EFFECTS OF ELECTRONIC MARKETS:
An Analysis of Four Cases
in the Dutch Flower and Transport Industries

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Abstract. This article aims to promote a better understanding of the positive and negative effects of electronic markets. The central questions are: what are the main effects of electronic markets and what factors can explain these effects. A framework to evaluate electronic markets has been developed. Analytical aspects of the framework are: motives of participants, mode of cooperation, entry barriers, electronic market structure and functionality, and effects of electronic markets on different stakeholders. Empirical evidence was found in four cases in two industries: the Dutch flower industry and the Dutch transport industry. In both industries the Netherlands is recognized as one of the world’s leading countries. Results indicate that a situation combining convergent motives for entering an electronic market, network modes of cooperation, high entry barriers, and a specific electronic market structure and functionality is related to positive effects for all stakeholders. A hyperbolic relationship between electronic market structure and electronic market functionality is reported. The results of the analysis and the framework itself illustrate the various complex issues that arise in the design and implementation of electronic markets.

Problem Specification. This article aims to promote a better understanding of the effects of electronic markets. Economies have two basic mechanisms for the coordination of the flow of materials or services through adjacent steps in the value-added chain: markets and hierarchies. Markets coordinate the flow through supply and demand forces and external transactions between different individuals and firms. Market forces determine the design, price, quantity and target delivery schedule for a given product that will serve as an input into another process [1:485]. Markets provide buyers and sellers with a venue for exchange or the transfer of property rights from one party to another. Generally speaking buyers and sellers are faced with a variety of uncertainties and risks in the process of trading goods and services. These uncertainties arise from the fact that traders are hampered by bounded rationality and their inability to forecast the future, combined with the potential for opportunistic behaviors. Markets as institutions provide specific routines, procedures and guarantees that enable the buyers and sellers to undertake the exchange by providing them with the relevant information and safeguards to reduce uncertainty and risk. Hierarchies coordinate the flow of materials through adjacent steps by controlling and directing it at a higher level in the managerial hierarchy. Managerial decisions, not the interaction of market forces, determine design, price (if relevant), quantity and delivery schedules at which products moving from one step to the next on the value-added chain [1:485]. New Information Technologies (IT) have been used and will be used in the coordination of goods and services resulting in electronic markets and electronic hierarchies. Malone, Yates and Benjamin [1] distinguished three effects induced by IT: the electronic communication effect, the electronic brokerage effect, and the electronic integration effect. In electronic markets coordination is supported by the use of IT (screen-based trading, data bases, electronic data interchange, AI applications). Electronic markets use IT to disseminate information on prices, quantities and qualities of products and services, and buyer and seller identities.

Research on the effects of IT on exchange organizations and processes is relatively new. Early research applied transaction costs and agency theory to predict shifts from hierarchies to market form of organizations [1][2]. The central argument of this line of research was that IT would improve communication, search, monitoring and information sorting capabilities, thereby reducing transaction costs and enabling purchasers to take advantage of production economies available in markets. A critical drawback inherent in this analysis was the definition of markets in abstract economic terms (i.e. markets coordinate economic activity through a price mechanism). In reality there are different market types (direct search, brokered, dealer and auction markets). Each of these mechanisms organize the trading process and related
information processing activities in different ways. Thus the role and impact of IT can vary across types. Some examples include: Kambil and Van Heck [3] showed the role and impact of IT on the Dutch flower auction markets; the predicted shift towards electronic markets was also questioned. Ribbers et al. [4] concluded that EDI will increase transaction costs by transaction specific investments and predicted a shift towards hierarchies. Recently IS researchers have examined the impact of IT on market institutions. Konsynski et al. [5][6] provided two descriptive case studies of electronic markets. Clemons and Weber [8] examined the effects of computerization on the London Stock Exchange. Economides and Schwartz [9] designed the Electronic Call Market Trading concept.

However, what is lacking is a method of systematic classification to cover a variety of different cases involving the various complex issues that arise in the design and implementation of electronic markets. Special attention must be paid to:

. the different effects of electronic markets for different stakeholders in different market settings; For example, Kambil and Van Heck [3:9] show that indicators of market quality for financial markets (liquidity and volatility) are inappropriate measures in the case of the Dutch flower auction markets.
. differences between the design of electronic markets and their underlying infrastructure.

Taking these two issues into account, we have provided a framework for analyzing the merits of electronic markets. The central questions are: "what are the main effects of electronic markets and what factors can explain these effects?". We use the framework to evaluate electronic markets in two industries: the Dutch flower industry and the Dutch transport industry. In both industries, the Netherlands is recognized as one of the world’s leading countries. The results of the analysis and the framework itself illustrate the various complex issues that arise in the design and implementation of electronic markets.

**Conceptual Framework.** Table 1 presents the conceptual framework, including the analytical aspects, theoretical approaches, and propositions.

**Motives of participants**

Participants in organizations and markets behave in a bounded rational way. The motives of participants can be defined as a desire to engage in satisfying behavior [12]. Motives of participants in electronic markets will shape the development and results of electronic markets. We propose:

Proposition 1: Convergent motives for entering an electronic market will lead to positive effects for all stakeholders (sellers, intermediaries, buyers);

**Mode of cooperation**

Firms are to be understood as the outcome of efforts aimed at minimizing transaction costs and are determined by asset specificity, uncertainty, and exchange frequency [13] and for a discussion see [14]. In Williamson’s approach, the entrepreneurial decision between ‘make or buy’ is presented as a decision between hierarchical or price-determined exchange relationships. The network approach developed by Swedish economists, [15], presents an extension of this market-hierarchy dichotomy. Networks are to be understood as intermediate forms between price-determined and hierarchical exchange relationships, see also Powell [16]. We propose:

Proposition 2: Price determined forms of cooperation in an electronic market (versus network and hierarchical forms of cooperation) will lead to positive effects for all stakeholder (sellers, intermediaries, buyers);

**Entry Barriers**

Another starting point is the barriers to market entry approach as formulated by Bain [17]. He distinguishes economies of scale as entry barriers, absolute cost as an entry barrier and product differentiation as entry barriers. We propose:

Proposition 3: More barriers to electronic market entry will lead to positive effects for all stakeholders (sellers, intermediaries, buyers);

**Electronic markets structure/functionality**

The Information Management approach discusses the structure and functionalities of IT architectures and infrastructures. Nielen and Ribbers [18] defined a so-called reach/scope framework for IT infrastructures. This framework is used in an electronic market context. It is proposed that electronic markets with a high reach (e.g., open structure, many participants) have a low scope (low functionality).
Table 1: The Conceptual Framework.

<table>
<thead>
<tr>
<th>Analytical Aspect</th>
<th>Theoretical Approach</th>
<th>Propositions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motives of participants</td>
<td>Decision-making</td>
<td>Convergent motives for entering an electronic market will lead to positive effects for all stakeholders</td>
</tr>
<tr>
<td>Mode of cooperation</td>
<td>Transaction cost, Network</td>
<td>Price-determined forms of cooperation in an electronic market will lead to positive effects for all stakeholders</td>
</tr>
<tr>
<td>Entry Barriers</td>
<td>Barriers to market entry</td>
<td>More barriers to electronic market entry will lead to positive effects for all stakeholders</td>
</tr>
<tr>
<td>Electronic markets structure/</td>
<td>Information management</td>
<td>Electronic markets' architectures with a closed structure and a specific functionality will have positive effects for all stakeholders</td>
</tr>
<tr>
<td>functionality</td>
<td></td>
<td>Electronic markets' architectures with an open structure and a broad functionality will have positive effects for all stakeholders</td>
</tr>
<tr>
<td>Effects of electronic markets</td>
<td>Information economics, Transaction cost, Stakeholders</td>
<td>Electronic markets will lead to positive effects (higher prices, more effective primary processes, more efficient primary processes) for all stakeholders (sellers, intermediaries, buyers)</td>
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Electronic markets with a low reach (closed structure, few participants) do have a high scope (high functionality). The question is which of these electronic markets will provide positive effects. We propose:

Proposition 4: Electronic markets with a closed structure and a specific functionality (low reach/high scope) will have positive effects for all stakeholders;

Proposition 5: Electronic markets with an open structure and a broad functionality (high reach/low scope) will have positive effects for all stakeholders;

Effects of electronic markets

Derived from recent research on electronic markets by [3][5][6][7][8][9][10][19] we distinguish three effects of electronic markets.

1. an increase in transparency and therefore decrease in prices of transacted goods or services;
2. an improvement in efficiency of primary processes of participating stakeholders (sellers, intermediaries, buyers);
3. an improvement in effectivity of primary processes of participating stakeholders.

Empirical Evidence. Four cases were used to show empirical evidence for the proposed framework. Cases were used for so-called analytical generalization (not to be confused with statistical generalization) [20]. The case study method was used because it enables 'reality' to be captured in considerably greater detail than other methods and also allows the analysis of a considerably greater number of variables [21:162]. In each case interviews with key officials were held. Relevant reports were analyzed and archival data were obtained. Two cases were chosen in the Dutch Flower industry: the Aalsmeer Sample-Based Auction System case and the Holland Supply Bank System case. Two cases were chosen in the Dutch Transport industry: the European Teleroute case and the Dutch/German Transport Management System case.
The Aalsmeer Sample-Based Auction System Case. The first case deals with the Dutch flower auctions. They are the world’s leading price discovery and trading centers for cut flowers and potted plants. Holland is also the world’s largest exporter and distributor of cut flowers and potted plants. Due to changing patterns of international competition, buyer preferences and information technology the traditional Dutch auction stays under pressure. One of the latest developments in that respect is the set up of a sample-based auction or so-called ‘informatievei-len’ for trading potted plants initiated by the Aalsmeer auction VBA, see Griffioen [22], Kambil and Van Heck [3], and Van Heck and Groen [23]. In a sample-based auction growers send a sample of the product to the auction house along with information on the quantity and quality of the product. Buyers bid for the product and they specify requirements for product packaging and delivery. Growers package the product as specified by the buyer and deliver it the next day to the buyer location in the auction complex or to a buyer warehouse.

Motives of participants
The different stakeholders (growers, auction, buyers) expected a number of different benefits. By uncoupling logistics and price discovery, the growers and the auction expected the number of transactions per hour to increase. In reality the number of transactions per hour decreased as buyers had to specify terms of delivery. While the auction expected 45% of the supply of potted plants to be transacted in the sample-based auction, only 10% of the product was transacted this way. Thus, sample-based auctioning did not effectively reduce storage requirements at the auction. Growers received no extra compensation for modifying packaging and delivery practices to suit the buyer. Growers also perceived they got lower prices in a slower auction. Better prices were obtained for the representative lots themselves (which were auctioned in a second round). As a reaction, growers would split the same product into different sample lots, hoping this would lead to higher prices during the auction.

Mode of cooperation
In the Aalsmeer Sample-Based Auction system, the mode of cooperation between growers and buyers can be characterized as a market mode. Growers cannot negotiate during the price discovery process.

Entry Barriers
Entry barriers to this market can be characterized as medium. Growers have to be members of the auction organization and have to deliver their products via the traditional Dutch auction, the mediation office or the sample-based auction. Buyers must be registered if they are to become trading partners at the auction.

Electronic markets structure
The architecture of the sample-based auction has a closed character and is only suitable for the direct participants therefore it can be characterized as low reach.

Electronic markets functionality
The scope or functionality of the architecture is medium. No specific functionality was created in the system for the purpose of tracking and tracing the products. The focus of the system was on efficient price discovery and requirements specifications.

Effects of electronic markets
The Aalsmeer Sample-Based Auction System has a negative effect on the functioning of growers, auction and buyers. Growers did not favor this market because product prices decreased dramatically after the introduction of the system. Buyers did not favor this market either because trade volume decreased as a result of these lower prices and resulted in uncertain supply. The lack of strong functionality in dealing with tracking and tracing meant the system did not bring buyers and sellers competitive advantage. Some changes to the auction rules (price floor of 70% of the average price, increase of lot size) have stabilized the market.

The Holland Supply Bank System Case. In recent years more cut flowers and potted plants have been distributed through the Mediation Office or ‘bemiddelingsbureau’ instead of via the traditional Dutch auction system. In the Mediation Office an auction employee acts as an agent for the growers and negotiates between growers and buyers in a forward market. Prices, product specification, number of lots, and delivery specifications are specified in a contract which is legitimized and monitored by the Mediation Office. The Naaldwijk auction BVH developed the Holland Supply Bank (‘Holland Aanbod Bank’), which is a database with the supply of potted plants of the growers, including 2,000 electronic product pictures [24]. Buyers can enter the system electronically and search for relevant products and use the information to buy and sell those products. Buyers can order products electronically too.

Motives of participants
Growers provide supply information to the Holland Supply Bank to obtain the best price and reduce risks
(compared with the traditional Dutch auction system) for their specific products. The auction develops and maintains the Holland Supply Bank because they would like to concentrate supply for their growers. Buyers would like to get up-to-date, reliable and complete information from the Holland Supply Bank to speed up their purchasing processes and make them more efficient. Buyers can obtain more specific products with this system, compared with the traditional Dutch auction system.

Mode of cooperation

In the Holland Supply Bank system the mode of cooperation between growers and buyers can be characterized as a network mode. Growers and buyers can negotiate during the price discovery process. The Mediation Office acts as an intermediary.

Entry Barriers

Entry barriers to this market can be characterized as medium. Growers have to be a member of the auction and have to deliver their products through the traditional Dutch auction or the mediation office. Buyers must be registered if they are to become trading partners at the auction.

Electronic markets structure

The architecture of the sample-based auction has an open character and can be approached by all growers and buyers of auction BVH. Buyers can read the supply data by using a supply book, a supply diskette or an electronic link with the Holland Supply Bank.

Electronic markets functionality

The functionality of the architecture is medium. Growers, intermediaries and buyers are happy with the current architecture which provides actual, reliable and complete supply information. Coupling with the auctions tracking and tracing system provides competitive advantage. There is no strong electronic integration with the logistical and financial systems of the buyers.

Effects of electronic markets

The Holland Supply Bank System has a positive effect on the functioning of the mediation office, growers and buyers. Trade volume and product prices increased after the system was introduced. A better tuning of supply and demand, especially for specific orders, created competitive advantage for growers and buyers. Buyers could order to specific requirements. If growers could meet these very specific requirements, they could get a high price. Strong functionality in dealing with tracking and tracing is another advantage. More efficient and effective purchasing processes for the buyers were effects mentioned.

The European Teleroute System Case. One of the examples of an electronic market in the transport industry in Europe is Teleroute, introduced by the Dutch Wolters Kluwer Publishing company, see Krcmar et al. [19:165]. Teleroute is an international, electronic transaction system for freight and vehicle space all over Europe to be used by forwarders and transporters, but not by shippers. Freight forwarders and transporters are directly connected to the Central Teleroute computer based in Lille (France). The database gives a picture of freight and vehicle space availability across Europe. The advantages of the system for the forwarder are that it saves time and money and the advantages for the transporter are a reduction in the number of empty truck trips and a more efficient use of the fleet of trucks. Some statistics to support these advantages: Europe has about 1000,000 trucking units, driving 100,000 km per year, 38% is driving around empty, average cost 1 ECU/km [19:165].

Motives of participants

Forwarders want to save time and money and transporters want to reduce empty truck trips and promote a more efficient use of the fleet.

Mode of cooperation

In Teleroute the mode of cooperation between selling and buying forwarders and transporters can be characterized as a network mode. Both forwarders and transporters who buy and sell freight and vehicle space can negotiate during the price discovery process. Teleroute acts as an intermediary.

Entry Barriers

Entry barriers in this market can be characterized as low. Every forwarder and transporter can use the system and it is offered at a very low price: hardware Dfl 300, subscription Dfl 915 per year. There is a marginal quality check before transporters are allowed to enter.

Electronic markets architecture

The architecture of Teleroute has an open character and can in principle be approached by all forwarders and transporters in Europe.

Electronic markets functionality

The functionality of the architecture is low. Mostly, the system is used to determine freight and vehicle space availability. It offers additional services like exchange...
rates, cost price calculations, and country regulations. Teleroute does not offer functionality for bargaining and contracting or services dealing with tracking and tracing.

**Effects of electronic markets**

Teleroute shows the following effects. In total there are 20,000 users all over Europe, there is a growth of 20 to 25% per year. There are approximately 20,000 national and international freight offers per day and about 12,500 accesses per hour [19:166]. Most forwarders prefer cooperations based on long term agreements. In addition, due to increasing competition, there is an unwillingness by forwarders to pass on loading to another forwarder and the fear of relinquishing more loading than someone has taken over [19:101]. Another disadvantage is the suspicion that Teleroute will increase competition and increase the transparency of the market, which reduce margins. Higher occupation of trucks will not compensate those reduced margins.

**The Dutch/German Transport Management System Case.** Edeka Fruchtkontor Benelux GmbH is a buying organization for a similarly named German retailer. Edeka exports on demand from the Dutch vegetable and fruit auctions to 50 distribution centers in Germany and then to 10,000 supermarkets. Buying in the auction is done by commissioners. In 1992 Edeka redesigned the fruit chain by decoupling logistics and information streams and by using Electronic Data Interchange (EDI). They invited Informore, a Dutch logistics and IT value added service supplier, to develop and maintain the Transport Management System (TMS), see Kooi [25].

**Motives of participants**

Edeka would like to improve the efficiency of the internal organization and the communication with external relationships (commissioners, repackers, transporters). Edeka would like to focus on a fast and reliable exchange of operational information between those actors by using EDI. Edeka would also like to increase their service level: orders processed before 16:00 on day A, goods delivered in Germany before the supermarket opens the next day. Informore was involved in this project on a no cure/no pay base.

**Mode of cooperation**

In the Transport Management System the mode of cooperation between Edeka and commissioners, repackers, transporters can be characterized as a network mode. One of the major advantages which TMS can offer, is raising the truck loading factor by making return freight possible and by combining freight from different accounts. Transporters have been able to plan for a return cargo. The result has been a 5% saving on transport costs.

**Entry Barriers**

Entry barriers to this market can be characterized as high. Edeka selects its commissioners, repackers and transporters. Other user-groups can use TMS but they use it independently from Edeka and can be supported by Informore.

**Electronic markets architecture**

The architecture of TMS has a closed character and can only be used by Edeka and its commissioners, repackers and transporters.

**Electronic markets functionality**

The functionality of the architecture is high. The offered services deal with structuring the transporters’ logistic process, processing the operational information (checking and confirming booking and instruction), translating bookings into transportation orders and tracking and tracing the transported goods. TMS generates management information for performance measurement and cost reduction and it simplifies financial processing.

**Effects of electronic markets**

The Transport Management System has a positive effect on the functioning of Edeka, its commissioners, repackers and transporters, and Informore. Edeka mentions an increase of the efficiency, reductions of transport costs and a higher service level. Also transporters were happy because they could plan return freights in advance with fewer waiting hours and an increasing truck load. Informore has succeeded in reengineering the Edeka fruit and vegetable value chain and in decoupling the logistics from the information streams.

**Comparison of the Four Cases and Analytical Generalization.** In table 2, we compare the results of the analysis of the four cases. It shows that the four investigated electronic markets differ in their characteristics and their effects. The Aalsmeer Sample Based Auction System had had a profoundly negative effect on all stakeholders (lower prices for growers, less trade, and therefore uncertain supply for buyers). The divergent motives for participation and the lack of functionality of the electronic market seem to be causal factors for those negative effects. In case 2, one sees that the Holland Supply Bank has medium functionality with an open structure in a network mode of cooperation which results in positive
effects for all stakeholders.

Table 2: Comparison of the Case Results.

<table>
<thead>
<tr>
<th>Analytical Aspect</th>
<th>Case 1</th>
<th>Case 2</th>
<th>Case 3</th>
<th>Case 4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Aalsmeer</td>
<td>Holland</td>
<td>European</td>
<td>Dutch/German</td>
</tr>
<tr>
<td></td>
<td>Sample Based Supply Bank</td>
<td>Teleroute Transport</td>
<td>Management System</td>
<td>System</td>
</tr>
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<td></td>
<td>Auction System</td>
<td>System</td>
<td>System</td>
<td>System</td>
</tr>
<tr>
<td>Motives of participants</td>
<td>divergent</td>
<td>convergent</td>
<td>divergent</td>
<td>convergent</td>
</tr>
<tr>
<td>Mode of cooperation</td>
<td>market</td>
<td>network</td>
<td>network</td>
<td>network</td>
</tr>
<tr>
<td>Entry Barriers</td>
<td>medium</td>
<td>medium</td>
<td>low</td>
<td>high</td>
</tr>
<tr>
<td>Electronic markets structure</td>
<td>closed</td>
<td>open</td>
<td>open</td>
<td>closed</td>
</tr>
<tr>
<td>Electronic markets functionality</td>
<td>medium</td>
<td>medium</td>
<td>low</td>
<td>high</td>
</tr>
</tbody>
</table>

Effects of electronic markets

- sellers: -lower prices +lower risks +lower prices +lower costs +higher service
- intermediaries: +concentration of supply +more users +no cure/no pay base
- buyers: +specified requirements +efficient use of fleet +efficient use of fleet -lower prices

Note: Negative effects: -, Positive effects: +.

The Teleroute case (case 3) shows us that even medium functionality of electronic markets architectures can create positive effects (lower prices for forwarders and efficient use of the fleet by transporters). Although in this case negative effects are reported (lower prices for forwarders are negative for transporters), important conditions seem to be low entry barriers and an open structure. The Dutch/German Transport Management System (case 4) shows that a closed and high functional architecture in a network cooperation mode with high entry barriers can result in very positive effects for all stakeholders (lower cost and higher service for Edeka, efficient use of fleet for transporters).

Conclusions. The analysis of four cases in the Dutch flower and transport industries, using the proposed frameworks, supports the following conclusions.

1. Electronic markets can produce negative and positive effects. These effects can differ between the participating stakeholders. In case 1 negative effects were reported for all stakeholders e.g. lower prices and less efficient primary processes for growers and buyers. In case 2 and 4 positive effects were reported for all stakeholders e.g. more efficient and effective primary processes. In case 3 positive effects for forwarders (lower prices) were negatively valued by transporters.

2. It is argued from a theoretical point of view that the motives of participants, the mode of cooperation between the participated stakeholders, entry barriers, the structure of electronic markets and the functionality of electronic markets play a significant role in explaining the main effects of electronic markets.

3. The four cases show that in each situation each of the factors (motives of participants, mode of cooperation, entry barriers, electronic markets structure, electronic markets functionality) can differ. Propositions were formulated and four case studies were performed to search for analytical generalization. The results indicate that there was some empirical evidence that convergent
motives for entering an electronic market will lead to positive effects for all stakeholders (Proposition 1). In case 2 and 4 convergent motives could be associated with positive effects. But divergent motives were, in case 1, associated with negative effects and, in case 3, with mixed effects. The results also indicate that price-determined forms of cooperation in an electronic market will not always lead to positive effects (Proposition 2). In case 1, price-determined forms of cooperation were related to negative effects in the Aalsmeer Sample-Based Auction System. In case 3 the network form of cooperation was related to mixed effects. Cases 2 and 4 show the strengths of network forms of cooperation. With regard to proposition 3, the results show that there was some empirical evidence that more entry barriers to electronic market entry will lead to positive effects for all stakeholders. Case 4 is a clear example, but case 3 shows that low barriers can also lead to some positive, but mixed, effects. The results indicate that electronic markets with a low reach (closed structure) and high scope (high functionality), proposition 4, will lead to positive effects (see case 4). The results indicate that electronic markets with a high reach (open structure) and a low scope (low functionality), proposition 5, will lead to mixed effects. The results also indicate that even with a high reach (open structure) and medium scope (medium functionality) one can provide positive effects for all stakeholders (see case 2).

4. Another important conclusion is that the structure and functionality of an electronic market might have a hyperbolic relationship. A higher reach (more open structure) of an electronic market is related to a lower scope (lower functionality) of that electronic market, and the reverse also holds. One can conclude that it seems to be difficult to design an electronic market with a high reach and high scope. In designing electronic markets one has to keep in mind this hyperbolic relationship between the reach and scope of electronic markets.

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