Towards Electronic Markets in the next Millennium of the Horticulture Product Chain

An agricultural product chain is a chain of businesses extending from the production of primary raw materials via the processing of possible semi-processed products through to the distribution of consumables to the consumer. In his paper, the author discusses the Dutch horticultural sector where the processing of the products mainly involves the sorting, packing and other logistic operations of fresh produce.

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The products of the Dutch horticultural sector are for the greater part sold at the auction to commission merchants and exporters. Figure 1 represents the main processes of the horticultural product chain, the divergency of the product flow and interorganizational information systems for the data interchange between the identified actors. An auction is an important part of the product chain, collecting the supply of flowers, fruit, mushrooms or vegetables from the growers.

Auctions have existed for more than a century in the Netherlands. They are based on co-operative principles with the producers being members of the co-operative. They have traditionally also been a meeting place for farmers and traders to exchange informal information and news. About 20 auctions of food products aggregate a turnover amounting to 4 billion Dutch guilders per year while auctions of plants and flowers total more than 5 billion Dutch guilders. The supply of horticulture produce is centred on the three biggest auctions which account for as much as 90 % of the turnover in this market. Their leading position on the world market is reflected by the fact that even cut flowers grown far away (e.g. Israel or Colombia) are marketed at auctions near Dutch airports.

Business Processes at the Auction

Figure 2 depicts a breakdown of the marketing process into the processes of registering supplies, classifying quality, arranging lots, selling products, managing accounts and distributing shipments. A further breakdown of the 'selling product' process would include a 'putting up for the auction clock' process as the most important one. Other sell activities take place in the Cash and Carry hall, where small quantities are directly sold to retailers. Furthermore, the management of auctions may also involve responding to a demand for huge quantities for export by mediating for such ad-hoc sales. Traditionally, auctions are held with the products to be sold unloaded in the auction hall. The perishable produce is taken into into storage rooms with controlled conditions where it is prepared for further transport. A process specific to auctions of fruit and vegetables is the third process in Figure 2, where supplies originating from different growers, but with the same qualities, are collected to permit bulk purchasing for export (this also reduces auction time). Less uniformity and the absence of combined blocks for tele-selling at auctions for pot plants and flowers are the reasons why this process is omitted at these particular auctions. Products of the ornamental plant cultivation are put on stacking waggons. At starting time of the auction, the waggons are filed into the auction room using the track in front of the clock and the stand of buyers.

The auctioneer starts with a high order price followed by a descending price pattern on a downward scale displayed on electronic clocks. It is the task of the auctioneer to open at an adequate price level. The price must be high enough to permit the bidder with the highest demand price to enter his bid at a maximum. If the auctioneer starts at a too high a price, the speed of the auction will slow down because it takes longer to reach the price level of demand. In the auction room for fruit and vegetables, we notice in the middle of the clock (see Figure 3) an electronic display which indicates the essential information of the current transaction (identification of lot, productcode, quality, quantity offered).

Computer Infrastructure for Auctions

It is the potential speed of the Dutch auction that allows numerous items to be sold in a short time. This is an important aspect if the goods sold are perishable. Figure 3 shows the essential components of the computer infrastructure that supports the business processes at an auction:

- Auction clocks connected to a real-time computer (RT) and to the push buttons of the traders at their stand in the auction room. This system identifies the highest bidder.
- Network for the transmission of the clock transactions to the computer systems for business administration (CBA) and on-line information for the managers via workstations and personal computers in the departments.
- Relational databases (RDB) for storage of the transactions and retrieving historical data for statistical operations.

Perspectives

The introduction of advanced information technology offers new challenges for the optimization of processes at auctions. Pilot projects about new information technology conducted at some auctions have resulted in:

- Supply registration systems (SR) that enables the grower to enter the data of his products via a modem at the nursery or with the help of a terminal in the auction hall. The introduction of these systems decreases the number of errors in the product database and, as a consequence, the selling proces accelerates. Client-server architecture supports the distributed processing of joint auctions. A replication server updates the geographical dispersed databases and will also provide on-line data for an executive information system (EIS).
- An image data system processes images of flowers and plants that are taken by video cameras. The resulting images are projected on a big monitor in the auction room.
- Agency centers for the selling of specialized produce (e.g. mushrooms), without using the electronic clock as a price-setting instrument.
- Tele-selling offers on-line connections between auctions to enable traders to purchase at different locations. Therefore, some additional organizational requirements have to be satisfied.

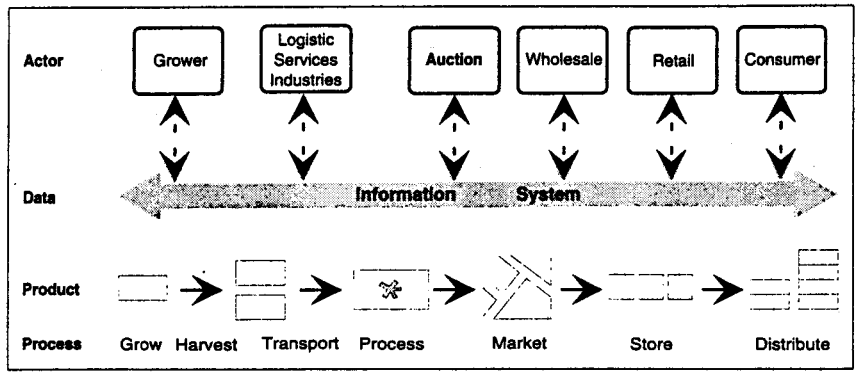

Figure 1: The horticulture product chain

- Voice-response computers (VRC) give adequate price information to the growers at home. This feed-back motivates growers to be flexible in responding to the market situation.
- Decision-support systems (DSS) for the allocation of large amounts of apples and pears to a great number of storage rooms. At the start of the season, a tactical storage plan is generated and during execution the DSS supports the operational decisions of the manager of the cold storage department. A special algorithm has been developed to tackle enormous non-linear mathematical problems.

The marketing process of horticulture produce is an area of enormous potential for integrating various information systems. Besides the integration of systems at a single auction, cooperating networks in the horticultural product chain require external integration. This calls for an adjustment of the semantic and pragmatic concepts, which are applied by the businesses involved. Information system architectures are essential for the business processes, especially for electronic marketing.

Information Systems Architecture for the Future

The 'Chain of Business' phenomenon is important for the businesses as well as for the individual. Sustainable production and distribution activities are important for everyone. Furthermore, societal constraints and requirements are imposed on the economic activities connected with horticultural production the need to minimize waste, restrict pollution and to economize on the use of resources. Currently, many changes are taking place and new strategic directions are emerging in the field of horticultural production. Some of the main issues are higher quality demands on the products, shorter product life cycles and broader assortments of products. Combined with the typical characteristics of the horticultural production process, e.g. the perishability of products, varying quality of products and the seasonal supply of raw materials, this imposes new demands on the businesses involved. To reengineer the processes of a single business is not sufficient, there is a need for a new concept: chain processes reengineering. As described, chain reengineering seeks to redesign processes with a view to enhancing productivity and increasing the competitiveness of a product chain. In order to optimize the logistic and information infrastructure of the horticulture product chain, we can focus on the several aspects to be represented in a meta-model: processes, data, network, time, people, and motivation.

Information planning is a decision-making process, by which the management of the auction and the representatives of growers and the trade must give directions to information system architectures. The payoff for creating information architectures is in the system development process, as there are still some obstacles to be overcome in introducing new systems. Information systems planning takes place in the context of other forms of planning practised within the business. This concerns the formulation of an information strategy and information plan, the latter containing the strategic planning of information systems. During the course of the information system planning study, several models should be developed. Two kinds of models are distinguished: models for analysis which are utilized to get a clear picture of a problem at hand and models for design. These latter models are more geared to describing the future business processes of the auction.

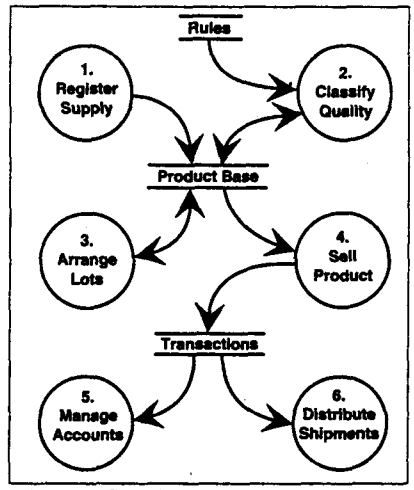

Figure 2: Data flows in the marketing process of the auction

The network aspect in the meta-model mentioned above includes the logistic infrastructure which is needed to collect the supplies from the growers, market the product and, finally, distribute it to the retailers. Re-allocation of the infrastructure and concentration of selected products on a nation-wide level seem inevitable for the near future. Shared data bases, made possible by advances in the field of distributed data bases are at the core of these future electronic markets. They provide a mechanism for integrating the processes across organizational boundaries by allowing the continuous sharing of on-line information. Distributed data bases will support the distributed nature of applications, e.g. information about product cultivation will be available within the database of the grower, an image data system may send shots of flowers to offices of the wholesalers via wide area networks. Data concerning the route and product conditions during transport will be stored in databases of the logistic service industry.

Architectures that provide these systems will enhance the tracking and tracing of horticulture products along the product chain. It is argued that innovations with the help of advanced information technology will be very important for successful competition of quality products. Further research is necessary for the planning and construction of information architectures that supports new demands. ■

References

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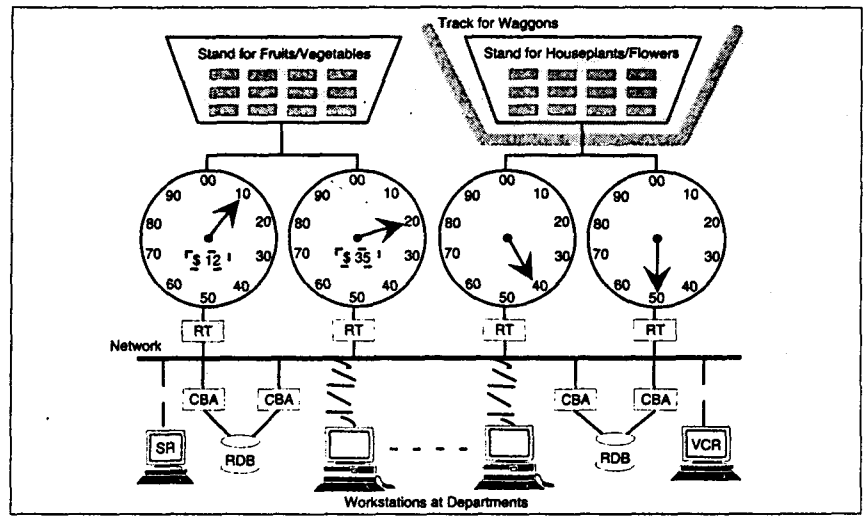

Figure 3: Computer infrastructure for an auction