes to customers' preferences.

In this sense, Jeong and Hong (2007) identify three aspects of customer orientation in supply chains: (1) customer-closeness, (2) customer-flexible and (3) customer-accessible. The first aspect of customer orientation is an organizational and individual commitment to stay in touch with customers and continue observing their changing needs over time (Bowen *et al.*, 1989; Conduit and Mavondo, 2001). Customer-flexible refers to the extent of awareness and the intention of firms that are willing to respond to changing customer expectations and preferences (Kerwin, 2003; Lau, 1996). And thirdly, customer-accessible refers to the extent to which a supply chain is ready to allow customers to access information that is critical for fulfilling their multiple requirements (quality, environmental, delivery, cost, etc.) (Cho and Park, 2003).

Taking into consideration that customer needs are heterogeneous, focusing on a single supply chain strategy does not seem to be a valid approach to achieve this goal (Godsell *et al.*, 2011). Consequently, it is necessary to design alternative strategies for managing supply chain.

The two methods of considering differentiated strategies in SCM, whether by linking them to the different products of the companies or considering the customer orientations, are approaches that have been discussed in the literature on SCM over the last three decades. If Fisher (1997) was the first to suggest differentiated strategies of SCM based on products, then Gattorna *et al.* (1991) proposed a similar argument, although by taking customer segmentation as a reference; and it is these two approaches that led two schools of thinking in SCM: the lean-agile school and strategic alignment school, whose principles have been endorsed by a significant number of works (e.g. Christopher *et al.*, 2006; Godsell *et al.*, 2011; Hjort *et al.*, 2013).

Nevertheless, using only the product characteristics in the strategy design (product focus) has a significant limitation: it does not reveal the different necessities of the market segments, which would imply a company turning its back on the customer. For this reason, a proposal was developed based on the strategic alignment school, and we consider it more suitable as customers can be divided according to shopping behavior, and, based on this, different strategies can be developed in the supply chain to satisfy the individual segment necessities (Jüttner and Christopher, 2013).

3.2 Strategies in supply chain management: strategic alignment

Despite the importance of approaches of strategic alignment at a theoretical level (Ericsson, 2011; Gattorna, 2005) there are few studies for reference when dealing with empirical terms, the most significant is the work of Godsell *et al.* (2011). The fact that the strategic alignment model presents a significant lack of empirical studies in the literature is because until recently the real implications of customer segmentation had not been considered in relation to SCM. In fact, it is not until the work of Christopher and Gattorna (2005) that we find an inflection point in this respect, as this study reveals a theoretical framework where there are four different strategies of SCM depending on the customer segmentation (Table 1).

As we can see in Table 1, Christopher and Gattorna (2005) propose the following classification in supply chain strategy: (1) Totally flexible; (2) Agile; (3) Lean system; and (4) Continuous supplies. Based on this, totally flexible supply chains are those adapted and oriented toward innovative customers who prioritize the newness of the product and not the classic attributes. On the other hand, agile chains are necessary when the customers have better stability in their buying preferences and higher exigency levels. SCM in lean systems is a characteristic for having a customer who looks for efficiency and who assesses financial value. This type of customer also seeks the reduction of inbound and outbound logistics, thereby offering a product which closer resembles what the customer actually demands and also decreasing delivery time. Customers demand fresh produce. Finally, continuous supply chains are suitable for the customers who look for cooperation, creating a link between the selling format offered by the chain and the customer.

Taking into account this classification, we can observe how customer segmentation is a key tool to determine the reach of the differentiation in the supply chain. Thus, the criteria and methods used to segment shopping behavior will be the ones which condition the type of management.

Table 1. Typology of the supply chain according to demand characteristics (adapted from Christopher and Gattorna, 2005).

Characteristics of the demand-customer	Summary →	Kinds of supply chain
Innovative solutions: <ul style="list-style-type: none"> • Changing demand (uncertainty). • New production methods (e.g. environmental respect). • Valuation of new products. • Low sensitivity to price. 	Make the response ability better	Totally flexible
Demanding: <ul style="list-style-type: none"> • Changing demand (risk). • Demanding customer (e.g. safety aspects, health standards, taste), more than apparent quality (e.g. freshness). • Media sensitivity to price. 	Response to unpredictable demand	Agile
Efficiency/consistency: <ul style="list-style-type: none"> • Foreseeable demand. • Demand values the apparent quality (freshness). • Evaluation of quality/price relationship. • Standard product demand. 	Taking advantage of scale economies	Lean
Partnership: <ul style="list-style-type: none"> • Foreseeable demand. • Evaluation of supply and demand relationship. • Consumer's worry by the origin (loyalty). • Price not an issue due to the customer loyalty. 	Look for confidence-collaboration	Continuous supply

4. Methodology

With the objective of analyzing how a supply chain strategy should be established in a customer-oriented approach, the present work performs a customer segmentation considering the proposals of strategic alignment suggested by Gattorna (1998) and adapted by Hjort *et al.* (2013). The aim herein, firstly, is to identify different customer profiles that feature heterogeneous needs and, secondly, to establish the strategic design of the supply chain that offers the best guidance for each of these profiles. This main objective of the SCM fulfills the function of achieving the highest satisfaction level for the customer.

With regard to selecting the most appropriate criteria for obtaining heterogeneous groups, customer segmentation based on shopping behavior is placed in what Wind (1978) considers behavioral rules, in which we find the benefits, perceptions or preferences originally sought after. In fact, if the objective of market segmentation is the identification of differences which have implications for a firm's marketing decisions, behavioral variables can be considered as the most suitable ones (Lilien *et al.*, 1992).

As for establishing the different strategies of a supply chain, we are going to consider the behavioral criteria that impact customer preferences. More specifically, this will be an examination of the predisposition to evaluate products or brands, taking three vegetables as reference: tomatoes, peppers and cucumbers.

Supported by the Conjoint Analysis methodology, we will establish customer preferences based on the combination of different determinant attributes. This will allow, through a Cluster Analysis, the attainment of customer profiles, from which we will be able to determine the most appropriate strategies for managing the supply chain.

Initially, it would seem plausible to consider that as they are from the same food category (vegetables), segmentation should offer similar results for the three products, which could lead us to consider a single supply chain strategy. If this were not the case, it would not only confirm the complexity that surrounds the act of shopping, even when dealing with products of daily consumption, but it would also oblige the design of different supply chains, even for the same kind of vegetable.

4.1 Research design

To conduct this study, the German market was selected as it is the most powerful in the EU and one of the most powerful world economies. In fact, Germany is the world's number one food importer, reaching nearly 40 million tons, of which approximately 2.7 tonnes are vegetables.

Among the most commonly consumed vegetables by German citizens, tomatoes, peppers, and cucumbers have a privileged place in the shopping cart (Rioboo, 2006). Similarly, they occupy the top three positions among German vegetables imports, hence their selection for this work. However, for the purposes of this study, we specifically asked consumers to evaluate these three products together as they are the most exported vegetables to Germany from Spanish companies.

German citizens were surveyed from June to September 2013, in the boarding area of an airport located in the city of Almería, in southern Spain, which is regularly frequented by German tourists. The questionnaires had been previously left at the check-in desk, thereby taking advantage of the waiting time before flights to Germany. We obtained 378 valid surveys. The fact sheet is displayed in Table 2 and the sample population in Table 3.

We believe that the composition of the sample suitably reflects that of German consumer demographics. It is important to note that 81.7% of the respondents were regular customers of supermarkets and, in addition to being customers, 96.5% were also consumers. Therefore, among these people, the role of customer and consumer coincided, so in this particular study the use of one term or the other is indifferent.

Table 2. Investigation fact datasheet.

Characteristics	
Area	International
Universe	German adult citizens
Sample size	378
Sample error	±5.05%
Confidence level	95.5% (p=q=50), k=2
Sampling	Simple random
Working area	Boarding area of flights to Germany in a Spanish city airport
Survey date	June to September 2013

Table 3. Sample population.

Variable		%	Variable		%
Sex	Man	43	Income level (€)	<18,000	9
	Woman	57		18,000-30,000	18
Age	18-24	21		30,000-42,000	28
	25-30	10		42,000-54,000	13
	31-40	17		>54,000	17
	41-50	28	Education level	No answer	16
	51-65	17		Primary	36
	>65	4		Secondary	38
No answer	No answer	3		University	22
				No education	1
				No answer	3

4.2 Attributes selection

When selecting the attributes which drive German consumer preferences, the existing literature provided little information, but all studies did reference the attribute of Price. However, a market research study conducted by the institute GfK on the attributes most highly valued by German consumers when buying vegetables (Oficina Comercial de España en Dusseldorf, 2003) offers important insights into this subject. In this study, the most valued attributes were: product freshness (66%), appearance (53%), consistency (28%), and price (26%).

In order to make a final selection of the attributes, in addition to the information obtained in this study, the following criteria were taken into account: (1) the opinion of experts closely related to the production and sale of vegetables and those who work with the German market, in particular; (2) the most used attributes in previous works on agrifood marketing, especially in reference to vegetables, and use preference analysis (mainly the combined analysis methodology); (3) the research objectives, according to the Christopher and Gattorna (2005) classification. Based on this, only four different attributes were chosen: price, country of origin, and method, as extrinsic attributes, and freshness, as an intrinsic attribute. Thus, the answers of respondents are provided to subsequently apply the preferences analysis.

Price, considered as a standard choice criteria, is an attribute considered in previous literature, which typically discusses customers preferences in the food sector in general (e.g. Chan-Halbrendt *et al.*, 2010; Krystallis and Ness, 2005) and in the vegetables sector in particular (e.g. Dagupen *et al.*, 2009; Jiménez *et al.*, 2010). Moreover, from a methodological point of view, as Hair *et al.* (1998) highlight, this is a factor included

in many research works because it implies a different value component for many products. Although it is an attribute that may have high correlation inter-attributes with other factors, or may interact with other attributes (particularly with more intangible factors such as the brand name), it must be included in studies that analyze customer preferences.

Considering product origin as a relevant attribute in customer preference is supported by the fact that the country of origin is considered one of the most important extrinsic attributes in the evaluation. Moreover, the importance of this attribute and its influence on product evaluation has been fully corroborated in previous works: Verlegh and Steenkamp (1999) or Laroche *et al.* (2005), including hundreds of works since 1960. In line with the present work, certain studies should be highlighted, such as Jaeger *et al.* (2001) and Nelson *et al.* (2005), which focus on fruits, and Dagupen *et al.* (2009) or Jiménez *et al.* (2010), which deals with vegetables.

Production method can also be considered as a very important attribute in evaluating preferences and it has been used in many studies (e.g. Campbell *et al.*, 2004; Dagupen *et al.*, 2009; Jiménez *et al.*, 2010). In addition, considering production method it is possible evaluating customer preferences about for organic products, because, as Montaner and Uzcanga (2007) point out, the coverage rate for organic consumption in German households nowadays reaches 91%, and 45% usually buy these products.

Finally, freshness is an attribute that has been considered in many previous works, for example in the works of Babicz-Zielinska (1999), Ragaert *et al.* (2004), or more recently in Dagupen *et al.* (2009) and Jiménez *et al.* (2010). Moreover, as stated before, the study titled 'Fruits and vegetables: changes in the eating habits' conducted by the German Institute GfK (Bulletin 4 from the German Market of the Spanish Commercial Office in Dusseldorf), took into account freshness as the most valued factor for vegetables among the German consumer. Freshness is an aspect that has been recently corroborated by the Spanish Commercial Office in Dusseldorf (2011) at the Fruit Logistica Fair 2010, where the preferences of German consumers toward fresh vegetables were also highlighted.

4.3 Market segmentation and survey

To segment the market in this study Conjoint Analysis was chosen (Green and Krieger, 1991). Firstly, the groups were determined based on their preference structures and, secondly, each segment was defined. Based on this, the segmentation was conducted in two parts: first, we performed a hierarchical cluster analysis to determine the number of proper segments using the Ward method, which gave results of three proper segments for values of a distance bigger than 10. Next, in a second stage, we made a non-hierarchical K-means analysis using the relative importance assigned by each person to the selected factors (price, freshness, origin, and production method) and for each vegetable. In addition, through a determinant analysis, we confirmed the validity of the resulting groups from the cluster analysis.

With regard to the questionnaire for analyzing the preferences of German consumers, nine combinations out of 54 total resulting profiles ($3 \times 2 \times 3 \times 3$)³ were evaluated by means of a Likert scale once the levels of four selected attributes were combined (price, country of origin, production method, and freshness).

The values related to relative importance of the attributes were obtained once a preference analysis was carried out using the Conjoint Analysis methodology (Silayoi and Speece, 2007) and the model parameters were estimated (Supplementary Tables S1 and S2).

³ The levels assigned to the selected attributes were the following:

- Three levels are considered for the attribute country of origin: Germany, Spain and the Netherlands.
- With regard to production method, two different levels are considered: organic and non-organic.
- As relates to freshness, three levels were considered: very fresh, quite fresh and not very fresh.
- For the attribute price, the only numeric variable, three different levels are considered: 1 € per kg, 2 € per kg and 3 € per kg.

5. Results

5.1 Segmentation of vegetables customers

The results of the non-hierarchical K-means Cluster Analysis made with reference to German vegetables customers are found in Table 3, where the final conglomerate centers and the ANOVA results are found. Taking into account the previous hierarchical analysis results, three segments are obtained that represent 35.4, 22.5, and 42.1% of those surveyed, respectively.

Table 4 shows the average scores of the final conglomerate centers for each of the three identified clusters and for each characteristic. As can be seen, in the first conglomerate there is a light preference for vegetable freshness (31.19 of average scoring), a circumstance that is made much more evident in the third conglomerate (51.87). For the second conglomerate there is a clear preference for origin. The results of tomato are also similar, while the customer segmentation of cucumber and pepper reveal somewhat different results, particularly in Segments 1 and 2.

The conglomerates must be independent of each other, but the characteristics of the subjects from the same conglomerate must be similar. This means that there must be similar inter-conglomerate characteristics (in each conglomerate) and different intra-conglomerate characteristics (among them). To know whether these differences between conglomerates are significant or not, the ANOVA method was utilized, which will make it possible to corroborate the hypotheses of equal means between the groups in each independent variable. As can be seen in Table 4, the statistic value for F for each of the four variables is indicative that they are

Table 4. Final conglomerate centers and ANOVA (vegetables customers).

	Segment #1	Segment #2	Segment #3	F	Sig.
Conjoint vegetables					
Price	11.77	17.22	14.45	5.182	0.006
Freshness	31.19	14.49	51.87	283.077	0.000
Origin	28.06	56.50	22.92	194.973	0.000
Production method	28.98	11.79	10.76	174.529	0.000
Segment size	134 (35.4%)	85 (22.5%)	159 (42.1%)		
Tomato					
Price	11.61	11.49	16.77	3.601	0.030
Freshness	31.34	10.61	48.75	88.249	0.000
Origin	29.26	68.13	23.65	111.894	0.000
Production method	27.79	9.76	10.84	65.908	0.000
Segment size	65 (41.7%)	20 (12.8%)	71 (45.5%)		
Cucumber					
Price	19.06	9.92	10.34	8.264	0.000
Freshness	23.79	7.23	54.08	139.753	0.000
Origin	30.49	72.77	21.79	98.779	0.000
Production method	26.66	10.09	13.80	20.638	0.000
Segment size	56 (47.1%)	13 (10.9%)	50 (42.0%)		
Pepper					
Price	9.97	17.51	9.22	5.338	0.006
Freshness	14.40	31.48	68.12	90.682	0.000
Origin	67.21	32.85	19.80	101.440	0.000
Production method	8.41	18.16	10.86	10.080	0.000
Segment size	15 (14.6%)	59 (57.3%)	29 (28.1%)		

significant (for conjoint vegetables and individually), rejecting the invalid hypotheses and confirming the existence of important differences between the conglomerates of these variables.

The Discriminant Analysis makes the groupings in Table 4 valid, as 94.7% of the cases it presents are properly classified (94.2% for tomato; 98.3% for cucumber; 95.1% for pepper). Moreover, the canonical interrelationship reaches a high value of 0.803 (0.818 for tomato; 0.852 for cucumber; 0.855 for pepper), which indicates that the discriminant variables allow distinguishing between groups as well as between the Wilks's Lambda statistic, which contrasts the invalid hypothesis that the multivariating means of the groups are the same, with a value of 0.187⁴ (0.187 for tomato; 0.151 for cucumber; 0.188 for pepper). The significance of the Wilks's Lambda statistic is evaluated through a chi-square transformation, obtaining a value of 626.854 which is significant up to 99% (266.165 for tomato; 217.198 for cucumber; 165.638 for pepper) and is a means to reject the invalid hypothesis, confirming heterogeneity in the groups.

Finally, Table 5 compiles the strategies that would prevail in the supply chain for each kind of customer resulting from the segmentation.

As can be seen in the vegetables segment as a whole, for Segment 1 and 3, where freshness is the preferred attribute in the analyzed vegetables, the strategy of the supply chain with a lean system is the most appropriate. On the other hand, in Segment 2, where product origin influences the purchase, results suggest a continuous supply chain strategy. For the analyzed vegetables, the choice was made to discard a design of the agile or flexible supply chain. In fact, it must also not be forgotten that there is an important aspect that characterizes supply chain, and conditions this decision: the type of variation in the demand. For vegetables, the demand is highly predictable because it is characterized by its seasonality (Pérez-Mesa and Galdeano, 2011). This causes consumption itself to discriminate against agile and flexible supply chains.

Nevertheless, it is necessary to emphasize that although the chosen supply chain strategy may have been based on preferred attributes in each segment, situations exist in which this selection process is not so evident, whether it be analyzed by considering all vegetables as a whole or each of them individually. Segment 2 serves as an example in the analysis of pepper in the sense that a lean chain could be just as valid as the chosen continuous type. Additionally, in the case of Segment 1 for cucumber, the importance acquired by the production method could lead us to conclude that this implies a probable change in trend from a continuous chain to a flexible one.

Finally, Supplementary Table S3 displays the importance of socioeconomic variables and demographics in each of the segments calculated by considering all types of vegetables. It can be seen that the same profile

⁴ Values near 1 of a statistic will indicate a similarity between groups (they are superimposed), and values near 0 will indicate a large difference between the groups (the variability intra-groups rises).

Table 5. Supply chain strategy by segments.

	Segment #1	Segment #2	Segment #3
Vegetables	Lean: Customer looks for efficiency (e.g. good relation freshness-price)	Continuous: Customers take into account extrinsic factors such as origin, there is a loyal consumer looking for an identified and standard product	Lean
Details by product			
Tomato	Lean	Continuous	Lean
Cucumber	Continuous	Continuous	Lean
Pepper	Continuous	Continuous/lean	Lean

prevails in all of the segments: an individual who shops on a regular basis and consumes frequently, middle-aged (35-55 years old), with non-university studies, and who belongs to the middle class. These data can serve to support the validity of the sample.

6. Implications of perishable products in supply chain strategy

In general, the approach proposed in this article has important implications in the industry that are worth analyzing as it implies giving the larger role to the final customer. This change means that it will be the customer who will define companies' behavior in the chain, as opposed to the traditional orientation toward perishable products, based on the existence of a 'hubfirm', where the retailer influences the rest of the members based on their strategies (Pérez-Mesa and Galdeano, 2015).

By taking into account the shopping preferences of vegetable consumers gathered from the segmentation with the method of SCM based on the customer proposed by Christopher and Gattorna (2005), can be established that: (1) when we have a consumer that prioritizes newness (e.g. production method) rather than the classic attributes based on quality and price, a total flexible supply chain must be designed. This is the case of innovative customers who do not have a defined and stable shopping diagram, although they will be influenced by intrinsic aspects based on the organoleptic value, safety, health standards, and nutritional values; (2) if the customer has a clear shopping diagram and exigency levels (like consumption comfort), then agile supply chains should be considered; (3) when the final customer looks for efficiency and bears in mind aspects related to apparent quality (freshness or absence of mechanical damages) and he or she values the quality-price relationship, then lean system management should be considered; (4) finally, when customers take into account extrinsic factors such as origin or packaging and the product acquisition in more standardized formats, the best option will be continuous supply chains.

It is obvious that there may be different strategies in the supply chain and the implications for actors will be different. For this reason, Table 6 displays the strategies derived from a SCM based on the customer, considering the ones which would affect the supply chain members (in the scope of this study, a vegetable provider).

Considering the predominance of a continuous supply system, the companies in the chain should prioritize relationships between its members. The supplier at the origin will have to strongly integrate with the retailer. In the lean system case, which is also relevant, the chain members will have to prioritize the sale of standard products at a reasonable price. In this situation, the provider will have to be able to provide a low cost product even though it is necessary to establish relationships between more competitive production areas (for example, the south of Spain, Morocco or Senegal) or even outsourcing part of production.

It is necessary to take into account that continuous supply will mean accepting retailer domination. The latter will work to interpret consumer demands, which also includes interpreting RI according to its own interests. This does not have any negative connotations per se, inasmuch as a better understanding of the customer is a source of competitive advantage over competitors. In short, the consumer wants the retailer to handle everything. It must be noted that continuous supply involves returning to a product-focus approach.

The lean system does not grant total control to the retailer. Basically, the consumer wants the producer to also assume their own responsibility by providing healthy produce. The former will continue trusting the retailer insofar as they know how to control their suppliers and offer a decent quality-price ratio.

After viewing the results, it is patently clear that the consumer does not act as the designer of the chain. Consumers prefer that the large-scale distributors assume the dominant role and provide them with an inexpensive product with acceptable quality. In this situation the retailer has no incentives to implement all of the requirements that RI demands of the chain, which is why the supply chain does not completely address risks and externalities. On the contrary, these would be treated more thoroughly if consumers demanded

Table 6. Management implications in a segmented supply chain (adapted from Christopher and Gattorna, 2005).

SCM ¹	General implications for members in the supply chain	Specific implications for a supplier of perishable products: vegetables.
Continuous supply	<ul style="list-style-type: none"> • Low promotional activity. • Cost reduction collaborative strategies. • Safe production programming: sharing demand predictions. • Close relationship between supplier-customer. • Focused on maintaining strategies from customer/supplier. 	<ul style="list-style-type: none"> • Search of long term relationships between retailer-supplier. • Trend toward full chain integration based on scale economics.
Lean system	<ul style="list-style-type: none"> • Low promotional activity. • Focus on cost shortages for production inputs. • Maintain enough but narrow margins between the members: offer lower price if possible. • Maximum capacity usage. • Look for efficiency in engineering and all processes. • Vertical relation activity in the chain is low. 	<ul style="list-style-type: none"> • Search for alternative selling channels: retailer, wholesaler, new countries, etc. The goal is to be inexpensive and profitable (to this end, it will be necessary to sell in many channels). • Search for long-term agreements with other providers (as me). Even inside and outside my area/country.
Agile	<ul style="list-style-type: none"> • Development of new formats for products and sales. • High promotional activity. • Focused on detecting changes in the final customer. • Search for easy ways for the consumer to access the product. • Flexible production structure in short periods. • The relationship activity in the chain is low. 	<ul style="list-style-type: none"> • Specialized production (small quantities and distinctive characteristics). • Tendency toward organic production. • Innovation in packaging. • Agreements with similar production companies. • Distribution centers (warehouse) at the destination.
Flexible	<ul style="list-style-type: none"> • Focused promoting activities. • Strong investment in innovation and technology. • Coverage agreements in case of unexpected changes. • Strong relational activity in the chain but only to solve particular problems. 	<ul style="list-style-type: none"> • Tendency toward organic production. • Investment or search for agreements with new varieties of investigation centers. • Keep arrangements with other production companies (farmers) with several alternative products.

¹ SCM = supply chain management.

Agile and Flexible chains. However, at present, it appears that the introduction of stricter quality standards (for example, by including obligatory social practices, such as the GlobalGAP Risk Assessment on Social Practice-scheme (GRASP)) will be put on hold for the time being.

7. Conclusions

To be competitive in a global market, companies must make an effort to innovate and differentiate themselves from the competitor, while keeping in mind consumer preferences and, in general, stakeholder engagement. A key element in this customer-oriented approach in supply chain strategy is the set of logistics activities which are intended to meet the needs of customers by offering high quality products and services, supplied through collaboration with the different members involved in this goal. This approach is directly linked to RI inasmuch as making customers the central element requires highlighting the concerns of customers themselves within the supply chain regarding issues such as environmental sustainability, health, social development in production areas, etc. In regard to the specific case in the present study (SCM of perishable products), this approach implies limiting the power of the retailer in favor of the final consumer, granting

the latter with the indirect power to condition the design of the supply chain. It is supposed that this would improve the efficiency from the point of view of society as a whole. The existence of a more 'transparent' chain, in which knowledge flows downstream, would help to improve collaboration (Pimentel and Oliveira, 2010) and also the balance in buyer-supplier negotiations as a consequence of the rupture in information asymmetry (Blok *et al.*, 2015).

This means that depending on the extent to which customer needs are different or simply change over time, the supply chain strategy must change accordingly. This approach implies overcoming the theoretical postulates that suggest the desirability of a single strategy for the supply chain based on the product, as opposed to others which see fit to use differentiated strategies according to customer needs (Godsell *et al.*, 2011).

In this work we have sought to reinforce these approaches with a perishable product typology, namely with vegetables. Although they are traditionally considered as commodities, there are many varieties available to the consumer. From a preference analysis and a cluster analysis, we have noticed consumer segments whose preferences are different from a selected attribute choice and, based on that, the necessity of considering alternative strategies in the supply chain has been analyzed.

The results obtained from the segmentation are a starting point to establish differentiated strategies for the supply chain based on, what Gattorna (1998) call, strategic alignment, a model which proposes a supply chain strategy oriented toward the consumer and driven by shopping behavior. It should be noted that we consider that strategic alignment is a relatively simple way to include the RI concept in the SCM. In parallel, the question is also put forth as to whether RI is explicitly included in the current SCM and whether the dominant actors in the chain possess the incentives to include it, that is, according to the demands of the final consumers.

As regards specific results, in the present case studied, customer segmentation has important consequences for SCM and for members' strategies, which will depend on the product sold. Based on selected attributes, in Germany there are basically two kinds of consumers: those who focus their preferences on product origin and those for whom product freshness is a priority.

If the customer preferences are focused on apparent quality (like freshness) and on the purchase of a standard product (homogeneous), the lean system will be the best option according to decisions that coincide with discount German distribution characteristics (Aldi, Lidl, etc.). In this situation, the provider must be capable of supplying a low-cost product and outsourcing (producing in less expensive areas) if necessary. Furthermore, when the origin is a preferred aspect, the continuous model will be the most appropriate for customers who value the supplier's effort to offer a quality product and promote customer loyalty. In this context, the supplier must focus on the establishment of long term relationships with the retailer. From the point of view of fruit and vegetable marketing firms, the lean system implies focusing on aspects of production and marketing cost control, without forgetting to meet the quality standards required by the customer. The continuous model, for example, would require 'open books' policies that facilitate the exchange of information so that the retailer may more easily design their own promotion and loyalty policies.

On the other hand, according to the present analysis, there appears to be deficient collaboration in the chain of perishables studied in terms of transparency, interaction and joint responsibility. However, the consumer characteristics, along with the design of the derived chain, suggest that considerable benefits could exist in the supplier-buyer relationship if this issue were addressed as a key priority. This leads to the question as to why this has not yet happened. The answer may lie in the fact that when dealing with highly perishable products the integration of the chain implies running great risks as a consequence of managing flows which are altered by uncontrollable variables (meteorology, pest, etc.).

It should be noted that from the perspective of RI implementation in the supply chain, both systems (lean and continuous) consider it essential that the retailer participate as the dominating actor, despite being based

on a customer approach. This implies important consequences: (1) the consumer trusts the retailer's effort to provide an inexpensive and quality product; (2) the consumer avoids the responsibility of demanding application of basic RI aspects in the chain, such as control of externalities; (3) the retailer, depending on purely economic motives, that will decide the rate at which RI is introduced; (4) quality standards (imposed by the retailer) will continue to be deficient with regard to the incorporation of RI. Of course, this outlook will change over time depending on consumer behavior.

The results of this work present some limitations as the study itself focuses on a particular market (Germany). On the other hand, the methodology obliges us to select some attributes and reject others. For this reason, there is the possibility that different attributes (e.g. quality, size or packaging) could have been part of the consumers' preference structure, creating different profiles and, consequently, other supply chain strategies. Another line of research could consider not only the customer as the starting point of SCM, but also all stakeholders, in a more general framework of RI. This would make it possible to avoid the problems caused by strategies that modify consumption trends, which are commonly used by the agriculture industry and large-scale distributors.

Acknowledgments

This research was partially funded by Excellence Projects of Junta de Andalucía (Spain) reference SEJ-7085 and SEJ-2555; Spanish MCINN and FEDER aid, project ECO2014-52268-P; Spanish Ministry of Economy and Science and the European Regional Development Fund-ERDF/FEDER (National R&D Project ECO2015-66504-P). The authors are also grateful for the support received from C-BIRD project, Cooperative Business and Innovative Rural Development (project 611490, FP7-PEOPLE-2013-IAPP).

Supplementary material

Supplementary material can be found online at <https://doi.org/10.22434/IFAMR2017.0019>.

Table S1. Estimated parameters of the combined preferences model.

Table S2. Factors relative importance.

Table S3. Socioeconomic and demographic description of the segments for vegetables.

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