Towards an electronic flower auction?

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Introduction

In this article we focus on the Dutch floristry chain or flori-chain. We define the flori-chain as the set of activities which add value for the customer to a flower product or service. For a detailed description of the Dutch flori-chain see appendix 1. The flori-chain is a dynamic entity. Customers are changing their preferences and organizations in flori-chains react and change their activities and/or their linkages toward those new preferences. Tuning of demand and supply of flowers are undertaken in the auction process. Effective communication and decision-making between organizations might speed up those reactions and changes. New Information Technologies (IT) like Electronic Data Interchange (EDI), multi-media, or telecommunications may help to improve the reaction time of organizations in chains. Electronic linkages across organizations occur (Konsynski, 1992).

Some IT applications were introduced in the flori-chain. Not all introductions of IT were successful. For example the introduction of image auction in the auction hall was not accepted by wholesalers. Other IT applications, like EDI and image databases, are slowly diffusing into the flori-chain. One of the latest business scenarios introduced, is the concept of information auctioning. This concept is presented as a step towards an *electronic flower auction*. At January 11, 1994 this concept became operational at Verenigde Bloemenveilingen Aalsmeer (VBA). After some weeks problems were reported (Agrarisch Dagblad, 1994). At that time the project leader of the information-auctioning project said in interview: 'The failing of the info-auction is hanging like a sward of Damocles above the floristry industry' (Uitentuis, 1994).

From a practical and theoretical perspective it may be interesting to study those introductions of IT in a flori-chain context. From a practical point of view we want to learn how to introduce IT in an effective way and how IT may improve chain management. From a theoretical point of view we want to learn what theories can (or can not) explain (and sometimes predict) those successes or failures. Both sides of the same coin are discussed in this article.

[1] This article deals with one of the projects within the ELECTRONICAL FLOWER MARKETS research program. This program will be executed by members of the Emory University (Atlanta, USA), New York University (New York, USA), Erasmus University (Rotterdam, NL) and Wageningen Agricultural University (Wageningen, NL).

The problem we address in this article is under what conditions an electronic flower auction might be successfully implemented in the Dutch flori-chain. The *objective* of the article is (1) to present a critical review of recent business scenarios around the auction process linking buyers and sellers with IT applications by identifying critical success factors, (2) to present critical success factors in other industries which implemented so-called electronic markets (3) to formulate hypotheses which define conditions and design characteristics of an Electronic Flower Auction (EFA). An electronic flower auction is a type of *electronic market*. Bakos (1991) defined an electronic market system as an inter-organizational information system that allows participating buyers and sellers to exchange information about market prices and product offerings. It represents an investment in multilateral information sharing with the goal to establish bilateral buyer-seller relationships (Bakos 1991:33). In general, markets are important in our society because 'under most circumstances markets are extremely efficient in facilitating the movement of products from the lowest-cost producer to the consumers who place the highest value on them. Organized exchange thus effectively advances human welfare' (Smith and Williams, 1992). Markets differ from networks and hierarchies. In market transactions the benefits to be exchanged are clearly specified, no trust is required, and agreements are bolstered by the power of legal sanction (Powell, 1990).

In section 2 we describe three different business scenarios which, at present, link buyers (wholesalers) and sellers (growers) to each other. The first scenario is the traditional clock sale. IT applications around the traditional clock sale are described. The second scenario is the mediation office. In the last years more transactions between sellers and buyers are succeeded by the mediation office. IT applications, like image-bases and electronic supply information systems, are discussed. The third scenario is the information auctioning concept. We discuss in this scenario two IT applications. The first one is the introduction of image auctioning at Bloemenveiling Holland. The second one is the introduction of information auctioning at Verenigde Bloemenveilingen Aalsmeer. One conclusion about those two systems will be that both systems not include a real information auctioning concept. There is no complete decoupling of physical floristry flows and the price discovery process. It is better to speak about pseudo-information auctioning. We will identify why both systems failed by using practical and theoretical literature.

In section 3 we focus on the discussion of developing electronic markets in other industries. For example, in the financial sector electronic bond and stock markets are implemented sometimes successfully. In the commodity markets (cotton, pigs) electronic markets are introduced. What can we learn from their experiences?

In section 4 we elaborate on the concept of the electronic flower auction as a new, fourth, business scenario. We will discuss features of it. Hypotheses will be formed dealing with conditions and design characteristics of the electronic flower auction.

In section 5 we formulate our conclusions and specify further research. Research will be carried out in a joint research program ELECTRONIC FLOWER MARKETS, executed by members of Emory University, New York University, Erasmus University and Wageningen Agricultural University.

Business scenarios between growers and wholesalers and their IT applications

In this section we describe three different business scenarios which, at present, link growers and wholesalers via the auction process to each other. Direct linkages between gro-

wers and wholesalers are not taken into account, because in the Netherlands those linkages hardly exist. The presented scenarios are the traditional clock sale, the mediation office and the pseudo-information auctioning concept.

Traditional clock sale

At this moment most floristry products are sold by traditional clock sales. Within the traditional clock sale concept we discuss two systems. The first one is the small lots auctioning. The second one is the large lots auctioning.

Scenario description

When floristry products are ready for auctioning the grower fill in a paper supply letter. With own or collective transport the products and the supply letter are sent to the auction. During the evening and night the products are inspected on quality and hold in buffer. The information of the supply letter will be typed in the auction computer. In the morning floristry products are transported to the clock, where the products are auctioned. The buying process and price determination occurs electronic by Dutch auction. After the auctioning process, the products are distributed to the wholesaler. The day after the transaction the grower receives a daily transcript with the price information. Paper documents forms the most important information carrier in the traditional clock sale. At this moment only a few growers send electronic their supply letters to the auction with the help of EDI. Price information can be asked electronic with videotext. This information can be processed if necessary in the yield registration of the grower. Larger lots auctioning is a clock sale process with large numbers of units. This system was introduced to handle logistic problems. The objective of this system was to receive high volume transaction. One starts the day by auctioning the large lots, afterwards the small lots will be auctioned.

Mediation office

Scenario description: Support by database

In contrast with traditional clock sale, mediation officers mediate in forward markets. Negotiations supported by the mediation office (MO) about delivery specifications occurs during the day. The grower sends a couple of times per week a supply list to the MO, who transmits this to the wholesaler. The information consist of floristry products specifications, lots and the offer price. The wholesaler wants complete, actual en reliable supply information and can get this information on paper, on disc and by electronic connection to the supply information system. Fax and the phone are important media to communicate. At Verenigde Bloemenveilingen Aalsmeer (VBA) small transactions and small wholesalers are not supported by the MO any more. In the near future MO pursuit to use EDI for messages, which do not ask negotiations and give more standardization. The supply information system can be connected with an order processing system.

Scenario description: Support by image database

Recently the mediation office of Bloemenveiling Holland (BVH) is busy to connect supply information with electronic product images. The wholesaler will be able to observe the data as well as the images on his PC. The, so called, Holland Aanbodsbank (HAB) is comparable with an electronic sample house. The wholesaler use the images for his sell-

ing process. Advantages for retailers at a long distance are speediness and cost reduction (De Boer, 1993). BVH developed their own open system, where all wholesalers can observe the images at the same time. As a result of the one to more relationship, more transactions can be made at the same time in the same system. An other advantage of the system is the concentration of the supply (data and images) (De Boer, 1993).

Pseudo information auctioning

Within the pseudo information auctioning concept we discuss two IT applications. The first one is the introduction of image auctioning at BVH. The second one is the introduction of information auctioning at VBA.

Scenario description: Image auctioning

One of the first projects who intended to decouple the physical floristry flows and the price discovery process was the Vidifleur project. This project was initiated by BVH. In this project visual displays are developed for use in the auction hall. On a large screen, which can be programmed, information in different formats was presented. On the screen also a clock was displayed, which was synchronized with a digital auction clock in the pot plant hall. Product images, information about the grower and of the product quality were displayed. The screen included the lot being auctioned as well as lots that were coming up for auction.

Scenario description: Information auctioning

Since January 11, 1994 information auctioning became operational in the VBA. Information auctioning replaces the system of large lots auctioning. The products are auctioned by using information representing the physical flower products. The information is presented on a display with the physical presence of a sample of the product. The grower sends before 15.00 hours his clock supply for the next day to the auction. The minimum supply is three trolleys. The electronic supply letter (EAB) is compulsory. At 16.00 hours the auction has processed the total supply in the supply information system (AIS). Wholesalers observe the AIS and discuss with their retailers which orders they needed. The next morning products are auctioned. During the transaction, the wholesaler mention the delivery specifications. The auction sends an (EDI) order to the grower, who confirms this order and makes the product ready as accomplished in the order confirmation. The product, combined with a paper supply letter is transported to the wholesaler. In the evening the wholesaler receives and checks the product. The product is made ready for transport to the retailer, where it will arrive the next morning (VBA, 1993).

After some weeks using this information auctioning business scenario problems were reported: less growers (sellers) and wholesalers (buyers), then expected, were using the information auctioning system. The result was lower product prices, which resulted in less sellers and buyers etcetera.

Discussion

In this section we try to make clear why IT applications are slowly diffusing in the auction. For each of the non-traditional business scenarios (mediation office and pseudo information auctioning) we identify the critical success factors related to IT.

Mediation office

The following weaknesses of the image database could be identified (De Boer, 1993):

- Wholesalers still have questions about the representation of the lot by the image. They still need a physical lot for their buying process;
- There are little efficiency improvements for the wholesalers;
- Responsetimes to get the images from the database are too long;
- In the selling process of the wholesalers one needs specific supply information. There is need for general available supply information;
- Due to a lack of standardization of flower products there is no need for an electronic exchange system including automatic order processing.

Pseudo information auction

The Vidifleur project (BVH) was stopped after some months of use in the auction hall. The following reasons could be distinguished, see for example (Automatiserings Gids, 1994):

- Images on the screen representing the flower sold were unclear;
- High costs to prepare the images;
- The auction-clock on the screen was unclear;
- The screen was implemented in a normal auction hall with normal clocks. Wholesalers had difficulties to concentrate on the screen.
- Wholesalers were suspicious about the level of representation of the image on the screen and the real quality of the product.

The following reasons could be identified explaining the problems of the information auction project. These reasons are:

- The concept is not a real information auctioning concept because growers still have to send a sample trolley. The consequences of this concept is that there are new physical flows sample trolley flows in the auction hall and that the sample trolleys are auctioned twice: as a sample of the lot and as a lot itself.
- Sample are not trusted by wholesalers as representing the lots.
- One of the possibilities in the system is that wholesalers can indicate delivery specifications of the products. Growers have fulfil these delivery specifications. Wholesalers complained that there are not enough specification possibilities.
- After the flowers are auctioned, growers have to prepare the sold lot with the ordered specifications. No extra charges are paid to the growers for these special preparations.
- In this concept products bought by wholesalers are delivered the late evening or the next morning in stead of right after the transaction. Products have to be transported from the growers address to the wholesalers. Wholesalers can provide the products to their clients only the next day in stead of the same day.
- It is only possible to supply three or more trolleys for information auctioning. Therefore this scenario was only interesting for large wholesalers and growers.
- New fee tariffs are introduced dealing with trolleys, lots and volumes. Therefore, mostly larger wholesalers become interested in the concept.
- During the first weeks of using this concept product prices went down. This is in general the case when the market becomes more transparent, see Bakos (1993). The

result was that growers supplied their products to the traditional clock sale. Wholesalers are also going to the traditional clock sale because there is little supply supported by information auctioning.

- The results of this introduction seems to underline the conclusion of Bakos (1991). He argued that electronic markets are likely:
  - For buyers to reduce the costs that they incur to acquire price and product information;
  - For buyers to enjoy lower prices because of the increased competition among sellers;
  - For buyers to be better informed about the available products and thus may choose sellers that better suit their needs.

In general we may conclude that:

- In the different business scenario's there are problems reported dealing with product identification, standardization of the quality and quantity of floristry products, representation of a lot, representation of product images. The used systems are not been able to specify the products in a reliable, actual and complete manner.
- Growers still got no clear insight who is actually the consumer of their flower or pot plants.
- Images seems to be useful in the selling process of the wholesalers in stead of the buying process of the wholesalers. One reason can be the difference in suffering risks. Wholesalers bear risks over a retailer's rejection of their offer. For this reason the wholesaler will first see the products to overcome this risk. In the selling process to retailers, wholesalers try to distinguish their self in relation to other wholesalers. Therefor an image data base (with standard products) where every wholesaler may have the same supply information is not necessary. However, retailers seems to accept electronic product images as samples (special products).

In other countries one developed also new alternatives to link growers and wholesalers to each other. For example, in Denmark a supply information system (DAMOT) became operational. In this system the wholesaler place an order to the grower. The input of the data system is done by the growers. This system is owned by the six largest wholesalers in Denmark. The growers have agreed to fulfil the agreements and they will be excluded as they fail to keep their promises. An advantage of the system is the customer orientation, the link between grower and wholesaler is short, efficient and direct. A disadvantage in contrast with the Dutch supply systems is the price-making by the grower. The price is not market orientated, because the lack of price determination by the auction clock. In the Netherlands MO transactions are still related to the clock price, which reflects the optimal price. However, DAMOT is still successful, because 80% of the Danish trade occurs by this system (De Boer, 1993).

Electronic markets in non-flori chains

In this section we discuss some examples of developments of electronic markets in non-flori chains. For example in the financial sector much knowledge and insight was gained about the introduction of electronic markets. Theoretical research is already employed in this sector. We present also examples of electronic markets dealing with jewels, cars and

pigs. In the discussion we answer the question what we can learn from the implementation of electronic markets in non-flori-chains.

Electronic Securities Markets

Practical examples
On the New York Stock Exchange the automatization of many manually floor processes including electronic order routing, execution reporting and the electronic specialist book are developed last years. Computer-based trading systems automate order matching between buyers and sellers. For example CATS (Computer Assisted Trading System) in the Toronto Stock Exchange is a well-known example. A major advantage of CATS is that orders can be entered by investors located anywhere in the world. Another example is NASDAQ (National Association of Securities Dealers Automatic Quotation), described by Riess (1989). It allows market makers to store quotes in a computer and display them on a widely distributed electronic billboard system. NASDAQ by its very nature closely matches the commonly stated requirements for worldwide trading. It is a geographically decentralized, highly automated system tying together competing markets and market-makers in a highly-visible and efficient way.

Theoretical research
Cohen and Schwartz (1989) believe that, if properly structured, an electronic based trading system should result in far better market performance. They designed an electronic call market called PSCAN. Its specific objectives are fourfold: (1) enable geographically dispersed traders to respond to floor information as the markets forms, (2) encourage traders to reveal their orders, (3) facilitate the entry of large orders and (4) find clearing prices that comprehensively reflect trader's desires to buy and sell shares. The key structural feature is a price scan procedure. Clemons and Weber (1991) compared two alternative trading mechanisms for securities markets using laboratory experimentations and computer simulations. One mechanism is the floor-based specialist auction (hoekman in dutch) and the other is an electronic alternative employing automatic order matching. They conclude that transition from the established floor-based exchanges to potentially superior electronic alternatives is possible, despite the inertia resulting from the experience of benefits investors trading in active markets and that current proposals for electronic markets are not demonstrably superior on generally accepted criteria used to assess market quality (Clemons and Weber, 1991). They conclude that 'since the benefits to systems innovators will frequently depend upon adoption, and since adoption of strategic innovations is frequently dependent upon decisions of a group of potential users acting without external coordination, valuing such systems innovations has been extremely difficult and uncertain'. Weber (1991) examines the possibility that today's security markets will be displaced by lower-cost electronic trading systems and discusses the importance of two necessary conditions for adoption of an alternative trading system. First, in the absence of regulatory intervention, an alternative trading mechanism must be capable of competitively drawing volume away from an established market; i.e. there must be a *feasible* transition path to a new trading mechanism. Second, it must be demonstrated that a proposed electronic market design does in fact improve recognize measures of market quality such as bid-ask spreads and transaction-to-transaction price variance. A new trad-

ing system must be *desirable* and improve the functioning of the market. The observed outcome is that transitions to alternative trading mechanism are feasible, but the electronic market design considered - an open order matching market - is *not* desirable to most traders or by important market quality measures in comparison to the specialist and limit order book market structure in use on the major U.S. stock exchanges (Weber, 1991:242). He concluded that if an electronic trading system were developed that offered lower costs and whose design provided demonstrably improved market quality, the evidence suggests that transitions away from an established market would be possible. Smith and Williams (1992) found that institutional rules governing trading play a crucial role in market efficiency. They tested how well price levels and trading tracked changes in the theoretical equilibrium under three sets of rules. The first one is called the *double continuous auction*. In this system any buyer or seller announced a bid or a offer to the entire group and a transaction occurred whenever any buyer accepted an offer or any seller accepted a bid. The second system is called the *posted-offer price*. In this system sellers set a price an buyers decide how many lots, if any, to purchase. The third system is called the *double sealed auction* in which traders prepare bids and offers, and a third party executes the appropriate trades. Post-offer pricing leads to market dislocations, but might interesting for large and stable markets, especially those in which each transaction involves small sums. The dampening effect of post-offer pricing on trading volume and its inability to track a shifting equilibrium are outweighed by the fact that it does not impose any negotiating costs (Smith and Williams, 1992). Doubles sealed auction set prices as effectively as the double continuous auction, but its transaction costs are lower. Smith and Williams (1992) suggest that stock, bond and commodity markets working to implement computerized trading procedures might do well to consider the double sealed auction in place of the double continuous model that has served them in face-to-face transactions.

Electronic Jewel Markets

Practical example: AGMS

The American Gem Market System, AGMS provides an integrated information, communications, grading and trading network in the gemstone industry (Warbelow, 1988). Many retail jewellers used the system to display international stone inventories to their customers. The possibility of incorporating images into the system was investigated. Stone images that could be merged with images of custom mountings are shown. Rather than transmitting a stone's actual image, a 'simulated' one could be constructed based on the information. The images could be processed by the computer and matched against a database to locate stones similar with the simulated one. Price variance could be reduced by a well-disciplined and efficient computerized market. The grading became more uniform and the sales could be increased. The mystery of the gemstone should be cleared. Dealers felt that the mystique should be lost when the stones were reduced to a few numbers on a computer. Jewellers could buy cheaper in the U.S.A. Dealers who go overseas buy better, in bulk and regularly and are able to give retailers a better buy. Stones have to be bought by looking at them. AGMS was convinced that by pushing for acceptance of grading standards and going direct to the retail jewellers, resistance at the dealer level could be overcome. With a dominant and profitable position in the gemstone industry,

new comers would not be able to dislodge AGMS from its monopolistic position (Warbelow, 1988).

Electronic Car Markets

Practical example: AUCNET
Warbelow and Kokuryo (1989) presented the AUCNET case. The TV Auction Network system was designed to create a centralized wholesale market in which cars were sold using images, data and a standardized inspectors rating. A car sold by AUCNET remained at he sellers location until the transaction was completed. Afterwards the car was delivered direct to the buyer, where he or she saw the vehicle for the first time. In the auctioning process buyers and sellers remained at their business. Each was equipped with a PC linked to AUCNET computer. A laser disk player and TV screen were attached to the PC. Images of the cars to be sold were stored on laser disc and retrieved to a TV screen at the appropriate time by an AUCNET command. Information about the car and the auctioning process were sent over the phone and overlaid the image. Buyers entered bids by pressing a button. The auction was controlled by the AUCNET computer and operator.

Cost and ease of use are key factors to start this network. By using a proprietary terminal with the program in ROM and buying in volume, the cost were kept low. Participants leased the necessary equipment. AUCNET paid most of the communications costs. AUCNET had purchased a satellite transponder and planned to shift the laser disk based images into a satellite feed and upgrade service. The system implementation was like a rocket, it took the most energy to get off the launch pad, to keep it going it took less energy. A high minimum of terminals had to distributed quickly, otherwise the system lost its reputation. If it succeeded, the trees and grass were attributed to it. It was a snowball effect. Either it succeeded big or failed big.

Electronic Commodity Markets

Practical examples: HAM
Neo (1992) described the realities of Singapore's Hog Auction Market (HAM). Neo (1992) showed that HAM changed the fundamental nature of pig trading in Singapore (1) from one based on private negotiations between importers and buyers to an open market bidding system. (2) Prices under the HAM system are determined by supply and demand, not independently by the importers. When HAM was introduced, prices dropped an average of 15% in the first two months of operation, and varied by as much as 40% in the same period. (3) HAM provides market information back to farmers more quickly and more precisely and indirectly forced suppliers to offer better quality pigs. (4) HAM has reduced the need for middle men, the importers and changed their role drastically. Farmers can bypass the importers to sell their pigs directly by HAM. HAM charges lower rate of commission, so it became relatively attractive for farmers to switch. Neo (1992:285) argued that the key issue for successful implementation of electronic markets like HAM is not necessarily the enforcement of mandatory use, but the planning of strategies to obtain a critical mass of early adopters so that the system will be given a fair chance of having the intended effects.

Theoretical research

Lee (1993) investigated the concept of intelligent electronic markets for commodity auctions in detail. Within the taxonomy of market structures (direct search market, brokered market, dealer market, auction market) he adopts the auction as the market structure for an intelligent electronic market. An auction market refers to a centralized intermediary where buyers and sellers trade with each other without specialists. Auction markets provide the most cost effective trading structures because traders do not have to pay broker commissions or bid-ask spreads. There are two types of auction markets: continuous trading and periodic call trading. Some financial and commodity markets start the day as an periodic call trading and change during the day into continuous trading. Intelligent electronic markets accumulate buy and sell orders over time and match those aggregated orders in a way that (1) not only maximizes total exchanged volume within bid and ask prices (2) but also satisfies the qualitative preferences of buyers and sellers (Lee, 1993). In the flower markets context the qualitative preferences over product attributes or delivery conditions are important. Lee (1993) employed social choice theory to satisfy these qualitative preferences in commodity markets.

Discussion

The following lessons can be learned from implementations of electronic markets in non-flower chains:

- Different electronic markets systems occur, each with their specific market structures and business scenarios. For example, the doubles sealed auction seems to be worthwhile to investigate. No clear insight could be identified under what conditions electronic markets could be developed successfully;
- Order matching and price determination are new features which are supported in electronic markets;
- Some electronic market systems became fully automated - not in the sense of taking judgment out of the process, but in the sense of fully integrating automation with human judgement in the total routing, market-making, and clearing process (Riess, 1989:223);
- Global trading became possible by the introduction of the electronic market concept;
- The role of floor-based specialists is of decreasing importance. Electronic markets feature direct access between sellers and buyers.

Towards an electronic flower auction

In this section we combine the weaknesses of the current business scenarios (described in section 2) with the lessons learned in non-flori chains (described in section 3). The result of this combination is a new business scenario: the electronic flower auction (EFA). We will discuss features of it. Hypotheses will be formed dealing with conditions and design characteristics of the electronic flower auction.

Features

Central in the concept of an electronic flower auction (EFA) is the decoupling of the physical flower flow and the price discovery process in the auction hall. IT provide several features to overcome problems dealing with the decoupling. Lee (1993:119) distin-

guished several features of intelligent electronic markets. We use them in the business scenario of the electronic flower auction. EFA provide the following features:

- On-line transaction
  The electronic flower auction enable sellers and buyers to obtain uniform prices through periodic call trading. They are able to exchange quickly through on-line transactions.
- 24-hour global market
  Screen-based trading might be done 24 hours a day. For all sellers and buyers around the world it might be in potential possible to place orders.
- Transaction cost-effective trading
  Electronic flower auctions may charge lower trade commissions.
- Electronic audit and surveillance
  There are surveillance and regulatory advantages to trading systems that provide an electronic audit.
- Maximized transaction volume
  The periodic call trading mechanism determines optimal transaction pricing so that sellers and buyers can maximize their transaction volume. Using the suggestion of Smith and Williams (1992) that stock, bond and commodity markets working to implement computerized trading procedures might do well to consider the double sealed auction in place of the double continuous model that has served them in face-to-face transactions. The physical (floristry) flows are hereby not considered.
- Satisfaction of qualitative preferences on product attributes
  Sellers and buyers can specify their preferences on the characteristics of products. The trade matching mechanism enables them to exchange goods with preferred trading partners on the best combination of their qualitative preferences.

The EFA business scenario seems to be useful in a global context, for full standardized flower products. Growers, wholesalers and retailers can easily be connected by IT to the price discovery process. Transports of the perishable flower products will directly go from grower to wholesaler/retailer.

Design strategy

Bakos (1991) identify that the best strategy for sellers is to control the type of system eventually introduced by (1) a system emphasizing product over price information may allow sellers to keep much of their monopoly power while giving buyers access to the allocation efficiencies and buyers can be charged user fees for using this system; (2) to compensate for the effect of the systems by making it difficult for buyers to extract price information or to compare alternative product offerings; (3) to increase the differentiation of product offerings, possibly using the technology to help differentiate what would normally be a commodity product. Buyers obviously have the opposite incentives and would like to encourage an electronic market place that facilitates comparisons among sellers' prices and products (Bakos 1991:43). We think that also in the electronic flower auction all three design strategies might be useful. In the design process of this business scenario buyers and sellers have to negotiate on specific design characteristics. Special attention in the development of IT have to be given to the early phases of the development life cycle.

Contracting management and design management seems to be crucial success factors, see Van Heck (1993).

Hypotheses

To summarize our conclusions we formulate hypotheses for further research. We used the framework of Weber (1991) to structure our hypotheses.

H1 If the electronic flower auction will be capable of competitively drawing volume away from an established market i.e. there must be a feasible transition path, then it will be adopted.

H2 If the electronic flower auction improves the functioning of the market i.e. it is desirable, then it will be adopted.

More specific hypotheses are:

H3 If transactions in EFA are auctioned by double sealed auctioning then EFA will be capable of competitively drawing volume away from an established market and improve the functioning of the market.

H4 If qualitative preferences on product attributes can be specified and product quality can be standardized in EFA then EFA will be capable of competitively drawing volume away from an established market and improve the functioning of the market.

H5 If EFA links growers with wholesalers and retailers around the world then EFA will be capable of competitively drawing volume away from an established market and improve the functioning of the market.

H6 If EFA enables to bypass wholesalers and links growers and retailers directly then EFA will be capable of competitively drawing volume away from an established market and improve the functioning of the market.

H7 If EFA enables to force growers more market orientated then EFA will be capable of competitively drawing volume away from an established market and improve the functioning of the market.

Conclusions

In this section we formulate our conclusions. In this article we answered three questions.

What sort of business scenarios link growers and wholesalers and how are they supported by IT applications?

We identified different business scenarios. A steady growth of the floristry industry in the Netherlands caused logistical problems around the auction halls. IT was used to speed up the traditional auction process by using faster auction computers and EDI applications like the electronic supply letter. There was a shift from the traditional auction towards transactions supervised by the mediation office. IT was implemented to support mediation office transaction. For example, the image database was set up to provide buyers more service. Finally, auctions are working to implement so-called pseudo information auction systems. In those systems there is a pseudo-decoupling of physical flower flows

and the price discovery process in the auction halls. Problems were reported with the pseudo information auctioning concept. We could explain those problems. We think that the pseudo information auctioning will not be suitable for grower and wholesalers in the near future.

What can we learn from implementations of electronic markets in non-flori chains?
In different non-flori chains electronic markets were developed the last years. Market structure, characteristics of transactions and the transacted products, characteristics of sellers and buyers seems to be essential for the structuring of the electronic market.

Design characteristics dealing order matching and price discovery are introduced in financial electronic markets. Effects were reported dealing with decreasing market prices and decreasing monopoly power of sellers, bypassing middle men and floor-based specialists. No clear insight could be identified under what conditions electronic markets could be developed successfully. Global trading is one of the important features of electronic markets. Special attention have to paid to the market structure and specific features of an electronic market.

What are features of an electronic flower auction and what sort of hypotheses dealing with the design of an electronic flower auction have to be researched?
Weaknesses of current business scenarios and lessons learned from introductions of electronic markets in non-flori chains formed the bases of a new business scenario called the electronic flower auction (EFA). In this scenario there is a decoupling of the physical flower flows and the price discovery process. Specific features of EFA are on-line transaction, 24 hour global market, transaction cost-effective trading, electronic audit and surveillance, maximized transaction volume and satisfaction of qualitative preferences on product specifications. Hypotheses have been formulated dealing with essential design characteristics of EFA. These hypotheses specify important aspects as the double sealed auction concept, global trading, qualitative preferences and standardized quality attributes, bypassing wholesalers and direct linking with retailers and forcing growers toward market orientation.

Overall, we think that there are advantages to introduce the electronic flower auction business scenario in a *global* context. A lot of questions still exist. The scenario has to be developed in more detail. Further research has to be employed in cooperation with growers, auctions, wholesalers and retailers in the Netherlands and abroad. Simulation techniques to forecast effects on market quality seem to be essential. Studies combining experimental economics and computer simulation provide useful results, see for example Weber (1991), Smith and Williams (1992) and Lee (1993).

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Appendix 1: The Dutch flori-chain

One of the most competitive sectors of the Netherlands is the floristry industry. The floristry sector comprises the cultivation and trade of cut flowers, pot and bedding plants. Pot plants and cut flowers have an almost 80% share of the world trade in ornamental plant products. In the last decade the industry was growing fast. Significant changes are occurring in the competitive floristry relationships worldwide. European integration, democratization in Eastern Europe and the liberalization of world trade in the context of the GATT negotiations will have consequences for the national and international cultivation and trade. A number of 'traditional' markets are going rough and displaying signs of saturation. This has been caused by the low conjuncture and the increasing competition from foreign countries. The exchange rate problems and the increasing of the tax-tariffs in France are of great importance. The sales to the most important client Germany is still going profitable. However, the price determination is still under pressure.

In the Netherlands logistical problems are dominant, resulted from the ever-increasing supplies brought to the auction centres. The shifting from a supply market to a demand market is pushing through. The increasing competition from foreign countries force the Dutch floristry industry till strategic management. All this affects profit margins and the power relationships in the floriculture chain. The many changes make it difficult to obtain a clear insight into the prospects for the floristry industry, while this is essential for making a timely response to opportunities, threats, strengths and weaknesses. The use of new Information Technologies (IT) is mentioned as one of tools to overcome this problems.

The linkages and the chain pattern of the Dutch floristry industry are showed in subjoined figure. The connections between the linkages show the direct information and physical flows. Foreign production is included while the cut flowers and pot plants trade have the Netherlands as their intermediate or final destination.

Suppliers
Suppliers deliver products to national and international growers. Examples of goods are plant material, fertilizer, crop protection and technical equipment.

Growers
More then 2100 companies with pot plant culture have a areal of approximately 1300 ha. The areal of cut flower culture is the amount of 3600 ha accomplished by almost 6500 companies. The cultivation of floristry products is mainly concentrated in South Holland, particularly in the area known as the South Holland Glass District (ZHG); 42% of floriculture areal is grown in this area. There is also a production centre around Aalsmeer. Because of the lack of well-developed large contiguous stretches of land in these old centres, many new nurseries are springing up in the fringe areas around the ZHG en Aalsmeer. A number of growers opt for other regions for expansion because of the land size, infrastructure, water quality, land prices and labour market (Groen, 1993).

The growers regard each other more as colleagues than competitors. A widespread participation of growers in study clubs shows that they do not rely solely on their own intuition (Leeuwis, 1993).

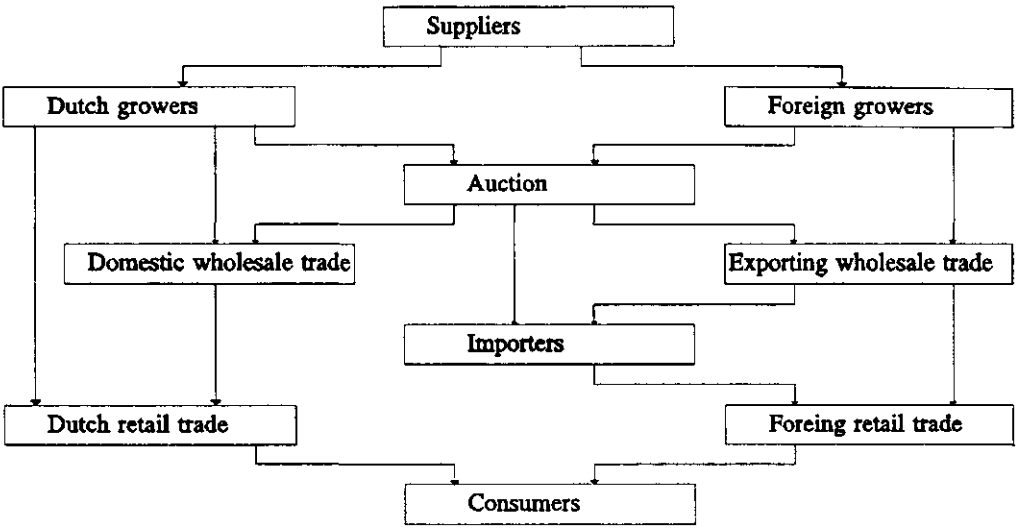

Figure 1. Actors and linkages in the Dutch flori-chain

Auctions
Floristry products are sold by seven auctions. The two largest auctions Verenigde Bloemenveilingen Aalsmeer (VBA) and Bloemenveiling Holland (BVH) account for 81% of the auction turnover in cut flowers and 92% of the auction turnover in pot plants. The auctions are sales cooperations of the growers. Their objective is to serve the interests of the members in particulary the sales of floristry products produced by the members. The trend towards strategic partnerships and mergers is continuing, enabling the role and power of the auctions to increase further.

Wholesalers
Domestic wholesalers and exporters receive their supplies by the auctions. Last year there were almost 1850 exporters and 350 wholesalers with domestic trade. The exporters can be divided into the scheduled delivery services and dispatch exporters. The former deliver their products directly to the foreign retailers, whereas the latter mainly deliver to wholesalers abroad.

Retailers
There is a widespread distribution network, with approximate 10.000 points of sale for flowers and plants. Most of the distribution to consumers takes place by flower shops (54%). In addition, there are sale by street traders (23%), grocery superstores (13%), garden centres (6%) and other channels (4%). Flower shops and garden centres have a gross profit margin of about 75%, street traders about 50% and the supermarkets and department stores around 65% (Haak et al, 1992).