Measuring performance at the supply chain level: the role of the chain director

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Abstract

Supply chains lack their own across-the-board managers that can design and implement a performance measurement system (PMS), nor do they have an explicit overall strategy from which the PMS can be derived. The focus of this article is to develop a qualitative theoretical model on PM in supply chains to explore how to adopt PMS as a tool to implement collaboration and integration in chains. The exploratory nature of the research question determined our use of a multiple case study. Two focal firms in the agro-food sector from Spain and the Netherlands, serving a total of five different chains, illustrate the message of the model.

The findings show when an attempt to implement a PMS at the supply chain level might be appropriate and effective (if a chain exists and has a director), and how the system's content should be focused on what is needed to improve chain performance (with end customers' demands as a starting point). The paper highlights the benefits obtained by the other partners if they comply with the best informed supply chain member in the development of the chain's PMS, as well as how a PMS cannot be developed when none of the partners can be labelled as chain director.

Keywords: Supply Chain Management; External Integration; Performance Measurement; Chain Director; Agro-industry.

Introduction

Carter, Carter, Monczka, Slaight,& Swan (2000) included performance measurement as one of the top ten areas of research interest in SCM for the 1998-2008 period. Many of the articles on supply chain PMS concentrate on what measures and metrics to use (e.g., Beamon & Chen, 2001; Gunasekaran, Patel, & Tirtiroglu, 2001; Folan & Browne, 2005; Bhagwat & Sharma, 2007; Martin & Patterson, 2009; Arif-Uz-Zaman & Nazmul Ahsan, 2014). Most of the above authors seem to suggest that similar measures and metrics can be applied at the chain level as at the company level. However, the difference at the aggregation level has some significant consequences, and measuring performance in the framework of the supply

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chain remains difficult. Supply chains do not have a management hierarchy that can design and implement a PMS, nor do they have an explicit overall strategy from which the PMS can be derived. Consequently, many questions relating to PMS, as a tool to implement collaboration and integration in supply chain implementation, evolution and maintenance remain (Aykuz & Erkan; 2010; Gopal & Thakkar, 2012; Shepherd & Gunter, 2006), considering, in addition, that developing a PMS for the supply chain is a dependent process, tailored to specific supply chain requirements (Cuthbertson & Piotrowicz, 2011).

Given the above observations, the focus of this article is on framework development and how to adopt PMS as a tool to implement collaboration and integration in chains. The framework should address two important differences between companies and chains: 1) a chain consists of a number of independent partners who cooperate with each other to a greater or lesser extent; 2) these independent partners can participate in different chains even if these chains are in competition with one another. Consequently, it may be difficult to identify the party-in-charge. Hence, important issues are: what customer demands will need to be converted into measures and who in a chain is in a position to do this and to implement these measures throughout the chain? Can the lack of hierarchy be overcome and if so, who can replace it?

To sum up, the core research question for this article is: which partner in a supply chain can, effectively, take the initiative to implement SCI through the use of a PMS, i.e., which partner in a supply chain can decide which measures and metrics to use and how can it implement them? This question consists of three sub-questions: (1) When do we have a chain? (2) Which party can decide? and (3) What measures can be used? Our research is in two industries in the agro-food sector in two different countries to allow for an in-depth study and create the richest material possible.

The remainder of the article is organised in four sections. Firstly, we build a conceptual model of a supply chain in which power differences between partners are supposedly natural and where partners' benign self-interest contributes to the performance of the chain as a whole. Concepts from the Global Commodity Chain (Gereffi, 1999) and SCM will be integrated into this model. Secondly, the methodology used for the empirical study of two cases, one in Spain and the other in the Netherlands, is described. In the following section we present the results of the Dutch case study of fresh poultry and the Spanish study of canned olives. Hence we create maximal richness: different countries, different products and different technologies. We research and present the cases in three steps: (1) What chains? (2) Who can take the initiative? and (3) What measures? In the final section we discuss the findings against the background of our conceptual model and draw conclusions.

Supply chain integration by means of performance measurement: a model

Chains and supply chains

De Haan, De Groot, Loo, & Ypenburg (2003) make a distinction between flows of goods and supply chains. Different types of relationships exist between partners in a flow or a chain, ranging from transactional to vertically integrated (Whipple & Russell, 2007). As supply chains require close cooperation between partners, not all chains are supply chains. Companies simply cannot afford either time- or money-wise to invest in close relationships with all their customers and suppliers. Fabbe-Costes & Jahre (2008) distinguish four intertwined layers of integration in SCI, from integration of (physical, information and financial) flows, through integration of processes and of technologies and systems, to integration of

(structure and organisations of) actors. The higher the layer of integration, the larger the investments in time and money needed, and the closer the cooperation between the partners will be.

Very few, if any, firms manage their supply chain from suppliers' supplier to customers' customer (Bagchi, Ha, Skjoet-Larsen, & Soeresen, 2005). Following Kraljic's (1983) classic distinction between kinds of goods according to related risk and contribution to profit, such close relationships are not always needed. Routine items with low risk and low contribution to profit are traded on the spot market where no close relations are required. However, high risk (of e.g., availability) strategic items with high contribution to profit do require close relationships and SCM. This implies a contingency approach to chains in general, and to SCI in particular.

For most manufacturers the supply chain is not a simple pipeline but much more an uprooted tree, where branches and roots represent tiers of customers and suppliers, respectively (Lambert & Cooper, 2000). In these cases the manufacturer is the focal company, but a processor or another partner could also be considered as the focal company. This is irrespective of their importance, but simply depends on where the analysis of the chain starts from. A chain of this type is simply a particular route through the network, starting with primary producers and ending at the end customer who has to be satisfied. In our approach we take extended supply chains as the scope of our analysis (Bagchi et al., 2005; Fabbe-Costes & Jahre 2008), rather than partial chains as distinguished by Bagchi et al. (2005), i.e., the direct supply chain or the dyads and triads mentioned by Fabbe-Costes & Jahre (2008).

Ultimately, the purpose of cooperation is to satisfy end customers' demands, i.e., customer satisfaction as a shared objective of the whole supply chain (Zokaei & Hines, 2007). Consequently, it will be a distinct advantage if a supply chain effectively captures genuine consumer attributes and analyses the value proposition at each step. Zokaei & Hines (2007) distinguish 'must-be attributes' and 'attractive value attributes', the former are hygiene factors, like order satisfiers, whereas the latter delight consumers and result in more than proportional satisfaction, like order winners. Hence, to be effective as a supply chain and obtain greater revenue than the firms operating individually, partners should integrate to the layer that enables them to achieve the cooperation that they need.

Who can take the initiative?

When the focal company is just another link in the chain, no different from any of the other links, there is no compelling reason for it to be the key partner in the chain. The role that each of the companies involved plays decides which is best-suited to assuming the 'management' role. As the ultimate goal of a supply chain is to satisfy the end customer, being aware of customer demands is one crucial aspect of a chain (Morgan, 2007). Another crucial task is to coordinate all the chain partners' behaviour towards satisfying end customers (Fabbe-Costes & Jahre, 2008). The question is: which partner can assume responsibility for this and, preferably, fulfil both of these aims at one and the same time?

Gereffi (1999) distinguishes between two types of international economic networks or chains: producer-driven and buyer-driven. In producer-driven chains, a manufacturer designs branded products and produces them with its own technology, suppliers provide the manufacturer with parts designed by the manufacturer, and customers distribute the product to the end customers in conformance with the producer's marketing strategy. Whether the product is a success or a failure depends on how well the manufacturer can 'read' the market. In a buyer-driven chain, the retailer decides what products are needed, when they

are needed and what they should look like. Suppliers produce these products in conformance with the specifications set. Whether the chain is a success or a failure depends on how well the retailer can 'read' or create the market. In both types of chains we see a key partner who is aware of the demands of the end customer.

Why would the other partners in the chain follow this key partner if they are independent companies and not subsidiaries? However, this is a prerequisite for overcoming the issue of different partners having different opinions on consumer demands that may cause conflicting behaviour and poor consumer satisfaction (Zokaei & Hines, 2007). Benign self-interest (De Haan et al., 2003) is a good explanation: if they follow, they join a successful team and enjoy the benefits. Immediate self-interest would cause adversarial relationships with chain partners vying with each other for a larger share of the pie, but benign self-interest results in a win-win relationship, with chain partners cooperating to create a larger pie. Consequently, partners view cooperation as a positive-sum game rather than a zero-sum game (Cao & Zhang, 2011). Hence, a benevolent partner will subordinate immediate self-interest to the long-term benefit of all partners (Batt & Purchase, 2004).

However, all parties have to be aware of this and of how they can take advantage of said benefits. Firstly, the dominant partner has to develop a strategy and address its immediate suppliers and customers to negotiate contracts in line with end customers' demands. For the other parties to be able to comply with what is demanded of them, their own suppliers and customers must also be aware of these demands and also fulfil them on the basis of negotiated contracts. In such a case the suppliers do not take great care to produce to direct customers' specifications as they often do not reflect consumer requirements (Zokaei & Hines, 2007). Secondly, it should be transparent that all partners benefit in a similar way from this knowledge: neither should the key partner take too much from the added value, nor should the other partners act as free riders and underperform. Each partner is able to do an analysis to see what its 'win' share is in the win-win relationship.

Another problem that arises is that companies can be partners in different chains and have to meet the demands of different categories of end customer. They therefore have to organise their processes in different ways to be able to do so. One-size-fits-all would imply that they over-perform for one chain but under-perform for others (Morgan, 2007). Over-performing would reduce the overall value added for the chain and hence would not be beneficial, as more would be produced than the customer has asked for and is willing to pay for. Under-performing might result in the chain not satisfying the end customer's demands and in it no longer being successful. In such a case, the under-performing partner might be excluded from the chain. So, since partners hold different positions and may be involved in different chains, they may have conflicting goals.

These different positions and goals may affect their contribution and complicate the availability and sharing of information (Zokaei & Hines, 2007). Collaborative planning depends on the level of trust and the quality of the information-shared between firms (Petersen, Ragatz, & Monczka, 2005).

To sum up: the dominant partner or 'chain director' assumes responsibility for being aware of demands and coordinating partners' behaviour. Hence the dominant partner's role is analogous to that of management in a company, despite the partners being independent and not part of a vertically integrated firm (Bagchi et al., 2005). However, the dominant partner must act in a way that goes beyond contracts and codes and includes the relational aspects of SCI. The dominant partner should adapt its behaviour to the supply chain's level of aggregation and should create circumstances that enhance information-sharing and

develop the mutual trust that enables all partners to recognise the benefits of the win-win relationship. Consequently, in a supply chain formed of cooperating independent firms, the dominant party replaces management in a firm to a certain extent, and so can be labelled 'chain director'.

Content of a performance measurement system for SCI

Performance can be measured at different levels where lower levels contribute to performance on higher levels, activities to processes, processes to companies and companies, finally, to chain performance (Morgan, 2007). For the supply chain, improvements in one partner's performance, e.g., because of immediate self-interest, may cause a drop in another partner's performance or in the chain's as a whole, e.g., because of re-work. Instead, the measures should facilitate the integration of functional areas and of the extended enterprises along the chains, i.e., reflect the collective interests of the parties involved (Medlin, 2006; Morgan, 2007).

To enhance the information flow within the chain, partners should have a number of measures in common and have sufficient mutual trust to share this information (Petersen et al., 2005; Handfield & Bechtel, 2002). They may also apply additional measures, e.g., for other chains or for their individual overall strategy. However, in practice these common measures do not always exist (Aramyan, Oude Lannsink, Van der Vorst, & Van Kooten, 2007). On the other hand, collaborative practices can be driven by supply chain models, such as Efficient Consumer Response to improve performance through information-sharing (Bailey & Francis, 2008).

In the above-mentioned literature, many measures and metrics are often proposed irrespective of product, industry or type of customer. But as SCM is about satisfying the end customer, chains, just like companies, have to meet their required standard of service level (Chan, 2003). Thus, different measures apply for different types of customers in different types of industries. It is currently widely recognised that metrics should principally reflect order winners and strategy: the crucial customer demands and how we try to meet them (Zokaei & Hines, 2007). Consequently, performance is a multidimensional concept and actions to improve one dimension may be indifferent or even counter-productive for other dimensions or overall performance (Murphy et al., 1996). Metrics should not be longer exclusively financial (Ghalayini & Noble, 1996) and global supply chains require new tools (Gunasekaran & Kobu, 2007).

The model

For chains to compete as supply chains, all cooperating partners should have a thorough and common understanding of what the end customer really wants. This understanding does not emerge by itself, but has to be developed and communicated. A chain director does know customers' demands and how to create value for them. The dominant party can take the initiative to develop the metrics for such a system based on its knowledge of final customers' expectations (Zokaei & Hines, 2007; Morgan, 2007).

To align their understanding, chain partners have to meet three requirements: (1) they must align processes (Fabbe-Costes & Jahre, 2008); (2) to be able to do so, they have to know the order winners and qualifiers (Zokaei & Hines, 2007); and (3) to be willing to do so, they have to know that the division of surplus value added is fair versus a more adversarial chain. The Model is illustrated graphically in Figure 1.
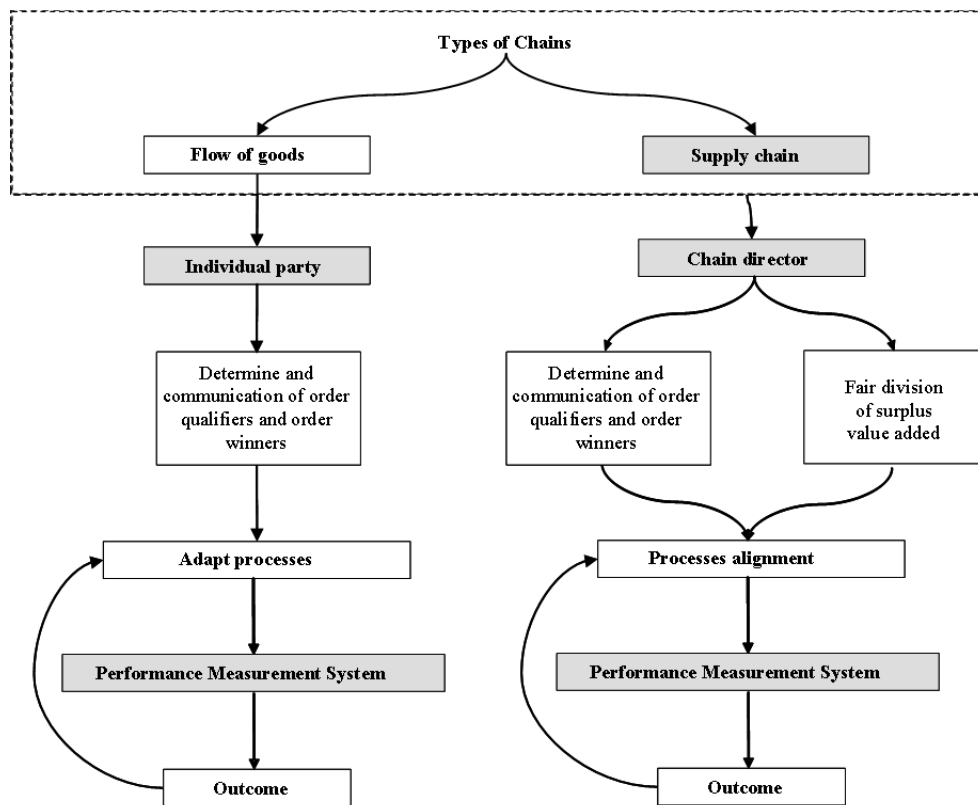
Figure 1. Theoretical model

Process alignment is needed to prevent downstream additional repair processes to adapt output from upstream processes that did not create end customer value. These processes add costs to the product, but do not create value. If these processes can be avoided, the partners create the desired value, but at a lower cost. Hence the supply chain becomes more competitive because of the synergy between partners rather than when the individual partners acted as independent groups.

Partners are able to align processes if they know what is expected. Shared market knowledge throughout the chain builds upon the knowledge of the chain director, who knows end consumer requirements and can turn them into order winners and qualifiers: what the acceptable price is for the requested quality, or what the acceptable quality is for the requested low price. The chain director can also turn these strategic requirements into operational performance criteria that the chain has to meet and to which each tier also has to contribute. Supply chain PMS can be developed in a focused way: only the criteria that matter for the end customer will be included.

Partners may be willing to adapt their processes if they know that it is also in their benign self-interest. The cost of process adaptations should be compensated for and hence the contribution to the chain should be perceived as substantial; it should be difficult for others to provide the chain with this, i.e., the contribution should be perceived as a strategic item. Whether these conditions are met can be shown by applying the supply chain PMS. The performance of all partners now becomes more transparent not only to their immediate partners, but also beyond them and throughout the chain as a whole.

Methodology

The exploratory nature of our research question determined our use of a multiple case study. As we ask 'why' and 'how' questions about performance measurement in chains in specific circumstances, little control exists over events, and the topic is current. In such circumstances a case study approach, which has also achieved great importance in the Operations Management area (Meredith, 1998; Voss, Tsikriktsis, & Frohlich, 2002), is most appropriate (Yin, 1994; George & Bennett, 2005).

The analysis of various levels of supply and demand is a fundamental requirement for establishing the rigor of research in SCM (Seuring, 2008). Performance measurement at the chain level makes field work more complicated than at the company level. Frohlich & Westbrook (2001) highlighted this complication previously.

The case studies are (a) theory-led, in as much as the model developed in previous section governs the case description and (b) explorative, in so far as their goal is to find out whether the model helps the empirical data on PM in supply chains to be understood.

The cases

As chains consist of independent companies, we chose focal companies instead of chains as our cases. These focal companies would give access to the other companies involved in the chain and would show whether parallel PMSs exist should the company participate in more than one chain. As a consequence, the two focal firms would give access to a larger number of chains.

The researchers are from Spain and the Netherlands; hence cases were selected from these two countries. This would not only allow easier access because of the local presence, but also enhance the richness of the data. The two countries have different distribution systems: in the Netherlands there is the dominance of a few large retail chains, whereas in Spain SMEs are still of major importance in addition to retail chains. Two industries with considerable differences were selected in the agro-food sector: vegetable (olive) versus animal (poultry), canned/processed products versus fresh products, segment commodities versus branded products. Finally, the focal companies were expected to be participating in chains both with and without chain directors. The aim was for all these differences to contribute to the richness of the data, which would enhance the chance of building theory from these cases (Figure 2 illustrates both cases graphically).

The Dutch focal organisation is a large processor of fresh poultry that serves two different retail chains (A and B), each serving different market segments. In poultry consumption, fillet of chicken breast is the dominant product and all other parts are by-products. The poultry market consists of different segments depending on the fillet as a percentage of the chicken's weight, value added to the meat, and the prices involved. Most of the sales to customer A are fillet of chicken breast and other value-added products, with a rather broad range of almost 70 different products (required by the retailer). With customer B, the assortment is only 30 products and most sales are of by-products.

The Spanish focal firm is a small family-owned company that is one of the four top producers in the country (which cover 30% of national production). It is highly integrated, although the firm outsources its logistics services. It developed its own wide assortment of products by adding value (removing pits, slicing, adding flavours and/or stuffing the olives) and using different types of packaging (sachets, cans and

jars) of different sizes. In total, the assortment covers some 70 items. Basically it caters to three types of customer: retail chains, local Spanish customers, and importers from other countries.
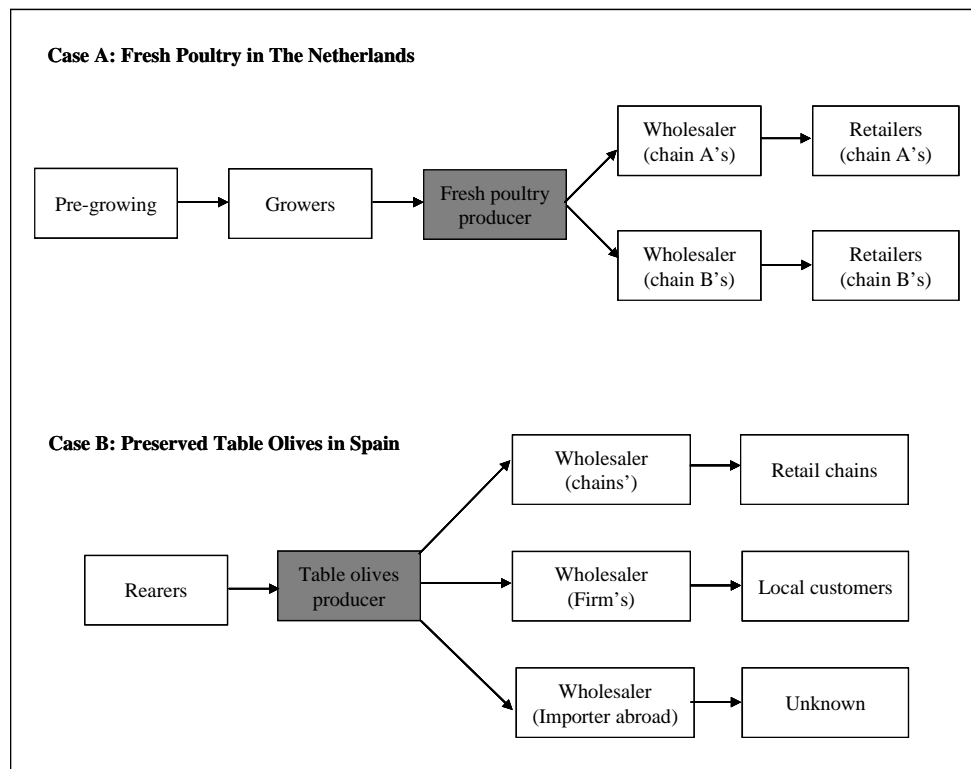
Case A: Fresh Poultry in The Netherlands

Pre-growing → Growers → Fresh poultry producer → Wholesaler (chain A's) → Retailers (chain A's)

Fresh poultry producer → Wholesaler (chain B's) → Retailers (chain B's)

Case B: Preserved Table Olives in Spain

Rearers → Table olives producer → Wholesaler (chains') → Retail chains

Table olives producer → Wholesaler (Firm's) → Local customers

Table olives producer → Wholesaler (Importer abroad) → Unknown

Figure 2. Theoretical model

Data collection and data analysis

Two people collected the data in each case, one working for the company and the other for a university, thus enabling researcher triangulation (Denzin, 1989). The first had access to all the data in their companies relevant for this study because of their day-to-day participant observations. They could triangulate these with (informal) talks and interviews with their colleagues, as well as with company documents.

This implies methods and source triangulation that further guarantee the reliability of the data in addition to researcher triangulation (Voss et al., 2002). The university researchers also visited the companies to observe the processes, interview executives and study documents. The two researchers discussed their reported experiences with interviews, documents and observations. The university researchers wrote preliminary reports on the companies and their chain(s) following the model that had been developed and ensured that all aspects were covered adequately. These reports were then sent to the corresponding company and the other university researcher for checking. Then the university researchers met to discuss the reports as well as the comments from the companies on their reports for these to be finalised. Finally, the university researchers determined the commonalities and differences between the cases and confronted these with the findings from the literature to identify the content of the variables from the model and the relationships between them. Input from the companies and the literature improved the level of internal validity in the case descriptions.

Results

Focal company chains

The Dutch focal company serves two very different customers, A and B. Both customers pursue specific and explicit strategies to satisfy their customers. Customer A offers a broad assortment at a relatively high price resulting from the value added to the poultry. It tries to attract its customers even more by weekly promotions of one or two items from the assortment, which means that week-to-week fluctuations exceed day-to-day fluctuations. Because of the value-adding activities, the shelf life of the products is only 4 to 5 days. Customer B offers a limited assortment, with only a minimum of added value, sold at a relatively low price. B applies an everyday low price strategy (EDLP). Consequently, day-to-day fluctuations exceed week-to-week fluctuations. Because of the relatively straightforward products, shelf life is up to 6 days.

The focal company serves customer A from two specialised plants. At the first the chickens are slaughtered, whereas at the second, about a one-hour drive from the first, further processing is performed, either simply packing or value-adding activities. Value adding activities can include marinating, pre-cooking, etc. Plants one and two have modern equipment that is kept up-to-date in order to preserve the quality of the final products. Customer B is served from plant three, which concentrates on slaughtering but has some departments for value-adding activities as well. The equipment at this plant has been in use for a period of time and reflects a mature technology. The R&D department is active in breeding new pedigrees of poultry that are more appropriate for customer demands. Such demands consist of resistance to illness, and chicken composition and weight.

Chicken farmers supply either plant one or plant three depending on their distance from the plants and the pedigree of their chickens. Some pedigrees are more suitable for value-adding than others and are supplied to plant one, whereas others provide larger chickens that are supplied to plant three. Experts from the processor advise the farmers on timing and numbers when rearing a new batch.

In most cases, farmers use feeding materials produced by a firm that belongs to the same conglomerate as the processor. Feeding materials differ for the various pedigrees to ensure the required composition and weight of the chickens to satisfy end customer requirements.

The Spanish focal company serves both domestic and foreign end customers. The domestic customers are served through both large retail chains and small local shops. Local shops serve end customers in their immediate vicinity in lower market segments. The market share of these shops is declining. They are served with the help of regional distributors. The retail chains serve higher market segments and their overall market share in increasing. Table olives are a very important product in Spanish supermarkets compared to other countries and shelf space and the number of varieties on sale reflect this importance. The processor only sells branded products and has succeeded in avoiding private label production. The chains supply their shops from their regional distribution centres. Although exports are relatively new for the processor, they are growing rapidly. The importers abroad have sole rights in the destination countries and are responsible for sales and distribution in their respective markets. Consequently, the downstream chain is unknown to the processor.

A network of regional distributors serves the local shops. The distributor is not the owner of the goods and only gets a fee for its services.

The processor receives the olives in the harvesting season: September-October. Upon arrival, the olives are cleaned and stored to size. Next, the olives are pre-processed and stored for production at a later date. The various items of the assortment are produced throughout the year and packed according to a production plan, based in essence on the previous year's sales. As might be expected, changing market shares complicate planning, for exports in particular, as products require labelling adapted to national requirements, but production runs need to be relatively long because of long set up times. On average, about three months' sales are kept in stock. Products are packed in sachets (cheapest assortment, domestic market), large (large consumers) and small (small consumers) cans and jars and special products. Jars are best suited to export, but not for stuffed products. The processor is responsible for transport to the chains' regional distribution centres.

A group of four or five growers supply the processor and have been doing so for many years. Supplies are checked in the field before transportation to the factory. Growers are experienced and know how to exploit their trees sustainably.

Roles of the partners in the chains

In the Dutch case (summarised in Table 1), customers A and B respectively target different market segments and hence require poultry with different characteristics and processes to satisfy their customers. Customer A focuses on selling a broad assortment and outsources poultry inventory management to the processor. Customer A plans its promotions and communicates them to the processor in time to facilitate timely growing and processing of chickens. Customer B requires daily delivery in conformance with expected sales. As its end customers want generous portions, chickens for customer B have to be relatively large in size.

The processor manages the inventory of poultry at customer A distribution centre level by means of vendor managed inventory (VMI). Two requirements have to be met: one on minimum and the other on maximum inventory. The modern equipment in plants one and two reduces processing time and enhances the freshness of the product upon delivery. The traditional equipment of plant three allows for low fixed costs and consequently low overall costs. Experts from the processor advise the farmers not only about batch planning but also about feeding and all kinds of hygiene-related aspects.

Farmers near plant one specialise in pedigree chickens with a relatively high amount of fillet meat. As these chickens are relatively small they cannot be used for customer B. Farmers near plant three specialise in pedigree chickens that produce more overall weight. These cannot be processed in plant one. Supplying nearby plants minimises travel time and costs. Farmers breed and feed in line with end customer demands as communicated by retailers.

	Dutch chain A	Dutch chain B
End customer	Assortment	Product, price
Retailer	Own shop, promotions	Own shop, EDLP
Wholesaler	VMI in own RDC	Own RDC
Producer	Value adding	Just processing
Grower	Proximity, legal requirements	Proximity, legal requirements, audits 3rd party
Pre-growing	Producer controls	Producer controls

Table 1. Summary of the Dutch Case

In the Spanish case (summarized in Table 2) all customers will get the branded products from the assortment that they order, although the labels for exported products will be adapted to national requirements in the country of destination.

The retail chains decide which part of the processor's assortment they will sell and whether they will also sell table olives from other processors. Whether, how and when the retail chains will use promotions is also negotiated when quantities and prices for the following year are determined. This indicates the processor's quality level. The shops order directly from the distributor. However, the distributor is not responsible for stock outs or running out of 'best-before' dates; the processor is.

The processor develops its assortment independently of the other parties in the chain and negotiates with retail chains on which part thereof they will buy and against what conditions. Local shops simply have to accept the conditions for the items that they order through the regional distributor. Recently the processor changed premises and invested in modern equipment and now meets requirements such as HACCP. The processor participates in collective promotion campaigns to develop markets in countries where table olive consumption is still low.

The growers are fully aware of the high quality standards because of their long-term relationships and advice from the processor. Consequently, no additional or detailed requirements need to be negotiated. Prices simply reflect levels of supply and demand in the market. The larger the olives are, the more attractive they are and hence the higher the price.

	Retail chains	Local customers	Exports
End customer	Assortment	Proximity, assortment	??
Retailer	Own shop, season	Local shop, season	??
Wholesaler	Own RDC	Firms' RDC	Importers
Producer	Pack, (pre-) produce	Pack, (pre-) produce	Pack by country
Grower	Producer advises	Producer advises	Producer advises

Table 2. Summary of the Spanish Case

Measures used in the chains

In the Dutch case the processor serves two very different customers and adapts its strategy and operations to them. Hence the measures used will have to be different to allow for effective SCM. Customer A's customers demand a wide assortment and accept a relatively high price, whereas B's customers focus on an everyday low price as well as large quantity/products. The demands for the intangible service part of the deal also differ: A's customer demands are less specific than those of B's customers. Table 3 summarises how A and B analyse the decisive end customer demands respectively, i.e., order winners converted to specific criteria.

Criterion	Chain A	Chain B
Product	Wide assortment (70 items), limited quantity/product, value added, fresh product, recognizable product	Fresh product, relatively large quantity/product
Service	Tracking & tracing based on codes	Traditional and healthy product
Price	Relatively high, but fluctuates because of promotions	Relatively low, but fixed everyday low price

Table 3. Translation of order winners by chain director

The next step is to identify strategic differences between the two chains in terms of these criteria, order winners and order qualifiers. Table 4 summarises these differences.

	Order winner	Order qualifier
Time/availability		A, B
Cost/price	B	A
Quality	A (assortment), B (audit)	A (safety, regulations), B (assortment)

Table 4. Strategic differences between chains in the Dutch case

Finally, the metrics used in the two Dutch chains to ensure that the end customers get what they want are determined on the basis of order winners and order qualifiers. Table 5 summarises these metrics for the two customers' chains.

Partner	Chain A	Chain B
Retail process	Time: shelf time 4-5 days, 99% of shop orders fulfilled, several fixed delivery times/day Quality: packaging specifications, proper coding of products, full assortment	Time: Black box Quality: Black box
Wholesale process	Time: delivery within 18 hours, 2/day, VMI buffer stock allowed 17-35%, Quality: full assortment, food safety in line with codes (BRC, IKB, HACCP), product composition specifications, some diseases are not allowed	Time: shelf time 6-7 days Delivery within 24 h., Quality: 100% fulfilled (might be in 2 batches, tracking & traceability based audits beyond codes, some pesticides not allowed
Processor	Time: lead time 18 hours Quality: 100% orders met	Time: lead time 18 hours Quality: 100% orders met
Grower	Time: period to get proper weight Quality: maximum weight, growth data	Time: period to get proper weight Quality: minimum weight, growth data, feed should not contain some pesticides and be vegetable (50%)
Pre-growing	Time: period of producing eggs/hen Quality: live up hens up to product demands	Time: period of producing eggs/hen Quality: live up hens up to retailer product demands

Table 5. Metrics used by partners in the Dutch case

The situation is quite different in the Spanish case as the relationships between the partners are much looser. The downstream part of the export chain is a black box for the processor; hence order winners or order qualifiers cannot be determined. The local shops can buy the processors' products against fixed conditions or decide to buy products from another, perhaps even unbranded, processor. The large retail chains negotiate a new contract on quantities, prices and other conditions every year. Based on previous experience, the processor pursues a strategy for two chains: local shops and retails chains. Table 6 summarises these strategies.

	Order winner	Order qualifier
Time/availability	LC	RC, LC
Cost/price		RC, LC
Quality	RC (assortment), LC (assortment)	RC (safety, regulations), LC (safety, regulations)

Table 6. Different strategies of partners in the Spanish case

Because of the importance of table olives in Spain, neither retail chains nor local shops can afford to be out of stock. Hence availability is crucial and this, together with market power, determines the metrics used in these chains. Table 7 summarises the metrics.

Partner	Retail chains segment	Local customers segment
Focal company	Time: Lead times depend on stock and season. Economic penalty if delay. Quality: 100% orders met	Time: Lead times depend on stock and season. No economic penalty if delay. Quality: 100% orders met

Table 7. Metrics used by partners in the Spanish case

Discussion

Supply chains

The scope of the description is for both the Dutch and the Spanish cases and full chains, even though the chains seem to be rather short (Fabbe-Costes & Jahre, 2008). The Dutch case starts with producing the right eggs ultimately to meet end customers' demands. The Spanish case starts not with the growing of the olive trees, as they are in use for decades, but with the growing of the olives, and finishes at the end consumer. Together the two focal companies serve five chains. The Dutch focal company serves two chains in which very close relationships exist to ensure that the crucial demands of the end customers are met. For all partners in these chains down to the producer, the product i.e., poultry, is, in Kraljic's terms, a strategic item. This product is what they concentrate on and hence contributes considerably to their sales and profits. If they do not deliver conformance to what the next partner needs to satisfy its next partner, essentially no alternative exists to remedy this. Hence product-associated risk is high. The risks are also high for retail chains A and B, as no alternative suppliers exist to replace the current processor at short notice. Although the direct contribution of poultry to sales and profit may be limited, these products fit in perfectly with what their customers expect. If the product is no longer available, there could be consequences for customer loyalty. Consequently, the retail chains may also consider poultry as a strategic item. Hence in these cases supply chains exist in which the customers' voices are heard even by the farmers who breed and feed to meet end customer demands. Everything in both chains can be characterised as seamless and reveals win-win relationships for the partners (Childerhouse & Towill, 2003). However, chain A has to be more responsive because of the broad assortment that the end customers require, whereas chain B is more efficient, as the final customers require low prices (Fisher, 1997). The level of integration in these chains is high, as the flows (e.g., the number of chickens communicated to the grower in chain A, and the promotions given to the processor), the processes (VMI in A and feeding advice in B) and the systems (e.g., regarding quality) are aligned. As both scope and level of integration are high, the overall degree of integration is high both for chain A and B.

The Spanish case serves three chains in all. The export chain is not a supply chain as the end customer is simply unknown or invisible to upstream parties in the chain. Although table olives, as such, may be strategic items for retail chains, any particular brand is not. The chains can sell different brands alongside each other and need not sell the full assortment of one particular brand, either. Hence the risk of availability is low and this is not a strategic item for retail chains, as other suppliers can replace our focal company, the processor. Consequently, a specific brand of table olives is much more a leverage product in Kraljic's terms. Despite the long-term relationship with the growers, both parties act as if they are in a spot market. Hence despite the crucial contribution to sales and profit, this is not a strategic item because

of the lack of availability risk. This flow of goods (De Haan et al., 2003) is much more representative of a traditional manufacturing-driven, adversarial chain (Childerhouse & Towill, 2003). To make the flow of goods as attractive as possible for all parties involved, it should efficient (Fisher, 1997). Although the scope of integration is high (full chain), the degree of integration is low, as the level of integration is very low, with only physical and financial flows aligned and little information shared.

Who can take the initiative?

In the Dutch chains the two retailers are in charge as they choose which market segment to serve and are fully aware of their end customers' demands. In addition, they are in a position to make their partners understand that it is in their benign self-interest to support the retailers' strategies. Finally, they manage to make information available for all the parties to know that they all comply with the norms and that nobody benefits more from their cooperation than agreed upon from the beginning. Consequently, they can be labelled as chain directors, who read the market and determine the route through the 'uprooted tree' to serve their market segments (Lambert & Cooper, 2000; Morgan, 2007; Fabbe-Costes & Jahre, 2008). However, the two retailers use different mechanisms to be effective chain directors.

Very few, if any, firms manage their supply chain from suppliers' supplier to customers' customer (Bagchi et al., 2005). Hence A contracts the focal organisation as a processor and shares information on future promotion activities and through VMI. Hence A is vulnerable as the processor could take advantage, but the latter does not because of the attractive business he gets from this contract. The processor has even greater control over the supply chain by means of his contracts with his suppliers, since these contracts also reflect the processor's customers' demands. He also contacts his suppliers and immediate suppliers on the kind of poultry as well as the timing of production. Finally, he advises on feeding materials, often produced by a sister company. Hence the end customer demands are known and transmitted throughout the chain. This allows for amplification to be dampened (Bailey & Francis, 2008) and provides incentives for collaboration and adequate mutual trust for information-sharing (Handfield & Bechtel, 2002; Dapiran & Hogarh-Scott, 2003; Cox, 2004). B also contracts the processor but with very different conditions which reflect his everyday low pricing strategy. Here an outside auditor gauges whether the partners in the chain meet demands (Ciliberti, De Haan, De Groot, & Pontrandolfo, 2011). The inventory at the retailer is a black box for the processor. Consequently, these supply chains are buyer-dominated (Gereffi, 1999), as the retailer turns end customer demands from the chosen market segment into production demands for partners upstream in the chain.

The Spanish focal company has its own brand of preserved olives and determines its own assortment. Contact with the customers is by means of contracts, which differ according to the power level that they have or are on in their chain. Local shop owners can only accept or reject, whereas the large retail chains can trial before adding to the contract. The customers decide which part of the processor's assortment they buy. Although contact with the olive growers has existed for a long time, prices are negotiated every year based on market conditions. Beyond this, communication may be social but will not refer to agricultural or commercial issues to any great extent. The low levels of mutual trust, openness and information-sharing may cause amplification across the flows (Dapiran & Hogarth-Scott, 2003; Cox, 2004). Apparently, the processor acts completely freely of customer demands, even those of the large retailers. This is unlike the Dutch processor, which does not have an assortment of its own but simply produces what the customer wants. Consequently, the Spanish chain is not producer-driven, as might have been expected

because of the processor's branded assortment (Gereffi, 1999). The large retailers are not in a position to impose their demands on the processor, as it can refuse to produce under a private label for these large customers. In short, the end customer demands are unknown to the processor, but not to the large retailers who choose a market segment to serve. Coordination in the Spanish chains occurs solely by means of prices based on supply and demand. None of the partners is in a position to decide on the strategy that the chain should follow to eventually enable all of them to be better off. Consequently, no information is shared (Handfield & Bechtel, 2002), and no amplification dampened (Bailey & Francis, 2008).

Content of a performance measurement system

The starting point should be customer demands, i.e., for individual companies, but for supply chains it should be the end customers' demands, as formulated by the chain director (Zokaei & Hines, 2007; Morgan, 2007). Consequently, PMSs may be very complicated as companies can act in different chains, serving different end customer segments. The Dutch focal company is an example of this as it serves both retailer A (differentiated assortment and relatively high prices) and B (everyday low prices). Hence this company should be able to show both of these chains that it meets the chains' demands. In addition, it may use another PMS for internal use to see whether its own departments, processes etc. meet the demands of the company and/or its investors. However, individual companies may also need different PMSs as they may serve different market segments. The Spanish focal company is an example in point as the large retail chains are able to negotiate their contracts, but local shop owners have no choice but to accept the contracts that the focal company presents them with. However, not only may the metrics be different for various segments and/or chains, but also the actual performance level required (Chan, 2003).

For the supply chain, the improvement measures should facilitate integration between functional areas and the extended enterprises along the chains, i.e., reflect the collective interests of the parties involved (Medlin, 2006; Morgan, 2007). Consequently, the process organisation needed to produce output may also be different. Again, the Dutch focal company is an example-in-point as it has specialised plants to process poultry for each of the chains it serves, as well as different inventory systems. In fact, poultry from one chain cannot be used in the other, whereas such flexibility could occur in the Spanish focal company.

The information flows to and from the two focal organisations differs considerably, as might be expected. The Spanish case reflects a flow of goods (De Haan et al., 2003); consequently, information flow between the participants is limited to the bare minimum. Because of the adversarial relationships, open information exchange would make the party involved vulnerable. However, the Dutch case reflects a supply chain (De Haan et al., 2003); consequently, information flows between participants should facilitate a seamless flow of goods. This is what can be seen in, e.g., chain A: the retailer informs the processor about promotions, the processor notifies the poultry breeders about the timing and numbers of a new batch and its sister company informs the breeders about the feeding of the chickens. Consequently, the retailer directs the quantity as well as the quality of the produce in the chain.

Conclusions

This paper has examined who in a supply chain can, effectively, take the initiative to implement SCI by means of a PMS, i.e., decide what measures and metrics to use and how to implement them. Although SCM and related concepts, such as SCI, are not well-defined in the literature, both theorists and managers implicitly believe that greater integration in a chain yields greater efficiency. As the empirical results of research on this relationship are ambiguous, a contingency approach is suggested for this phenomenon. The first issue addressed is what the right conditions for SCI are. A distinction is made between flows of goods and supply chains, following Kraljics' classic distinction between the nature of products according to related risk and contribution to profit. SCM is restricted to relationships between companies that deal with products regarded as strategic (high risk and high contribution). In the Dutch case we found that the focal company participated in two supply chains, as the product was strategic for all partners from the chicken farmer to the end customer. For everyone involved it made a large contribution to profit. There was also high availability risk, as partners are not interchangeable because of the different requirements of the customers in the various segments served. In the Spanish case, the focal company knows neither its end customers nor their requirements: its 70+ item assortment differs only in packaging for the various national and international segments. Partners can buy from, and sell to, other suppliers and customers with no major problems; hence availability risk is limited. In the Dutch case, supply chain collaboration and integration should be expected, whereas in the Spanish case this would be superfluous. Time and money invested in close relationships with suppliers and customers in the Dutch case would pay off, whereas in the Spanish case it could be a waste.

However, supply chain collaboration and integration do not just happen, but rather have to be initiated by one of the partners in the chain. Hence, the next question is, which partner is in a position to initiate collaboration and integration effectively? This is a relevant question only if a supply chain exists. Thus, in the Spanish case, if it exists, supply chain collaboration and integration will not contribute to greater efficiency in the chain; however, in the Dutch case, with two supply chains, it is a relevant question. As the two retailers dominate one supply chain each, the Dutch chains can be characterised as buyer-dominated. Hence the retailers can initiate supply chain collaboration and integration. Whether they can do so effectively depends upon their ability to read the market, i.e., understand end customer demands, turn these demands into measures and metrics and communicate them, and persuade the other partners in the supply chain to adhere to these measures and metrics. In the Dutch case, each of the retailers has defined the market segment that it wants to serve and understands which measures reflect customer demands. Whether they can persuade the other partners in their chains depends on how attractive the offers that they can make them are. They should be able to show that accepting their offer is advantageous for all parties because the result will not be a zero-sum game, but rather a positive-sum game, and, in addition the division of the positive-sum among all the partners in the chains is fair. Partners may accept a smaller part of the overall profit if the amount is more than the original amount of revenue earned, especially if less effort has to be put into participation. The latter can occur if, e.g., coordination and collaboration reduce rework to adapt work-in-process to end-customer demands. Consequently, partners' benign self-interest may help to support persuasion by the retailer (as the dominant partner). In the Dutch case, the farmers know how many chickens are needed by the processor and when to facilitate the latter providing the retailer with an adequate number of end products. This can be the chicken 'as is' in chain B, but in the case of chain A, it is all kinds of specialties. A similar situation exists with respect to quality, as the processor's sister companies seek to optimise the pedigrees for each chain, as well as give advice on how to feed the chickens in order to achieve the optimal result to meet end-customer demands. Hence, both retail

chains A and B can be characterised as chain directors. In the Spanish case, neither the processor, nor the retailer is in a position to persuade the other partners. Despite the respected brand name of the processor, end customers are also able to buy products processed by other companies with respected brand names. Despite the large quantities that large retail chains may buy from the processor, the latter perseveres with its own assortment rather than adapting recipes to retailers' demands.

Once the chain director has chosen and defined the measures that reflect customer demands, it can convert these into the metrics to be met. The order winners for end customers determine which measures will be used in the supply chain, both ex ante (knowing what should be done) and ex post (knowing whether the output conforms to demands). The chain directors can include the defined metrics in the contracts that they negotiate with the focal company, i.e., the processor. The latter will have to do the same when negotiating with its suppliers to be sure that it will meet its customers' demands, i.e., satisfy the retailer. Even though no formal PMS exists, all the parties thus know what is expected and what the recompense for this will be, as well as what their share of the price paid by the end customer is.

To conclude, the major conditions for effective supply chain collaboration and integration are:

- Firms must form a supply chain, i.e., they trade strategic items with each other;
- One partner can act as a chain director and read the market, define end-customer demands, turn these into specific measures, and persuade the other partners in the chain, who accept because of benign self-interest; and
- The resulting measures and metrics derived reflect the order-winning end-customer demands.

If companies participate in more than one supply chain, they may have to use different sets of measures and metrics. In such cases they may split their processes to serve each of the chains, in the same way that the processor in the Dutch case does. The processor in the Spanish case does not need to make this split, as all its customers receive the same product, albeit in different packaging for export.

In order to be aware whether supply chain collaboration and integration can contribute to a more efficient supply chain, managers need to know whether they are participating in a supply chain, and whether their company is its chain director. If both answers are no, supply chain collaboration and integration will not create customer value but are additional costs that diminish a company's profit. If the first answer is yes, but the second no, the company knows that it cannot initiate effective supply chain collaboration and integration, but that, because of benign self-interest, it may respond positively to initiatives from some other potential chain director.

Although these results answer a number of questions raised in the literature to a certain degree, further research could provide more 'thick evidence'. Most supportive evidence is from one buyer-driven supply chain from the fresh product agri-business in the Netherlands, whereas the Spanish case shows that if the conditions are not met, collaboration and integration do not result in more efficient supply chains. More cases from other countries, applying other technologies, dealing with other kinds of products and with other dominant parties, and so on and so forth, could strengthen, nuance or reject the preliminary findings of the analysis presented here.

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