DAVINC^{3}I: Towards Collaborative Responsive Logistics Networks in Floriculture

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Abstract Today most flowers physically pass through the Dutch auction houses on their fixed routes from growers located all over the world to European customers. Physical presence is necessary to allow for inspection, quality control and break-bulk activities. Several developments, such as increased internationalization and virtualization, stimulate the sector to develop an efficient European hub distribution network, in which cut flowers, plants and other products are delivered to detail, retail and e-tail (i.e. webshop) customers using different logistics concepts. The DaVinc^{3}i project has had the objective to strengthen the international leading competitive position of the Dutch horticulture sector in a global, virtualized trade network by researching the opportunities for new logistics coordination, consolidation and collaboration concepts in extended international trade park networks. In the last years over 30 case studies with business partners have been conducted within the DaVinc^{3}i project. In this chapter we highlight the main research advances and lessons learned when moving towards collaborative responsive logistics network designs for perishables, illustrated with five case studies.

Keywords Virtualisation · Collaboration · Perishables · Logistics network design

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1 Introduction

The floriculture sector in the Netherlands is of world-class quality, and serves as main trading hub for Europe. The sector as a whole has a huge impact on the Dutch economy, being the largest exporter of fresh products in Europe, the top-3 largest exporter in the world with still significant opportunities for further growth. Most flowers physically pass through the Dutch auction houses on their fixed routes from international growers to European customers to allow for physical inspection, quality control and break-bulk activities. However several developments, such as the upcoming of new markets in Eastern Europe and increased virtualization, will move the centre of gravity eastwards and stimulate the chain to become an efficient floriculture hub-network, in which cut flowers, plants and other products are delivered to international customers taking different (direct) routes and using different logistics concepts. Cross-dock centres and hubs (trade parks) are being set-up in Europe (linking local with global flows) and the sector is searching for efficient coordination and control mechanisms for the complete logistics network to consolidate flows and fulfil market demands. However, this is not easy as the sector is characterized by a large number of independent SMEs (many growers, traders, and small LSPs) and a large auction on a cooperative basis, each with their own objectives and views on roles and functions of parties in the supply chain network.

The Dutch sector wants to continue being the (virtual) floriculture-trading hub of Europe, and has therefore initiated the DaVinc^{3}i project. DaVinc^{3}i is an acronym for *D*utch *A*gricultural *V*irtualized *I*nternational *N*etwork with *C*oordination, *C*onsolidation, *C*ollaboration and *I*nformation availability (see www.davinc3i.com). The project aims to develop innovative logistics concepts supported by an information platform and collaborative business models in support of the Dutch competitive strength. More specifically, we study:

- the functional specifications for potential logistics coordination, consolidation and collaboration concepts, with particular attention for responsive quality driven logistics networks and synchromodal transport management;
- opportunities for advanced information exchanges and architectures to facilitate the advanced planning and control concepts developed in the project;
- relevant collaborative business models that work for specific settings.

The next sections, successively, present sector specific characteristics and developments resulting in industry needs, key issues in the design of a responsive synchromodal logistics network for perishables, and five illustrative case studies resulting in determining key factors for successful and sustainable collaborative logistics.

2 Sector Characteristics and Industry Needs

The Netherlands is at the heart of the international floriculture sector. It has an intricate and high-quality network of companies, ranging from breeders and growers to sales experts and export firms, representing every aspect of the business. The supply chain network consists of the following links: growers, auctions, traders, logistics service providers and outlets (Fig. 1).

The FloraHolland flower auction consists of five auction centres for trading in cut flowers (about 70 % of turnover) and ornamental plants (about 30 %), a national intermediary organization (facilitating direct trade between growers and traders) and an internationally active import department. FloraHolland is a primary cooperative: its roughly 5000 members, especially *growers* in the Netherlands, own the business. *The traders* can be split up in three groups: wholesalers, exporters and importers. Sometimes this overlaps, when a Dutch wholesaler also acts as an exporter. There are about 1200 Dutch traders, dealing with many (inter)national customers. Most important import countries are Kenya, Ethiopia, Israel, Ecuador and Germany. Key export countries are Germany, United Kingdom, France, Italy, Belgium and Russia. In many cases, the transport between two chain stages is outsourced to one of over 70 *logistics service providers*. In some cases, the providers execute extra activities like quality control, handling and packaging. On average there are 20,000 truck movements per day and about 1800 truck movements per day between the five marketplaces.

Different *sales channels* can be identified in the market. The DaVinc^{3}i project distinguishes between three types of sales channels: the traditional “detail”

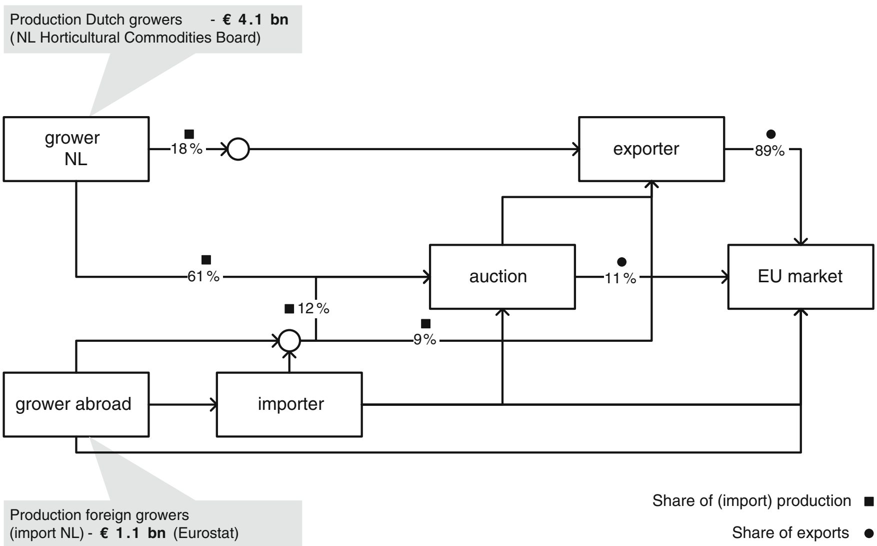

Fig. 1 The floriculture supply chain network (de Keizer et al. 2014, p. 162)

(specialist shops) and "retail" (including supermarkets, garden centres and construction outlets) channels, and the expanding "e-tail" channel (online shops). Retail industry has seen significant consolidation and concentration, which led to dominance of the market by large retailers. Retail sells flowers and plants as by-product and aims for large volumes of specific products guaranteed via long-term (preferred supplier relationship) contracts and fixed prices. Specialist shops often gain their competitive advantage due to a deep product assortment (and hence small volumes per individual product) and a focus on high-quality products. They market value-added products via small-scale shops using day-to-day prices and volumes available. Online shops are relatively new to the sector and the result of increased digitalisation and virtualisation. It is not yet clear how this channel will further develop and what kind of assortment will be offered as well as which order fulfilment strategies will be applied.

The *cut flower detail chain* is a supply driven chain with small but very perishable product flows to, and main inventory placed at, geographically dispersed detail shops. The cut flower retail chain is a growing demand driven chain with large product flows and customizing processes like bouquet-making, labelling and packaging, at locations at a one to three days distance from customers. The *potted plant detail chain* is a relatively small chain which resembles the flower detail chain but has more slack in lead times in production and distribution due to the less perishable nature of the product. The *potted plant retail chain* is a rather predictable pull chain with large product flows and customizing processes at locations at a one to three days distance from customers in which products are sold piece by piece. In the world of the ornamental plants the role of the garden centres and lumber yards is stronger than in cut flower chains. This leads to direct deals between retailers and growers with a much higher volume.

Using expert interviews and chain process analyses, we identified multiple types of supply chains in the complete network, specific bottlenecks and floriculture industry dynamics and needs. Important examples are the following:

- Product quality deteriorates during distribution, whilst there is an increasing demand for guaranteed vase life.
- Traders increasingly order in higher frequencies and in smaller quantities. Current logistics does not fit this need.
- Very limited supply chain visibility causes suboptimal internal processes at all chain actors. There is a need for sharing real time information and supply chain transparency.
- The transportation market is fragmented with few possibilities for consolidation of volume. However, faster transport at lowest possible cost between market places is needed with guaranteed product quality.
- High dynamics and uncertainty in supply and demand result in many last-minute changes, rush orders and inefficient transportation.
- There are many possibilities for information exchange in the supply chain, but they are inefficiently used; a lot of manual/phone communication occurs.

In summary and simply put, the sector is characterized by a diversity of products, actors, and market outlets (each with their own specific demands), and these characterizations require a redesign of the current logistics concepts.

3 Logistics Research Challenges

The specific developments and sector characteristics result in research challenges on the level of the design and management of logistics processes. Based on desk research and stakeholder interviews we identified the following issues.

3.1 Need for Differentiated Demand-Driven Logistics Concepts

As indicated earlier, different market channels can be distinguished: retail, detail and e-tail. There is a trend towards retail and e-tail chains, which are foremost demand driven, whereas traditional detail chains are foremost supply driven (using the auction clock). In all these channels, product quality (vase life) is one of the most important product attributes (for flowers nowadays about 7 days); hence speed and responsiveness are key. As a result, order lead times are continuously being reduced and there is a trend towards smaller order batch sizes. Furthermore, growers are more and more shifting from mass delivery to auctions to direct delivery to traders. As a result they have to change from supply driven to demand driven working practices.

3.2 Need for Collaborative Logistics Hub-Network Design

The floriculture sector is characterised by intensive cooperation between all actors in the network. However, from a supply chain perspective still many logistics flows from source to sink are managed independently by many chain actors, resulting in less efficient transport flows. This becomes more and more difficult due to increasing end-customer demands and a growing political pressure to reduce logistics movements. Flowers and plants are sourced internationally and might in the future, instead of being transported via the market places in the Netherlands, be directly distributed via a logistics hub network in Europe to regional customers. These customers require value-added products packed and delivered within a complete assortment with specific logistics service constraints. More logistics collaboration between different actors in the chain, vertical as well as horizontal, may improve the efficiency of processes like harvesting and transport, and reduce product waste. Key issue is that in a virtualised network, opportunities arise for different trade park network configurations, for different route and process (e.g. where to assemble and pack) configurations of supply chains through the network, and for transport consolidation practices of actors in the network. Sophisticated facility location models are necessary to determine the best supply chain network design (cf. Melo et al. 2009; Klibi et al. 2010).

3.3 Need for Robust and Flexible Quality Controlled Logistics Concepts

One of the main logistics challenges for the sector is to deal with strong dynamics and uncertainty in supply and demand, regarding fresh product quality as well as the available volume in time at a specific place. The sector is characterized by last-minute changes and rush-orders. A particular characteristic is the difficulty to predict the exact quality of fresh produce before it has been harvested. The prediction of these quality changes is even more difficult during the trade, transport and storage processes (resulting in potentially large product losses if logistics is not organized adequately). At the same time there is a trade-off between expensive measures that could prolong the vase life of the flowers and the use of slower and cheaper transport modalities with often less carbon emissions. Typically, next to biological variations, the quality of flowers and plants is determined by time and environmental conditions (such as temperature and humidity during transport). Environmental conditions may be influenced by, for example, the type of packaging, way of loading and the availability of temperature conditioned transportation means and warehouses. Customers demand guarantees on quality specifications leading to strict requirements on the logistics network concepts used in the sector. As a consequence, the required prediction and planning concept and accompanying logistics system need to be very flexible, enabling last minute changes and reallocations, but also to provide a robust planning (compared to the many rush orders and transports at the moment). More specific, it should allow for advanced logistics decision making taking real-time information on product quality behaviour into account, resulting in the delivery of the right product to the right outlet in time; a concept called “Quality Controlled Logistics” by Van der Vorst et al. (2011).

3.4 Need for Innovative Collaborative Distribution Strategies

The horticulture sector is confronted with many emergency orders requiring more efficient and responsive logistics processes. In order to be responsive, a supply chain can make use of multiple delivery modes in which the slower and cheaper modes are employed for shipments under usual planning (push process) to enjoy the economies of scale and contribute to a cleaner way of transportation by emitting less carbon emissions (lean and green), while the faster and more expensive delivery modes are used for speedy and emergency replenishments by market demand (pull process) (Chan and Chan 2010). Synchromodal transport receives increased attention in this sector. Rail and sea transport using conditioned containers instead of speedy air transport has already proven to be a successful technology. This holds true especially for import flows as these containers usually contain large volumes of the same flower or plant species. In export flows multiple types of flowers or plants have to be distributed together (often using a diversity of load carriers), but they each respond differently to specific temperatures and humidity. If these new conditioning technologies can be used to transport products over long distances, it could also provide us with opportunities to hold inventories at strategic locations within the network, i.e. at international distribution hubs. This shows that it is relevant to research the optimal temperature when facing different quality decay profiles for different products; as well as, given the demand for multiple products, which products could be combined in a common (flexible) container transported by rail, road, water or air.

4 Case Studies

In the course of the project over 30 case studies have been investigated in close collaboration with the projects' business partners, dispersed over the flower and plant supply chain as well as over the different market outlets as research focus areas. It is of course impossible to discuss all case findings in depth, hence we take a few illustrative cases to show our findings related to the defined logistics research challenges in the previous section. Afterwards, we will present the overall findings and lessons learned from all cases.

4.1 *Case 1: From Supply to Demand Driven Grower Practices*

One of the practical implications of virtualisation and increasing direct trade between growers and traders is the increase of customer ordering frequencies and decrease in ordering volumes. Multiple growers in the DaVinc[3]i project took up a research project how to address this challenge in their logistics processes.

We now focus on a grower of gerberas, that are mostly sold through specialised shops, such as florists. Over time, the grower has seen a significant increase in the share of flowers sold directly to wholesalers/exporters instead of via the traditional auction clock. Auction flows need to be ready for shipment by around 6 pm and can be considered a push flow: a grower offers a bulk volume of products assuming it will be sold to traders. On the contrary, shipments for direct sales are ordered even before harvesting takes place and can thus be considered a pull flow: they are picked and shipped only after the customer orders have been received. Direct sales orders, for the large part, have to be processed between 7 and 11 am. Practically, the increasing share of direct sales means that an increasing number of orders arrive up to two hours before they have to be shipped, creating significant logistics challenges.

Given existing constraints in processing capacity, the grower faced increasing difficulty in preparing batches within the given timeframes. Our research has shown that some changes to the classical way of working enable the grower to deal with these practical implications of virtualisation. The basic principle is in line with a shift of the customer order decoupling point (cf. Olhager 2010); instead of harvesting the products bulk wise in the most efficient way (i.e. using the shortest route through the nursery to harvest flowers), the grower changed his practices to first harvest those products that need to leave the building first. As a result the efficiency of the harvesting process reduces (due to smaller lots and more order picking time), however, modelling results showed the total system performance increases (i.e. reduced costs, reduced throughput time and, most important, increased fill-rate) due to much more efficient demand-driven processing and handling of customer orders. In the new design, all customer orders could be harvested and handled in time resulting in higher service levels. The change in working practice turned out to be relatively easy to implement. Goods flows were actually rescheduled, order handling was changed and a new layout for the processing area was implemented, requiring only a relatively small investment.

4.2 Case 2: Design of a Consolidated European Hub-Network

In this study, we explore the potential of an advanced logistics concept, i.e. logistics orchestration, that aims collaboration between actors in the European potted plant supply chain network. We optimized the design of a global supply chain network, thereby incorporating routing in supplier and customer regions and analysing the trade-offs between multiple objectives. One of the key aspects in our study is effective and efficient consolidated distribution of potted plants. Consolidated distribution could improve logistics performance, e.g. increasing capacity utilization by combining less than full truck loads when the volume of the goods to be distributed is smaller than the transport unit size; or decreasing total travelled distance by splitting and re-combining full truck loads based on sources and destinations of the goods to be distributed.

A multi-layer, multi-product mixed integer linear programming model was developed to investigate the benefits of logistics orchestration in three scenarios, i.e.

a scenario with no collaboration, a scenario with consolidation in collection of products at supplier regions, and (on top of the previous one) a scenario with consolidation in distribution to points of sale in customer regions (see Fig. 2). For these scenarios the effects of enhanced hub-network designs and logistics consolidation on logistics costs, working times and CO_2 emissions were quantified. An enhanced network design implies a shift in the number of hubs, the hub locations, and the degree of consolidation. Modelling assumptions, data and results were

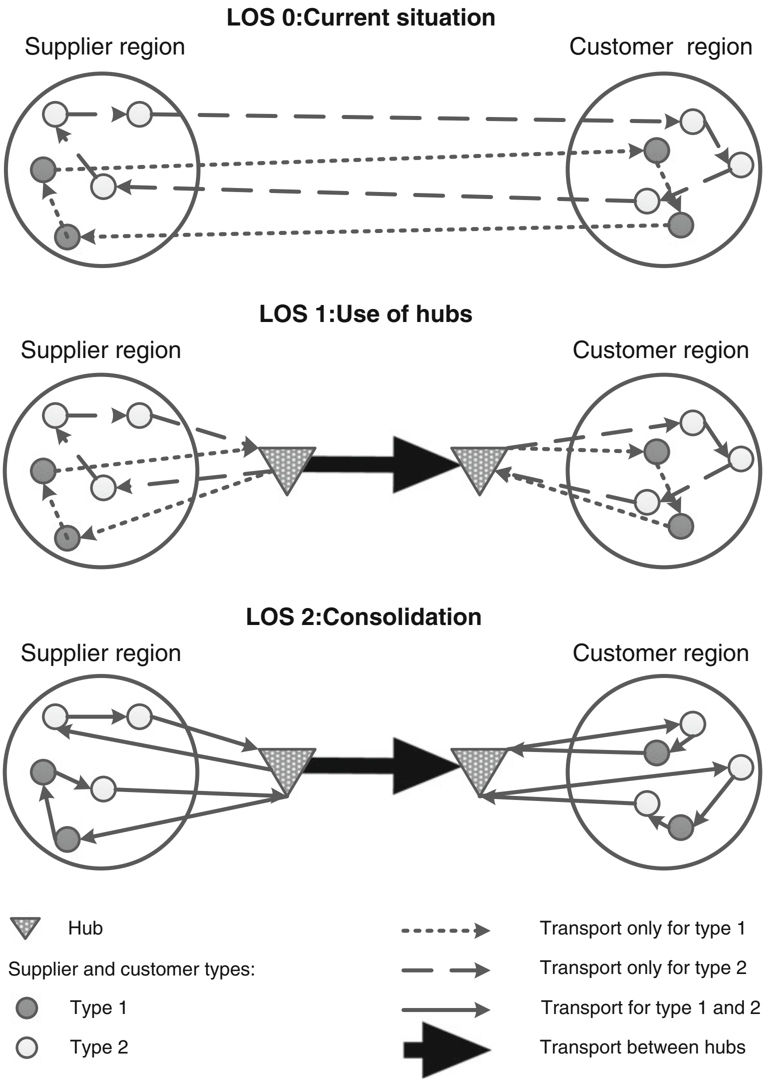

Fig. 2 Logistics orchestration scenarios (de Keizer et al. 2014, p. 164)

Table 1 Normalized performances for different scenarios

	Hubs	Normalized KPIs		
		Costs	Time	Emissions
LOS 0	–	100	100	100
LOS 1	15	81	73	91
LOS 2	15	72	62	80

validated in collaboration with business partners. More information can be found in de Keizer et al. (2014).

The results of enhanced network designs and consolidation can be seen in Table 1. Opening hubs across Europe (LOS1) decreases logistics costs by 19 %, distribution time including work shift durations by 27 %, and kilometres travelled and CO_2 emissions by 9 %. This is mainly due to time savings because long transportation routes in the current situation are split into routes to and from a hub, which gives less violations of work shift durations. If one also consolidates the flows to, between and from these hubs (LOS2), costs, time and CO_2 emissions decrease even further by 9, 11 and 11 % respectively. The optimal hub network for scenario 1 and 2 (equal in both scenarios) has three hubs in the Netherlands and 12 across Europe (excluding the Netherlands). When we look at the locations of the hubs, there is a gradual path of development. At first hubs are opened in the centre of Europe, and after these centres are covered hubs in the east and south of Europe are suggested to be opened.

4.3 Case 3: Quality Controlled Logistics Concepts

The management of product quality is of vital importance in supply chains of fresh produce such as flowers and plants. Until now, tracking and tracing of quality conditions in the logistical process from production to market was mainly carried out with the help of data-loggers. These are capable of recording trajectories of the environmental conditions like temperature and relative humidity, but the data can only be accessed afterwards (Verdouw et al. 2013). In this case study, innovative technologies are introduced to realise real-time management of plant and flower quality all through the supply chain. It involves technologies in the field of tracking & tracing (like RFID), quality monitoring (like wireless sensor networks) and internet (like cloud computing and web services). The case study aimed to design and demonstrate an innovative system for real-time virtualisation of product quality in floricultural supply chains. This system enables that logistic processes throughout the supply chain can be controlled, planned and optimized continuously based on real-time information of the relevant quality parameters.

Focal company is a Dutch trader with the role of supply chain orchestrator. Via this trader, also a grower, transporter and auction are incorporated. The study is leveraging the trader's current logistics tracking system, which is based on the ultrahigh frequency RFID tags that are attached to the complete pool of plant trolleys. In the study we: (i) defined the user requirements, (ii) designed an information systems architecture, and (iii) developed a prototype system. The requirements analysis and system design has addressed three use case scenarios:

- *Quality Monitoring*: real-time access to quality information including ambient conditions (e.g. temperature), prediction of remaining shelf life using prediction models, and early warning in case of deviations of plans;
- *Quality Controlled Distribution*: flexible (re)planning and (re)scheduling of distribution based on real-time quality information;
- *Quality Controlled Vendor Managed Inventory*: intelligent replenishment of retail stores by proactively balancing retailer demand and grower supply, concerning the availability and quality of flowers and plants.

The prototype system focuses on the Quality Monitoring scenario. During the development, mock-ups were used to define the detailed specification in interaction with the stakeholders (see for example Fig. 3).

The designed system provides practical functionalities for (i) sophisticated quality monitoring from producer to the market; (ii) dynamic and intelligent logistics management based on up-to-date quality information (including early warning, rapid scheduling, remote control and shelf life simulation); and (iii) seamless and secure interoperability. The involved end users expect that implementation of these functionalities will especially result in a significant reduction of product waste throughout the supply chain and in improvements of product quality for end-consumers.

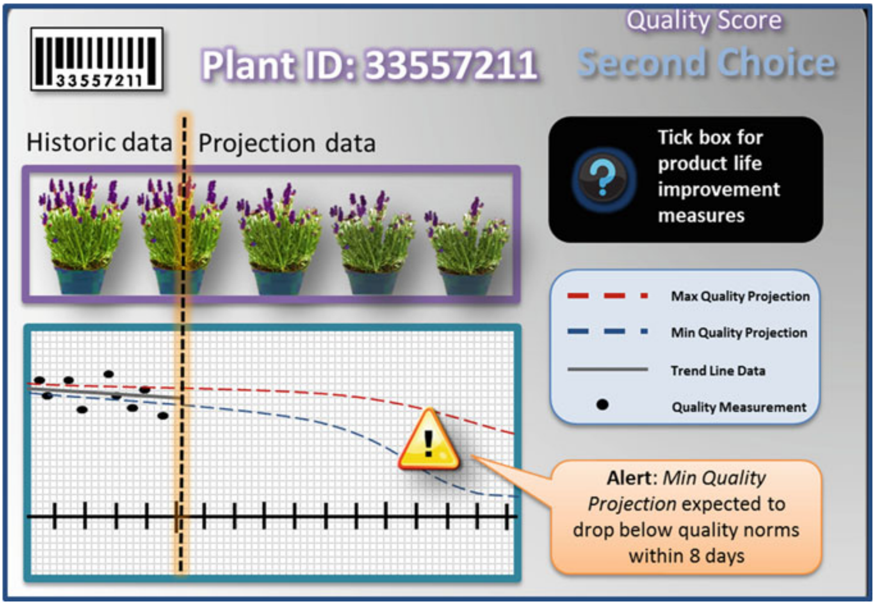

Fig. 3 Example plant quality prediction and pro-active alerts

4.4 Case 4: Synchromodal Logistics Network Design

Whereas business case 2 focussed more on the location and number of hubs in the network, DaVinc^{3}i also investigated the use of multiple transport modalities and route options in the network (e.g. SteadieSeifi et al. 2014). This is done by introducing a synchromodal *metro model*. This metro model consists of multiple inbound hubs (points to enter the metro model after leaving the grower), break-bulk and consolidation hubs (where value adding activities take place), and exit points (where products leave the network). After leaving the network the products are ready for the last mile distribution to the customer. In the metro model it is possible to travel from point A to point B through different routes using different modalities (truck, ship, train, airplane); either directly or through one or multiple transhipment points. The flowers and plants are transported according to a high frequency fixed time schedule. The metro model is designed to achieve more flexible routes between growers and different kind of customers. Figure 4 gives a schematic overview of the metro model.

One of the studies conducted focused on the effect of multimodal transportation and the choice of the greenest, fastest, or cheapest transportation routes. The first part of the research consisted of long-haul transportation, which is described by a service network design (SND) model. The second part of the research is a short-haul last mile distribution problem, which is described by a vehicle routing problem (VRP). Results showed that the use of a metro model in the floriculture

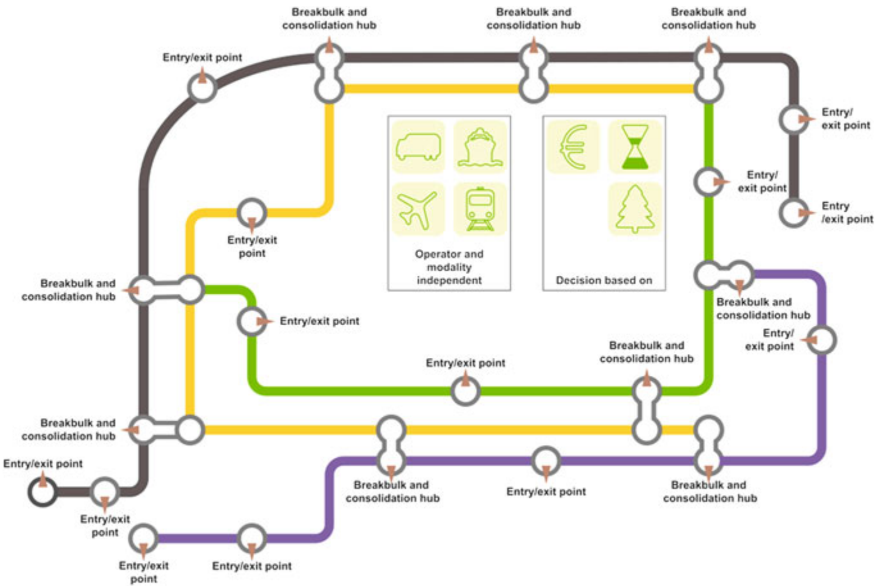

Fig. 4 Overview of the metro model

sector can result in a cost reduction of 5.1 % (from 2.85 to 2.70 euro per trolley)—which is quite interesting in this low margin business. By contrast, the average lead-time will increase from 0.44 to 0.74 days. This automatically indicates the need for forward inventory positions close to the market, reducing the need for high speed logistics networks.

4.5 *Case 5: Collaboration on Returnable Transport Items*

Internationalisation in floriculture takes place across the supply chain. The growth of distant demand regions and distant supply regions not only increases distances, but also creates new challenges for Returnable Transport Items (RTIs). RTIs used for distant markets have longer turn-around times decreasing the return on investment. Most Dutch exporters currently use their own type of RTI to deliver products to their customers abroad. The question is whether this is the most efficient solution. Together with exporters and logistics service providers, the DaVinc^{3}i project has therefore researched what opportunities exist to realise gains in this area. These studies indicate significant savings are possible while maintaining the service levels and flexibility that would be required.

In our research we distinguish between six possible options for export RTI cooperation: (1) a decentralised structure where each exporter manages its own (type of) RTIs, or (2) a centralised depot. In both cases there may be (a) the current RTIs, (b) a uniform export container used by all exporters (UEC) and (c) a uniform supply chain container (UCC) used throughout the complete chain. The expected benefits include time savings and error reductions associated with sorting and distributing returned RTI. The impact for different scenarios is shown in Table 2.

This case clearly shows the benefits of cooperation. However, the distribution of the benefits of cooperation between groups of stakeholders turns out to be uneven. Modelling results show exporters would see their costs decrease by 20–40 % (respectively for a centralised deport with the current containers and a centralised depot with a uniform container). For logistics service providers the costs would decrease by 6–17 %. It is clear that more insights on pain and gain sharing are needed to facilitate implementation of identified favourable scenarios.

Table 2 Impact indicators for new scenarios of RTI management

	Decentralised structure			Centralised depot		
	Current container[a]	UEC	UCC	Current container	UEC	UCC
Operational cost	0.00 %	−10.29 %	−15.58 %	−9.52 %	−16.69 %	−22.80 %
Average trip cycle time (days)	17.90	16.27	15.78	17.93	16.13	15.66

[a]This scenario describes the current situation

5 Lessons Learned for the Design of a Responsive Collaborative Logistics Network for Perishables

Next to the five business cases presented above, more than 25 other projects were conducted within the DaVinc^{3}i project with actors in the supply chain. Many of these projects entailed chain or business process analyses of specific business cases and quantitative modelling studies to analyse the advantages and disadvantages of new logistics concepts for the businesses involved. Other studies focussed more on extended literature reviews on the related topic to formulate an analytical research framework (comprising all relevant factors that influence decision making, e.g. on pooling inventories or transport flows for perishables) and test it, successively, using expert interviews. Outcomes of the last studies resulted in the formulation of hypotheses, hence theory building. The modelling studies focussed on theory testing, hence indicating the gap between theory (what is possible in the ideal case?) and practice (what can be achieved in this particular practice?).

The nice thing about the DaVinc^{3}i project is that it brings together theory and practice. Using real life data, we have conducted strategic research at the sector level into logistics network design, consolidation strategies, alternative transport modalities, information systems and collaboration models. These projects resulted in theoretical insights that help businesses prepare for the future. But we also conducted very practical studies with companies via master students internships resulting in concrete improvement options and actual implementations.

The project team has made an attempt to abstract the lessons learned from all projects and to categorise them. Table 3 presents findings according to the design elements of the logistics concept (e.g. Ribbers and Verstegen 1992), i.e. configuration, planning and control system, information system and organisation. Furthermore, we defined a number of eye openers and more generic lessons learned when designing a responsive collaborative logistics network. The main are as follows:

- Most chain actors in the floricultural sector are aware of current developments, but are waiting to take action until it is urgent;
- Virtualisation requires collaboration and synchronization of processes and information in the complete chain network;
- Responsive, high frequent delivery of high quality cut flowers to the international market requires an international hub network with quality controlled logistics principles;
- The added value of such an international hub network depends on collaboration: it requires high volumes and frequent flows to be cost efficient;
- Due to the advantages of consolidation, supplying to the nearest location is not always the cheapest;
- Advanced conditioning technologies and reefer containers enable the use of more sustainable transport modalities;
- Supply chain redesign is very complex comprising many different elements and disciplines;

Table 3 Lessons learned in the DaVinc^{3}i project

Element	Lesson learned
Network configuration	• Build a common synchromodal logistics infrastructure that allows for consolidation and economies of scale • Create a logistics network with hubs close to the markets to be responsive at low cost; especially when high product quality is demanded • Create and manage a closed cold chain from grower to consumer • Create inventories close to market using conditioning technologies • Postpone value adding logistics (VAL) activities as much as possible; this increases flexibility and reduces cost and lead times • Use standardized (conditioned reefer) containers
Planning and control system	• Build a central planning, dynamic and pro-active control system for collaboration, coordination and consolidation • Be responsive to changes in supply and demand by establishing flexible order fulfilment processes, and predict where needed • Re-allocate inventory positions closer to the market and pool inventory (this can reduce inventory costs whilst the same service levels are obtained) • Align planning processes with supply chain partners and pool inventory • Integrate quality management systems with supply chain partners • Quality controlled logistics enables dynamic pricing • Adapt and synchronise business processes to customer demand to create responsiveness (establish demand driven chains)
Information system	• Use one primary information and communication network/platform • Build an open trading platform • Know your customers; get information on their specific demands • Create transparency: exchange POS, product quality information • Harmonise product coding and create integrated business information systems (create interoperability between systems) at sector level • Manage data ownership, data reliability and security
Organisation	• You do not have to be the best in everything; collaborate with partners at the vertical as well as horizontal level • Collaborate with local partners if one enters a new international market; they understand the culture and successful practices • Have common logistics means (and outsource the management of these means to dedicated partner) • Collaboration will not work without a good governance structure in which pain and gain sharing is defined • Collaborate out of strength and not out of weakness • The strength of a business model is increasingly dependent on that of the supply chain: have a shared approach to maximise consumer value

- Information also has a best before date;
- “One size fits all solutions” for logistics concepts, IT solutions or business models will not work;
- “Trust is nice, control is better”: contracts are increasingly required to support cooperation between supply chain partners.

6 Conclusions

This chapter discussed innovative logistics concepts in the floriculture industry. In collaboration with business partners, the DaVinc^{3}i project has developed many new insights on responsive collaborative logistics networks for perishables, and in most cases the business projects resulted in concrete changes of daily practices. Overall we see the sector needs to move—and is moving—towards:

- demand driven logistics concepts, linking growers in different international sourcing areas directly to customers, thereby enabling new collaborative supply and logistics management concepts—while considering the continuous need for supply driven concepts (using the (virtual) auction clock);
- coordinated logistics control concepts with emphasis on responsiveness and guaranteeing product availability and product quality to customers;
- new (synchromodal) network designs in which hubs are established in the European market that allow for value added activities and sustainable responsive supply to (web based) customer orders;
- dynamic configurations of information systems, advanced information exchanges and transparency to facilitate virtual trade and advanced coordination and collaboration concepts.

This development will strengthen the international leading competitive position of the Dutch horticulture sector in a global, virtualized trade network. Of course, more research and foremost business case studies are needed to translate the developed theoretical concepts and business opportunities into successful business practices.

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