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Is Collaboration Necessary? Or: Might the Physical Internet be implemented by Internalization?

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Abstract: *This paper discusses the necessity of collaboration in transport logistics, outlining two contrary case studies (retailer amazon and the small-structured fresh vegetables sector in Austria). We question if an internalization of crucial logistical activities might also lead to an implementation of the basic concept of the Physical Internet (PI). On a first glance, in-sourcing is contradicting the PI mindset as there is only little collaboration in this setting. So far, we consider that especially the PI community should investigate this topic of developments in more detail. If the PI, or the main concepts of the PI, could be realized via internalization as carried out by e.g. amazon, one should think about loosening competition rules. Furthermore, we would like to encourage this discussion together with ALICE via the organization of an event during one of the next ALICE plenary meetings with corresponding representatives on the podium.*

Keywords: *collaboration, internalization, competition, fresh vegetabels, retail*

1 Introduction

Which kind of challenges is humankind facing now? What is driving us? And where does it lead us to? In 2018, the European Union identified five priority societal challenges underlying the next research framework programme “Horizon Europe” where targeted research and innovation can have a tangible impact, i.e., health, inclusive and secure societies, digital and industry, climate, energy and mobility, and food and natural resources (EC 2018). Considering these aspects and the trend towards a greater socio-economic and political individualization, fair and responsible action and management become more and more relevant for today’s society. As a result, companies will be acting increasingly fair and responsible, assuming that fair and responsible action will guarantee profit and sustainable growth (cf. Schwab et al. 2019). In that context, logistics plays a central role in supporting companies to become “fair”.

Four main drivers that affect “fair and responsible logistics” can be identified (cf. UN 2015, p. 21 and DHL 2015, p. 3):

- changing societies (growing consumer demand for more transparency and fairness, increase in the consumption of fair and responsible products),

- disruptive technologies (convergence of social, mobile, cloud and big data technologies to achieve more transparency in and access to (green) supply chains)
- climate change and
- stringent policies (increasing regulatory framework for compliance and anti-corruption measures and social and environmental standards for businesses). (cf. UN 2015, p. 21 and DHL 2015, p. 3)

“Fair and responsible logistics” even goes beyond common measures to reduce the environmental impact of logistics activities and includes the industry’s sustainability agenda.

hygienic, stackable, compatible and meet the economic requirements of the food retail trade. In principle, reusable transport packaging is used.

One aspect that must not be ignored in the transport process is the container types used in food retailing, some of which differ greatly from one trading company to another. For example, REWE Group works with foldable trays made by Container Centralen GmbH with dimensions of 600*400 mm in three different heights (110, 167 and 220 mm), which only have a height of 36 mm when folded (cf. REWE, 2009). This reduces waste on the one hand and makes the reverse transport of empties more efficient on the other (cf. REWE, 2010). At the same time, the retail companies have strict requirements with regard to the containers they deliver. For example, SPAR AG has specified that fruit and vegetables (unless otherwise agreed) must be delivered in STECO returnable packaging (cf. SPAR, 2013). These are foldable reusable plastic packaging produced by IFCO. Depending on the turnover, the size of the vegetable containers varies (higher turnover requires larger crates with more contents), as do the package sizes, which entails additional logistical work (due to the need-based order picking). Hofer KG delivers fruit and vegetables in non-folding pool crates.

Cooling zones

With regard to the transport of goods with different temperature requirements, so-called multi-chamber refrigerated vehicles have proven themselves, which divide the loading space into two temperature zones. This enables a more efficient use of the loading volume of a truck. Thermo- and insulating hoods are also used in the transport of temperature-dependent goods. This means that goods with very different temperature requirements can be transported, such as frozen goods (-18°C) together with fruit and vegetables (6°C) and ambient goods (20°C) (cf. Krautz, 2014). The cooling zones and insulating hoods ensure optimum product quality.

2.2.2 Specific characteristics of the fresh vegetables sector

Both consumers and retailers have high expectations of the quality of products. To certify this, products are labelled with quality seals and logos. In order to receive a seal of quality or a logo, products must comply with specified standards. The labelling of products with quality labels can be based on private law or on EU food quality regulations. Private quality seals are awarded by the brand owner, who himself defines the quality requirements and determines the number and form of controls (cf. BMLFUW, 2010, 106). In addition, there are quality and safety standards such as the International Featured Standard, which is intended to ensure uniform verification of food safety (cf. IFS Management GmbH, 2014a).

The International Featured Standard (IFS) and the worldwide GLOBALG.A.P. are among the Europe-wide valid and recognized standards. Quality seals are awarded to conventionally produced products. The AMA seal of approval and Pro Planet are relevant for fruit and vegetables in Austria

All products produced organically comply with EU Regulations (EC) No 889/2008 and (EC) No 834/2007. Organic farming aims to have the least possible impact on nature in the production of agricultural goods. The use of artificial fertilizers and pesticides is essential for organic production. Only living organisms or mechanical processes may be used. Only natural or naturally derived substances may be used as fertilizers. Great importance is also attached to the welfare of farm animals, animal welfare and animal species-specific standards must be met and go beyond the Animal Welfare Act. Genetically modified organisms (with the exception of pharmaceuticals) are prohibited. Within the EU, organic foods are labelled with

the European Union's organic seal of approval. This is shown by a leaf consisting of stars on a green, white or black background. Below the logo there is a code of the authority or body responsible for control. The origin is also subdivided and labelled into "EU agriculture", "non-EU agriculture" (production of raw materials in third countries) or "EU/non-EU agriculture" (if the raw materials were partly produced in third countries) (cf. Regulation (EC) No. 834/2007, Article 24).

In addition to the EU organic seal of quality, there are many other seals of quality and private labels in Austria that identify organically produced products (e.g., *AMA-Biosiegel, SPAR Natur Pur, JA! Natürlich, Zurück zum Urspung)*.

Efficient Consumer Response (ECR)[1]

Efficient Consumer Response is the cooperation of all companies along a value chain and therefore of great importance for the vegetable sector. Like Supply Chain Management (SCM), ECR is based on the so-called pull strategy, since production and supply are geared to demand at the point of sale (cf. Ahlert and Kenning, 2007, 198ff). In contrast to supply chain management, which considers the entire supply chain, ECR focuses primarily on the processes between producers and retailers (cf. Meffert et al., 2012, 582). On the logistics side, an efficient, demand-driven replenishment of goods should be guaranteed. The aim is "to save resources by optimizing the processes between manufacturer and retailer (e.g. by reducing inventories) and to better satisfy demand (e.g. fresher vegetables through shorter delivery times)" (cf. Meffert et al., 2012, 584). The special feature of the food industry is that the goods turnover rate is much higher than in other sectors. Very precise planning is obligatory in order to avoid excessive losses due to spoilage on the one hand and to guarantee the supply of fresh goods on the other.

Identification codes

Different techniques for product identification are used in logistics and trade. The most important technology is a barcode, which is available in different versions. PLU (price look-up) numbers play a decisive role in retail as well. The most important identification codes used for fruit and vegetables are discussed below.

GS1 barcodes

When marking a product with a barcode, it is important to distinguish what the product is marked for. A distinction is made between consumer units for the scanner cash register, retail units (repackaging and overpacking) and transport units for standardized retail units, such as pallets (cf. GS1 Austria GmbH, 2014).

The end consumer units should be uniquely identifiable worldwide by their number. For standardized consumer units, this is guaranteed by a Global Trade Item Number (GTIN) (cf. GS1 Austria GmbH, 2014). Standardized end consumer units are equalized articles that the end consumer (consumer) pays at the scanner cash register of the retailer. Examples would be chocolate, milk, ready meals, etc. In the case of goods that are charged by weight, such as vegetables, for example, standardized end consumer units are not used because variable end

[1] ECR is a grocery industry supply chain management strategy aimed at eliminating inefficiencies, and excessive or non-value-added costs within the supply chain, thus delivering better value to grocery consumers. https://www.researchgate.net/profile/Paula_Swatman/publication/228588591_Efficient_Consumer_Response_a_preliminary_comparison_of_US_and_European_experiences/links/0912f50bc0809a6378000000/Efficient-Consumer-Response-a-preliminary-comparison-of-US-and-European-experiences.pdf

consumer units are used here (cf. Austria GmbH, 2013a, 1). The barcode symbols used are EAN-13, EAN-8 and UPC-A (North American form of EAN-13) (cf. GS1 Austria GmbH, 2013a, 2).

In the case of variable end-user units, on the other hand, identification is more difficult. By restricting the number, the variable end-user units can be allocated to 13 positions exclusively nationally (not worldwide) (cf. GS1 Austria Gmbh, 2014). Areas of application are products which are calculated by weight and not yet weighed or per unit of goods sold, as well as pre-packaged and excellent vegetables supplied to food retailers by the producer. The 13-digit article number has a 2-digit prefix, followed by a 5-digit identification number (HPID), then a field for the value of the variable unit and finally a check digit. The check digit is titled Modulo 10 (cf. GS1 Austria GmbH, 2013b, 1).

Price Look-up (PLU) Code

PLU codes are four- or five-digit numbers that make it easier to identify fruit and vegetable products at the checkout or during inventory. The code ensures that the correct price is paid by consumers without the cashier having to be able to identify the product. The four-digit codes are not assigned according to any particular system; they are random numbers assigned to a product. They are glued to conventionally produced products. The five-digit codes, on the other hand, identify biologically produced products or products containing genetically modified organisms. The digit 8 presented here means that it is a genetically modified product, the digit 9 indicates that it is a biologically produced product. The PLU codes are issued by the International Federation for Produce Standards (IFPS) and are not mandatory (cf. International Federation of Produce Standards and Produce Marketing Association, 2014).

2.2.3 Non-collaboration in the food sector due to…

Especially in the fresh vegetables sector, a small-structured supplier portfolio (smallholder farmers / gardeners) prevents logistical collaboration (in Austria). Producers face a large number of different seals of quality and (quality) standards and are confronted with high demands on his or her products. Whilst deliveries depend much on the time of harvest, the required quantities are based on an annual cultivation plan. However, retailers demand flexibility, and announce concrete order quantities approx. 1-2 weeks before delivery, which makes collaborative transport planning or routing difficult.

Moreover, food retail works with different types of containers, which makes picking more difficult, especially during preparation. Various types of containers also generate additional costs due to increased storage requirements. Customer-specific packaging is required. This prevents the goods from being handled quickly and leads to a negative effect on the freshness of the vegetables. At the same time, repacking is too time-consuming, so once products are packed for a trading partner, they cannot be sold elsewhere.

Mostly, transport is outsourced to the freighter, who also takes care of route planning. The maximum delivery time between the central warehouse and the branches is 18 hours. They are confronted with short order windows and short delivery time windows. Additionally, each actor works with his or her own IT solutions.

3 Conclusions and Discussion

As explained in the previous section, for some branches and/or companies (horizontal) cooperation is not the target. Even more, they focus on internalization and solely managing the whole supply chain. The question is, however, whether this approach – which is successful for at least some companies – finally leads to the same (positive) impacts as an ideal realization of the PI would lead. It is not easy to answer this question but from our perspective, we have to state that it seems to be likely that the main impacts will be met. However, especially in the European Union competition regulations are taken serious meaning that competition on the market is fostered and therefore cooperation and monopolies are not allowed or at least are checked in detail.

As in the case of fresh vegetable logistics, logistical collaboration is prevented by its special supplier structure; which is the case in sectors such as automotive as well. Moreover, varying short term and long term planning horizons complicate collaborative transport planning or routing. Moreover, different types of containers that are used in different branches makes picking more difficult, especially during preparation. Various types of containers also generate additional costs due to increased storage requirements. Customer-specific packaging is oftentimes required. This prevents the goods from being handled quickly. PI boxes such as the MODULUSHCA box are first approaches to solve such challenges.

However, another additional question arises here: If one company starts to optimize its own logistics services and this company reaches a critical mass, it might happen that other(e -4(t)-1(f) “4(klj8(c)u1

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