

# Packaging paradoxes in food supply chains: exploring characteristics, underlying reasons and management strategies

Packaging paradoxes in food supply chains

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## Abstract

**Purpose** – The purpose of this paper is to explore different types of packaging paradoxes and the reasons for their existence in food supply chains.

**Design/methodology/approach** – The research uses a multiple case study approach with rich empirical data from seven leading companies in Swedish food supply chains. The research uses coding and a paradox theory lens to analyse packaging paradoxes, both within and between companies in a supply chain.

**Findings** – The paper provides a novel theoretical lens which uses comprehensive empirical data to identify and categorise four types of packaging paradoxes on two system levels in food supply chains. It presents detailed descriptions of, and underlying reasons for, the paradoxes. It also discusses strategies required to manage packaging paradoxes.

**Research limitations/implications** – Future research should confirm and extend the findings in this study by incorporating data from companies in other countries. It should cover the importance of paradoxes, their impact on company performance and innovation, and how different paradoxes are related to each other. It should also investigate strategies to manage paradoxes further.

**Practical implications** – The findings should help companies acknowledge and identify management principles for packaging paradoxes in food supply chains.

**Originality/value** – It is the first study which systematically explores packaging paradoxes in food supply chains. The study offers a new approach to understand the complexity of packaging decisions in food supply chains. It contributes to the packaging logistics literature by extending theoretical knowledge about conflicts of interest related to packaging. The management discussion offers initial insights into management of packaging paradoxes and directions for future research.

**Keywords** Paradoxes, Packaging, Food supply chain

**Paper type** Research paper

## 1. Introduction

Food packaging should protect, contain, unitise, apportion, communicate and provide convenience and logistics efficiency. It is a never-ending challenge for packaging logistics to

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manage these functions in the best possible way to fulfil as many economic, environmental, ergonomic and legal requirements as possible for companies throughout the supply chain, from production to consumers. In the centre of this challenge is the act of balancing conflicts of interest related to the selection and design of packaging. Some of these conflicts of interest are paradoxes, as they represent competing, yet individually logical arguments which are impossible to combine over time (Schad *et al.*, 2016). In food supply chains, paradoxes originate from different performance goals, as well as from competing logics within and between companies in their way of organising packaging development (de Kooijer *et al.*, 2017). For instance, packaging faces paradoxes related to simultaneously fulfilling the three performance goals of avoiding food waste, enabling efficient logistics and transport operations throughout the supply chain and reducing packaging waste (Pålsson, 2018). Typically, these goals cause paradoxes, as more packaging material usually improves the degree of protection, which may reduce food waste and facilitate logistics operations. However, at the same time, more packaging material also increases packaging waste.

The packaging logistics literature generally acknowledges these conflicts of interest as trade-offs between various incompatible requirements on packaging. A broad spectrum of trade-offs related to packaging performance has been recognised, such as trade-offs between packaging cost and sales attributes, or between economic and environmental performance (e.g. Lockamy, 1995; Paine, 1990; Pålsson, 2018), as well as those related to the organisation of packaging development (Klevås, 2005).

Although current research observes and illustrates a variety of conflicts of interests, more research is needed to understand the reasons why these conflicts of interests arise and how they affect the supply chain (White *et al.*, 2015). There is also a need to broaden the perspective on conflicts of interests from trade-offs with either/or solutions to both/and possibilities where interrelatedness of competing demands are acknowledged (Smith and Lewis, 2011; van der Byl and Slawinski, 2015). Understanding the complexity in such conflicts of interest is a necessary step before studying how to manage them (Schad and Bansal, 2018). In particular, packaging logistics research needs empirically-driven studies to explore packaging paradoxes, their underlying processes and procedures, as well as management strategies (Pålsson and Sandberg, 2020).

As a way to deepen researchers' and practitioners' understanding of incompatible packaging requirements, a premise for this research is that paradox theory, which stems from the field of organisational research (Poole and van de Ven, 1989; Schad *et al.*, 2016), provides researchers and practitioners with a more rigid and holistic lens through which to understand these incompatibilities in detail (Arlbjørn and Halldórsson, 2002). Paradox theory captures and emphasises paradoxes related to performance and competing organisational logic respectively: these two categories of conflicts of interest are currently recognised as trade-offs in the packaging logistics literature. Paradox theory also extends the scope beyond these two categories. In particular, it acknowledges paradoxes related to conflicting values between members of different organisational units, as well as conflicting focus on developing knowledge in different organisational units (Smith and Lewis, 2011).

In an initial step to broaden the perspective of conflicts of interests in packaging logistics, Pålsson and Sandberg (2020) introduced paradox theory in a conceptual framework; this framework defines and categorises different types of packaging paradoxes. Packaging paradoxes cover paradoxes related to packaging itself and to how packaging practices are organised within and between companies. This paper continues on this research path by exploring paradoxes in empirical settings as a means to gain detailed insights regarding their complexity and specific characteristics. The purpose is to explore different types of packaging paradoxes and the reasons for their existence in food supply chains. To fulfil this purpose, the paper makes a qualitative inventory of existing packaging paradoxes and examines the reasons for their existence in a multiple case study of seven Swedish companies

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in food supply chains (three producers, two brand owners, a retailer and a distributor). The study covers the supply chains from the point of filling to the point of sale. The paper also discusses strategies to manage the packaging paradoxes. This is an attempt to increase “paradoxical sensemaking” (Xiao *et al.*, 2019) in a packaging logistics context and to offer initial insights into managing packaging paradoxes; an attempt which opens up future research possibilities. The paper contributes theoretically to understanding the complexity of packaging decisions in food supply chains. It is the first study which systematically explores empirically grounded packaging paradoxes in food supply chains. It also widens the perspective from trade-offs to paradoxes and proposes strategies for managing packaging paradoxes, which is relevant both for theory and practice. Practically, the paper also helps companies identify and become aware of a wide variety of packaging paradoxes. Ultimately, such insights should help managers to make more informed packaging decisions.

## 2. Literature review

To assess and measure the performance of packaging, it is essential to view its components as one system. A packaging system consists of three components: primary, secondary and tertiary packaging. Primary packaging is in contact with the product. Secondary packaging contains a number of primary packages, and tertiary packaging contains a number of secondary packages. Assessing packaging as a system emphasises that the performance of a packaging system depends on each packaging component as well as on the interactions between them all (Hellström and Saghir, 2007). One example of the necessity to consider interactions is that strong secondary packaging may reduce the need for primary packaging to ensure sufficient product protection during transport. As packaging may influence many organisational units, the assessment should include organisational impacts of packaging systems, which are covered by organisational paradoxes in this review.

### 2.1 Packaging features

Packaging has strategic value in logistics and supply chain management (SCM). Even if the cost of packaging often is quite low, its strategic value is high (Found and Rich, 2007). Packaging can provide a competitive advantage in the marketplace by enabling eco-efficient supply chains and by increasing sales (Lockamy, 1995; Pålsson, 2018). To this end, different packaging features must be examined. Robertson (1990) presented an early categorisation of basic packaging features: protect, contain, unitise, apportion, communicate and provide convenience. This categorisation is still useful, but has also been complemented with additional features in the current literature.

Several studies have studied the promotional attributes of food packaging. Wells *et al.*'s (2007) empirical study demonstrated a strong link between packaging design and the consumer's decision to purchase food. A majority of consumers relied on packaging in the decision-making process. In another empirical study, Wang (2013) found that the design and communication features of packaging affect how consumers perceive the quality of a food product; they also illustrate consumers' brand preference.

The communication feature of packaging also covers a company's ability to track and trace the product. In a study on track-and-trace features for reusable packaging systems, Johansson and Hellström (2007) indicated that an increased track-and-trace capability is likely to result in significant cost savings. Johansson and Pålsson (2009) studied various identification technologies on packaging for track-and-trace purposes. The findings show linkages between different identification technologies on packaging, attributes of the tracking system, use and sharing of tracking data and logistical improvements. The volume and weight efficiency of packaging is essential for transport and material-handling efficiency. Based on a case study of outbound transport from a retail warehouse, Santén (2017) created a

framework with packaging efficiency as one of three categories which had an effect on transport efficiency.

The protection feature packaging has to reduce food waste is a hot topic. [Verghese et al. \(2015\)](#) analysed the role of packaging in reducing food waste in supply chains. Their study highlighted that the whole packaging system can help to reduce food waste. Such reduction can be done through product protection, ventilation and temperature control. The study concluded that the packaging system greatly affects food waste in supply chains, and that more packaging is sometimes necessary as better protection may save food.

The strategic value of packaging is also addressed by specific approaches. [Twede et al. \(2000\)](#) presented packaging postponement as a strategy to improve supply chain effectiveness and efficiency. Packaging postponement may improve effectiveness through reduced obsolescence as packaging customisation is postponed. Efficiency may be improved through more bulk transport with higher fill rates. [Pålsson et al. \(2017\)](#) reviewed studies which included the role of packaging in energy-efficient e-commerce. They found that the current literature only takes the environmental impact of packaging material into consideration, whereas the impact of packaging on logistics and transport efficiency, and on food waste, was missing.

### *2.2 Trade-offs on packaging in food supply chains*

Packaging follows food products throughout all stages of the supply chain until consumption. It is a delicate, complex matter to incorporate and balance many different stakeholder requirements to maximise the value of packaging. The packaging logistics literature addresses such conflicts of interest, typically labelled trade-offs, but a literature review emphasises that more research is needed to identify and describe opportunities and obstacles within supply chains ([Azzi et al., 2012](#)).

Empirical studies show that conflicts of interest are inevitable in food packaging development. In a multiple case study, [Pålsson and Hellström \(2016, p. 16\)](#) found that different companies in a supply chain have different priorities when it comes to which packaging features “(1) are the most important, (2) perform the best and (3) have the greatest improvement potential.” The different priorities mean that it is challenging but crucial to integrate packaging development and selection processes. The study also showed that companies in food supply chains are conservative when it comes to packaging features. In general, they tended to focus on basic packaging features such as product protection and volume efficiency, whereas convenience and environmental efficiency were ranked as lower areas of focus.

A frequently occurring packaging trade-off is related to standardisation. Packaging standardisation may result in both logistics efficiency and lock-in effects. This dilemma was illustrated by [Jahre and Hatteland \(2004\)](#) in a case study of roll containers in the dairy industry. The study indicated that “*the better it [roll container] works from a single chain’s perspective the worse it would work with regards to the other chains.*” In a regional context, [Min et al. \(2014\)](#) studied the development and implementation of standards in Asia-Pacific countries. They identified sources of difficulties in logistics standardisation in these countries, difficulties such as a limited awareness of logistics standardisation and a lack of a regional standardisation organisation. They also emphasised that companies and governments need to collaborate to develop and implement logistics standards. Otherwise, there is a risk of suboptimisation.

### *2.3 Organisational paradoxes*

Logistics and SCM scholars have, for a long time, researched trade-offs in a wide range of areas ([Sandberg, 2017](#)), and in general, there is a growing awareness of conflicting interests between economic, environmental and social goals in the supply chain ([Xiao et al., 2019](#)). Outside the logistics and SCM domain of research, the most rigorous research on conflicts of

interest has been conducted in organisational theory. In this field, a specific paradox theory (Poole and van de Ven, 1989; Lewis, 2000; Smith and Lewis, 2011; Lewis and Smith, 2014) has emerged in recent years.

Paradox theory can be seen as a meta-theory which deals with a variety of tensions and their management across multiple contexts (Lewis and Smith, 2014; Schad *et al.*, 2016). As a result, other types of tensions which are possible to settle, such as dilemmas or dialectics, are also discussed in paradox theory (Smith and Lewis, 2011). The distinction between paradoxes and dilemmas or dialectics is, however, sometimes difficult to define in practice (Smith and Lewis, 2011; Stoltzfus *et al.*, 2011). A dilemma or a dialectic may prove paradoxical when considered over a long period of time, in cases when a choice or integration solution becomes temporary and underlying tensions resurface (Smith and Lewis, 2011; Schad *et al.*, 2016). Conceptual distinctions among these terms may thus be fraught with ambiguity, and tensions may be experienced differently by the involved stakeholders (Stoltzfus *et al.*, 2011). Given the scope of this research, the paper focuses on the content-wise exploration of long-term conflicts of interest, which we label and define as paradoxes.

In the centre of paradox theory is the observation that competing elements which underscore the paradox may foster innovation in a company, i.e. function together as a catalyst towards development and change (Graetz and Smith, 2009). However, if not properly managed, the same competing elements may jeopardise development and negatively influence company performance by neutralising the beneficial aims in each element (Gebert *et al.*, 2010). It is thus necessary to embrace paradoxes and utilise them as a positive force. A first necessary step is to identify and explicate paradoxes inherent in an organisation. As a useful structure for such identification, paradox theory offers a categorisation of paradoxes into the four types of performing, organising, belonging and learning (Smith and Lewis, 2011).

*Performing paradoxes* are a result of competing goals among stakeholders. As outlined by Hahn *et al.* (2018), sustainability efforts along a triple bottom line where economic, social and environmental objectives are simultaneously sought, may result in tensions. In the packaging logistics literature, performing paradoxes are recognised as trade-offs, for example, targeting the tension between the economic and environmental objectives of packaging design.

*Organising paradoxes* originate from competing organisational design logics, such as centralisation versus decentralisation, collaboration versus competition and control versus flexibility. Organisational units, i.e. subunits in companies or different companies in a supply chain, must simultaneously act independently and interdependently, which may cause organising paradoxes (Jarzabkowski *et al.*, 2013). The organising of packaging development typically faces paradoxes related to the advantages of centralisation versus advantages related to decentralisation (Klevås, 2005). In a similar vein, collaboration on packaging development between supply chain members often aims to optimise the overall supply chain effectiveness of packaging. A contradictory approach with a company-internal focus may, however, result in short-term advantages for an individual company in the supply chain at the expense of other advantages.

*Belonging paradoxes* address paradoxes related to competing values, roles and memberships among different hierarchical organisational levels, ranging from individuals, to companies and supply chains (Schad *et al.*, 2016). Such paradoxes may arise when different organisational units hold competing values on sustainability (Hahn *et al.*, 2018; Xiao *et al.*, 2019). The requirements and performance of packaging may, for example, be exposed to competing values on environmental sustainability.

*Learning paradoxes* revolve around tensions between individuals' or organisations' established understandings and experiences on the one hand and new or future practices based on newly acquired knowledge on the other (Maalouf and Gammelgaard, 2016). To manage learning paradoxes is a balancing act between using and building upon current

knowledge and principles, while at the same time enabling new knowledge to develop the company (Smith and Lewis, 2011). Learning paradoxes may also arise due to different time horizons in different organisations – an organisation with a short-term objective may recognise the value of new knowledge differently than an organisation with a long-term objective (Slawinski and Bansal, 2015).

In addition to classifying paradoxes in different categories, paradox theory also offers insights into strategies to manage paradoxes. Poole and van de Ven (1989), in one of the first articles to address this, identified four strategic responses towards paradoxes which are still valid (Schad *et al.*, 2016):

- (1) Acceptance approach: A paradox is allowed to remain in an organisation. The companies involved do not ignore the paradox, but they “live with it” (Schad *et al.* (2016). An acceptance approach is recognised as a catalyst towards change and renewal (Graetz and Smith, 2009; Hahn *et al.*, 2015).
- (2) Spatial separation: Different interests related to demands, processes or perspectives are organisationally separated. For instance, the paradox between exploration and exploitation could be dealt with by assigning different objectives to different organisational units. Another spatial separation strategy would be to keep paradoxical elements at different levels, distinguishing between, for example, part-whole, micro-macro or individual-society (Poole and van de Ven, 1989).
- (3) Temporal separation: One side of the paradox is favoured at a point of time which is followed by a period when the other side is chosen (Jarzabkowski *et al.*, 2013). Such coexistence may, over time, enable reinforcement between the paradoxical elements (Poole and van de Ven, 1989).
- (4) Synthesis approach: New perspectives are applied which can remove paradoxical tension. As argued by Poole and van de Ven (1989), some paradoxes may stem from conceptual limitations that can be eliminated by new perspectives. Such a reframing of the paradox typically includes a paradoxical leadership as a means to handle it (Jarzabkowski *et al.*, 2013).

In practice, a variety of different strategies for managing paradoxes exist (Jarzabkowski *et al.*, 2013), often built upon a combination of Poole and van de Ven’s (1989) four strategies (Schad *et al.*, 2016). For instance, Smith and Lewis (2011) introduced a dynamic equilibrium model in which paradoxical tensions are proposed to be handled with an acceptance strategy in the long-term perspective, whereas short-term strategies for either finding synergies or temporal separation (oscillation) between paradoxical elements are opted for.

### 3. Case study methodology

#### 3.1 Research design and case selection

This multiple case study explores packaging paradoxes holistically in their real-world context with contextually rich data (Blumberg *et al.*, 2014). It enabled the researchers to identify a wide spectrum of packaging paradoxes and their underlying reasons for existence. It also made it possible to contrast and confirm the paradoxes in different organisational settings (Yin, 2018). The study aimed to explore and categorise packaging paradoxes and the reasons for their existence throughout food supply chains. The unit of analysis was packaging and how packaging practices are organised within and between companies.

The study applied a paradox theory lens, which enriched the study in three ways. First, Smith and Lewis’ (2011) seminal categorisation of organisational paradoxes helped us to develop and structure a semi-structured interview guide. It ensured that the empirical exploration of packaging paradoxes covered all types of potential paradoxes. Second, in the



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analysis phase, paradox theory enabled the researchers to structure and analyse the existing packaging paradoxes and the reasons for their existence. Third, management strategies in paradox theory (Poole and van de Ven, 1989; Schad *et al.*, 2016) framed a discussion of how to manage packaging paradoxes.

Several actors in the supply chain have a stake in packaging. In order to capture paradoxes from various actors, the study incorporated empirical data from seven companies with different roles in Swedish food supply chains: three producers, two brand owners, a retailer and a distributor. Each company has a leading market position in its sector.

Four criteria guided us in the selection of cases. First, the cases cover all stages of general food supply chains, from harvest to grocery store shelf. Analysis can thus capture packaging paradoxes throughout the entire supply chain. Second, the cases combine a variety of packaging design requirements in terms of protection, commercial interests and logistics requirements. This facilitates a rich, comprehensive discussion on conflicting interests. Third, more than one company influences packaging development and selection in all the cases. These multiple influences acknowledge a variety of inter-organisational paradoxes. Fourth, the companies have a major market share in Sweden; at least 30% of the market in their sector. This means that the packaging paradoxes these companies experience have an impact on their sector.

### 3.2 Data collection

Data collection included semi-structured interviews, observations and information from homepages, annual reports and sustainability reports. Table 1 shows company and respondent characteristics. We interviewed two respondents in the large companies and one in the medium-sized companies. The selection criteria were that the respondents should be responsible for packaging selection and development and have significant work experience in the company in order to know its business. In the medium-sized companies, the respondents in this study were involved in all work related to packaging.

The researchers developed an interview guideline based on literature reviews of packaging logistics (with an emphasis on trade-offs) and on organisational paradoxes. The interview guideline in Appendix included questions within six areas:

- (1) Background data (e.g. company name, turnover, etc.)
- (2) Overall descriptions (e.g. packaging systems and the role of packaging supply chain processes and activities).
- (3) Packaging performance goals and their fulfilment.
- (4) Organisation of packaging development.
- (5) Company values with effects on packaging.
- (6) Packaging knowledge development.

Both researchers participated in the interviews to ensure that they understood the respondent correctly. One of the researchers had the main responsibility of conducting the interview. The other researcher followed the discussion and complemented with follow-up questions. In this way, both researchers gathered first-hand information, which facilitated analysis later on. The interviews lasted for approximately one hour. Each interview was recorded. Afterwards, one of the researchers transcribed it and the other verified the transcription.

In addition to interviews, the researchers observed work at the three producers' plants, at one of the brand owners' production sites and at the retailer's distribution centre. The observations were guided by the respondents, lasted for 1–2 h and followed the goods flows in each facility. The aim was to understand how packaging is handled, how it interacts

**Table 1.**  
Characteristics of the  
companies and the  
respondents

	Producer 1	Producer 2	Producer 3	Brand owner 1	Brand owner 2	Retailer	Distributor
Industry	Fresh fruit	Fruit and vegetables	Food	Dairy	Food	Grocery	Fruit and vegetables
Turnover (million €)	18	13	15	1,400	500	8,500	460
Employees	38	70 (+130 seasonal workers)	55	3,000	18,000	8,300	100 (+400 in warehouses)
Market share Respondent(s)	Major CEO	Major CEO	Major Site manager	Major Packaging manager	Major Innovation and packaging development manager	Major Packaging development manager	Major Quality manager
Years in the company	5	27	2 (+5 earlier)	20/30	6/18	25/13	6
				Product manager	Vice president company group procurement - packaging and indirect material	Manager; packaging private labels	



with equipment, as well as the production characteristics and their effect on packaging. The observations also helped to elaborate on and validate the interview questions. Of particular value during the observation were considering primary, secondary and tertiary packaging and discussing their physical attributes and handling efficiency in relation to their design.

The final data source was secondary data from homepages, annual reports, sustainability reports and internal company presentations. These data provided general company information and triangulated some of the interview and observation data. The triangulation included, for example, supporting company perspectives on sustainability, specific environmental goals on packaging and company performance.

### 3.3 Data analysis

The two researchers analysed the transcribed data in three steps: first, a within-case analysis, then a cross-case analysis and finally a review of all data. Before starting the analysis, observations and secondary data were summarised. The summaries include company information, supply chain information about goods flows and supply chain members and packaging characteristics and its application in the various activities. Another form of preparation was to give each interview transcription a unique colour, which made it possible to trace data to the original source.

Overall, to decrease the complexity of the analysis process and increase construct validity, the researchers defined a chain of evidence from the theoretically derived interview guide via colour-coded transcriptions and summaries of secondary data to within-case and cross-case analyses (Yin, 2018). Quotes which strengthen and clarify essential findings supported the chain of evidence (Stuart *et al.*, 2002).

The analysis combined the theoretical lens from paradox theory with two system levels, i.e. the analysis identified intra-organisational and inter-organisational paradoxes in a supply chain. This combination provided a comprehensive framework for classifying and structuring packaging paradoxes in food supply chains.

The within-case analysis started with each researcher's thorough perusal of the transcribed interviews. Thereafter, the researchers coded the interviews in an iterative process. The process focused on identifying packaging paradoxes in the data by applying the four categories of paradoxes in Smith and Lewis (2011). It was also noted whether each paradox identified was intra- or inter-organisational. The paradoxes were continually refined and compared to the paradox categories, thus ensuring internal validity (Stuart *et al.*, 2002). The first interview was coded by both researchers to reach consensus on coding structure and the level of analysis. After the first round of coding the first interview, the researchers compared and discussed the results. Then they repeated this procedure until they reached consensus. For the other interviews, one researcher coded one interview. The results were then discussed with the other researcher, and coding was updated. This process was repeated until both researchers agreed on coding for all interviews. For the cases with two interviews, interviews were coded separately by the same researcher and synthesised after final coding was agreed with the other researcher. The within-case analysis was finalised by synthesising the paradoxes for each case in the categories of performing, organising, belonging and learning. To triangulate and deepen the synthesised interview results, the researchers compared them to the summary of observations and secondary data.

The second step was a cross-case analysis in which the two researchers jointly compared the paradoxes in the seven cases. This step aimed to merge similar paradoxes in the different cases. This was done by comparing all paradoxes within each of the four categories to each other. All paradoxes related to the performing category, for instance, were combined in a new document with the unique colours from the interview transcription. This maintained links to

the original sources for the different interviews. The researchers analysed the paradoxes in each category separately and then together in an iterative process until they reached consensus. As a final step, the researchers reviewed the empirical data related to each paradox in order to identify underlying reasons for its existence. These reasons were synthesised according to their content.

The final version of the results was sent to the respondents for verification. They approved both the manuscript and the quotes.

#### 4. Case studies

The seven cases together cover a wide range of actors whose businesses represent considerable market shares in Swedish food supply chains (Table 2). Producer 1 is an economic co-operative association which organises eighty apple farmers in Sweden. It is the largest apple supplier in Sweden, representing about 65% of domestic production. Directly after being harvested the apples are packed into secondary packaging and taken to cool storing rooms with a reduced oxygen content atmosphere. This long-term storage enables Producer 1 to offer its customers a minimum of five varieties of Swedish apples throughout the year. Customers include all major wholesalers and retailers operating on the Swedish market. Producer 2 is one of the leading Swedish producers of lettuce, onion, broccoli and other vegetables. Its main product, iceberg lettuce, is a fragile, low-margin product. It is harvested three times a year and immediately packed (with or without a plastic bag as primary packaging) into secondary packaging (primarily reusable plastic crates) and stored in the producer's cooling facility. Within a few days, it is distributed to the customers' warehouses. The customers are major retailers in Sweden, restaurants and other wholesalers. Producer 3 is one of the largest jam producers in Sweden. Its production consists of processing with automated filling of glass jars or plastic refill bags. Products are mainly stored in the factory in corrugated board trays in wooden pallets wrapped in plastic. These pallets are distributed to the customers' warehouses when orders are placed. Customers include all the major retailers in Sweden. Brand owner 1 is an economic co-operative association which organises 2,600 farmers in Sweden. The company produces and sells dairy products, primarily a wide variety of milk and yoghurt products. Geographically dispersed throughout Sweden, the company operates fourteen plants to which the raw material (i.e. milk) from the farmers is delivered in bulk trucks. The milk is processed and packed in the plants using highly automated packaging machines, and thereafter stored in four distribution centres around Sweden, before distribution to the physical stores of the major Swedish retailers. The company owns its own reuse systems of plastic crates as well as roll containers, from its plants to stores and back again.

Brand owner 2 is one of the major brand owners on the Swedish food market with eleven plants in Sweden. It produces, sells and distributes a wide range of packaged food products, such as fruit and berry products, cereals, processed potato products and pickled vegetables, to Swedish retailers. Its size and international presence mean that the company has a key position in packaging development in the Swedish food industry, with a variety of in-house experience and competence. Retailer 1 is a combined wholesale and retail company group, in control of more than 1,300 company-owned and franchise grocery stores in Sweden. The central organisation acts as a buying group which organises subunits, such as sourcing, logistics, IT and marketing; these work with its own stores and with the franchisees. Retailer 1 sells private labels and producer brands. In charge of a large, complex distribution system, the company continually designs, improves and selects secondary and tertiary packaging for all kinds of products. It also designs primary packaging for private label brands. Distributor 1 sources fruit and vegetables domestically and from global suppliers. The company is the main supplier of fruits and vegetables to one of the biggest food retailers

	Producer 1	Producer 2	Producer 3	Brand owner 1	Brand owner 2	Retailer 1	Distributor 1
Product category	Fresh food	Fresh food	Jam	Chilled dairy products	Food	Colonial products, fresh products, frozen products	Fruit and vegetables
Price product (€)	3.5 €/kg Small	1 €/kg Small	3–10 €/kg Small	1.5 €/litre Small	Various	Various	1–10 €/kg
Packaging range	Small	Small	Small	Small	Wide (glass bottles, carton boxes, plastic, etc.)	Wide	Wide (carton boxes, plastic, etc.)
Primary packaging	None	Plastic bag/None	Glass jar or plastic refill bag	Carton board plastic jar	Various	Various	Various
Secondary packaging	Reusable plastic crate	Reusable plastic crate	Corrugated board tray with plastic wrapping	Reusable plastic crate	Reusable plastic crate	Reusable plastic crate	Reusable plastic crate
	Corrugated board box (alternative)	Solid board packaging (alt.)		Roll container	Corrugated board box	Corrugated board box	Corrugated board box
Tertiary packaging	Euro pallet	Corrugated board box (alt.)	Euro pallet	Corrugated board box			
Shelf life (packing to consumption)	1–10 months (in controlled atmosphere)	Short	Long	Euro pallet	Euro pallet	Euro pallet	Euro pallet
Temperature sensitivity	High for long shelf life	Chilled	No requirement	Short	>2 months	Varies	Varies
Important packaging features	Packaging cost, protection	Packaging cost	Protection efficiency unitisation stackability	Chilled	No/Chilled/Frozen	No/Chilled/Frozen	Chilled
			Protection efficiency unitisation stackability	Protection Logistics efficiency Environmental efficiency	Packaging cost Protection Promotional attributes Environmental efficiency	Protection Promotional attributes Stackability Environmental efficiency	Protection Promotional attributes Logistics efficiency

**Table 2.** Product and packaging characteristics for the cases studied

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in Sweden. All imported products and a great share of domestic products go through the company's distribution centre in southern Sweden. The basic domestic produce goes directly from the producer to the retailer.

## 5. Results

The analysis of the seven cases revealed a number of packaging paradoxes between companies in their supply chains (inter-organisational) and a number of packaging paradoxes between subunits (intra-organisational) within the companies. Both inter- and intra-organisational paradoxes are sorted into one of four paradox types, as described in the literature review: performing, organising, belonging and learning.

The following sections present the empirical insights for each paradox type. All identified paradoxes are summarised in [Tables 3 and 5–7](#) with examples from the cases, whereas the running text aims to give general understanding of each paradox type.

### 5.1 Performing paradoxes

Performing paradoxes cover tensions related to the fact that stakeholders have multiple and competing goals on packaging. This category of paradoxes is the most commonly addressed one in the packaging logistics literature, but the paradox lens helped us to frame and structure these paradoxes in a new way. We identified three performing paradoxes at the inter-organisational system level and two at the intra-organisational system level ([Table 3](#)).

The first performing paradox on the inter-organisational level is manifested in a set of sub-paradoxes. They appear because supply chain members have contradictory performance goals on packaging features. [Table 4](#) summarises these paradoxes.

The second performing paradox (P2) on the inter-organisational level appears because of lock-in effects in expensive packaging equipment as companies have competing goals on investments. An investment which modifies packaging equipment to improve packaging performance for one type of products can have negative consequences on other types in the same equipment, or the payback time can be long. For instance, if Distributor 1's producers invest in a new packaging machine, which replaces lids with a heat seal, they can reduce the amount of packaging material and increase pallet utilisation. However, it is challenging for producers to make a long-time investment, as their contracts with producers are only for one season at a time.

The third performing paradox (P3) on the inter-organisational level appears because companies in the supply chain have different priorities: some focus on maximising packaging performance within the company boundaries and some within the supply chain boundaries. An example is a supply chain where Retailer 1's focus on maximising packaging performance from the distribution centre to the retail store, which is in conflict with Producer 2's aim of maximising packaging performance for the production plant. Another example is that Distributor 1 experiences that the demand for environmentally sustainable material for a product in one end of the supply chain increases the total negative effect, because the new material has worse protection features. As a result, "*new sustainable plastics have increased the waste in production by 10–15%.*"

There are also inter-organisational performing paradoxes between subunits within the food companies. P4 refers to priorities in the different pillars of sustainability performance. The subunits measure sustainability performance of packaging in contradictory ways. The subunits place different emphasis on the economic and environmental performance of packaging, which creates a paradox when these performance measurements are contradictory. For instance, even though Retailer 1's company strategy emphasises the importance of environmental efficiency, when it comes to packaging the respondent states

Paradox	Description	Producer		Brand owner		Retailer		Distributor	
		1	2	3	1	2	1	1	
Inter-organisational									
P1	Packaging feature X vs. Packaging feature Y	x	x	x	x	x	x	x	x
P2	Opportunities to improve packaging performance with investment vs. Risks to change expensive packaging equipment		x						x
P3	Supply chain performance vs. Company performance	x	x				x		x
P4	Economic packaging performance vs. Environmental packaging performance								x
P5	Individual packaging feature performance evaluation vs. Packaging system performance evaluation								x
Intra-organisational									

**Table 3.**  
Performance paradoxes in the cases

**Table 4.**  
Conflicts between  
packaging features at  
the inter-  
organisational  
system level

		Example
A Promotional attributes	vs 1	Logistics efficiency
	2	Production efficiency
	3	Handling efficiency
	4	Volume efficiency
B Packaging cost	vs 5	Packaging material
	6	Promotional attributes
	7	Protection
C Packaging material	vs 8	Packaging material
	9	User friendliness
D Protection	10	Protection
	vs 11	Logistics efficiency

Example

A market-driven design allows for 10 primary packages in a standardised secondary package, but a design slightly adjusted to logistics allows for 15 primary packages (distributor 1)  
 Automatic production with a reusable packaging system *“is the most cost-efficient in the world”*, but to fulfil promotional attributes from its customers producer 1 uses a much less efficient manual packing procedure  
 Retailer 1 uses standardised reusable crates because of, e.g. handling efficiency at the expense of promotional attributes  
 When developing a new package, brand owner 2 had a conflict between using the same outer dimensions as similarly dimensioned competitors’ packages or choosing a more volume efficient package with less exposure surface in the store  
 Distributor 1 uses primary packaging for its ecological products to enable communication even though they do not need packaging  
 Producer 1 sells certain apples in an expensive package to obtain a higher price  
 Retailer 1 emphasises that it sometimes makes packaging purchase *“at a really good price, but 5% are damaged during transport because of bad packaging”*  
 Sometimes recyclable packaging *“is more expensive, it reduces the production efficiency, and consumers cannot see any difference compared to the current packaging, which means that the price cannot increase”* (brand owner 2)  
 Brand owner 2 changed the metal lid on its glass bottles to be easier to open, but it also contains more metal  
 Consumers perceive a metal clip on net bags for onions as a negative environmental impact, but the alternative solution of joining the bags through melting reduces packaging strength, which leads to food waste (distributor 1)  
 Producer 2 uses reusable plastic crates and has *“never damaged products or a broken package”*, but *“it takes 15-20% less products as it is more bulky, which leads to increased logistics costs”*

Paradox	Description	Producer			Brand owner 1	Brand owner 2	Retailer	Distributor
		1	2	3				
Inter-organisational	O1 Standardised packaging vs. Customised packaging among supply chain members	x	x			x		
	O2 Short-term planning vs. Long-term planning among the supply chain members				x		x	
	O3 Joint planning processes vs. Individual planning processes	x	x			x		
Intra-organisational	O4 Development processes for standardised packaging vs. Development processes for innovative packaging	x	x		x			
	O5 Standardised range of packaging vs. Customised packaging	x	x	x	x			
	O6 Centralised packaging mandate for the packaging unit vs. Decentralised packaging mandate for other units			x			x	
	O7 Reactive packaging development vs. Proactive packaging development	x	x		x			

Table 5. Organising paradoxes in the cases



**Table 6.**  
Belonging paradoxes  
in the cases

Paradox	Description	Producer 1	Producer 2	Producer 3	Brand owner 1	Brand owner 2	Retailer 1	Distributor 1
Inter-organisational	B1 Sustainable packaging at company X vs. Economically efficient packaging at company Y	x					x	x
	B2 Definition of environmentally responsible packaging at company X vs. Definition of environmentally responsible packaging at company Y							x
	B3 Definition of economically efficient packaging at company X vs. Definition of economically efficient packaging at company Y	x	x				x	
Intra-organisational	B4 Definition of environmentally responsible packaging at subunit X vs. Definition of environmentally responsible packaging at subunit Y							x
	B5 Loyal to the subunit vs. Loyal to the company			x		x		
	B6 Packaging value in subunit A vs. Packaging value in subunit B						x	x

Paradox	Description	Producer 1	Producer 2	Producer 3	Brand owner 1	Brand owner 2	Retailer	Distributor
Inter-organisational	L1 Incremental packaging knowledge development in company X vs. Adopt new, emergent packaging knowledge in company Y	x	x		x			
	L2 New packaging knowledge in company X vs. Restrictions to apply new packaging knowledge in company Y				x			x
Intra-organisational	L3 Incremental packaging knowledge development in subunit A vs. Adopt new, emergent packaging knowledge in subunit B	x	x	x			x	x
	L4 In-house packaging competence vs. Outsourced packaging competence				x			
	L5 Resources for formal training vs. Informal training with minimal resources	x	x			x		x

Table 7. Learning paradoxes in the cases

that “*we are measured on the purchasing price . . . it is hard to promote packaging changes due to environmental benefits if it increases costs.*” The second performing paradox at the intra-organisational system level refers to packaging performance evaluation, i.e. whether a subunit evaluates individual packaging features or the packaging system as a whole (P5). For example, even though a new packaging solution for tomato sauce at Brand owner 2 reduced the essential shelf life feature from 24 months to 9 months, it improved the overall packaging system performance from the perspectives of logistics, production, marketing, etc.

### 5.2 Organising paradoxes

Organising paradoxes appear if packaging development processes or packaging selection processes have competing logics in different companies in a supply chain or in the companies' subunits. The seven cases revealed four organising paradoxes at the inter-organisational system level and three at the intra-organisational system level (Table 5).

On the inter-organisational system level, the cases revealed a paradox between standardised and customised packaging among supply chain members (O1). Brand owner 1's standardised roll containers are, for example, highly efficient for large sales volumes, but not for products sold in small volumes. The cases also revealed an inter-organisational paradox related to competing planning horizons for packaging development, where one supply chain member may have a long-term perspective whereas other members have a short-term one (O2). Distributor 1's producers prefer a relatively long planning horizon for packaging design to enable economies of scale in the purchase of packaging material, investments in packaging machines, etc., but its obligations towards producers is usually short. The contract for fresh strawberries is, for example, limited to a few months. A related paradox occurs between different approaches towards planning processes (O3). Joint planning processes can optimise packaging practices in the supply chain as a whole, but it can contradict optimal planning processes at each individual company. Here, Retailer 1 notes that the most effective approach for packaging decisions consists of planning and communication along the entire supply chain; between the producer, the retailer and the packaging supplier. Meanwhile, producers such as Producer 2 and Producer 1 tend to only involve their suppliers and customers, e.g. Retailer 1, in packaging development decisions on an ad hoc basis. The fourth inter-organisational paradox (O4) refers to packaging development processes. Those that aims at standardised packaging result in logistics efficiency in the mid-term, but they hinder long-term development and innovation processes. For instance, the industry standard for product and packaging exchange procedures facilitates efficient administration for Brand owner 2, but because of costly administration when making packaging changes, it also hampers Brand owner 2's willingness to innovate and improve packaging.

On the intra-organisational system level, different subunits may have competing policies for the packaging range and packaging mandate, which result in two paradoxes (O5 and O6). To standardise, Producer 2 has reduced the number of different widths of plastic film for bags to minimise inventory and complexity, but the company still customises packaging on request, which often leads to inefficiency in production and internal packaging waste for the producer. Having the packaging mandate in a decentralised packaging organisation offers both pros and cons compared to a centralised organisation. Retailer 1's packaging experts argue: “*the packaging improvements that does not involve other organisational functions often leads to phenomenal improvements, but the root causes caused by a limited system view are not possible to solve.*” A third intra-organisational paradox (O7) exists because reactive packaging development, i.e. only develop packaging when requested, is resource efficient, but it does not create innovative packaging solutions or identify improvement potential in the entire packaging range as a proactive approach may do. Producer 1 is mainly reactive in packaging

development: it is done as a response to a customer request. This approach is resource efficient, but it does not seem to create innovative packaging solutions or identify improvement potential in the entire packaging range. Brand owner 2, on the other hand, supported by a packaging development team, has a more proactive approach. This approach has resulted in several innovative packaging solutions, e.g. an easy-to-open lid and a transport-efficient bottle being inflated in the plant instead of empty bottles being supplied.

### 5.3 Belonging paradoxes

Belonging paradoxes cover competing values on packaging preferences in different companies in a supply chain or in the companies' subunits. The analysis revealed three belonging paradoxes at the inter-organisational system level and three at the intra-organisational system level (Table 6).

At the inter-organisational system level, the analysis revealed competing values between supply chain members regarding how to prioritise between sustainable packaging and cost-efficient packaging (B1), how to define environmentally responsible packaging (B2) and how to define economically efficient packaging (B3). Overall, the companies value the three pillars of sustainability differently, which affect their packaging decisions. For instance, regarding B1 Retailer 1 states that its "*sustainability work is a strategic priority and is integrated in all the group's operations*", whereas Producer 2 primarily values cost efficiency. Regarding B2, Distributor 1 perceives that consumers often define environmentally responsible packaging based on type and amount of material, whereas the company also takes other aspects into account, aspects such as the effect of packaging product waste and recyclability.

In a similar manner, different subunits on the intra-organisational level also have competing values. These refer to competing definitions of environmentally responsible packaging (B4), being loyal to the subunit's values or to the company's overall values in packaging development (B5) and different perceptions of packaging value (B6). B5 is exemplified by the fact that different subunits at Retailer 1 have different incentives, focus and scope for packaging analyses, e.g. purchasing focuses on price and logistics on handling efficiency, but they lack a unified company perspective.

### 5.4 Learning paradoxes

Learning paradoxes arise when new knowledge challenges current knowledge so that an organisation must decide whether the future should build upon or abandon current knowledge. The empirical data revealed two learning paradoxes at the inter-organisational system level and three at the intra-organisational system level (Table 7). As background, food companies have different resources to develop packaging and packaging knowledge. Small and medium-sized companies may lack the infrastructure and resources for formal training and knowledge development in packaging.

On an inter-organisational system level, this creates a learning paradox regarding focussing on incremental knowledge development or on adopting new, emergent knowledge (L1). Distributor 1 notes, for example, that its new knowledge and innovation efforts are sometimes overruled by limitations in existing production equipment at their suppliers'. It also creates a paradox between developing new packaging knowledge in a company and having restrictions in another company to apply the knowledge (L2). For instance, Distributor 1 notes that a development initiative from a laminated package to a new bioplastic bag was not implemented, because the producer was unable to make necessary investments in packaging machinery.

On the intra-organisational level, the empirical data showed a similar paradox between subunits in the companies where one subunit may prefer incremental packaging knowledge development, while another aims for emergent knowledge (L3). One example is that Producer

3 and Distributor 1 are interested in acquiring new packaging knowledge, but they are often limited to the current knowledge base due to restricted packaging expertise in their organisation.

Other learning paradox within companies are about packaging competence, in particular on whether to keep it in-house or outsource it (L4) and whether or not have resources for packaging knowledge development (L5). Resources for formal packaging training would improve future packaging, but this approach is too costly in the short term.

## 6. Discussion

The results show four types of packaging paradoxes on two system levels in food supply chains. An analysis of the empirical data related to these paradoxes helped us propose underlying reasons for their existence; this analysis is discussed in the first part of this section. The clarification of underlying reasons for each type of paradox is a necessary basis for subsequent discussion in the second part of this section of how to manage these paradoxical tensions.

### 6.1 Reasons behind the paradoxes

We identified two reasons behind performing paradoxes on the inter-organisational system level. First, they arise because the role of different types of actors in a supply chain leads to different requirements on packaging. For instance, Producer 1 and Producer 2 emphasise low packaging costs and promotional attributes, as these features affect their profitability, whereas their customers place emphasis on logistics efficiency, which affects their costs. Second, company strategy varies between the companies, which affects investment plans (e.g. payback time) and within which system boundaries the company assesses packaging performance. Brand owner 2, for example, needs longer development time for new packaging solutions than its customers offer when it comes to adopting new packaging solutions in the customers' assortment.

The performing paradoxes on the intra-organisational system level have two underlying reasons. First, different subunits in a company have different incentives and therefore focus on different areas (e.g. purchasing, sales or logistics); this results in different requirements on packaging. Second, paradoxes related to sustainability performance depend on the fact that the case companies operationalise financial goals, whereas sustainability goals are only general. This means that KPIs (key performance indicators) are solely related to financial measures in the case companies.

The organising paradoxes on the inter-organisational system level originate from the fact that companies in the study have different logics and requirements on being responsive and cost efficient in designing their packaging organisation and its processes. For instance, Brand owner 2 aims to be responsive, whereas Producer 2 focuses on cost efficiency. This is reflected in the fact that Brand owner 2 has significant resources and well-established processes for packaging development, whereas Producer 2 puts minimal resources into packaging development. The different logics can also be expressed as a company focus on *lean* or *agile*. These differences between companies determine the level of standardisation, planning objectives and packaging innovation.

On the intra-organisational system level, the organising paradoxes originate from a struggle between organising packaging processes with an aim to obtain economies of scale or customisation through flexibility. Subunits with a focus on economies of scale prefer a centralised packaging mandate, a standardised packaging range and reactive packaging development, whereas subunits with a focus on flexibility prefer a decentralised packaging mandate, a customised packaging range and proactive packaging development.

Belonging paradoxes in the seven cases, on both system levels, arise because companies and subunits value packaging sustainability differently. On the inter-organisational system level, companies value the environmental impact of packaging in relation to its financial impact differently. Companies in the study do not collaborate to iron out these differences. Instead, interaction is characterised by opportunistic behaviour and arm's lengths relationships, which leads to paradoxes for sustainable packaging considerations. On the intra-organisational system level, paradoxes regarding sustainable packaging between subunits originate from the fact that the subunits have different performance goals and KPIs related to packaging. Such differences have led to different values and norms in the subunits.

Learning paradoxes on the inter-organisational system level reflect an organisation's view of packaging as a strategic component (e.g. Retailer 1) or a necessary evil (e.g. Producer 2). When packaging is seen as a strategic component, companies allocate resources for packaging knowledge to be able to develop innovative packaging solutions. They are also keen to keep packaging in-house. When regarded as a necessary evil, companies aim for incremental improvements to existing packaging solutions and they are more eager to outsource packaging development. In the latter group of companies, it is also easier to encounter situations with lock-in effects in expensive equipment, as companies are unwilling to invest in new equipment. In a similar manner, the subunits on the intra-organisational system level sometimes have different perceptions of packaging as a strategic component. This explains why one subunit (e.g. production), which perceives that a packaging solution works well, wants to maintain current packaging knowledge, whereas another subunit (e.g. marketing), which perceives that the same packaging solution has limited performance (does not sell enough), wants radical changes which require emergent knowledge development.

The underlying reasons for the four types of paradoxes are summarised in [Table 8](#).

### 6.2 Managing packaging paradoxes

Managing paradoxes is the logical next step, after recognition ([Keller and Sadler-Smith, 2019](#)) and sense-making ([Smith and Lewis, 2011](#)). Unless packaging paradoxes are acknowledged and managed, the strategic value of packaging is not fully utilised ([Found and Rich, 2007](#)). Management of paradoxes has received research attention in recent years and is discussed in various research disciplines ([Schad et al., 2016](#); [Keller and Sadler-Smith, 2019](#); [Hargrave and van de Ven, 2017](#)), but only to a limited extent in logistics and SCM research ([Pålsson and Sandberg, 2020](#)).

To discuss management strategies for *performing paradoxes*, we first reiterate that they originate from different incentives for and goals on packaging performance among stakeholders, both internally in a company and externally throughout the supply chain. This is because subunits have different roles in a company and companies have different

Paradox category	Inter-organisational Companies have different . . .	Intra-organisational Subunits have different . . .
Performing	Roles and company strategy	Incentives and KPIs
Organising	Logics and requirements regarding responsiveness and cost efficiency	Logics and requirements regarding economies of scale and customisation
Belonging	Values and norms related to sustainability	Performance goals and KPIs related to packaging
Learning	Perception of packaging as a strategic component or a commodity	Perception of packaging as a strategic component or a commodity

**Table 8.**  
Underlying reasons for  
packaging paradoxes

roles in a supply chain, and because companies have different strategies. Performing paradoxes are often manifested or enforced in contradictory KPIs. As noted by [Hahn et al. \(2015\)](#), acknowledging contradictions regarding sustainability goals is an essential starting point for management. A starting point to manage these paradoxes can thus be to create awareness among different stakeholders about KPIs, as a way to gain stakeholder acceptance and find feasible ways forward. Such an acceptance strategy ([Poole and van de Ven, 1989](#)) in which performing paradoxes are worked through ([van der Byl and Slawinski, 2015](#)) may lay the foundation for an effective and efficient balancing act between the different stakeholders and their objectives. Spatial separation of an organisation can be applied to management of packaged products with different characteristics. This may, for instance, refer to organisations dealing with both commodities and premium products. It may also refer to packaged products with major differences in sales volumes. The latter example can also be applied to temporal separation – for those products with a paradox between *promotional attributes* and *volume efficient packaging features*, the side of this paradox to favour can change if the sales volume changes. A new product with low sales may, for example, favour promotional attributes, but if the sales raise volume efficient packaging features may become more important. A long-term goal may be to apply a synthesis approach to remove performing paradoxes. One possibility may be to apply innovative packaging strategies; packaging postponement ([Twede et al., 2000](#)) can, for example, combine volume-efficient packaging in transport with graphically appealing sales packaging with a large exposure area in the sales location. For KPIs, synthesis may be to develop weighted measures which combine different perspectives.

*Organising paradoxes* originate from competing organisational logics and requirements regarding responsiveness and cost efficiency. While a responsive logic focuses on an organisation's capabilities to respond to customer demands on packaging, a cost-efficient logic focuses on economies of scale and being lean. To cope with this paradox, i.e. being both responsive and maintaining cost efficiency in packaging management, spatial separation ([Poole and van de Ven, 1989](#)) can be applied with inspiration from leagile strategies ([Christopher and Towill, 2001](#)). A leagile strategy seeks to differentiate supply chain activities or products to simultaneously fulfil multiple objectives. To manage packaging paradoxes, this means separating the organisational logics for ongoing packaging operations, which may focus on cost efficiency and from development projects for new and customised solutions. In such separation, organising principles in Graetz and Smith's article ([2009](#)) about managing contradictory organisational logics across organisational structures, processes and boundaries can be used to design the organisational logic.

*Belonging paradoxes* often originate from differences in values and norms regarding what sustainable packaging means and how to assess it. These kinds of belonging paradoxes are also addressed in research on paradoxes in other fields ([Xiao et al., 2019](#)). As the general awareness and need for sustainable packaging are growing rapidly ([White et al., 2015](#)), it is essential to consider belonging paradoxes as related to packaging. To manage these paradoxes, a starting point may be to make people in different organisational levels (subunit, company and supply chain) aware of the three pillars of sustainability and how sustainability is measured in different parts of the organisation. Such awareness is a step towards accepting the paradoxes, but it can also facilitate change when people in different organisational parts have the bigger picture ([Poole and van de Ven, 1989](#)). Improved or aligned KPIs at different hierarchical levels may, for instance, bring clarity and remove false perceptions of sustainable packaging and thus align different stakeholders' perceptions. Furthermore, spatial and temporal strategies ([Poole and van de Ven, 1989](#)) may also help in managing values and norms related to sustainable packaging. An analysis framework for managing tensions between the three pillars of sustainability by [Hahn et al. \(2015\)](#) shows that values and norms with respect to



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packaging can co-exist at different organisational levels (spatial strategy) and be given different emphases at different points in time (temporal approach).

Finally, *learning paradoxes* originate from disparities in the view on packaging as a strategic component or a commodity. This view affects the organisations' willingness to allocate resources to packaging development. Companies that regard packaging as a strategic component are willing to allocate resources for radical change, but companies that regard packaging as a commodity allocate less resources with a focus on incremental improvements. It seems difficult to manage these paradoxes with an acceptance approach, because the organisations' allocation of resources for knowledge and packaging development are fundamentally different. Instead, a spatial strategy approach (Poole and van de Ven, 1989), which separates learning approaches in different organisational units may be a way forward. Incremental learning with a base in existing packaging practices can be fostered in some company units, whereas other units may be geared towards more quantum leap improvements and new thinking. A similar approach can be applied to a supply chain – a company is usually part of several supply chains – in some supply chains, the learning approach can be on incremental improvements and in others on radical change. In addition, a temporal strategy (Poole and van de Ven, 1989) can be considered to manage long-term changes in market requirements on packaging. Over time, individual companies as well as entire supply chains may need to shift between periods of relatively stable market conditions with incremental improvements in packaging practices and periods of fundamental market changes. These changes require new learning to introduce, for example, new packaging practices, new materials and new equipment.

## 7. Conclusions and future research

This explorative study uses a novel theoretical lens to identify and categorise four types of packaging paradoxes on two system levels. It presents detailed descriptions of, and underlying reasons for, the paradoxes. It also discusses strategies to manage packaging paradoxes.

Theoretically, the paper offers a new way to understand the complexity of packaging decisions in food supply chains. It contributes to the packaging logistics literature by extending the theoretical knowledge about conflicts of interest related to packaging. These conflicts of interest have previously been mainly addressed as trade-offs between packaging features or packaging requirements (Azzi *et al.*, 2012). Grounded in paradox theory and empirical data from leading companies in Swedish food supply chains, existing knowledge regarding performance and organising trade-offs is further detailed. In addition, the research presents empirical data for belonging and learning paradoxes which are new in a packaging logistics context. The research goes beyond the identification of existing paradoxes, to also include the reasons for their existence and a discussion on strategies for how to manage them. As such, our research offers an empirically grounded understanding of a wide range of detailed packaging paradoxes present in food supply chains. This is in line with Stoltzfus *et al.*'s (2011) consideration of pragmatic paradoxes, addressed as paradoxes “*that arise from ongoing relationships rather than outgrowths of deductive reasoning or grammatical form*” (p. 353).

From a practical perspective, the structured categorisation and detailed descriptions of packaging paradoxes at two system levels indicate the complexity of packaging decisions in food supply chains. The research emphasises the need to take paradoxes into consideration when creating innovative packaging solutions or processes. In particular, our findings provide guidance for managers with respect to the identification and awareness of packaging paradoxes, as well as strategies for how to manage them.

The findings of this study feed into a number of suggestions for future research. As the study is limited by empirical data from seven food companies in Sweden, future research

should confirm and extend the current findings by incorporating data from food companies in other countries. For instance, such research could cover the importance of paradoxes, their impact on company performance and innovation, and how different paradoxes are related to each other. The latter includes how inter- and intra-organisational paradoxes may interact.

In addition to research on the importance of paradoxes, future research should continue to do research on strategies for how to manage paradoxes (Waldman *et al.*, 2019). This paper initiated such a discussion in a packaging logistics context, but several research possibilities remain. Future research could develop the strategies proposed in this paper further and then empirically test and evaluate them by investigating their implementation. More knowledge regarding when to apply a certain strategy, and the challenges related to specific strategies, should be researched.

A related future research area concerns a distinction in managing paradoxes on intra- and inter-organisational system levels. Based on the results from this study, strategies to manage intra-organisational paradoxes can be determined and implemented by the management group in a company, as it controls the business. Strategies to manage paradoxes on the inter-organisational level require another approach. Here, companies need to collaborate, increase transparency, negotiate and come to mutual understandings.

Finally, a paradox persists over time. It should be managed both in the short term and the long term. Usually, there are fewer management options available in the short term, because of limitations in the current organisational structure and available resources (Schad and Bansal, 2018). In the short term, some conflicts of interest may successfully be treated as dilemmas or dialectics, whereas in the long term, they need to be treated as paradoxes (Lewis and Smith, 2014). This paper focused on the paradoxes, which leaves opportunities for future research into how short-term dilemmas or dialectics can be dealt with, without jeopardising paradoxical management strategies applied in the longer term. In the longer term, more comprehensive management options are available. Managing packaging paradoxes requires taking both perspectives into account, so that a change is not hindered by conflicts between short-term and long-term requirements (Smith and Lewis, 2011). More research into how companies can combine short-term with long-term strategies would therefore be interesting for future research initiatives.

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## Appendix

### Interview guide

Present the interviewers and the purpose with the study and the interview.

**Background data** (name, company, position, years in the company, turnover and employees).

- (1) Describe the supply chain for a number of packaged products – processes, activities, challenges, damaged products, repackaging
- (2) How do you develop and select packaging?
  - Collaboration with other actors
  - Cost and benefit sharing
  - Symbiosis between demands from different customers and suppliers
- (3) Which packaging features are important to you for primary, secondary and tertiary packaging?
  - Which packaging features are important to other actors in the supply chain?
  - To what extent does the current packaging systems fulfil these features from your perspective?
- (4) For which time horizon does the company make packaging decisions?
- (5) What is your view on pay-back time for an investment in packaging equipment or?
- (6) How do you consider requirements on packaging in the supply chain that are outside of your company's boundaries?
- (7) To what extent do you include suppliers and customers in selection and development of packaging (P, S, T)?
- (8) How does this extent affect time and resource efficiency in selection and development of your packages?
- (9) To what extent are your and the suppliers and customers requirements on packaging similar? Please exemplify!
- (10) Is the focus on fulfilling requirements on specific packaging systems or on having a unitised packaging range (towards the network of customers and suppliers)?
- (11) Which industry standards affect your packages (does it affect the fulfilment of requirements in the supply chain)?
- (12) As a company, which goals and values are the most important out of economic efficiency, environmental efficiency, customer satisfaction? What does it mean for packaging?
- (13) What kind of information and knowledge do you seek when you develop or change packaging?
- (14) How do you develop your knowledge base about packaging and packaging technology over time? Do you foresee risks or challenges with this focus of the company? (If outsourced packaging development: How do the packaging developers get insights into new packaging requirements from your products and supply chains?)
- (15) How do you develop your staff about packaging and packaging technology? What support do you have in the company (education programme, external educations and informal education)?
- (16) How does the company think about in-depth packaging knowledge and packaging technology (e.g. new materials, new technologies) versus the capability to adjust the current packaging solutions in the company to different contexts (same packaging with e.g. different colour, thickness, etc.)?

- (17) How important is expertise about packaging material and different packaging features to the company? How important is knowledge about the supply chains where the packages are used?

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