7. Fish Markets

Chapter 7

Fish Markets
Introduction

This chapter covers the development of remote bidding electronic fish auctions. The first electronic fish auctions were introduced in Holland and they emulated the clock auctions seen in Dutch vegetable and flower auctions. In a Dutch auction lots are offered at a high price, then the price is progressively lowered until someone bids. While Dutch auctions developed in the Continental agricultural industries for idiosyncratic reasons, it will be argued in this chapter that the split between English and Dutch auctions has led to the emergence of two contrasting approaches to electronic market development. In the livestock industry electronic auction systems discussed in the preceding three chapters the electronic market was seen as an alternative market channel, but in Dutch auctions technology has been used to link existing markets and then open them to remote buyers.

This chapter describes the growth of SCS, the leading supplier of electronic fish auction systems, an unsuccessful attempt to introduce an electronic fish market in Scotland, the emergence of two competing fish auction systems in Iceland and two rival projects to develop pan-European networks of linked markets.

In Iceland two electronic markets have emerged linking networks of fish markets. The success of these systems may be ascribed to the close community in the Icelandic fish industry, enabling traders to rely on descriptions provided by the boat skippers. However, in the United Kingdom the introduction of electronic fish auctions has been prevented by the complex structure of the industry, with large numbers of fish selling companies auctioning fish in the major markets, and the use of an opaque market to disguise breaches of quota regulations. The chapter includes a study of the attempt to introduce an electronic market into Lochinver and Kinlochbervie harbours in Scotland, in which the local government proponents could not overcome objections from traders. This is contrasted with Iceland, where in ten years they have evolved from having no markets to having two competing networks of electronic markets. The comparison shows the difference between building upon a close community compared to a wider community of lower trust relationships.

Finally, two projects to develop pan-European electronic fish markets are described. The European Commission funded INFOMAR project is compared to the system being developed by Zeebrugge fish market. While the INFOMAR project started with a radical vision of selling fish electronically off boats in a pan-European market, the Zeebrugge project is a more incremental vision to link markets to build a pan-
European network of existing market. It is seen that the two projects have converged due to the complexity of the European fish industry leading INFOMAR to operate through existing markets.

**Continental Markets for Agricultural Produce**

In the nineteen thirties Copenhagen was the leading Danish fruit market, but it suffered from poor prices being achieved for buyers if, by chance, the market was flooded with fruit. Sellers could not return the fruit to their farms. A Rand, Director of Fruit and Vegetable Auctions in Copenhagen, introduced sale by samples, in which a representative crate of fruit and a statement of total quantity were presented to potential buyers. After the sale the vendor forwarded the fruit directly to the buyer. To attract as many buyers as possible auctions were held simultaneously in Copenhagen and Aarhus, linked by telephones and using public address speakers to broadcast the auction to buyers. During the war the system was not used, but it was restarted in 1952, extended to include the market in Odense, using teletype machines to link auctions. Sample boxes of produce were displayed in the auction halls in Copenhagen, Aarhus and Odense, with bidders bidding by pressing a button at one of the locations. The auction method was an English auction, with the bidder pressing a button to register their bid with the auctioneer. The seller paid 3% commission and the system was described using the Danish Ministry of Agriculture’s quality specification. In 1954 there was a plan to extend the synchronised auction beyond apples to include potatoes (Meissner, 1954).

However, the countries in which electronic marketing developed most rapidly were Belgium and the Netherlands. In the Netherlands and Belgium there is an established tradition of auctioning agricultural products. Vegetable auctions operated by producer co-operatives first appeared in the Netherlands in 1887 and by the nineteen fifties there were 170. The auctions are co-ordinated by the Central Bureau of Fruit and Vegetable Auctions in the Netherlands (CBT), which was formed in 1917 to standardise trading terms. The CBT ensured that across Dutch vegetable markets a standard system of produce grading and description was in use. By 1992 the market had become increasingly concentrated, with only 21 markets still operating (Mansell & Jenkins, 1992). The traditional mechanism is a falling price Dutch auction in which the auctioneer progressively lowers the offer price until someone bids. In approximately the year 1900 mechanical auction systems were introduced manufactured by van der Hoorn and Wouda, Utrecht (Cassady, 1967), some of which were still in use into the 1960s. In these mechanical auctions the buyer had a button and, as the lot price fell on a mechanical clock, the buyer who first pushed his button bought the lot at the price shown on the clock (LS).

In 1983 a teleauctioning system was introduced linking vegetable markets in Belgium, using telephones to link bidding in markets. Following this the Dutch markets at Bleiswijk and Utrecht commissioned a
software house, COVAM, to develop a system, Televier, to link electronic clock markets. This system became operational in January 1984 linking Bleiswijk and Utrecht. By 1992 Televier was linking six auctions with a turnover of £312,000,000, representing 20% of the Dutch vegetable produce market (Mansell & Jenkins, 1992). While automation in Dutch auctions was first applied in vegetable auctions, flower auctions are more significant, with the value of flowers auctioned in Holland being three times that of vegetables. In 1996 the Netherlands traded 59% of the world export market in cut flowers (van Heck & Ribbers, 1997).

**Schelfhout Computer Systems (SCS)**

In Europe there are six firms selling electronic auction systems for the fruit, flowers and vegetable markets, but over 80% of the market is held by Schelfhout Computer Systems (SCS) of Stekene in Belgium and Nieaf-Smitt of Utrecht, Holland. Nieaf-Smitt specialise in a small number of large projects and SCS in a larger number of smaller projects. Nieaf-Smitt’s biggest customers are Dutch flower and vegetable auctions, including the biggest at Aalsmeer. The two firms generally are competing for the same customers and are represented at the same trade shows in the agricultural and fish industries: “We meet each other very often and it is always fun to meet them” (LS). Nieaf-Smitt is a direct descendent of van der Hoorn and Wouda, the original makers of mechanical auction clocks. Nieaf-Smitt supplied the internal auction clock systems into the Dutch vegetable auctions, with VABA supplying the interconnections, but in flower auctions both Nieaf-Smitt and Schelfhout supply complete systems.

Luc Schelfhout, the founder of SCS, was brought up in a vegetable farming family in northern Belgium. After graduating from university with a degree in computer systems, he saw an opportunity to use computers to automate the auction mechanism in Belgian vegetable auctions and in 1983 he founded Schelfhout Computer Systems. His first electronic auction was a vegetable market at Roeselaire in Belgium. Some of the buyers in this market had dropped out due to bankruptcy and the market sought to use IT to link markets together. From 1989 Schelfhout have been marketing electronic auction systems across Europe, specialising in systems for perishable agricultural products: “The problem is if you have roses or fish, you have to sell them, you cannot put them back. That is different to livestock” (L S).

In continental vegetable markets producers bring their products to a central market where the sale is generally organised by producer co-operative. The producer co-operatives set up auctions to protect the interests of their small grower members relative to the large wholesales. First the buyers inspect the lots to check that descriptions are accurate and then go to the auction room where the auctioneer uses the falling clock to auction the lots in rapid succession. For the auctioneer the use of auction puts pressure on buyers to bid the best price as soon as possible. The speed of auctioning using an auction clock is also an
advantage for buyers, with lots being sold much faster than in an English auction. SCS have produced clocks handling 2000 lots per hour and in 1996 were building an auction system for the VBA Almsmeer flower auction in the Netherlands that would handle 3000 sales per hour. Luc Schelfhout believed that the speed of auctioning increased prices: “if you put pressure on the market you get higher prices, buyers have less time to think and probably pay a higher price.” The auction systems also carry out the administration of the auction and the printing of delivery notes.

Luc Schelfhout argued that electronic markets were becoming more attractive to market organisers because increasing concentration in markets was weakening traditional intermediaries: “On the producers’ side in agriculture, horticulture and fishing there are fewer larger producers. On the other hand, if you look at the buyers, there are less and less players, they become bigger” (LS). These changes have reduced the numbers of intermediate wholesalers, making the supply chain more responsive and reducing the margins which can be made by intermediaries. Luc Schelfhout also argued that prices paid to producers in these vegetable markets had been falling, due to the growing power of major retailers and produce coming in from a wider range of sources:

“A friend of mine grows pot plants. He specialises in growing Brothermaheras. He is selling them to a wholesaler in Belgium, who is selling to another wholesaler in the United Kingdom, who is finally selling to a big supermarket chain. I tried to trace the plant back to the grower. Marks and Spencers sold the plant in their stores for £5.00. So the consumer comes, picks up the plant, goes to the cashier pays £5.00 for it and he goes away and Marks and Spencers have the money. Marks and Spencers had made a deal with the United Kingdom wholesaler, Blackwell. Marks and Spencers say “okay you deliver me next week x hundred thousand of those plants. I want them that size, with that pot, with that package, you will put my label, bar-code and price on it, so then for Marks and Spencers it is very easy -they just put in on the shelf. The price that Marks and Spencers agreed with Blackwell was £2.00 and Marks and Spencers pays after 60 days. So we see already that there is a big gap in added value due to the price change and the payment delay. Then Blackwell goes with that order to a wholesaler in Belgium and says “I need plants meeting this specification”, and then the Belgian wholesaler goes to a grower who can deliver it. The grower gets paid the equivalent of 50 pence four months after delivery. Because of oversupply, the grower has no choice - if he says no somebody else will supply them. They are in a situation now that they can hardly survive at that price, some of them are going out of business, the economic situation for them is very bad. In this case we do not have an efficient transparent market. You have a dominating position on the market for one group, in this case the supermarkets, who can dictate the price and take advantage of a more or less monopoly situation to make an extremely large margin. This market structure gives great power to the large purchasers. We see ourselves not as being a computer company, although
we build computers and supply software. Our customer, the market organiser, comes to us because we are market architects” (L. Schelfhout).

For Schelfhout, the benefit of electronic auction systems is to make the market more competitive and more transparent. From his roots in the agricultural sector, Luc Schelfhout also saw electronic auctions as a means of defending the position of smaller scale producers in the face of international competition: “So the answer is to make your market more competitive, more transparent, and try to keep the added value on the production level as much as possible” (LS). Schelfhout claimed that the “market is information” and the aim in designing auction systems is to communicate to buyers the range of products available and to producers the requirements of buyers. In the more efficient market Schelfhout believed that there would be fewer players, with intermediaries squeezed out of the supply-chain.

Prior to the 1990s most Belgian produce markets were small local markets. Northern Belgium had twelve vegetable auction rooms working independently with 100 buyers in each. A wholesaler needing products from each market needed to have a buyer in each auction connected by telephone with a central office co-ordinating buying. Schelfhout have reorganised the markets so that a buyer physically at one of the auctions has access to all the markets. This reduces the number of buyers required to cover all the markets from 13 to 1.

“If you have 2 markets which are completely separated with buyer and producers in both trading in a perishable commodity, you can on any day have a shortage in one market, and high prices, with a surplus and low prices for the same commodity in the other market. The next day the prices may be the other way round. This causes uncertainty for producers, but it also adversely affects buyers. Wholesalers will be buying from the buyers in both markets. The wholesaler will know the price in the market that the buyer bought in and bid them down on that basis, while using the existence of lower prices elsewhere to push the prices down for the buyers who paid the higher price. If you link those markets together, then you stabilise it, you make it equal. Stable market prices are good for both the producer and the buyer. What the buyers don’t like is that the markets will become more transparent, more open. The information will become more available on what the market situation is so it will be more difficult for them to make a high profit on it. The buyers become more and more handling agents who buy the product and takes a commission on it, transport it and deliver it to this customer. So we have done that in Belgium with the 12 vegetable markets.” (Luc Schelfhout)

The twelve vegetable markets were linked together by computer links in 1985/86. Some of the markets initially stayed out of the network, believing they were strong enough to stay separate. However they found that because the linked market was a stronger more stable market than an isolated market, producers
started to shift their stock to the linked markets, so they belatedly joined the network. There may only be five buyers in each auction room but each one can be buying from all twelve physical markets.

Having developed systems to link markets, the next step was to remove the local wholesaler who, for example, buys in local Belgian markets then sells to a wholesaler in the Paris Rungis vegetable market. They could be bypassed by allowing the French wholesaler to buy directly off the system in the local market. SCS have introduced this in Denmark at Odense. A remote market requires accurate description, because the buyers will be less aware of the reputation of sellers. The Euroclass vegetable classification system grades vegetables in terms of size, quality and colour. While European standards exist for vegetables and fruit, flowers have been found to be more difficult to describe accurately because of the huge variety of species, sizes and colours. To a lesser extent fish have also been difficult to describe reliably because the principal factor in determining the value to a potential buyer is the fish’s freshness. Luc Schelfhout accepted that there is a lot of work required develop a fish classification system reliable enough to create efficient remote fish selling.

The Danish co-operative GASA Odense approached Schelfhout in 1989. A new director saw that there would be benefits to GASA in opening the market to remote buying. Schelfhout claimed that this appointment overcame the conservatism which affects many markets: “a big problem that you have in changing markets is tradition..... you will have a lot of friction or people that don’t want to change”.

GASA came to Schelfhout wanting a system which was open, where buyers not only from Denmark, but also from Norway, Sweden and Germany could buy. GASA Odense’s objectives were: to make it possible to participate in the auction remotely; to give the trade improved information on the availability of Danish fruit and vegetables; to ensure that the price structure was based on supply and demand; and to improve the efficiency of distribution, giving fresher produce to the consumer (Schelfhout, 1995). Each purchaser required a personal computer linked using the Datex-network to Gasa’s central computer. The aim was that supermarket chains from across Europe could buy directly, by-passing wholesalers The system started out on a small scale with only two buyers, but by 1996 had 48 buyers in five countries, with 80% of the products bought remotely.

Luc Schelfhout saw the greatest area of growth for electronic markets as being in trading futures. This, he said, requires quality standards, an information provider and a market organiser, the equivalent of a clearing house in financial markets, which clears transactions, sets up the rules and guarantees any payment. To create an efficient electronic market Luc Schelfhout argued that it should be done incrementally: “If today you want to go from one extreme to another, from a not organised, not transparent market with a lot of Mafia around it, to the ideal, it is not possible. Go step by step, taking a
lot of years. If you have a market, then start a local system to improve it. Then link to outside markets to widen the market, and then make it possible for buyers to buy from. To buy from home you need descriptions, you need an organiser who can guarantee that the descriptions are reliable, so you need quality controls. When you have that you are near to creating an efficient market.” (LS) Schelfhout sees SCS as system suppliers: “We will never be a market operator, we go to parties who can be market operators and we say we have the know-how, we have the experience and we have the solutions; buy from us.” (LS)

SCS produce systems tailored to the needs of customers: “We try to understand what the market needs, what the mentality is, we tailor it to make it more acceptable and then it starts living its own life, because markets are not static, markets evolve, so a system should evolve as well,” with system users returning to seek enhancements to their systems. SCS analyse the needs of potential customers and produce a functional analysis. Sometimes, as in the case of a system sold to Scottish Milk, a demonstration version was produced. SCS’s relationship with Scottish Milk is typical: SCS sought to sell Scottish Milk a system, whereas APEX UK, the operators of the United Kingdom electronic livestock market sought to operate the market and be paid a commission on sales. “How can you promote efficient market systems if you want to operate the market yourself? Then you have a conflict of interest.” (LS) Schelfhout supply the system and the customer can then use it to sell whatever they want.

This strategy has led to SCS developing systems incorporating a wide range of auction mechanisms and technical standards for interconnection. In some SCS systems buyers bid and, if successful, decide how much of the available items they want, as seen in Scottish Milk, whereas in other cases lot sizes are predetermined. Of SCS’s auction systems, 80% have been Dutch auctions and 20% English rising price auctions. Fish are generally sold on a rising price system, because this is the mechanism used in traditional “shout” fish auctions. Electronic continental meat, cattle and milk auctions tend to use a falling price Dutch auction, again because this is the mechanism buyers are familiar with.

**Technical Background to SCS Systems**

SCS systems use personal computers incorporating their own proprietary Syncrator synchronisation board to ensure that the clocks in each computer are synchronised and to ensure that the first bidder to bid is identified as the successful bidder, irrespective of data network delays. This synchronisation is particularly important in Dutch auctions, where otherwise bidders bidding remotely with network delays would be at a disadvantage. Beyond this basic architecture Schelfhout offer a wide range of data network and auction mechanism options. Schelfhout have developed systems using a wide range of communications protocols. Early systems used dedicated telephone lines, then they moved on to offer X21, X25, X400 and ISDN. By
1996 ISDN was Schelfhout’s first choice for linking remote buyers. The use of ISDN allowed the transfer of larger quantities of data than the earlier systems. Schelfhout had implemented a system in Denmark for GASA Aarhus in which ISDN is used to send data, audio and pictures for a flower market. The system uses a video conference system standard. They bought a video conference system and have adapted the software so that it is integrated into the auction programme. The buyer sees the clock, the information describing the lot and an image of the lot simultaneously on screen: “The value of pictures is that they help to make people accept the system” (LS).

Markets for Fish

Fish is a commodity sold by auction throughout the world. As with livestock auctions, the structure of the fish industry is for a large number of boats to sell their fish to a smaller number of processors in local markets, usually at the harbour where the fish is landed. The buyers are looking to meet their requirements by buying in a number of markets, but the seller, once the fish is landed, has little option other than to sell to someone in that market. The volumes of fish landed are influenced by the luck of the boat and the weather, leading to price volatility and price variations between markets. The use of electronic clock auctions, developed for vegetable and flower markets and described in the previous chapter, when linked to the automated processing of transactions, speeded up the sale and reduced the cost of auction administration. In Continental European markets the practice of selling fish by the individual box made the introduction of electronic auctions more attractive than in the United Kingdom, where the standard practice is to auction all the boxes of the same species and size off a boat as a single lot. The number of lots needing to be sold in the continental markets led SCS to develop the Moby-Clock, an electronic auction clock mounted on a battery powered vehicle which could move through the auction hall. The availability of widely disseminated market price information has led to a growth in direct selling between the boats and agents acting for the processors. In some smaller ports, for example Ullapool in Scotland, there is no organised fish auction.

SCS’s first installation of an electronic fish auction was in Zeebrugge in 1987. The market had been privatised and was being run by a private company whose other activities were outwith fish auctioning. They invested £19 million in a new fish market and sought to change radically the marketing of fish and become Europe’s leading fish port by opening up access to anyone. Zeebrugge had the locational advantage of being well connected by road to the cities of northern France, Belgium, the Netherlands and western Germany, but was restricted by the low volumes of fish landed into Belgian ports - in 1988 Belgian landings were only 37,000 tonnes out of total Western European landings of 9,702,000 tonnes (FAO, 1988).
SCS’s first fish auction which was open to remote bidding was in Bergen, Norway in 1992 for Norges Sildeslag (NSS) (Schelfhout, 1995). Norway has the largest fishing industry in Western Europe but the ports at which fish are landed are separated by large distances and poor roads, making transfers between ports difficult. In the old system boats radioed the details of their catch to NSS in Bergen who then faxed the details to buyers from across Norway. Buyers then had one hour to fax back tenders for the fish. The highest bids were identified and the winning bidders faxed with confirmation of the fish they had bought. The advantage of this system was in remotely selling the fish while on the boat so that the boat could then divert to land the catch at the location nearest the processor who had bought the catch. The computerised system reduced the administrative cost for NSS in running the fax auction and speeded up the auction for buyers, allowing them to adjust their bidding strategy as the lots were sequentially sold. An auction with catches from 25 vessels being marketed to 25 buyers, which previously took over three hours, could now be completed in thirty minutes. Schelfhout developed similar remote buying systems for La Rochelle and Cherbourg in France and IJmuiden, Den Helder and Urk in the Netherlands. Schelfhout learned that the variability in fish quality and the lack of reliable standards for fish description were barriers to remote fish selling, but the fish buyers subscribed to the system initially to gain access to current price information in each local market, leaving their agents in each harbour to inspect the fish and bid at the auction. They then increasingly started to buy remotely, knowing which suppliers had a good reputation (LS).

SCS’s largest market for fish auctioning systems was in France: “there they accept it and they are open to it” (LS). According to Luc Schelfhout the difference in reactions to electronic markets is not due to structure but to attitudes: “Some market places are not ready for it and don’t want it and are afraid of it.” SCS has employed an agent in the United Kingdom for seven years but by 1996 had only sold one system to Scottish Milk. However, their main targets in the United Kingdom were the fish markets. SCS also identified Japan as a large potential market for electronic auction systems, but they have been unsuccessful in persuading Japanese markets to replace their ritualised shout auction markets: “Japan is a country with very high technology, but go and see the fish auctions and you go back hundreds of years, it is unbelievable” (LS).

**Building the Continental Market Networks**

Unlike in the North American, Australian and British markets covered in earlier chapters the pattern by which electronic markets with remote bidding have emerged on the Continent is distinctive. Whereas in the livestock markets the electronic auctions were developed in parallel to existing markets, the incremental development of technology in the Continental auctions provided a path for the progressive opening of markets to remote bidders, first by linking markets and then by allowing bidders to bid from their own
offices. These contrasting paths evolved because of the emergence of English auctions in the UK, where there is little incentive to automate the auction internally, and Dutch auctions on the Continent, where rudimentary automation could adjudicate on the first bidder. The Dutch auction mechanism suffered from disputes over which bidder bid first and at what price. Mechanical systems linking a falling clock to levers overcame this problem ninety years ago. The existence of this rudimentary technology led to the formation of firms specialising in supplying auction systems, who combined an awareness of technical aspects of the systems and the needs of auction users. Resistance from existing traders was limited because they would be at an advantage relative to remote bidders because they could inspect the stock directly. SCS only emerged as technology supplier in 1983, but Schelfhout’s electronics education and background in farming enabled him to see how the technology could meet the perceived need to improve market efficiency. Whereas in the livestock systems described in earlier chapters there was a separation between technical and business aspects of each systems design, Schelfhout fits Hughes’ (1988) model of a heterogeneous engineer, treating the technical and social aspects as being inextricably entwined. Where the IT specialists were enrolled the livestock projects with a pre-defined specification of the system’s functionality, SCS are enrolled by operators of existing markets to analyse the existing market and propose solutions. This process follows the NEMI and satellite auction systems in North America, simplifying the conception phases by automating the existing market mechanisms, but the adoption phase is also simplified because the implementation is also an evolutionary change for existing market users. Similarly, the linking of markets and opening up of markets to remote bidders can have limited impacts on existing buyers in the market who will keep the advantage of being able to inspect directly the fish for sale. With the technology developed for these auctions the system suppliers could then offer their systems to market operators in the fish industry, where there was not a history of using clock auctions, but demonstrating to them their use in other sectors.

Highland Harbours

Similar difficulties in gaining user agreement were encountered during the first attempt to introduce an electronic fish market into the United Kingdom. Lochinver is a fishing port on the North West coast of Scotland. Lochinver’s harbour and fishmarket is owned by Highland Harbours, the section of Highland Council’s Transport Services Department responsible for the management of the harbours in council ownership. Highland Harbours own the harbours at Kinlochbervie, Lochinver, Portree, Gairloch, Kyle and Uig. While Highland Harbours own the harbour and associated buildings, the selling of fish in the harbours is carried out by fishselling companies. In Lochinver, the Lochinver Fishselling Company (LFC) is the sole fishselling company, organising the daily evening fish auctions. LFC is a subsidiary of Denholm
Fishselling which operates fish selling in several Scottish ports. LFC also operate as vessel managers, with shares in twelve boats fishing out of Lochinver, and act as agents in the Lochinver fishmarket for a number of fish processors (GM).

Derek Forester, support services manager within transport services at Highland Council in Inverness, first became aware of electronic marketing in 1987/88 when Highland Harbours were planning the redevelopment of the harbour at Kinlochbervie. They looked at the harbour and market facilities at harbours across Europe, because they recognised that fish landing was becoming an international business. They were aware that fishing harbours on the continent had been using information technology to improve the efficiency of the auction. The plan was to invest £7M in creating a new harbour basin vertage and auction market at Kinlochbervie and Highland Harbours wanted to ensure it could accommodate future changes in fish selling.

In the Lochinver auction fish are landed by the boats having been sorted into boxes by size and grade. The boxes are lined up in the auction hall and the auctioneer, followed by the buyers, auctions the fish using an English auction, boat by boat. Where there are a number of boxes of the same size and grade from the same boat the auctioneer will first auction them “choice” allowing the successful bidder to select how many of the boxes they want at that price and which boxes. Other buyers may then take boxes at the same price and then the remainder are then auctioned for a lower price. Highland Harbour’s survey of continental markets identified the existence of alternative selling systems to this United Kingdom “shout” system of rising bids. Forrester visited the marketing hall in Zeebrugge, which at that time was seen as being the most innovative system in Europe. There he saw the Schelfhout Moby clock, which was a battery driven lorry with a clock on it with computer connections to bidders in the old market. While in the Belgium and the Netherlands they also visited fruit and flower auctions and visited Nieaf-Smitt’s fish market installation at Scheveningen which used a mobile clock travelling on a rail. These visits to continental markets led Highland to realise the advantages of a more automated bidding mechanism in their own markets. In part these were savings from being able to computerise auction administration, but benefits were also expected from opening up the auction to more competitive bidding. In the “shout” auction, in practice only two bidders are usually bidding: when one drops out the auctioneer needs to find a third bidder but this leads to a loss of momentum and the risk of a prospective bidder being overlooked and the highest price being missed. In Highland’s markets the buyers are either buyers buying on their own account for resale or agents acting for remote merchants. It is common for fish sold through a Highland auction in the evening to be sold again at an English auction, such as Grimsby, the following morning by someone who believed there was a price differential between the markets.
During 1988 Highland considered using the existing electro-mechanical technology to link their markets in Kinlochbervie and Lochinver. Nieaf-Smitt provided a dummy system to demonstrate to people what the system would look like, and SCS personnel also visited to assess the existing markets. There were significant differences between the continental markets and Highland Harbours markets. In the United Kingdom fish are sold in much larger lots. In the United Kingdom the lot is not a box of fish, rather it is all the fish of a particular grade and species landed by a particular boat, which could be 300 boxes of fish. Therefore the speed and administrative advantages of automating the auction were less in the United Kingdom than in mainland Continental markets. George Mackay, the manager of LFC, the Lochinver fisheselling company, was invited in 1990 by Schelfhout to see the electronic auction in Zeebrugge: “We were quite impressed. We could see differences with Lochinver, which is a much more mixed port, whereas Zeebrugge majored on two or three species” (G Mackay). Mackay saw that the cost of grading the fish for remote customers was a barrier to setting up an electronic auction in Lochinver and that there would be no advantage in introducing a local clock auction for buyers present in the Lochinver auction. In 1991 Highland decided not to proceed with an automated market. They decided that the technology was not sufficiently flexible, as it was an electrical development from the traditional mechanical falling price Dutch auction. A bidding up English auction was then new to both of the suppliers. Both Schelfhout and Nieaf-Smitt were in the process of offering bidding up English auction systems, although they both argued that a falling price auction would give better prices. To accommodate these possible future changes the Kinlochbervie market was built with an auction hall in which a moving clock could be installed later and a room was included which could be used for buyers bidding using terminals.

The biggest change in Highland Harbours’ operations during the nineties was a rapid increase in the landing of fish at Lochinver for onward transport to the continent. In 1996 Lochinver accounted for 80% of non-United Kingdom fish landings in Scotland, with fish landed by French, Spanish, Faeroese and German boats. From a position where the harbour was dominated by United Kingdom boats landing their catches for sale through the market, they now found a large part of fish landed was not going through the market but was being consigned to continental markets. The fish was still sorted and graded at the harbour, but the harbour was losing the commission on auctioning.

The most significant foreign landings were by French boats from Lorient, Brittany. The connection between Highland Harbours and the port of Lorient started in 1991 when Jego Quare, France’s largest fishing company, approached Highland Harbours to set up a base in Lochinver for landing deep-sea fish caught on the continental slope for transport by road to Lorient. Lochinver harbour was being redeveloped and they wanted to use it as their main landing point for their nine large trawlers fishing in the North Atlantic. In 1994, following a financial crisis, Jego Quare was taken over by a predominantly
Spanish consortium, but it still operates a fleet of five large trawlers in the North Atlantic. The large French trawlers fishing the continental slope are predominantly based in three harbours: Lorient and Concarneau in Brittany and Boulogne. When landed in Lochinver the fish is sent by road for auction in the trawler’s home port (DFII).

The commission Highland Harbours receive on fish landed at one of their harbours is taken as a percentage of the sale price at the first point of sale. In 1994, when Jego Quare was in financial difficulties, Highland Harbours contacted the Lorient harbour authority to ensure that they would be paid its charges on fish sold through the Lorient market. From this contact it was realised that both harbours could gain from co-operation. The fish processing industry in Lorient had to source fish from beyond Lorient. In 1996 processors based in Lorient processed 90,000 tons of fish but the total landings of fish by Lorient boats was only 30,000 tons. However, Highland operated harbours with no fish processing capacity, so Lorient saw the Highland harbours as a potential source of fish for their processors. The Lorient harbour operator suggested to Highland Harbours that deep-water fish landed in Scotland be consigned for sale and processing at Lorient, not just the fish landed in Scotland by Lorient based boats. Lorient sought to buy the fish landed in Scotland for resale through the Lorient market. As Highland’s commission was based on the first sale price and they sought to increase the volumes of fish going through their markets, this offer was not attractive to Highland Harbours.

The continental boats were fishing the continental slope for deep water species, whereas the United Kingdom boats were fishing the continental shelf for more orthodox fish. When the continental boats started landing these fish there was no United Kingdom market for them so the fish had to go to the Continent, generally to the market in Lorient. Since 1994 there has been a further change, with the deep water fish targeted by the French also being targeted by Spanish and United Kingdom boats. Increasingly United Kingdom boats are being built with the capability of fishing the continental slope for non-quota species, which include blue ling, roundnose grenadier, scabbard, greater forkbeards, argentines and redfish. In 1996 these species were still outside EU quota, but there was an expectation that due to competition for the fish stocks a TAC (Total Allowable Catch) for each species would be introduced, with national quotas based on the proportions of unregulated landings by the boats registered in each country. There was therefore a policy motivation in encouraging British registered boats to land these species by creating a United Kingdom market for them.

While there was hardly any competitive market for deep sea fish in the United Kingdom, elsewhere it had been shown that there was a demand. Principally there is a well established market for deep sea fish in France, with even deep sea fish landed by United Kingdom boats tending to be sold on to France, but also
there is a market for grenadier in Portugal, which has a history of catching them by line off Madeira. Twenty years ago Russian boats industrially fished continental slope fish in the North West Atlantic. Denholm Fishselling, through the Lochinver Fish Selling Company, had established a demand on the local market for these fish, most of which were for consumption in France and Spain, but it was reported that prices had fallen as the quantity landed had increased. In May 1996 it was reported that blue ling had fallen to £30 per box, compared to £50 in 1995 (Fishing News, 1996a).

The strategic attraction of electronic auctions to Highland Harbours was that their harbours are closest to where the fish are caught and they need to offer fishermen a good price if they land and sell their fish through the Highland markets. This requires there to be sufficient buyers in the market to guarantee boats a good price, which has not historically been the case. A single boat has landed 120 tonnes of deep water fish in one cargo, which was equal to the total sales through the market in the preceding six months. To auction that quantity of deep water fish in a day requires access to a wider market than provided by the buyers present every day in the market. For these reasons large landings of deep sea fish are consigned to continental markets. When deep sea fish are landed at Highland Harbours and sold through the market, because there are very buyers for these fish in the market, the auction sells the fish by telephoning possible buyers and negotiating a sale, so it is not a true auction. Having a computer system would allow potential buyers from across Europe to be notified of future landings, who may then either bid or ask their sub-buyers to check the catch when it is landed. The main expected benefit of an electronic auction was overcoming the thin market which existed in Highland Harbours remote landing points, particularly for fish considered exotic to British tastes. Also, Highland Harbours smaller harbours did not have auction markets and it had been found difficult to persuade skippers landing fish at these ports to transport them to Lochinver or Kinlochbervie. Highland Harbours were initially interested in the potential of an electronic market to give boats landing at these smaller harbours access to a wider market (DFII). Highland Council feared the smaller harbours would decline because boats that landed at them would either have the cost of consigning their catches to other markets or take the lower prices offered by the buyer on the spot. The fishing industry was under stress, with quotas preventing boats landing enough to be viable and leaving the processors short of fish to meet the demands of their own customers, the large grocery supermarket chains. For Highland Harbours, being a division of local government, their formal strategic objective in promoting electronic selling was to ensure that the economic activities in the harbours were maintained and jobs not lost.

To create a viable remote auction it was recognised by Forrester that it would require the support of buyers. One approach considered was to develop electronic links with less than a dozen major buyers, but
it was feared that because they had good market information this would not lead to a competitive market. To make the market competitive it was believed to be necessary to include medium sized buyers.

Between 1994 and 1996 Highland Harbours discussed forming partnerships with several continental auctions in which their local buyers would buy electronically from Highland Harbours. In 1996 IJmuiden, Zeebrugge and Egersund announced that they were combining their electronic sales to form a consortium running a joint auction. IJmuiden and Zeebrugge proposed to auction very high quality fresh fish simultaneously in both markets. They then proposed to develop this incrementally to include further auctions.

Highland were keen to exploit their partnership with Lorient. Although the Lorient harbour market is managed by a subsidiary of Companie General des Eaux, like Highland Harbours, it is owned by the local authority. Lorient did not operate an electronic auction. Highland proposed that Lorient would connect to the Highland electronic auction and buyers in Lorient would remotely buy fish landed in Scotland. In the Lorient auction they charge commission on the seller and the buyer. In the proposed system Lorient would get the buyer’s commission if their buyers bought a lot, but the seller’s commission would be paid to Highland. To Highland the advantage of operating through the Lorient market rather than setting up the system unilaterally and allowing French buyers to connect directly was that the partnership would give the market legitimacy and ensure the enforcing of contracts locally in France.

Highland Harbours knew that deep-sea fish were achieving much higher prices in France than were being achieved by the small quantities going through their own markets because there were few buyers for them in Scotland. Highland proposed to Lorient the setting up of a pilot electronic market which would be open to buyers anywhere because Highland Harbours were concerned that a system only open to buyers based in the Lorient market would be open to distortion through collusion between the Lorient buyers. Lorient reacted positively to this suggestion, concerned that Highland would enter into an electronic market partnership with another European fish market. Highland Harbours approached three companies who sold fish marketing systems, including Schelfhout of Belgium and Nieaf-Smitt of Holland. Of these, Schelfhout’s bid was the lowest to meet Highland Harbour’s specification (DFII).

There was some resistance when the concept of the electronic auction in Highland Harbours was proposed, particularly from fish trading firms. Highland claimed to them that the electronic market would provide a facility they could use and that they would still get their commission. There were also political objectors who believed that the strategy for developing the economies in the West Highlands should be to develop fish processing rather than set up mechanisms for selling wet fish for processing outwith the region. However, Highland Harbours countered this by pointing out that the existence of an electronic auction did
not preclude the buying of the fish locally and the market demand across Europe is for whole wet fish rather than prepared fillets. The potential of a competitive market in drawing increased foreign landings into their ports which would otherwise have landed at other harbours was seen as overcoming this disadvantage. It was believed that in the electronic market the local buyer would have an advantage, because they see the fish and can deal in smaller quantities.

The system was bought outright from SCS without restriction on what it could be used to auction. The system was to run on a Novell server PC network with ISDN links, with the server in Inverness, and bidding terminals in Kinlochbervie and Lochinver. One PC would do administration and the other would run the auctions. Fifteen bidders would be able to connect to the auction locally and remote buyers would connect by ISDN. ISDN operates at 64,000 b/s which, with the built in synchronisation, would overcome the problems of synchronising bids. Lorient were keen to use satellite communications, but Forester believed this was largely because their parent company was involved in satellite communications. This was seen as a very expensive option, with the installation of satellite dishes and the cost of satellite time. The Highlands has a high level of ISDN infrastructure, having had digital telephone exchanges since 1991.

Highlands and Islands Enterprise, the government sponsored economic development agency, offered to fund fifty percent of the project costs. HIE had a history of supporting the Highlands fishing industry and Highland Harbours had close links with HIE’s fishery section, which had funded studies into the market potential for deep-sea fish. HIE were keen on electronic marketing as a means to keep the smaller harbours viable, with the potential of the system to develop the landing of deep-sea species in Scotland secondary.

(DFII)

At this stage only Highland Harbours, Lorient and HIE were directly involved in the project. Highland Harbours had consulted some of the fishermen based in their harbours. They deliberately only spoke to fishermen independent of fish selling companies, as it was believed that employees of the vertically integrated companies which were involved in fishing, trading and processing would not be able to give a clear fishermen’s view. Highland Harbours viewed the boat operators as their primary customers, not the wider fish industry. Highland Harbours also spoke to buyers based in the smaller harbours, who generally bought fish from the boats on contract and sold directly. These buyers could see an electronic market as giving them a channel for selling any surplus. Lorient spoke to buyers in their own market, while Highland spoke to “one or two” buyers based in France who were not based in Lorient. These consultations were informal, seeking to assess the general degree of interest in an electronic market pilot. No one was expected to commit themselves to using the system. At the end of this consultation Highland Harbours
were able to tell Lorient that if the prices achieved on the system were “right” fish would be offered for sale electronically (DFII).

In July 1996 the plan was to run the auction as a pilot scheme for deep water species with only one auction per week. The aim was to run the pilot system from late Autumn 1996 for 12 months. It would operate in Lochinver and Kinlochbervie, but would then be extended to Highlands’ smaller ports and then to non-Highland Harbours ports, including Mallaig, Ullapool and Scrabster, who would use it commercially. While Highland Harbours’ prime concern was their own harbours, the council also have an interest in the future of the other harbours in the Highlands run by harbour trusts. Highland were also considering auctioning mussels electronically. Mussels are sold in existing markets and Highland Council manages the harvesting of mussels in the Firth of Tain for the Tain City Common Good Fund under Royal Charter, selling 2000 tonnes of mussels each year. Highland also saw the potential for auctioning added value fish products, such as smoked fish fillets, and for auctioning live crabs, lobsters and langoustine, which are generally exported live in tanks of water to France. Shellfish are generally landed at the smaller Highland harbours by local fishermen, with the electronic market potentially giving them access to a wider market, rather than having to accept a price from a single local buyer.

Forester believed that selling their fish electronically at Lochinver would be less costly for the French boats than consigning their fish to the market in Lorient. For fish landed at Lochinver Highland charged 2% plus a further 2.5% if they were sold through the market. To sell the fish in the Lochinver market LFC charged 1.75%. The proposal was for the electronic auction to charge the same selling commission, 2.5%. In Europe the pattern is for a single fee to be paid in harbours. Forester believed that the lowest commission in France was 4½% and the highest 10%. In the port of Lorient the combined seller and buyer commission is 6.25%. For a boat landing fish and selling them through the proposed electronic market the total commission would be 6.75% (the fishselling fee of 1.75%, plus the landing fee of 2%, plus the market fee of 2%). This appears to be 0.5% higher than the fee to sell the fish through the Lorient market, but the true Lorient total commissions would be 8.25% because they would still have to pay Highland for landing the fish in Scotland. Forester was unsure whether Lorient had realised that the proposed fee structure gave an advantage to French boats auctioning their catches through the Highland auction with the buyers connecting in France: “I hope they have not worked out the figures” (DF). Further, he argued that the fee difference would be even greater if the French boat sold their fish on the system without using the fishselling company: “that might be a threat to their business, it is not something we are pushing, but it might happen” (DF).
The plan for the pilot electronic auction was featured in an article by McCaffrey (1996) in Fishing News on 31st May 1996. This article was the first that many in the fishing industry knew of the proposed system. The article stressed the remote bidding capability and its use to give a wider market for deep-water species. McCaffrey acknowledged that traders had resisted computerisation due to fears of losing jobs, but he argued that on the continent these job losses had not happened due to the need to employ extra people to verify the quality of the fish sold. The same issue of Fishing News included an editorial suggesting that the pilot electronic auction would be “part of something bigger, and probably inevitable: the computerisation of industry”, but arguing that this would lead to rationalisation and “Europeanisation” of auctions. These articles triggered a negative response from across the United Kingdom fish industry, with merchants fearing that they would be displaced by electronic auctions. Forrester had a letter published in Fishing News attempting to allay their fears, reassuring existing users of Lochinver and Kinlochbervie that the system would not jeopardise their market and that use of the system would be voluntary (Forrester, 1996). Of the six buyers seen operating in the Lochinver fish market, three were employees of Denholm and two were strongly anti electronic selling. The final buyer was less antagonistic, saying that he and his customers realised that an electronic market might give them access to fish which were not passing through the market. In particular he criticised LFS, who through Euroscot and their direct selling, were forestalling fish from appearing in their own market. He believed that in the electronic market the buyer who was at the auction and able to visually inspect the fish would have an advantage over remote buyers buying on description.

The proposed establishment of an electronic system in Lochinver and Kinlochbervie also threatened the fish selling companies in the two ports, because boats might sell their catches directly on the electronic system bypassing the salesman. Forrester claimed that their fears were misplaced because they do more for their fee than sell the fish in the auction: they also represent the boats, but get paid through a sales commission. George Mackay, manager of Lochinver Fishselling, first learnt of Highland Harbours plans when he read about them in Fishing News. Lochinver Fishselling and JW Holdings, their equivalent fishselling company in Kinlochbervie, demanded a meeting with Highland Harbours: “We were annoyed that the region were promoting this in the press as if it was a fait accompli. We were getting accused by the buyers and their customers of pushing this” (G Mackay). At the first meeting attended by the managing directors of LFS and JW Holdings, Highland Region promised that the fishselling companies would be consulted. Six months later there was a further report in the fishing press saying that Highland were going to introduce the electronic system in Lochinver and Kinlochbervie from March 1997. LFC and JW Holdings’ fish processor company customers in the east of Scotland threatened to boycott the markets. LFC and JW Holdings sent Highland a four page lists of points to be addressed and a meeting was
arranged. Another meeting was held in Aberdeen, described by Mackay as “quite heated”. Highland promised that there would be a feasibility study, but in July 1997 Mackay had not heard of any progress (GM).

George Mackay believed that Highland had not thought through how the electronic auction would operate: “We couldn’t understand who was going to do what. They shrugged their shoulders and said it was just a pilot study. We asked ‘Who is going to organise the grading and the quality control?’ and they said ‘We thought the fish-selling companies would do that’, but we hadn’t been asked” (G Mackay).

LFC’s relationship with Highland Harbours was described by Mackay as “not too good”. In the past LFC would supply boats landing at the harbour with fuel and ice. In 1987, shortly after Denholm took over LFC, Highland refused to renew LFC’s lease on the oil tanks, saying that they were going to take over the fuel supply business. LFC wanted them to take over the ice plant, as LFC did not see the ice business being profitable without the oil business, but Highland refused. They have been suspicious of Highland’s objectives since, so when Highland admitted they were planning an electronic auction it was suspected that Highland wanted to take over the actual auctioning of the fish.

JW Holdings are more vehemently opposed to electronic auctioning than LFC because most of their fish is sold to United Kingdom processors, whereas the majority of fish landed at Lochinver is destined for France and Spain. George Mackay could see advantages in selling electronically to overseas buyers, based on their involvement in the direct consignment of fish to French markets. LFC have a partnership, Euroscot Ltd, with a French Fish trader, Phillipe Formale, who first came to Lochinver to set up the base station to support the French boats, but left Jego Quare to market fish, mainly in Brittany. Euroscot buy fish, predominantly directly from the boats, grade it to French market standards and pack it in French boxes and ship it direct to French markets (GM).

In the existing auction fish are graded by size and quality on the boats and boxed in ice. George Mackay was concerned whether an electronic auction could raise prices sufficiently to cover the additional commission which would be necessary to pay for the independent grading of the fish. For some boats, LFC sell fish on the description of the crew. Larger boats will fax LFC with details of their catch and LFC will sell it to the processors by telephone, charging the same commission as they would for sale through the auction. However, the buyers are basing their prices on their knowledge of the reputation of the boat, and the relationships are not purely market-based, with buyers buying fish from boats when there is an oversupply in return for the expectation that the boat will supply them in times of shortage (GM). In an open electronic market the problems of guaranteeing the descriptions would be much greater.
The need for someone to assess the fish and someone to pay for the assessment became a major barrier to the introduction of the electronic auction. To sell fish electronically to remote buyers they would require an assessment of the fishes’ size and quality. The European system for fish grading is specified in regulation 100/76, article 2-4, with detailed provisions in regulation 103/76. These specify that fish must be sorted into homogenous lots of three freshness categories (E, A and B) and into either 3, 4 or 5 size categories, depending upon species. Freshness is assessed using appearance and smell. The responsibility for grading falls on the industry, with it usually being undertaken by employees or agents of the local producers association. Fisheries inspectors supervise the operation of the grading scheme but do not themselves grade fish (Howgate, 1983). Torry Research Centre (1995) developed a more discriminating sensory scale for assessing fish freshness based on a scale from 0 to 10. Compared to livestock carcasses, the quality grading of fish is an imprecise exercise. E is “excellent”, which corresponds to fish caught on the day sold and which has been carefully handled with bright eyes: “it smiles at you” (GM). Grade A covers the majority of the fish landed, covering fish caught in the past week. Grade B fish are at the point of smelling, but still just fit for human consumption. In the United Kingdom, the Sea Fish Industry Authority is involved in developing more discriminating standards, but an electronic system linking Highland Harbours and Lorient would require a standard recognised and accepted by buyers in both countries. The development of a reliable and discriminating system for the European fish industry is the aim of an pan-European project funded by the European Commission, CRAFT. In United Kingdom harbours, fish is first graded by the skipper who is landing it, who completes a tally of his landings with grades and sizes. This record is checked by the auctioneer, who may reject the skipper’s assessment and substitute his own. In the Highland electronic auction the aim was that the fish would be landed, weighed, sorted by EU grades for size for the species and graded. (Currently United Kingdom catches are not necessarily weighed, but measured in boxes of a nominal 54 kg, which may be overfilled to avoid quota. Forester’s expectation was that all the fish sold electronically on the planned Highland system would be A grade. If any was B grade it would be boxed separately and sold as such. If fish was to be sold on the electronic auction on the skipper’s assessment and estimated weights the bidders would be notified of this, but Forester suspected that the lower prices they would get from the uncertainty in this would tend to lead to this dying out.

There was a hiatus in the project to set up the electronic auction in mid 1996 because one of the two Highlands Harbours staff involved was taken ill for six months. Highland Harbours did not have a surfeit of people to draw on, with the management of Highland Harbours only representing 10% of Forester’s responsibilities. SCS continued developing the system, but the organising of the electronic market fell behind schedule (DFII). It was planned that a delegation from Lorient would visit Inverness in summer
1996 to agree how the market would be used. This visit did not take place until February 1997. This visit included a formal meeting to identify activities to be undertaken by the two sides. A key issue identified was to agree a system for describing the quality of fish sold electronically. A joint working party was set up to resolve this by June 1997 including people from both sides (DFII).

The Lorient franchise holder comprises the town council, the Brittany regional government and their district council (holding 70% of shares), with the remainder held by two merchant banks and the harbour operator, a subsidiary of Generale des Eau. Highland Harbours negotiated with the harbour operator on behalf of the franchise holder. The French delegation returned to Brittany and Highland planned their activities for the four months up to system implementation, including informing harbour and fish market users of the pilot system and “truthfully selling it to the industry and letting the various parties know that this isn’t something to cut them out, it is not to do anyone down” (D F). The Lorient harbour authority released a statement to their local papers which was picked up by United Kingdom traders selling fish into France. Forrester was telephoned by East of Scotland based processors and merchants threatening to boycott Highland Harbour’s markets because they feared it would take fish away from them: “The question was put by a trader - ‘Why are you doing it?’ To which the answer was fairly simple - to increase the price obtained at first point of sale, and we hope, as harbour operators, to make our harbours more attractive and bring more volume in. At which point the party we were speaking to said ‘Huh, right, hmm...’ and hung up” (DFII). Processors objected to the electronic system because they feared that it would increase the proportion of fish leaving Scotland for processing in France. Forrester explained to them that they would now be able to buy and process fish that currently was going to France unprocessed. Forrester recognised that traders who bought at the harbour to make a profit by reselling in another market would feel threatened. To minimise this resistance the pilot was restricted to deep-sea fish, 98% of which was never being made available for local buyers. He stressed that in the electronic market local traders would have the chance to bid for this fish. (DFII)

Highland Harbours planned in March 1997 to have ongoing meetings with merchants and processors to keep them informed and boat operators to persuade them to land fish at Highland Harbours and offer the fish for sale on the system. Highland Harbours’ longer term plan was to use the system to attract fish currently being landed at Scrabster, a trust operated harbour in Caithness on the North coat of Scotland, Killybeg, Ireland’s largest fishing harbour, and Milford Haven in Wales, by offering a port nearer the fishing grounds at which a good market price can be obtained (DFII). Tentatively they saw the operation of the system as placing them at the centre of a network of harbours. However, on the Continent the same pressures were leading other fish markets to co-operate into networks.
Lorient’s neighbouring port of Concarneau introduced an electronic market in 1996, which made Lorient investigate the use of electronic auction for selling fish landed at Lorient. La Rochelle, another French fishing harbour, entered into a collaboration with Zeebrugge in Belgium, in which Zeebrugge’s 150 buyers would bid remotely for fish landed at La Rochelle. Zeebrugge also collaborated with Milford Haven and is linked to Ijmuiden in the Netherlands, which itself is linked to Den Helder in Northern Netherlands and Urk on the Ijsselmeer and Egersund in Norway. This emerging network is missing harbours in Scotland and Brittany - Zeebrugge had approached Highland Harbours and Scrabster to explore participation in this network of auctions. Zeebrugge, like Lorient, is a harbour short of fish. The market is owned by a private company which has invested £15M in a new market with associated fish processing facilities. Zeebrugge only lands 15,000 tons of fish per year. Up to 1995 Zeebrugge were, again like Lorient, trying to get fish landed elsewhere consigned for sale and processing in their market, but their strategy changed to one of developing alliances with other harbours to gain access to fish for its local buyers. Forrester recognised that if the pilot electronic market was a success they would want to join a wider European network of fish auctions (DFII).

In early 1997 the system had been developed by SCS. The system hardware comprises a personal computer displaying the auction clock to bidders on a number of screens. Three bidders were to share a screen, each provided with a bidding button. The auction could be in either English or Dutch. For remote buyers the price is displayed in their local currency based on that morning’s exchange rate. However, the system stayed in its boxes until the resistance of market users could be overcome and the procedures for operating the auction agreed.

In Spring 1997 Highland Council had retreated from installing the system in Lochinver and Kinlochbervie and planned to operate the pilot system in two smaller harbours, Kyle and Gairloch, for a year. The timetable for extending it to the other harbours was flexible due to the need to avoid a boycott by merchants. To be successful for deep-water species it would have to be implemented at Lochinver, the harbour at which most of these fish are landed. Initially it was planned to auction one lorry load of fish per week (DFII). The aim was to start selling creel caught live prawns, as opposed to the lower quality trawled prawns landed at East coat harbours, landed at the two smaller harbours with remote buyers from Zeebrugge. These would be transported live to the continent using the newly inaugurated daily flights between Inverness and Schiphol, Amsterdam (DF III).

The owners of the Zeebrugge market visited Lochinver several times, speaking to Highland Harbours and LFC, arguing initially that Zeebrugge is located centrally near to the major European fish consuming areas,

38 Telephone interview with harbourmaster.
and that fish landed at Lochinver could be consigned for sale in Zeebrugge. Mackay was sceptical, believing that Zeebrugge was too close to the successful market in Boulogne to generate the volumes of trade sought by its owners. He was however impressed by the automated fish sorter at Zeebrugge, which cost over £1 million, which sorts fish by species and size (GM). Zeebrugge are now seeking to enrol Highland in their pan-European network of fish auctions which will be discussed later.

Network Building in Highland Fish Markets

The project to introduce an electronic market in Scotland exemplifies the difficulties of trying to implement a technology which requires a high degree of trust between those involved within a community in which there is initially a low level of trust. For Highland Harbours an electronic market was seen partly as a commercial exercise, partly as an economic development project and partly because it interested the instigator. The systems in use on the continent, particularly in the vegetable and flower markets, demonstrated to them the technical feasibility of a fish market in which bidders bidded remotely. A remote electronic auction was seen by Highland Harbours as a means of gaining extra revenue from landings of continental slope fish which were being landed and being consigned for sale in French markets, by-passing the Scottish markets. Forester developed a vision of using an electronic market to auction fish to French customers. Highland needed to enrol Lorient in a partnership to ensure boats would use the system and that French buyers would use it to buy fish. For Lorient the attraction of the electronic market was to draw more fish for processing in Lorient. Lorient and Highland were able to approach boat owners who would be willing to place their fish on this system and Lorient were able to enrol the French fish processors. The most difficult stage in building the electronic market was in enrolling the support of the buyers and agents active in the Highland fish markets. They were suspicious that the system would lead to fish not being available to local buyers, or would lead to fish becoming more expensive in the local market. These fears were aggravated by their non-involvement in the conception. Those agents who arbitraged by buying fish in the local markets for sale in the French markets were naturally unwilling to see the introduction of a system which would make them redundant. Highland deliberately did not consult LFC as they sought to build an electronic market. However, Highland’s plan would either involve LFC running the sales on the system or be excluded. Unsurprisingly LFC interpreted the lack of consultation negatively when they learnt of the proposed system. Similarly Scottish buyers, who would be expected to use the system, were not consulted, leaving them suspicious about Highland’s motives. In parallel with Highland’s attempt to set up an electronic market, Zeebrugge sought to enrol LFC into their own network of fish auctions. The proposed electronic market threatened buyers in the Lochinver market, but their perception of this threat was accentuated by the lack of consultation. The buyers were able to enrol their customers, the major
Scottish fish processors, who had concerns about the effect of the electronic auction on the price and availability of fish, who threatened to boycott Highland Harbours. If they had put this policy into effect a large proportion of the boats landing fish for Scottish processors would have diverted to Scrabster, Ullapool of Mallaig. Forrester was surprised by the ability of the fish merchants to redefine the objections to the electronic market as being related to the internationalisation of a market which had traditionally been insulated from international pressures. The threats to boycott Highland harbours made by agents, processors and merchants halted progress in getting the systems off the ground. Highland sought to bypass this opposition by introducing the system in their smaller harbours which lacked the organised markets to provide organised resistance. In the background Zeebrugge maintained contacts with Highland Harbours and LFC, seeking to enrol the Scottish harbours into their network of linked fish markets which will be discussed later in this chapter.

The failure of the Highland project may be seen as a failure to enrol potential users at the conception phase which limited their involvement in specifying its functionality, but more significantly created a barrier to their enrolment during the adoption phase.

Iceland

With annual production of 1,576,000 tonnes, Iceland’s fishing industry is twice the size of Britain’s and only slightly smaller than Norway’s. However, despite the economic importance of fish to the Icelandic economy, it is only in the last ten years that fish auctions have been established. The lack of fish auctions in Iceland was noted by Cassady (1967, p 20), who saw it as an inexplicable anomaly, but suggested that it was because the fish landed in Iceland was almost wholly for canning and freezing, for which the processors would know the stable market price. However, it was suggested by the operator of one of the markets that it was more due to the number of harbours and difficulty for buyers of moving themselves or the fish between harbours. In Iceland fish are landed at a large number of small harbours around the coast and were purchased directly from the boats by merchants and processors. The poor road network outwith the Reykjavik area made the transfer of fish between harbours difficulty, with fish dried at the point of landing, so there were few buyers at each harbour. The first fish markets in Iceland were established in 1987 in Reykjavik, nearby in Hafnarfjodur and 50 kilometres away at Sudernes. These markets were formed by consortia of entrepreneurs, companies in the fish industry and local government who could see the commercial potential of opening trade in local harbours to wider customers. From these three companies operating markets two competing electronic systems have developed to link markets, which have spread to almost all the Icelandic fishing harbours.

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In 1987 FMS (Fishmarket of Sudernes) opened the first Icelandic fish markets in three towns in the Sudernes area of the Reykanes peninsula: Njarvik, Grindavik and Sanderöi. The supporters of FMS did not want to see fish trading concentrated in only one of these three locations. An electronic market to connect the three markets would avoid processors having to have buyers in each harbour. They commissioned a software company to develop a system, Tengill\textsuperscript{39}, to link their markets. FMS then allowed other fish markets to use the system. The system was first used in January 1992 linking five markets. The success of the system in generating higher prices for sellers led increasingly to boats based at outlying harbours landing their catches at harbours operating the electronic system, so that they would be offered to the 80\% of buyers based in the Reykjavik/Sudernes area. The fish processors based in outlying areas were seeing less fish and therefore wanted to see the establishment of fish markets at their local harbours connected to the fish markets in Sudernes and Reykjavik. (I O G)

A company, RSF (Reiknistofa Fishmarkada hf), was formed by the three initial market owners to operate the electronic marketing system. Eighty five per cent of RSF is owned by FMS. Total commissions to sell through FMS’s markets are 4\%, of which 3.35\% goes to the market company and 0.65\% to RSF for the market service. The Tengill system runs on an Hewlett-Packard 9000 D-250 UNIX computer using the Icelandic X.25 data network to connect to local auctions. Each local auction has a personal computer, modem and printer. Tengill does not use the falling clock system. Instead it has an auctioneer based at RSF linked to each of the local auctions through teleconferencing who conducts the auction. Prior to the auction all the buyers at each market pick up a print-out describing the lots for sale in terms of species, weight, size, time since catching, catching method, location and whether gutted. In Iceland there is currently no unified standard for fish descriptions. The eight markets in the Tengill network all use the same descriptions, based on grading each species into six size categories (I O G). On the Tengill system fish may be auctioned prior to landing, based on a description by the boat’s skipper. The system was designed to provide market reports and statistics, which can be produced covering specific buyers, sellers, harbours or fish auctions. The auction follows the English method of bidding, with the central auctioneer progressively raising the price, with buyers at each auction able to hear him over a public address system. At each local auction bidders who still wish to remain bidding raise paddles displaying their number and the operator at each local auction has a button which he presses if their is still someone at their location bidding. The auctioneer can see on their computer which locations still have active bidders. When there is only one bidder left holding up their paddle, the system can identify the location of the successful bidder.

\textsuperscript{39} Tengill is Icelandic for “network” - “an Icelandic word for an object/device which links other objects together” I O Gudjonsson
and the price they offered, but he does not know the specific identity of the bidder. The auctioneer then contacts the local operator who gives him the number of the successful bidder which is then entered into the system. The credit limits of buyers are monitored centrally, which is a major administrative saving for individual markets. In the Tengill system there is a tendency for local buyers to buy fish landed in their local harbour but, because a large proportion of fish is auctioned before it is landed, this is mainly due to the lower transport charges. At Sudernes 50% of fish is auctioned prior to landing, having been sorted on the boat. (I O G) In winter 50% of the fish is landed ungutted from fisheries close to the shore, removing the uncertainty for buyers of the quality of the gutting. In summer the deterioration in ungutted fish due to higher temperatures makes this less practicable and the fish is gutted on the boat. (I T J)

The Icelandic Tengill system has been in use since January 2 1992 linking between 6 and eleven fish auctions. The system serves 300 buyers and 1000 sellers. Annual sales in 1996 amounted to approximately 51,000 tons, worth $58 M.

Table 13: Volumes traded on TENGILL in Iceland.

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Sales (tons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1992</td>
<td>36,952</td>
</tr>
<tr>
<td>1993</td>
<td>41,176</td>
</tr>
<tr>
<td>1994</td>
<td>41,955</td>
</tr>
<tr>
<td>1995</td>
<td>46,474</td>
</tr>
<tr>
<td>1996</td>
<td>51,373</td>
</tr>
</tbody>
</table>

The market share of fish landed in Iceland sold through the Tengill system is relatively stable, with the increase in traded volumes due to the decrease in the proportion of Icelandic fish landed into European ports, down from 40% to 10% between 1992 and 1996.

**BODI**

The competing BODI system in Iceland was developed by two other fish markets. Fishmarkets were opened in Reykjavik and Hafnafjordur in 1987 using a traditional floor auction in which an English auction mechanism was used with the auctioneer calling out rising prices and buyers holding up cards while they were bidding until there was only one card left, held up by the successful bidder. In 1991 the
fishmarket operators, Faxmarkadur in Reykjavik and Fishmarkadur in Hafnarfjordur, negotiated with RSF to take a 50% stake in RSF for 10MKr (~£1M). According to Olafur Johannsson, RSF general manager, RSF had invested 35MKr in Tengill’s development, so RSF did not believe the amount was sufficient.

Faxmarkadur and Fishmarkadur claimed that a system could be developed for 20MKr. Later in 1991 the fishmarkets Faxmarkadur in Reykjavik, Fishmarkadur in Hafnarfjordur and Fishmarkadur in Breidafjordur contracted for Schelfhout of Belgium to carry out a feasibility study for implementing a remote electronic fish auction. SCS was represented in Iceland by Gylfi Adalsteinsson, an Icelandic fishing industry consultant. The objectives of the proposed system were: connect many fish auction markets, combine the bank guarantees for buyers buying in several markets and have a centralised system of debt collection (Sverrisson, 1993). The proposal was to develop a system mirroring Tengill’s linking of dispersed markets but replacing Tengill’s use of bidders holding up paddles with an auction clock and button bidding. Instead of having Schelfhout supply the system, Faxmarkadur and Fishmarkadur set up a company, Islandmarkadur HF (Fish Market of Iceland), and decided to have a remote bidding clock auction system developed by Icelandic contractors. In 1991 Islandmarkadur contracted with Fang Ltd to develop the BODI system, with Plusplus Ltd, a firm in which Adalsteinsson had an interest, and Bjorgvin Gudmundsson as sub-contractors (Sverrisson, 1993). The development of BODI took one year and the system became operational in 1994. Islandmarkadur carries out administration of the transactions but the independent auctions compete for fish. Buyers require only one bank guarantee to bid in all the connected auctions. Each auction market has a computer to run their auctions, computers for bidding and a button computer for each participating bidder. The auction computers of the network are connected through a wide area network (WAN), which can be X.25, the PTT’s network or leased lines, using either TCP/IP or UDP/IP protocols. The auction computers are UNIX computers which hold a relational database of lots for sale which can be queried from anywhere on the network. The central office invoices customers at the end of each weekly period, with the local computers holding details not just of fish sales but also oil and ice sales through the markets. The bidding computers are personal computers connected to the local auction computer through a local area network. This computer shows on its screen the bidding clock and the auction is by Dutch auction. Buyers bid using micro-computers attached directly to the bidding computer. The system is able to catch the identity of the first bidder to bid and the price on the clock at that time. Buyers have an electronic key which is inserted in the button computer so they do not have to always use the same computer (Hallgrimsson, 1994). While the number of auctions linked in the BODI system is fewer than in the Tengill system, the volume of fish traded on the system is higher because it includes the two largest Icelandic fish markets. Between January and August 1997 ISM marketed 48,564 tonnes of fish compared to RSF’s 38,324.
Failed Merger of Tengill and BODI

It appears anomalous that a country the size of Iceland should support two essentially similar electronic fish market systems, both developed in Iceland based on linking bidding across a network of fish auctions. In March 1997 negotiations took place to merge the two systems. In comparing the two systems Hallgrimsson of ISM saw their system as being more sophisticated while for Johannsson of RSF this sophistication led to unreliability and very inflexible procedures for entering data. Any merger of the systems would have come down to a choice between the manual bidding of Tengill and the button bidding on BODI. An independent telephone survey was commissioned by the two system operators to identify the preferences of buyers. Of these buyers, 72% preferred Tengill, mostly because they could listen to the voice and read their notes, whereas with the clock system they had to concentrate on watching the clock. A further barrier to merging the systems was the selling of a modified version of the Tengill system to a market operator in New Bedford, Massachusetts, which would have placed a requirement on the merged company to provide technical support to the American system.

CASS in Massachusetts

RSF bid to supply a fish market system to Portland, Maine, but the contract went to a local company. RSF took part in the Boston Seafood Show in 1995 and 1996, leading in 1996 to the opportunity to supply a fish auctioning system in New Bedford, Massachusetts, instigated by the Massachusetts Seaport Advisory Council. RSF renamed the system CASS for marketing outwith Iceland. The implementation of an electronic remote fish auction in Massachusetts was announced in August 1996 (Stewardson, 1996), with the State of Massachusetts funding the system to improve the marketing of seafood. The auction was initially to automate the New Bedford auction and then it was intended to link to the auction in Gloucester. The $300,000 of state funds would pay for a system to be implemented in 1997 and the development of a “reliable system of grading so buyers would know the quality of fish they are bidding on.” This public funded system was pre-empted by two fish processors setting up a company BASE (Buyers and Sellers Exchange) to operate an electronic fish auction in New Bedford. BASE licensed the CASS system from RSF, adapted to suit their needs. The first electronic auction was held on the Massachusetts CASS system on February 10 1997. In the CASS system sold to Massachusetts teleconferencing is not used, with buyers only interacting with the system through computer terminals, thus avoiding the need for both data and voice connections. CASS is a real-time remote auctioning system in which the buyers link directly into the auction computer by phone lines, allowing buyers to bid from computers in their offices. Bidders see the price for the lot increasing on their computer screen and press ‘1’ to enter the bidding and ‘0’ to leave. The winning bidder is the last person in as the price rises. The United States system was developed by RSF, but the program code was extensively rewritten, especially the auction mechanism. (I O G) Buyers are able to
access the United States  CASS system via dial-up modems to look at information on their previous purchases and credit balance. The system keeps track of sales orders (issued to sellers) and purchase orders (issued to buyers). CASS has a built-in accounting module and the system keeps track of each buyer’s credit limit, adjusting it when a purchase is made or when payments are received.

**Building the Icelandic Fish Market Networks**

While the embeddedness of existing social relationships was a barrier to the enrolling of actors into the Highland system’s network, the development of the two Icelandic systems was facilitated because organised fish markets were a recent innovation. Using electronic auctions to link markets was a means of ensuring a competitive market in dispersed ports while the buyers were concentrated in the Reykjavik region. For sellers enrolment in the auction systems gave access to a competitive market in their home port, whereas for buyers it removed the need to have agents in each port. While the Tengill system is an idiosyncratic system linking manual auction, the BODI system was an emulation of an SCS system 40. Once two separate networks had formed and both sides could see advantages in a single national system the embeddedness of the social networks and their incompatibility became barriers to their merger.

**Pan-European Fish Markets**

The introduction of electronic markets for local buyers in continental fish markets may be seen, as was the case in Continental fruit and vegetable markets, as an incremental evolution towards the linking and the emergence of remote buying. It is unsurprising that this process has been extrapolated to create a vision of a pan-European fish market, in which fish are auctioned to buyers from across Europe. In 1997 two alternatives projects appeared aiming to build a market allowing buyers from across Europe to buy fish landed at ports elsewhere in Europe. These two projects started out with distinct approaches, but as they developed there solutions converged.

**INFOMAR**

The first project, INFOMAR, was supported by Directorate General III of the European Commission to use IT to integrate the European fish industry. The project was initiated by an Icelander, Gylfi Adalsteinsson 41, and Rob Gallagher, of Navigs, France. Adalsteinsson produced a presentation of a vision of the European fish industry, which Holmes says was derived from a presentation by Arthur Anderson Consulting in Spain in the early 1990s. Adalsteinsson sought funding from the European Commission to

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40 The extent of this emulation only became apparent when Luc Schelfhout saw the BODI system in operation during a visit to Iceland.

41 This is the same Adalsteinsson who acted as a consultant in Iceland for SCS then was involved in the development of the similar BODI system.
support this project. European Commission Esprit support was conditional on applying as a consortium of partners. Adalsteinsson contacted Vega, a systems and telecommunications specialist, based in Welwyn Garden City to undertake the technical elements, and Havinfo of Tromso, a small Norwegian company, to take responsibility for developing the satellite links to vessels. The INFOMAR project was budgeted to cost over £3 million, with part-funding from Esprit. The project had two elements. First, a Trade Information and Forecast Service, providing data and forecasts on fish prices, weather, quota status and other industry data and forecasts. Second, a Fish Exchange Trading System “a value-added module to the network where buyers and sellers can match their needs, agree on prices and define handling, processing and transport routes”\(^42\).” It was expected that the service, once developed, would be operated by existing markets as franchisees. The project started in May 1996 with Susan Holmes of VEGA as project manager. “It was fairly rapidly apparent that the original business concept was unworkable” (S. Holmes). The business case for the redesign of the industry was based largely on the structure of the Icelandic industry. The aim was to bypass the existing market infrastructure and connect buyers and sellers directly, but it was found by Holmes during preliminary discussions with people in the English fish industry to be difficult to do this as the markets’ functions were wider than simply auctioning the fish, including credit clearance, payment of crew wages, landing and packing. If a system could be developed it was unclear who would operate it and ensure these roles were carried out. The project was restructured towards including existing market operators rather than trying to bypass them. In July 1996 Holmes met Bryan Renn, the United Kingdom representative of SCS, and Luc Schelfhout in September, seeking a partner with experience in supplying electronic market systems. She also met a representative of SCS’s competitor, Nieaf-Smitt. She negotiated for Schelfhout to join the consortium. It was at a meeting at this stage in Iceland that Luc Schelfhout realised that the BODI system was a precise copy of a Schelfhout system. Adalsteinsson left the consortium and was replaced by Schelfhout. The project became more focused towards the markets, and in particular, as a pilot, the Dutch market in IJmuiden. In a press release published to announce Schelfhout’s joining of the consortium, INFOMAR aimed to: “link first-hand fish traders through a wide-area data network which is extended to fishing vessels at sea via satellite communication systems. Buyers and sellers pass information to each other using an extranet (an intranet solution used for electronic trading). Centres in each country, usually sited at the local auctions, administer a database containing up-to-date catch information from fishing vessels and current auction prices and demand. They co-ordinate the transmission of information and provide a gateway to facilitate the efficient trading of fish between buyers and sellers around Europe, both on land and at sea”. According to Holmes, Rob Gallagher of Navigs has a large involvement in the technology on the vessels, Schelfhout are driving the business concept, and

\(^{42}\) CEC GDIII Project Summary for Infomar (22201)
VEGA are responsible for the land-based development and project management. Schelfhout discusses the details of the systems with the auctions. “I don’t think a vision of what the project involves has ever been agreed by all the participants - they have widely differing commercial aims and backgrounds, and the project has changed so much since it started that there are always tensions” (S Holmes). It is planned that the service will be commercially launched in May 1998, but the form of the service is unclear.

**Pan-European Fish Auction (PEFA)**

While INFOMAR evolved to a less ambitious vision of the use of IT in the fish industry, Zeebrugge was developing a plan to link European fish markets into a network. In Summer 1997 Milford Haven Fish Auction, Zeebrugge and La Rochelle linked their three markets using ISDN lines, allowing buyers in each market to bid for fish landed in each other market. Milford Haven is 99% owned by Zeebrugge and each of the auctions in the network uses an SCS auction system. It was planned that the network would then be extended to IJmuiden and Den Helder in the Netherlands, and discussions were ongoing with a number of other markets including Plymouth and “one in Scotland”. On June 19th 1997 boxes of ray and plaice landed at Milford Haven were bought by a buyer in Belgium (Fishing News, 1997b). The system was innovative because it allowed two-way international buying and selling of fish. The network planned to use the Torry Count fish standards system, rather than the REVO Dutch system used in IJmuiden and Den Helder (MJ).

In Summer 1997 Zeebrugge reassessed their policy of using ISDN lines to link the markets, finding the cost of international ISDN lines excessive. They decided to develop an alternative electronic fish market based on a world-wide web (WWW) site. The site is planned to have various levels of access, from passive observers to active bidders who have credit clearance to buy. The systems has been named Pan-European Fish Auction (PEFA). The project is being managed from Milford Haven, with AT&T managing the Web site. The site is planned to be in operation in February 1998 linking ten fish auctions across Europe.

According to Jay, the Zeebrugge strategy is still to use the system to build incrementally a network of linked auctions. PEFA and INFOMAR may therefore be seen as very different routes to achieve the same end: a pan-European fish market with remote bidding. Jay was particularly critical of the decision in INFOMAR to integrate the advertising of the fish caught, which he saw as open to misrepresentation and primarily the role of the boats’ agents. He saw the INFOMAR project as remote from the needs of the industry, driven by the interests of communications and computer specialists.

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43 When observing the fish auctions in Lochinver and Grimsby systematic under-reporting of fish was seen. Boats landing at Lochinver would fax Denholm with details of their catch, but this often underestimated what was landed. Similarly in Grimsby, fish consigned by ferry from Iceland arrived in a much larger
Building the Pan-European Markets

At the time that they were studied both PEFA and INFOMAR were still in their conception phases. INFOMAR’s instigation came from Adalsteinsson in Iceland, who, drawing on concepts seen elsewhere and the example of the Icelandic auction systems, built a network to obtain EU funding for creating a pan-European network. To achieve this a network of technology and industry specialists was built and an electronic market problematised as a mechanism for creating single European market in fish. In contrast, PEFA’s instigation in Zeebrugge was more limited in scope and evolutionary rather than radical, involving the progressive enrolment of the operators of fish markets across Europe into the network. The conception phase of Infomar followed two patterns seen in the livestock systems seen earlier in two ways. First there was a realisation early in the conception phase that to enrol a network of boats and buyers would be easier to achieve by enrolling the operators of existing fish markets rather than setting up in opposition to them. Second, while a system of trading on description and trust had been seen to work in Iceland, where business relationships would be embedded in a tight social network, this would be difficult to achieve in a pan-European network with trading between distant partners in transient trading. These two realisations led to the redefinition of the project, with Adalsteinsson departing and SCS joining the network which switched to a strategy of developing a system for use by existing markets. SCS were enrolled partly because of their technical expertise in auction systems but also to enrol indirectly their user-base of fish auction operators. Therefore again we see a pattern in which enrolment combines the translation of technical resources combined with the translation of stabilised actor networks through the enrolment of pivotal members of existing networks.

Building the Fish Market Networks

As with livestock markets, the pattern observed in fish markets is for electronic markets to develop around existing markets, but as in Continental vegetable markets, the pattern has also been for electronic markets to evolve from existing physical markets. This provided a route for the market for fish auction systems to be dominated by SCS and Nieaf-Smitt, the leading suppliers of systems to fruit, vegetable and flower markets. The opening up of electronic markets to remote bidding was due to two complementary pressures. First, in small markets remote bidding allowed the linking of markets to create a more competitive market, as seen in both the Icelandic systems and in NSS in Norway. Second, for markets in harbours where processors were short of fish remote electronic markets were seen as a means of gaining access to more fish, as seen in Zeebrugge and Lorient. The success of the Icelandic systems in relation to the abortive attempts to establish an electronic auction in the United Kingdom can be attributed to two factors. First, quantity than expected. It appears that sellers underestimate their catch when they are advertising it to prevent their announcement pushing prices down.
the short history of fish markets in Iceland reduced the embeddedness of the social structures on which the systems were overlaid; essentially the developers had only to deal with sellers and buyers, not the complex structure agents and merchants seen in the United Kingdom. Second, the Icelandic fishing industry is a more culturally homogenous community than in the United Kingdom, where it is diverse with fish being brought into the market from a wide range of sources and bought by a wider range of customers, from small scale fish mongers to multi-national processors.

The reputation of the seller is more important for remote buyers of fish than it is in livestock auctions because the standards for describing fish are less well developed. In close intensive networks the strength of existing social ties enables the buyers to buy based on their knowledge of the seller, confident that sellers will not behave opportunistically. In close networks opportunism is controlled by the knowledge that it will prevent the other party from trading with you again and there will be costs if they tell others of the behaviour, but in anonymous perfect markets these pressures are much less. It was therefore the literal insularity of the Icelandic fishing industry which enabled buying on description to be successful without a complex system to guarantee descriptions. In Scotland, while LFC, through Euroscot, could introduce selling on the basis of description for a sub-network of boats and their customers, in Grimsby the electronic auction planned for Dutch plaice was also for a well-defined sub-network of beamers and their habitual customers in the Netherlands. To introduce a market open to all bidders and sellers requires a means of guaranteeing the transactions, specifically guaranteeing to sellers that they will be paid and to buyers that they will receive the fish described. It was the necessity of these institutional roles which led to realisation that INFOMAR would have to operate through existing markets rather than bypass them.