



**Views of stakeholders in fish supply chains on  
implementation of electronic systems for traceability  
and temperature data:  
Survey at the Brussels Seafood Exposition 2010**

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## Preface

The surveys and focus group activities reported herein, were part of the sixth framework EC-funded project CHILL-ON (project no. FP6-016333-2) entitled “Developing and integrating novel technologies to improve safety, transparency and quality assurance of the chilled/frozen food supply chain - test case fish and poultry”. The aim was to explore the view of stakeholders in fish supply chains, towards implementing a traceability system and technologies to monitor temperature and apply rapid q-PCR microbial technologies and shelf life prediction models for decision making and supply chain management in food supply chains. The ASCS research group at UoI was responsible for the implementation of the CHILL-ON technologies in field trials in the project and conducted the interviews at the Seafood Exhibition in Brussels 2010. The SSRI at UoI was responsible for focus groups conducted in Iceland (Appendix III), the design of the questionnaire and data analysis. The aim of the focus group activities was to obtain a vision for commercialization of the CHILL-ON project’s traceability and monitoring tools, the optimized and/or best practice chilling protocols and novel packaging concept.

The views expressed here are solely the responsibility of the authors. The results have been presented as oral and poster presentations at the following conferences and submitted for publication as a scientific paper.

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Hafliðason, T., Ólafsdóttir, G., Bogason, S., Guðlaugsson, E., Ómarsdóttir, I.L., Jóhannesson, G.Þ., 2010. Stakeholder views on implementation of information and supply chain management systems in the fish sector. 15th Annual China Fisheries & Seafood Expo, Dalian, China, Nov 2-4

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<i>Ágrip á íslensku:</i>	<p>Eitt af markmiðum Evrópuverkefnisins CHILL-ON var að þróa rafrænt kerfi fyrir ákvarðanatöku í virðisæðju matvæla. Markmiðinu var náð með þróun á tækni sem gerir ráð fyrir rauntíma skráningum á hitastigi, fljótvirkum mæliaðferðum til að geina örverur (q-PCR) og spálíkön fyrir hillulíf byggðum á örveruvexti og upplýsinum um uppruna afurða. Aðalmarkmiðið var að tryggja neytendum upplýsingar og stuðla að bættum gæðum, öryggi, gagnsæi og rekjanleika sjávarafurða.</p> <p>Til að renna stoðum undir þróun tækninnar í CHILL-ON verkefninu og til að öðlast betri innsýn í skoðanir og þarfir hagsmunaðila í virðisæðju sjávarafurða var komið á fót rýnihópum hagsmunaðila og viðtölum til að skoða nánar þörf fyrir rauntíma upplýsingar um hitastig, gæði vöru og spálíkön um öryggi afurða. Markmið rýnihópanna var að fá betri innsýn í reynslu hagsmunaðila á Íslandi varðandi upplýsingaflæði og rekjanleika og fá þeirra sýn á möguleika markaðsvæðingar á nýrri tækni eins og þróuð hefur verið í CHILL-ON verkefninu. Niðurstöður umræða í rýnihópum voru notaðar sem grunnur til að hanna spurningalista fyrir alþjóðlegan hóp svarenda á sjávarútvegssýningunni í Brussel dagana 27.-29. apríl, 2010. Markmiðið var að fá innsýn í skoðanir aðila úr virðisæðju sjávarafurða um upplýsingaflæði og miðlun gagna til að greina helstu hvata og hindranir fyrir innleiðingu á rafrænu upplýsingakerfi byggt á nýrri tækni til að tryggja gæði í virðisæðju sjávarafurða.</p> <p>Niðurstöður sýndu að reglugerðir voru oftast nefndar (40%) sem helsti hvati að innleiðingu tækni til að tryggja gæði í virðisæðju sjávarafurða, kröfur neytenda voru í öðru sæti (31%), en þar voru gæði og hillulíf afurða helstu þættirnir. Í þriðja lagi skiptu hagræn gildi máli, einkum hlutfall kostnaðar og hagnaðar ásamt bættri stjórnun virðisæðjunnar (28%). Umhverfisgildi voru í síðasta sæti í forgangsröðun um mikilvæga hvata (8%), sem áhrif hafa á innleiðingu á nýrri tækni. Þess má þó geta að þessir fjórir þættir voru innbyrðis tengdir og háðir hvor öðrum. Þó að umhverfismál væru ekki álitin helstu hvatar fyrir innleiðingu á tækni, þá voru umhverfismerki talin mjög mikilvæg markaðstól, kostnaður var álitinn helsta hindrunin, en svarendur töldu að hindranir vegna tæknivandamála og /eða skorts á trausti væru auðveldar að yfirstiga, ef kostnaðar/ hagnaðar hlutfall fyrir innleiðingu væri jákvætt.</p>		
<i>Lykilorð á íslensku:</i>	Viðtöl byggð á eigindlegum og megindlegum aðferðum, skráning á hitastigi í rauntíma, gagnsæi í virðisæðju sjávarafurða, upplýsingatækni		

*Summary in English:*

One of the key aims of the CHILL–ON project was to provide food supply chain actors with an electronic Supply Chain Management and Decision Support System. This was achieved through an integrated approach that combines technologies allowing real time temperature monitoring, rapid detection of bacteria (qPCR), shelf-life models based on predictive microbiology and information about geographic location. The overall objective was to provide consumers with improved quality, safety, transparency and traceability of fish products.

To underpin the further development of the CHILL-On technologies and to gain insights into the need of the fish supply chain, a dialogue with stakeholders was undertaken both in focus groups as well as in structured interviews to probe the perceived need of supply chain actors towards real time temperature and data on quality and predicted safety of products. The goal of the focus group was to gain insight into the experiences of supply chain actors in Iceland on information flows and traceability in fish supply chains and draw out their views on the potentials of the CHILL-ON technologies. On the basis of the group discussion a questionnaire was designed to obtain an international perspective by gathering data on the view of key actors in the supply chain at the Seafood Exposition in Brussels, 27-29 April 2010. The aim was to gain insight into the views of fish supply chain actors on information flows and data sharing and further to explore their view on the key drivers and main barriers for implementing electronically based information systems and novel technologies for quality assurance in fish supply chains.

The results demonstrated that regulation was most often mentioned (40%) as the key driver, consumer values were ranked in second place (31%), where quality and shelf life of products were the key attributes. Thirdly, economic factors, such as cost-benefit ratio and improved supply chain management, were considered important (28%). Environmental issues were ranked last (8%) as an important driver for implementing new technologies (Figure 3). However, it was noted that the four choices were all interlinked and dependent on each other.

Environmental labels were highly ranked as important marketing tools. Cost was considered the main barrier, while barriers regarding technical issues and trust could be overcome if the cost/benefit ratio of implementation was favourable.

**English keywords:** Qualitative and quantitative interviews, real time temperature monitoring , fish supply chain transparency, ICT,

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## Introduction

The aim of the EC funded CHILL-ON project was to develop a holistic system and technologies to ensure the quality, safety and traceability of fish and poultry products for the consumer. The main hypothesis is that transparency of the supply chain will be enhanced by giving actors in the chain access to real time temperature data and location of products and translate this information in quality related attributes such as shelflife of the products. Such systems, which apply real time temperature and logistic monitoring technologies thus give improved transparency and real time information on products. Furthermore, by applying the data as input to shelf life prediction models and decision support systems the CHILL-ON technologies will give supply chain actors possibilities for more efficient supply chain management and waste reduction (Olafsdottir et al., 2010).

The main benefits of implementing traceability system are seen through product differentiation, reduction of product recalls, identification of liability among the actors of the supply chain, and supply chain management improvement. According to experts from the field of food risk management in Europe, effective food and ingredient traceability systems have the potential to improve food safety, however further improvements regarding harmonisation of practices and pan-global legislation are needed (Kher *et al.*, 2010). Any means that facilitate efforts to appoint liability to responsible actor in the chain in case of food safety issues or fraud would be of benefit for the whole supply chain. In a survey on the view of risk management experts from food safety agencies and those involved in research or in quality maintenance in the food supply chain, the main advantages of food chain traceability were seen in relation to more accurately tracing products in case of food safety incidences and product recall, liability of responsible actor, more reliable information of product components (i.e origin), and improvement of trust (Kher et al., 2010). The consumers may not be well informed about the definitions of the concepts of quality, safety and traceability. Safety is often taken for granted, but consumer's perception of food quality and safety appear to be interlinked and traceability is linked to both and thus these concepts may all influence the purchase decision of consumers (Rijswijk and Frewer, 2008).

The most common incentives for implementing traceability systems according to a Chinese fishery processing company were product quality improvement, need for healthy consumption, and management improvement while private and joint-venture enterprises, also considered marketing drivers important, like potentials; to meet the customers' requirements; to extend international and domestic markets; and to differentiate products (Wang *et al.*, 2009).

Numerous studies have pointed out that the benefits of implementing traceability and information systems have to be reflected in better supply chain management, resulting in better quality of the products on the market, longer shelflife and less waste to gain more profit. In general values that contribute to enhanced image of the company would be of benefit for marketing. The main

determinant for implementing new information technology tools is the strategy of the company which may obviously become a barrier if not interested in the implementation of such system. Arguments on cost sharing among companies at different links of the supply chain have been reported and are based on the perceived benefits of traceability systems for different types of companies (Mai *et al.*, 2009). According to Doluschitz *et al.* (2010), clear statements on costs, benefits and sustainability of developed IT systems are considered a prerequisite for acceptance in industry. The common benefits of actors are often not clear and therefore there is a lack of commitment and barriers are existing since actors are not willing to share information as mentioned before. However, this is dependant on the chain and the type of information that is being shared. Other factors may also be barriers for the sharing of electronic temperature information as has been reported in the case of ERP implementation. The barriers were not technology-related issues such as technological complexity, compatibility, standardization, etc., but mostly concerned with organization and human-related issues, such as resistance to change, organizational culture, incompatible business processes, project mismanagement and top management commitment (Helo *et al.*, 2008). Another study on the effect of the food traceability system for building trust underlines, that uncertainty is due to fears of seller opportunism originating from lack of trust (Young *et al.*, 2009).

Environmental values and labelling are becoming recognised as marketing tools. The concern for the protection of the environment, better utilisation of resources, less waste and organic production linked to green values is very well acknowledged. Although sustainability of production is commonly not well defined, there is interest in some companies to utilise sustainability, or rather the environmental indicators (carbon footprint and Food mileage), as marketing tools, to present their concern for the environment. However, more research is needed based on Life Cycle Assessment and validation of environmental indicators. A response to these environmental supply chain challenges has been the use of market-led instruments to shape food supply sustainability and food consumption. The private corporate managers of supply chains among the large food manufacturers and retailers have led the approach to utilize a combination of standards setting and accreditation, backed by audits, traceability and labeling instruments that shift more responsibility to the consumer in the pursuit of policy goals. As a result, the retailers dominate the terms of trade along food supply chains since the buyers have imposed control and power over suppliers (Rayner *et al.*, 2008): European retailers delivered in 2009 a voluntary environmental code of conduct where the retailers signing up to the code commit to a set of principles and measures aimed at reducing their environmental footprints (EU, 2009). Furthermore, large international businesses, such as Tesco, PepsiCo, Carrefour and others, have already started to label products as having lower carbon footprints during the production, packaging and transport of certain products.



This report presents results of a study undertaken to explore the trends and dynamics within the fish value chain when it comes to sharing information, especially on temperature, as well as to identify potential drivers and barriers for the implementation of a real time electronic information system. The methodology applied is based on a two-step exploratory approach. First, a focus group interview was conducted with ten actors purposively sampled for the study (see Appendix III). The goal of the focus group interview was to gain insight into the experiences of supply chain actors in Iceland on information flows and traceability in fish supply chains and draw out their views on the potentials of the CHILL-ON technologies. Based on the findings from the focus group interview and literature review a question survey was designed and carried out at the Seafood Exposition in Brussels in spring 2010. The exposition provided ideal setting for reaching stakeholders within the fish supply chain. The survey had two objectives: First, to obtain the view of the key commercial players in the fish supply chain regarding existing trust between the chilled chain actors and their willingness to share information. Second, to prioritize main drivers and barriers for implementing electronic information systems, including traceability and real time temperature monitoring systems and quality of products.

## **Aim and methodology**

On the basis of the focus group discussion a questionnaire was designed and administered via a convenience sample at the Seafood Exposition in Brussels, 27-29 April 2010 (n=115). The aim of the survey in Brussel was to obtain the view of the key commercial players in the fish supply chain regarding existing trust between the chill chain actors and their willingness to share information as well as to identify main drivers and barriers for implementing real time electronic information systems, including traceability and real time temperature monitoring systems.

The questionnaire was in English and included ten questions, both fully structured and open ended (see questionnaire in Appendix 1). The questionnaire focused on three central factors that emerged from the focus group: 1) *trust in the value chain and how real time temperature sharing would affect trust between actors*, 2) *information sharing and the use of electronic information systems* 3) *drivers and barriers for implementation of electronic traceability system*. To give examples of questions, trust and the potential to increase trust through real time temperature sharing was measured on five point Lickert scale with response options ranging from 'Strongly agree' to 'Strongly disagree' to statements on the matter. Respondents were also asked to point out where in the supply chain the strongest mistrust existed and which actor(s) would benefit from using a real time temperature monitoring system. Interviewers also jotted down comments from their respondents. Four researchers obtained 115 usable questionnaires. Open ended questions and comments were coded and analysed in similar way as the focus group material and descriptive statistics were run for the remaining data set.

## Results

The results from the Brussel survey are based on a convenience sample of respondents and are thus only indicative of key trends among stakeholders. Since the sample size was small (n=115), the results were not analyzed specifically based on the background information. However, the findings give important insights into the value positions and attitudes of central stakeholders of the fish supply chain.

### Demographics

Background information for companies of the respondents were collected. In total, companies from 34 countries were involved in the survey (Appendix I). Representatives from processing companies were most pronounced (41%), fishing, including auctions encompassed 16% of the respondents, 11% came from aquaculture, 8 % came from transport companies, while service and retail sector were represented by 4% and 3% of the the respondents, respectively (Figure 1 and Figure 2). The company sizes ranged from being of micro size, with less than 10 employees to large companies with more than 250 employees (Figure2).

About one third of the respondents or 38% were employed by large companies and similar ratio or 37% by medium-sized companies (51-250 employees). Only 8% of the respondents were from micro sized companies and 17% from small companies (11-50 employees). The majority of the respondents (72%) interviewed were from sales and marketing departments in the companies, 5% were working in production and processing, 4% in quality management and only 1% in product development (Figure 3). It must be noted that the respondents can be responsible for more than one of the categories as a number of respondents selected more than one activity for their companies.

The venue at the Seafood Exposition gave an opportunity to obtain an international perspective, since the respondents came from 34 countries. The countries were grouped according to geographical regions as seen in Figure 4. Approximately half of the respondent came from Europe and thereof 23% from the Nordic countries. Other main regions of respondents were from N-America (22%) and Asia (17 %) and the remaining 7 % came from other countries.

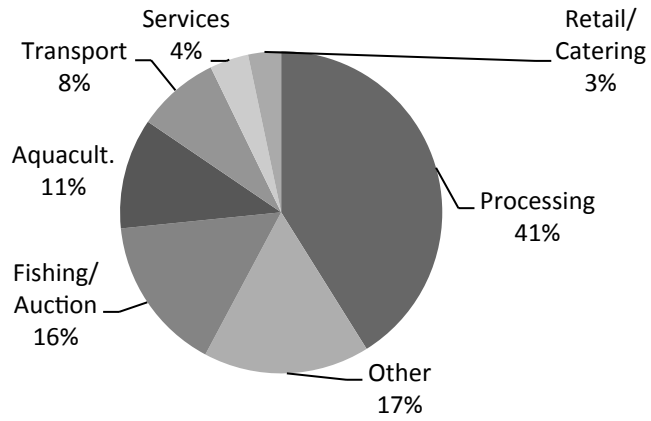


Figure 1. Type of companies of respondent's from 34 countries

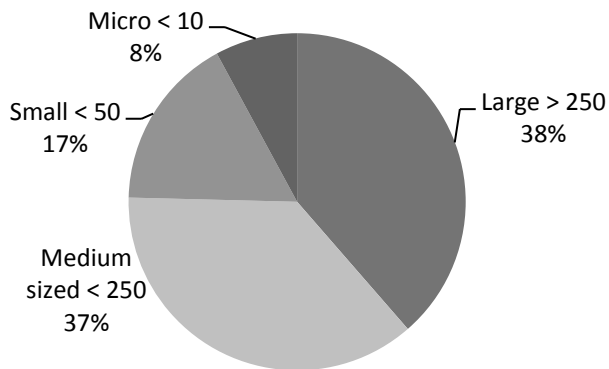


Figure 2. Size of companies according to number of employees

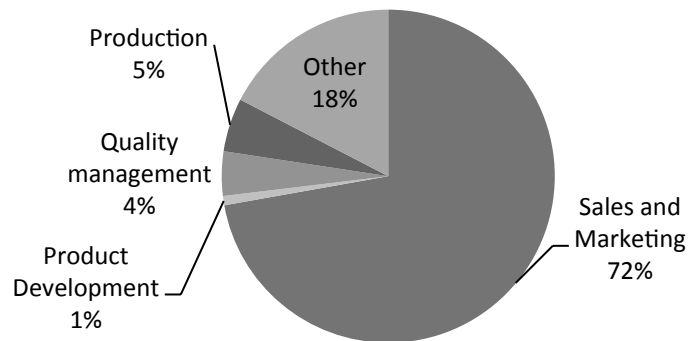


Figure 3. The respondent's position in the company

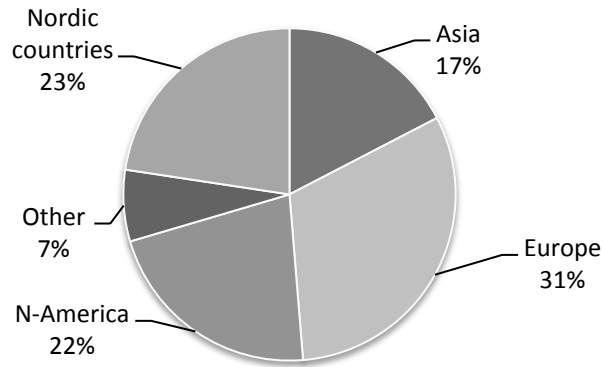


Figure 4. Countries of origin of respondents grouped according to geographical regions

### Trust between actors

Most participants or 85% stated that trust existed regarding information sharing between actors in the supply chain and many said that there were no real communication problems. Almost half or 47% strongly agreed with the statement (see table 1 in Appendix I) and only 9% disagreed with the statement (Figure 5).

Trust was considered necessary for the operation of the business and therefore in place throughout the chain. However, some stated that they were not willing to share all information and the trust depended on the type of chain. For example in aquaculture there is existing trust regarding the temperature, since this can be well controlled and monitoring by dataloggers is a common practice. However, they do not have real time monitoring information but for live fish this was considered a benefit. In the wild fish chain the demands for information and trust depends sometimes on availability of raw material. The mistrust is more if market price is low, since more demands and requirements are then put on suppliers. In such cases it was stated that it would be an advantage to have an overview of the status of temperature in the chain.

A few were neutral or disagreed that there was trust in the chain (15%). For example an IT company providing supply chain management services disagreed that trust was existing in the chain and their opinion was that the cold chain was always broken at some point. Similar opinion was shared by a consultant who claimed that there was not much trust in the chain between actors and definitely not between competitors.

It was stated that traceability is becoming an ever larger issue in the industry and a very important one. In general there is trust, but in case of claims the traceability data is important.

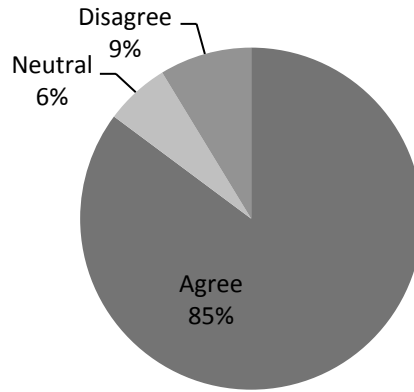


Figure 5 Do you agree or disagree that trust exists regarding information sharing between actors in the fish supply chain?

A negative aspect was the opinion that the status of traceability in some countries outside of Europe was not reliable, but it was accepted and was reflected in lower price.

**Weak links in the chain - where in the chain is the mistrust?**

Those that disagreed to the statement that trust existed in the supply chain were asked where in the chain they thought the strongest mistrust existed. The view on the matter was rather divergent but the most frequently mentioned actor in the supply chain was Primary processing (10 times). Others often pointed out were Transport (9 times), Wholesale (6 times) and Retail/Catering (6 times). Only one actor was never mentioned in this context and it was Insurance companies (See table 2 in Appendix I).

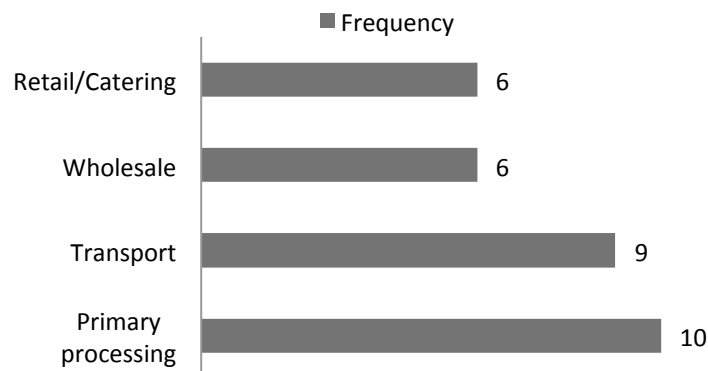


Figure 6. Where in the supply chain does the strongest mistrust exist?

Mistrust can occur anywhere in the chain in all steps until retail. In particular there was mistrust towards the transport at all handover points, between transport and the respective next link i.e. primary processing and transport and further on between the transport and wholesale. Thus, a representative from a company exporting frozen products claimed that there was a lack of trust in the transport. It can be very difficult to have access to temperature readings from the transport

company and this was in agreement with others, who stated that the mistrust in the transport link was related to broken cold chain and to the fact they are not willing to share information. This is however not uncontested. A contradictory view was expressed by a respondent who did not consider this a big issue in the case of frozen products. He claimed that they had an agreement with a transport company and if there were any troubles the transport company would be fired. The mistrust can also exist between retail and consumer. One respondent stated that the way business is done is not based on trust, it is not only regarding temperature, but also information about weight and he claimed that fraud was not uncommon. Lack of trust that can occur between fishing and auctions is often more related to size of the fish and weight rather than temperature. In retail there are often problems associated with taking products in and out of freezers.

### Real time temperature sharing and enhancement of trust in the chill chain

Although most of the respondents believed trust to be existing between actors in the fish supply chain the large majority of them or 84% also believed that a real time temperature sharing between actors could enhance trust and commitment in the chain (Figure 7). More than half of them or 59% strongly agreed with the statement (see table 3 in Appendix I). As can be seen in Figure 7, only 6% disagreed with the statement.

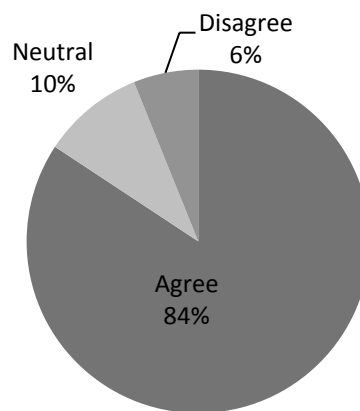


Figure 7. Do you agree or disagree that a real time temperature sharing between actors could enhance trust and commitment in the fish supply chain?

### Verification of quality and transparency

Participants were asked why a real time temperature sharing between actors would enhance trust and commitment in the fish supply chain. The reasons most often mentioned were “Verification” and “Transparency” (see table 4, in Appendix I).

It all comes down to the quality, that has to be ensured for the customers first and foremost. Documentation of actual conditions and processes would be a verification of the condition of the fish and a guarantee of quality, and would enhance trust and prevent fraud. The sharing of

temperature was believed to enhance the trust in the whole chain until sale. Real time temperature monitoring would be positive for supply chain management and all actors would benefit since a well managed, controlled chain with an implemented monitoring system would have an impact throughout the whole chain. This would guarantee freshness and high value products and provide verification for processors and retailers.

Temperature transparency would give companies a competitive advantage since verification of temperature would consequently allow companies to avoid quality problems. Furthermore, less time would be wasted if transparency of temperature would be implemented and this would increase the commitment of the actors and solve problems related to claims.

The general opinion was that it would be useful to ensure the quality of products and this would improve confidence in the supply chain. Moreover, it was stated that it would be an advantage for the customer to know the location and proof of quality of the service.

Proof and verification of critical temperature conditions was considered important in case of breakdown in the cold chain and it would be easier to find out where the break in the chain had occurred. Verification of temperature is often problematic when products are taken in and out of freezer in the chain. As one respondent stated, verification of real time temperature and sharing would enhance transparency and there would be "no more lies".

### **Lack of interest to implement systems for temperature monitoring**

Some operations already have good temperature control and did not see a benefit in additional systems. This underlines the diversity of the fish supply chain that has to be taken into account. Following are some examples of views expressed by those who already had temperature monitoring in place and claimed that there was no need for real time temperature monitoring systems, since they did not see it would enhance trust in any way. This would only be implemented if it would be required by the customer or central authorities: 1) For RSW (refrigerated seawater) system applied at sea, it was mentioned that since temperature was well controlled it was not considered likely that temperature sharing would enhance the trust; 2) In aquaculture, the temperature is already monitored quite well by the use of temperature loggers, so there was not considered a need for an additional system to monitor temperature; 3) A transport company informed that they did not need a real time temperature monitoring in their trucks, since the truck driver could observe the temperature and was responsible for controlling the temperature. The company claimed that their customers trusted them to deliver products at right temperature and did not want to be bothered with worries. Temperature monitoring was in place in some of the trucks, but they were not sharing the information with customers. If required, the temperature data can be exported to a spreadsheet application such as Microsoft Excel and the file sent to customers;

4) For a fresh fish exporter the routine is to measure temperature by handheld devices before sending the products for transport or sale. It was stated that careful control and monitoring of temperature is already in place to meet temperature requirements (2-4°C) for import of fresh fish to the EU; 5) One company who already shares some temperature information with other actors claimed that real-time sharing of information was not needed and this would be very expensive; 6) For frozen products, there was not considered a need for real time temperature monitoring, since good temperature control was in place and therefore, the respondents only saw this as an annoyance, additional work and no added benefits.

Many companies claimed that they were using different types of temperature monitoring although these were not real time logging devices. Data can easily be uploaded from data logging devices into spreadsheets and sent to customers via e-mail. The data logger info is uploaded when necessary and available weekly according to one company where this has been in use for 10-15 years. Others, who were in favour of the real time monitoring system, were still concerned about the **cost** of the system. It was stated that the implementation might be difficult, and some actors did not see it happen.

**Who would benefit by real-time monitoring of temperature?**

Primary processors were most often mentioned (75 times) as the ones in the supply chain who would benefit from using a real-time temperature monitoring system (see table 5 in Appendix I). Other frequently mentioned actors were Retail/Catering and Wholesale. As can be seen in Figure 8 no actor differed significantly in this aspect.

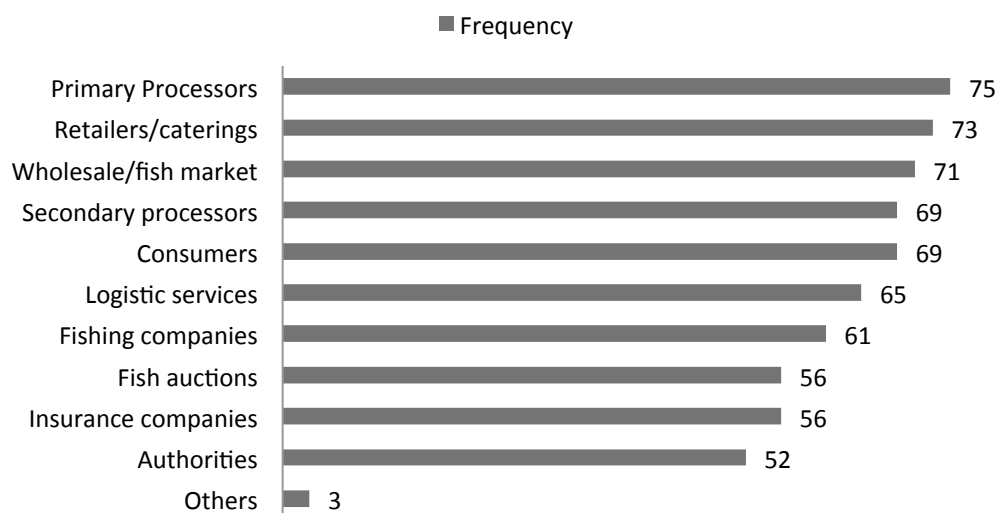


Figure 8. Who in the supply chain would benefit from using a real-time temperature monitoring system?

Participants were asked further if there were any actors that would gain more than others in terms of using a real-time temperature monitoring system.



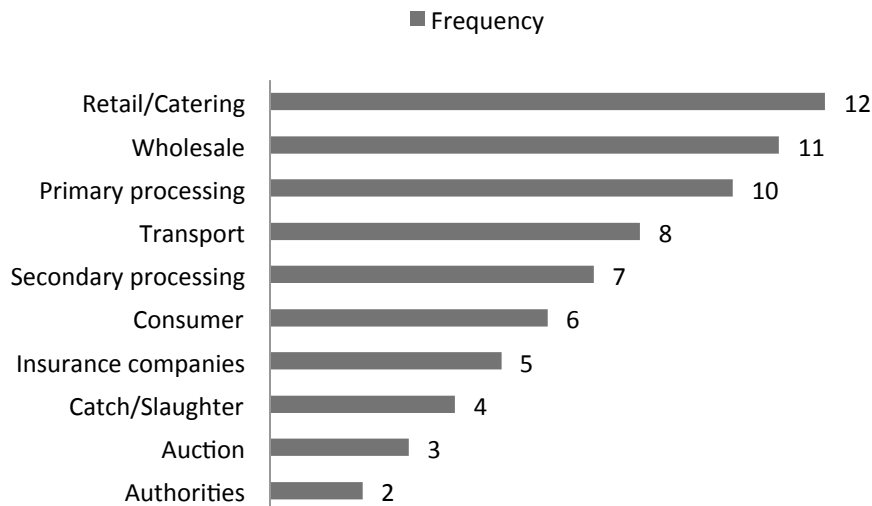


Figure 9. Are there any actors that would gain more than others?

The actor who was most often pointed out was Retail/Catering (see table 6 in Appendix I). All the actors were mentioned by participants, but the frequency was very different as can be seen in Figure 9. In general it was agreed that the end customer (buyer) would always have the biggest advantage. The quality of the product was the main concern of respondents, real time monitoring was considered useful for the whole chain, since this would ensure better quality of products. All actors would benefit but consumers would in the end get better quality.

Insurance companies might have special interest in case of broken cold chain and claims. Primary and secondary processors would benefit and for the transport and logistic services this would be useful for verification. Those who are selling i.e. fish auctions, wholesalers and retailers would benefit from being able to verify the quality and the benefit was also stated as more transparency of conditions in transport from secondary processing to retail

The retail sector would benefit since this would be a verification, that the products had been well managed in the chain and the consumer would benefit from consistent quality of products.

### Sharing of information

Participants use E-mail in 85% of cases to share information with actors in the supply chain. They use Paper/post in 41% of cases and Traceability system in 34% as can be seen in Figure 10.

Basically, all forms of communication are in use today, it is a question of what is the fastest and most effective way to pass on information. E-mail is primarily used (85%) and is the most common form of communication. Internally, the communication is often very informal. This leads to the information not being clear at all times. Telephone is used a lot but is unreliable since paper based evidence is always needed for verification purposes. All information is registered on paper and then put into computerized form. Information on temperature and quality is often

registered in an electronic system. Buyers demand information on quality and HACCP based information and electronic trading system are common.

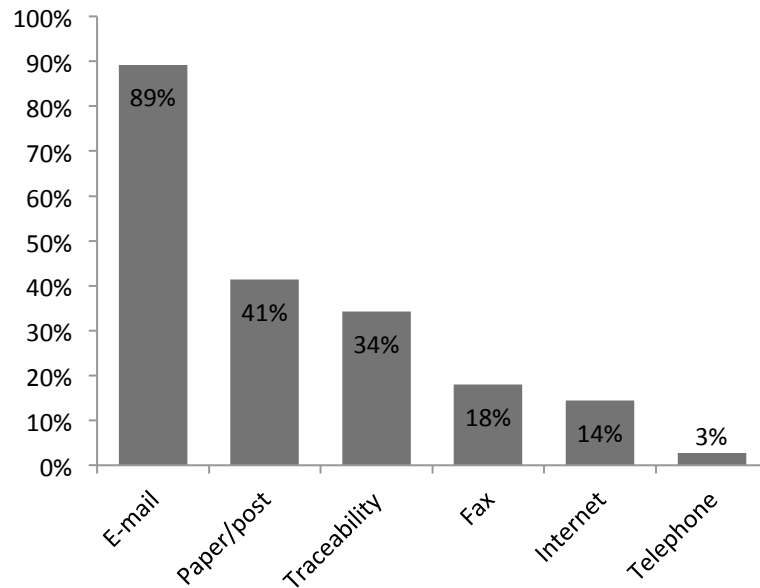


Figure 10. How do you share information with actors in the supply chain?

Traceability information as required by regulations is always at least available in paper based form. If customers need any information the most common means of sharing today is by email. Many claimed that they were not sharing any information with customers, just the invoice and export papers.

IT companies offer traceability and supply chain management system and ERP (Enterprise Resource Planning) systems for the whole chain

Electronic traceability systems either developed in-house or as a solution provided by IT companies were mentioned only by 34% of the respondents and many of them had no system.

Temperature sharing was not at the top of the list for some of the respondents, who mentioned that other variables play a more important role (cost, product size, condition, etc.) and the proof of the location of products was an added benefit. However, it was stated that access should not be given to all in the chain. Sharing of traceability information in general is of importance rather than only the concept of temperature and transparency and enhanced trust would result from sharing information. Some stated that there were no problems to install this kind of system. It is just a question about motivation. Others expressed the view that traceability issues were very important and they regarded it as mandatory to have such a system. Those companies did not see barriers that could not be overcome, since they were confident of the benefits.

A large logistic service company providing a supply chain management system for their customers claimed that there were worries among their customers about the information sharing between companies. It is essential to make sure that only relevant companies can see the data

and no others. It was seen as a benefit to have the possibility to share information with bigger customers, including location of the truck.

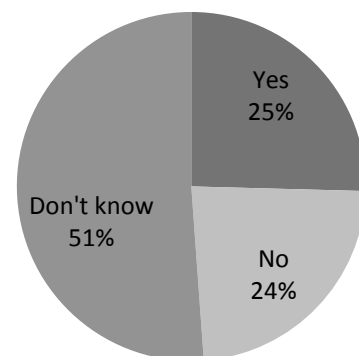
Data loggers are often in use on board the vessels. It was mentioned that sometimes, info can be questionable, i.e. if data loggers are activated later than expected. The reason stated was that sometimes, captains try to save fuel on the boats by not powering on the cooling systems.

Some fishing companies stated that they were already benefitting from electronic systems and on one occasion the company mentioned that they used their ERP system to collect and control traceability information, but they did not share this with others in the chain. It would be beneficial if certificate of origin/catch could be issued and transferred electronically in the chain. Currently, it is time consuming for buyers to obtain certificates for every batch bought at the fish market from different boats. In the case of shipping companies, they already record the temperature. One respondent explained that the company had a huge, precise system in use (APC - Automated Production Control). In this way, they are able to prevent any misunderstanding or if something goes wrong, they had evidence from the system.

### Interoperability of electronic systems

Just over half of respondents did not know whether the electronic information systems were interoperable throughout the supply chain. Twenty five percent believed they were interoperable while 24% did not (Figure 11).

Figure 11. Are the electronic information systems interoperable throughout the supply chain?



Electronic trading systems with traceability information in standardized format like GS 1 or electronic data interchange (EDI), meaning structured transmission of data are in place and often serviced by software companies. However, these systems are often of limited use for smaller companies since they do not possess an entirely interoperable system for traceability, while some big customers have systems that are interoperable according to a IT service and software company. An implemented electronic traceability system was in use by one of their big customer of the company. They send traceability information through special web interface to share traceability information with their customers. According to an Indian company the authorities require certain information which is sent directly to them from the company's ERP system. Implementation of electronic systems was not seen as a benefit by some processors, because they have many different customers, who all

want to use their own traceability systems, so at the end of the day, they would be supposed to implement f.ex. 10 different systems. Other companies, that had not implemented traceability and temperature monitoring systems, claimed that the IT systems needed to be a lot better than they are today. In general traceability systems are often developed only for part of the supply chain i.e. for use onboard vessels where information can be used for stock control, or within a processing company for internal traceability. Between the exporters and buyers, the information is standardized, but the information is not accessible for the consumers. The prices of traceability system varies and companies have difficulties to understand their difference and their benefits.

Some companies which have their own traceability system can only communicate internally but not externally

### **Key drivers for implementing electronic information systems in the fish sector**

The attributes of the key drivers and barriers for implementing electronically based information system and real time monitoring devices, were selected based on results of focus groups and literature sources, when designing the questionnaire. The aim was to facilitate the discussion in the interviews and provide quantitative data for the main trends. The lists of value drivers and main barriers were shown to the respondents (Appendix II) and they were asked to prioritize the suggested attributes from the list. Justifications for selection of attributes for key drivers and main barriers that interviewees were asked to prioritize are, as the whole questionnaire, based on literature review and the view of stakeholder obtained in focus group meetings in the CHILL-ON project (Appendix IV). The results of this prioritation are illustrated in Figure 12 and Figure 13, respectively.

The choice Regulations was most often mentioned (40%) as the key driver for companies to implement new technologies related to food safety (Figure 12). Consumer values were ranked in second place (31%), where quality and shelf life of products were the key attributes. Thirdly, economic factors, such as cost-benefit ratio and improved supply chain management, were considered important (28%). Environmental issues were ranked last (8%) as important drivers for implementing new technologies. However, it was noted that the four choices given were highly dependent on each other.

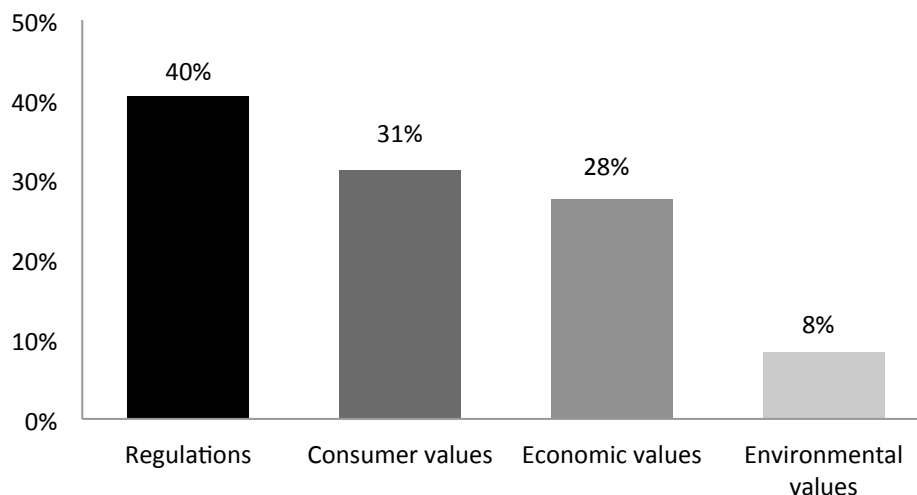


Figure 12. Which of the following choices is the key driver for implementing electronically based information system? Prioritize the choices.

### Regulations

Concern was raised because of the impact of regulations, since actors in the chain did not want additional complications in the trade of fish. Number of actors did not see a need for an electronic traceability system since all traceability information was already in place in the chain, as required by regulations. It was stated that “they had to see the added benefit by implementing electronic traceability system” and many were of the opinion that they would only implement the system, if it was forced upon them by i.e. regulations or their customers. However, systems or demands enforced by regulations were not considered desirable and many respondents mentioned that they did not want the authorities to be involved in pushing for traceability and temperature monitoring systems. If an electronic system would be enforced by regulations, it was noted that it had to be implemented throughout the entire chain. One of the respondents claimed that there was no need for such system and expressed a negative attitude against regulations and requirements and “....simply wanted to manufacture fish without the authorities intervening”. Similar concerns were raised in focus group discussions with fish supply chain actors in Europe (IS), where the view was expressed that the industry was not interested in solutions that were imposed upon them and made reference to the fact that the fish business is a very highly regulated industry, which is burdened by costly audits. If regulated, then companies obviously have to use such a system. It could help to solve issues regarding claims, but they are so few according to respondents in fresh fish export, that installment cost is greater than the losses due to claims. This system is therefore not needed today. A representative from a consulting company, wanted to see much more industry driven initiatives, rather than having regulations as the key driver to influence implementation of new technologies. Those who were in favour of implementing an electronic system believed that it would facilitate more efficient product recall and support efforts to appoint liability of responsible actor in case of damages. More reliable

information of product components and more efficient and transparent record keeping was stated as beneficial to help companies to comply with regulations and facilitate audits (Figure 13)

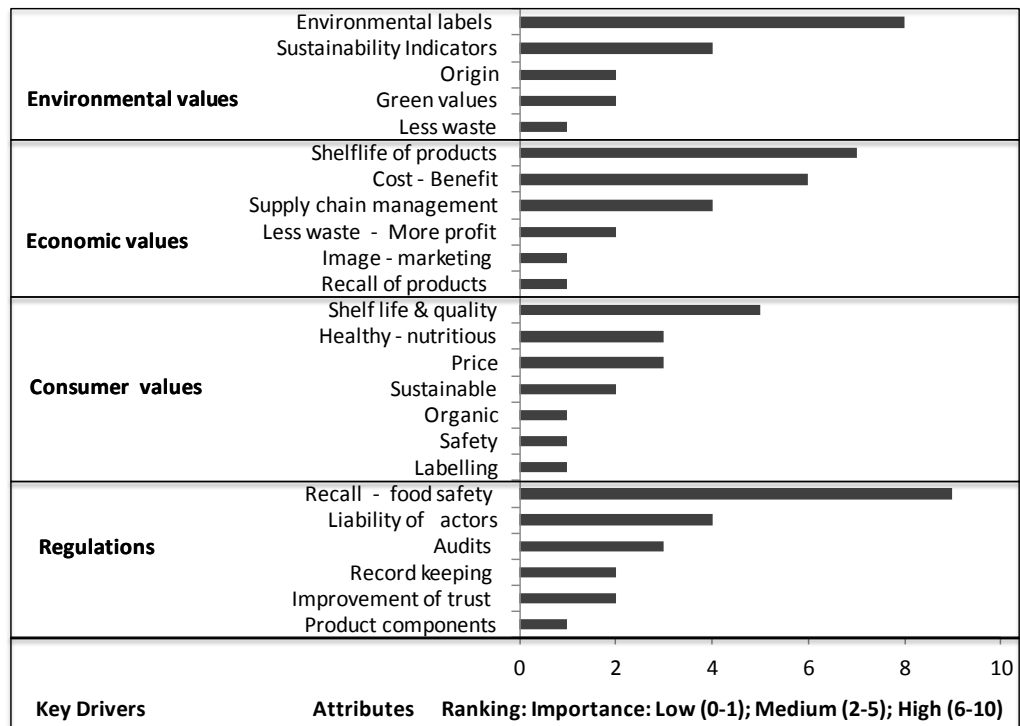


Figure 13 Prioritized attributes of the key drivers categories (regulations, cost, environmental factors and consumer values) for implementing electronically based information system

### Consumer values

Consumer values were prioritised by 31% of the respondents and had almost equal number of respondents, when ranked as the second (30%) and third choice (27%). Only 11% of the respondents considered consumer values as the least important driver. The attributes of the consumer values selected, are well acknowledged as determinants in buying behaviour. Here, shelflife and the quality of products were the most important attributes. According to respondents who were selling aquaculture products (i.e. sea bass and sea bream from Turkey and Greece), the price, cost, healthy and nutritious products, origin and labelling, were selected as the main consumer attributes. If the system would ensure improved quality, it was seen as an added benefit. In general the view on the consumer values was that, the price is most often the main determinant when purchasing food, but shelf life, quality, freshness, taste, healthy and nutritious attributes are of high value. Environmentally concerned consumers and niche groups are looking at labelling and appreciating values like origin, green, sustainable and organic production.

### Economic values

Economic values were ranked first as the key driver by 28% of the respondents, but 43% ranked economic values as the second most important driver. Shelflife was considered most important, which was also in agreement with the key attribute of consumer values. Consumer values and quality of products were always prioritised by the processors, since it was considered most

important to ensure shelflife and quality of products to meet both consumer and economic values. Shelf life and healthy nutritious products were drivers, safety was taken for granted, but cost was an issue. The attributes cost/ benefit and supply chain management were considered important for many. Better supply chain management and means to ensure shelflife of products are of key importance and customers are interested in improved efficiency in the chain, better quality and less waste. Some of those who ranked economic values as most important drivers also stated that supply chain management and traceability were important drivers and considered faster recall of products the main advantage.

Economic values are of major concern for businesses when evaluating the possibility to implement new technologies and the cost /benefit ratio is the main determinant.

### **Environmental values**

Only 8% of the respondents prioritized environmental values in first place. A lot of feedback is coming backwards in the chain and influencing improvements, but environmental values were still considered the least important factor by 56% of the respondents. The companies were mainly interested in the application of environmental labels as marketing tools as seen in high value of responses (Figure 13). Many respondents noted, that environmental awareness influenced the retailers, who were considered a key driving force and pushing for information, but the consumers were believed to be less aware. Environmental labels (Marine Stewardship Council, MSC), Save /Friend of the Sea, and sustainability indicators like CO<sub>2</sub> footprint are gaining interest as marketing tools. A company holding an MSC certification (mackerel and herring) was interested in sustainability indicators from a marketing point of view. Sustainability and environmental issues are of interest to support marketing approaches for industry and in particular of interest for the retailers. Life Cycle Assessment (LCA) of products and carbon footprints as environmental indicators were therefore of interest for labelling purposes. The retailers in the UK are asking for MSC certification. This requires audits and is time consuming according to a respondent from a company producing MSC certified products. They have good control over the fishing and are Certified by Friends of the Sea (Human killing methods). The operation is well monitored and efficient, but the trade is already burdened by regulatory requirements. It was noted that sustainability demand and certification was primarily of interest for northern Europe, Germany, UK, France, Norway and Sweden. South Europe for example Spain and Portugal are not interested in environmental certification.

It was commented that all the value drivers suggested were linked and highly dependant on each other. Efficiency of the production and the processes is the key, economical, environmental and consumer value are equally important. Therefore, all values mentioned have equal importance as stated by one of the respondents.

In Faroe islands there is a governmental lead and support for sustainable fisheries. They believe that their fisheries are sustainable and MSC chain of custody certification was in process for a company for saithe. Many companies were interested in MSC labels, although there were mixed opinions on the value of the label. Environmental demands exist in the trade according to a company with a MSC certification, who expressed his opinion as follows: “regulatory drivers are mandatory, while environmental values are currently the key marketing driver. Consequently environmental values are interlinked with economic values and environmental labels are currently very important as marketing tools”.

For aquaculture companies, environmental labels and indicators were considered important drivers, there are however no specific sustainability indicators defined although the companies state that their products are sustainable, but in general organic aquaculture is assumed to be sustainable. Organic is a niche which is growing to a certain level as well as the demand for healthy and nutritious food.

### Barriers for installing electronically based system

Participants were also asked to prioritize likely barriers when installing electronically based system that is capable of sharing real time information on traceability data, GPS location, temperature and shelf life. The factors were Cost, Trust and communication and Technical issues (Figure 14).

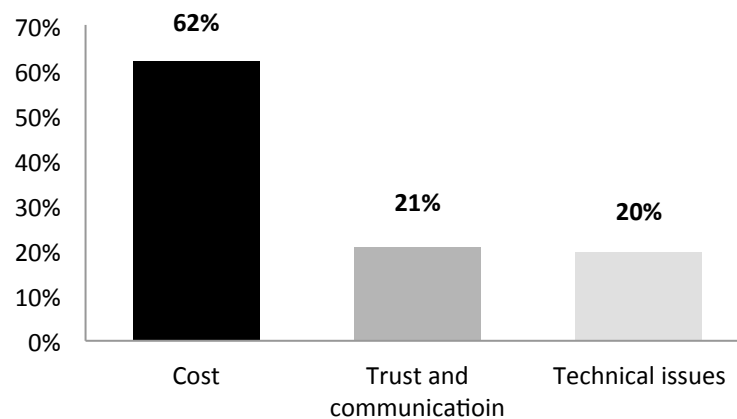


Figure 14. Prioritise following factors as possible barrier that could arise when installing electronically based information system for sharing real time information on traceability data, GPS location, temperature and shelf life



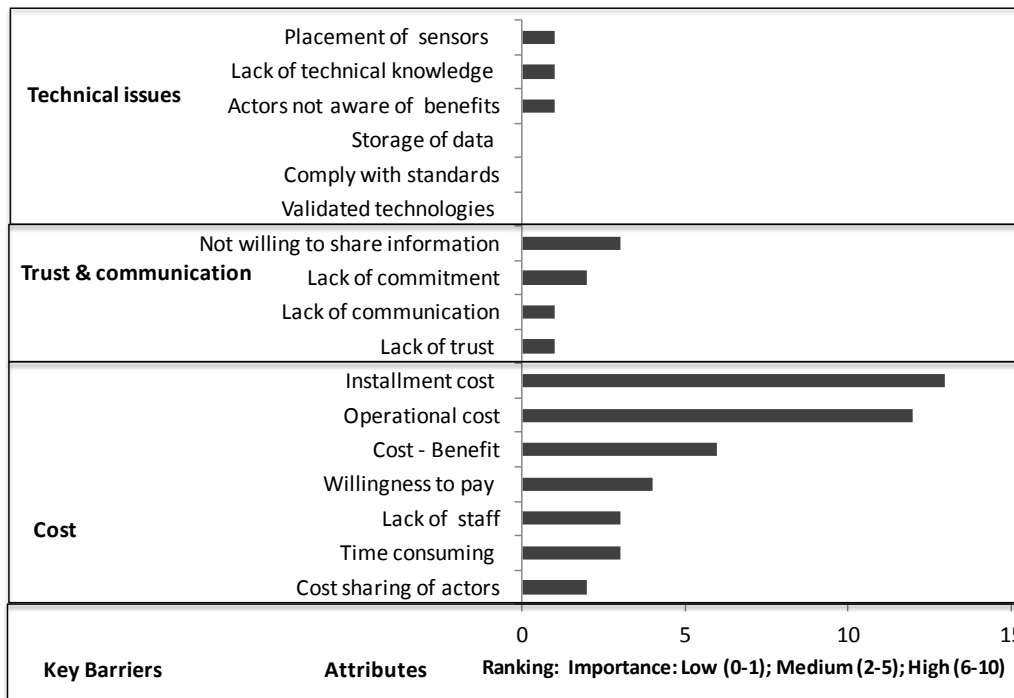


Figure 15. Prioritized attributes of the key barriers' categories (cost, trust or technical issues) that could arise when installing electronically based system that is capable of sharing real time information on traceability data, GPS location, temperature and shelf life

### Cost

The factor Cost was most often pointed out (62%) as the main barrier (Figure 10). Cost benefit ratio is important and cost issues i.e. installment cost and operational cost were identified as the main barriers for some companies and cost issues were pointed out most often. In focus group discussions in agreement with respondents in Brussels the cost issues were of main concern as barriers. The installment cost, operational cost, lack of staff and more time consuming processes were all factors of importance when evaluating the cost benefit of the implementation and the willingness to pay for new technologies.

Cost sharing of supply chain actors has been emphasised and the role of government to facilitate the implementation of standardised electronic system while other believe that industry driven initiatives will be more successful.

For the smaller companies, the willingness to pay and operate an electronic system appeared to be the largest barrier according to respondents. Today, such a system is not needed in small companies, because 'everything always works out eventually' according to one of the respondents.

Only about 16% selected "Cost" as the least likely barrier (see table 10 in Appendix I). Those who were not concerned with cost stated that besides the installment cost, no barriers existed and thus cost was not important. Cost is only an issue if you do not understand the value of information. If the right technology would be available and the system was robust and

maintenance free it was assumed that the system would be of a benefit in particular if customers could log in to view the temperature.

### **Trust and communication**

Trust and communication was prioritized as the most likely barrier by about 21% of the respondents, but almost 46% selected this factor as the least likely barrier.

Comments from the respondents indicated that many were not willing to share information and this may be an important barrier linked to lack of trust. For such a system to be feasible, all actors in the chain would have to collaborate. However, some were concerned that each customer had to be assured that no one else had access to his information and they were not in favour of sharing information with their customers. Therefore, lack of trust and lack of communication between actors in the supply chain appeared to be barriers. Some respondents stated that there was little demand for such a system, and therefore lack of motivation and no commitment since nobody had asked them for this kind of service. Others mentioned lack of interest to implement such systems, since they did not see the value in the system and were not sure, that such systems would guarantee improved quality.

### **Technical issues**

Less than 20% of respondents considered technical issues the most likely barrier, but roughly half of those interviewed ranked technical issues in second place (51.2%) as barriers. Technical issues were seen as the main barriers for companies with low technology skills. Technical issues were not seen as a problem for example on larger boats that are already well equipped<sup>1</sup>. It was commented that new technologies always needed to be adapted, but this would be solved if the technology is worthwhile and benefits would be proven to exceed the costs. Some respondents stated that they already had a system in place. However, some actors noted that the common benefits of actors were not clear, and some might not be aware of the benefits that the new technologies could offer. The demand is that the technologies or systems have to be as good or better than current system regarding the accuracy and precision, the technologies need to be validated and they have to comply with standards and current legislations.

Lack of commitment to operate the system efficiently, may prove to be a barrier and others also mentioned that a lack of standardised form of information for sharing data would be a barrier. This was noted by a company who had their own system, but did not share the information. They were worried about the technical aspect of sharing information.

Practical constraints like difficulties in placement of remote sensors / tags on units (pallets or boxes), and difficulties in retrieval of remote sensor / tags were identified as barriers for their

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<sup>1</sup> ISO TC234 Technical committee on Fisheries and Aquaculture. Draft International standards for traceability of finfish in Aquaculture and capture fisheries. Working Group 1

implementation in focus group discussions with Icelandic stakeholders. This is in agreement with interviews in Brussels where discussions about complications regarding retrieval of equipment were common, and actors asked if the tags for temperature monitoring was a single trip usage.

### **Lack of knowledge**

Supply chain actors may not all be aware of potential benefits of new technologies and lack of technical knowledge in companies may hinder the uptake of new technologies. Lack of knowledge in the companies may be a barrier since the staff does not understand the real value of information provided by electronic systems. One respondent underlined the need to educate people within the companies. It was also pointed out that knowledge was lacking among the consumers, not least regarding temperature. Furthermore, concerns were expressed that the current technology in many trucks does not provide any possibilities of sharing information with others and thus the flow of knowledge between handover points is impeded. A respondent from a trucking company explained that there was a need for trust in the chain. He stated that trust was usually in place, but not always and according to his opinion, information sharing was usually not an issue with trust but rather technical issues and lack of knowledge. Another company who was an agent for transport of goods stated that there was a big difference between companies in their attitude towards sharing of information. Many times the drivers were an obstacle, since they were not familiar with the technologies. In the case of trucking / transport it was mentioned that it can be troublesome to retrieve data from the truck or the container for sharing, since there was not a central control of this data.

## **Conclusions**

According to the stakeholders opinion trust was considered necessary for business and therefore in place throughout the chain. However, some stated that they were not willing to share all information. In fact, when a question about potential mistrust was posed, it was generally agreed that mistrust can occur anywhere in the chain. The majority of the respondents agreed with the statement that sharing of real-time temperature data between actors would enhance trust and commitment in the fish supply chain. However, those who did not agree stated that temperature was already controlled and monitored well by handheld devices or data loggers. The main concern was that sharing of electronic data would be too costly, extra work, "annoyance", and with no added benefits. Proof and verification of critical temperature conditions was however considered important in the case of a breakdown in the cold chain. It was also acknowledged that it would be easier to determine where the break in the chain had occurred if sharing of electronic temperature data were in place. For the customer, the verification of the GPS location and proof of quality of the transport service were considered as benefits.

Regulations were mentioned most often as the key driver for implementing an electronically based information system. Consumer values were ranked in second place, where quality and shelf life of products were the key attributes. Thirdly, economic factors, such as cost-benefit ratio and improved supply chain management, were considered important. Environmental issues were ranked last as important drivers for implementing new technologies. However, it was noted that the four choices given were highly dependent on each other. Environmental issues were considered as marketing tools and important to enhance companies' image and to address consumers' environmental awareness and sustainability demands.

The findings from the survey verified that cost was the main barrier for installing an electronically based system that is capable of sharing real-time information on traceability data, GPS location, temperature, and shelf life. The cost-benefit ratio was emphasized, as well as barriers regarding installation and operation cost and the short-term issue that it would be time consuming to have such a system implemented.

#### **Limitations and suggestions for further work**

More extensive survey is underway and will give information about the different needs and views in various steps of the supply chain in particular environmental awareness and actual actions performed to meet environmental demands. The survey did not include questions on what companies are doing to enhance their environmental performance, but some companies mentioned that they were focusing on more environmental friendly packaging than EPS boxes, and were looking into solutions with reusable boxes with RFID labels. It was also considered useful if the system could promote more efficient use of energy and consider sustainability issues.

## **Acknowledgement**

The studies reported herein were funded by the sixth framework EU-funded project CHILL-ON (project no. FP6-016333-2) entitled “Developing and integrating novel technologies to improve safety, transparency and quality assurance of the chilled/frozen food supply chain - test case fish and poultry”. The authors would like to thank the Icelandic focus group participants for their valued input and the respondents at the Brussels Seafood Exposition.

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## Appendix I - Frequency tables

### Type of company

	N	Percent (%)	Percent of cases (%)
Processing	74	41,1	64,3
Fishing/Auction	28	15,6	24,3
Aquaculture	20	11,1	17,4
Transport	15	8,3	13,0
Services	7	3,9	6,1
Retail/Catering	6	3,3	5,2
Other	30	16,7	26,1
<b>Total</b>	<b>180*</b>	<b>100%</b>	<b>157%</b>

*\*Companies have multifunctional operation therefore the total number of type of company is higher than the number of interviews*

### Size of company (no. of employees)

	N	Percent (%)	Valid percent (%)
Large > 250	44	38,3	38,6
Medium sized < 250	42	36,5	36,8
Small < 50	19	16,5	16,7
Micro < 10	9	7,8	7,9
Missing	1	0,9	-
<b>Total</b>	<b>115</b>	<b>100%</b>	<b>100%</b>

### What department of the company does the respondent represent?

	N	Percent (%)	Valid percent (%)
Sales and Marketing	83	72,2	72,2
Product Development	1	0,9	0,9
Quality management/Risk management	5	4,3	4,3
Production	6	5,2	5,2
Other	20	17,4	17,4
<b>Total</b>	<b>115</b>	<b>100%</b>	<b>100%</b>

### Respondents position in the company

	N	Percent (%)	Valid percent (%)
Management	84	73,0	73,7
Staff	30	26,1	26,3
Missing	1	0,9	-
<b>Total</b>	<b>115</b>	<b>100%</b>	<b>100%</b>

**Respondents country**

	<b>N</b>	<b>Percent (%)</b>
China	8	7,0
England	2	1,7
Faroe Islands	3	2,6
France	7	6,1
Norway	7	6,1
Denmark	9	7,8
Scotland	6	5,2
Iceland	7	6,1
Russia	1	0,9
Turkey	1	0,9
Azores Islands	1	0,9
Netherlands	2	1,7
New Zealand	1	0,9
Germany	3	2,6
Shetland Islands	1	0,9
Madagascar	1	0,9
Italy	3	2,6
Ireland	4	3,5
USA	18	15,7
Canada	7	6,1
Spain	3	2,6
Belgium	2	1,7
Portugal	1	0,9
Oman	1	0,9
Greece	2	1,7
Vietnam	3	2,6
Chile	1	0,9
South Africa	1	0,9
Malasia	2	1,7
Marocco	1	0,9
Thailand	2	1,7
Taiwan	1	0,9
Argentina	1	0,9
South Korea	1	0,9
India	1	0,9
<b>Total</b>	<b>115</b>	<b>100%</b>

Table 1. Do you agree or disagree that trust exists regarding information sharing between actors in the fish supply chain?

	<b>N</b>	<b>Percent (%)</b>	<b>Valid percent cases? (%)</b>
Strongly agree	53	46,1	46,5
Rather agree	44	38,3	38,6
Neutral	7	6,1	6,1
Rather disagree	8	7,0	7,0
Strongly disagree	2	1,7	1,8
<i>Missing</i>	1	0,9	-
<b>Total</b>	<b>115</b>	<b>100%</b>	<b>100%</b>

Table 2. Where in the supply chain does the strongest mistrust exist?

<b>Actor</b>	<b>Number of times</b>
Primary processing	10
Transport	9
Wholesale	6
Retail/Catering	6
Catch/Slaughter	5
Secondary processing	3
Auction	3
Consumer	3
Authorities	1
Insurance companies	0
<b>Total</b>	<b>45</b>

Table 3. Do you agree or disagree that a real time temperature sharing between actors could enhance trust and commitment in the fish supply chain?

	<b>N</b>	<b>Percent (%)</b>	<b>Valid percent(%)</b>
Strongly agree	67	58,3	58,8
Rather agree	29	25,2	25,4
Neutral	11	9,6	9,6
Rather disagree	3	2,6	2,6
Strongly disagree	4	3,5	3,5
<i>Missing</i>	1	0,9	-
<b>Total</b>	<b>115</b>	<b>100%</b>	<b>100%</b>



Table 4. Why would a real time temperature sharing between actors enhance trust and commitment in the fish supply chain?

	<b>N</b>	<b>Percent (%)</b>	<b>Valid percent (%)</b>
Verification	16	13,9	13,9
Transparency	4	3,5	3,5
Cold chain break	1	0,9	0,9
Enhanced trust	1	0,9	0,9
Food Safety	1	0,9	0,9
Guarantee of Quality	1	0,9	0,9
If it would be possible	1	0,9	0,9
Implementation difficult	1	0,9	0,9
Increase commitment, improvements in claim situations	1	0,9	0,9
<b>Total</b>	<b>27</b>	<b>100%</b>	<b>100%</b>

Table 5. Who in the supply chain would benefit from using a real-time temperature monitoring system?

	<b>N</b>	<b>Percent (%)</b>	<b>Percent of cases (%)</b>
Primary Processors	75	11,5	70,8
Retailers/caterings	73	11,2	68,9
Wholesale/fish market	71	10,9	67,0
Secondary processors	69	10,6	65,1
Consumers	69	10,6	65,1
Logistic services	65	10,0	61,3
Fishing companies	61	9,4	57,5
Fish auctions	56	8,6	52,8
Insurance companies	56	8,6	52,8
Authorities	52	8,0	49,1
Others	3	0,5	2,8
<b>Total</b>	<b>650</b>	<b>100%</b>	<b>613%</b>

Since participants could mention more than one actor the total percent of cases exceeds 100%

Table 6. Are there any actors that would gain more than others?

Actor	Number of times
Retail/Catering	12
Wholesale	11
Primary processing	10
Transport	8
Secondary processing	7
Consumer	6
Insurance companies	5
Catch/Slaughter	4
Auction	3
Authorities	2
<b>Total</b>	<b>68</b>

Table 7. How do you share information with actors in the supply chain?

	N	Percent (%)	Percent of cases (%)
E-mail	99	44,6	89,2
Paper/post	46	20,7	41,4
Traceability	38	17,1	34,2
Fax	20	9,0	18,0
Internet	16	7,2	14,4
Telephone	3	1,4	2,7
<b>Total</b>	<b>222</b>	<b>100%</b>	<b>200%</b>

Since participants were able to choose multiple options the total added proportion exceeds 100%

Table 8. Are the electronic information systems interoperable throughout the supply chain?

	N	Percent (%)	Valid percent (%)
Yes	29	25,2	51,8
No	27	23,5	48,2
Don't know	59	51,3	-
<b>Alls</b>	<b>115</b>	<b>100%</b>	<b>100%</b>

Table 9. Which of the following choices are the key driver for implementing electronically based information system? Prioritise the choices.

	<b>Most important (no. 1)</b>	<b>no. 2</b>	<b>no.3</b>	<b>Least important (no.4)</b>
Regulations	40,40%	17,10%	20,00%	17,80%
Consumer values	31,20%	30,30%	27,30%	11,10%
Economic values	27,50%	43,40%	18,20%	15,60%
Environmental values	8,30%	22,40%	34,50%	55,60%
<b>Total</b>	<b>107%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>

Since some participants chose more than one option as priorities number one, the total added proportion exceeds 100%

Table 10. Which of three following factors are possible barriers that could arise when installing electronically based information system that is capable of sharing real time information on traceability data, GPS location, temperature and shelf life? Prioritise the factors.

	<b>Most likely barrier (no. 1)</b>	<b>no. 2</b>	<b>Least likely barrier (no.3)</b>
Cost	62,0%	27,9%	16,2%
Trust and communication	20,7%	23,3%	45,9%
Technical issues	19,6%	51,2%	37,8%
<b>Total</b>	<b>102%</b>	<b>102%</b>	<b>100%</b>

Since some participants chose more than one option as priorities number one and two, the total added proportion exceeds 100%

## Appendix II - Guidelines for interviews at the Brussels Seafood Exposition 2010

**Fill in your name and date on each survey sheet**

**Introduction :** University of Iceland is conducting this survey as a part of an ongoing EU project

**The survey should take about 5-10 minutes**

**The Chill-on project** is funded by the EC (6th Framework programme). 25 partners from 12 countries.

**The aim of the project** is to develop and implement technologies to ensure traceability, quality and safety in the supply chain of fish (and poultry)

Software and hardware development: Remote temperature sensors /RFID, data acquisition, storage and retrieval of data - Visualisation of data (Tracechill server) – Supply Chain management –

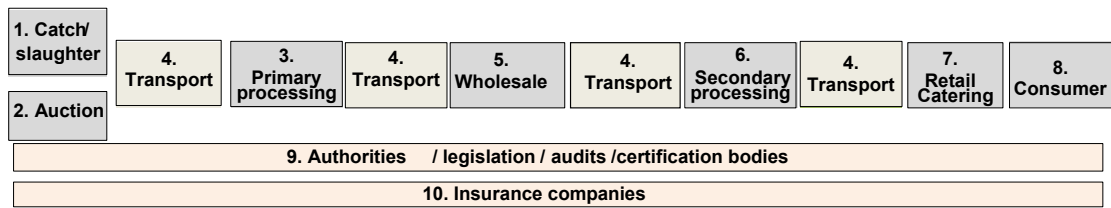
Decision support system / shelf life prediction - rapid microbial testing, TTI/ OnVu.

**The aim of the questionnaire** is to obtain the view of the **key commercial players** in the fish supply chain to identify main drivers and barriers for implementing electronic information systems, including traceability and real time temperature monitoring systems:

- **Trust between actors** regarding sharing of information that **influence quality, safety, and traceability of products and transparency** in the whole supply chain
- Identify **the main drivers** for implementing real time temperature monitoring systems
- **Benefits and barriers** for installation/implementation of the technology/system?
- What systems/services are already implemented in the supply chain to transfer information ?
- Are the **systems interoperable** ?



### Example of food supply chain



1. Fishing companies
2. Fish auctions
3. Primary processors
4. Logistic services / transport
5. Wholesale /fish market
6. Secondary processors
7. Retailers/catering
8. Consumers
9. Authorities
10. Insurance companies
11. Others, who?

**6. Which of the following choices is the key driver for implementing electronically based information system?**

1. Regulations
2. Economic values
3. Environmental values
4. Consumer values

***Which of the following factors are important, please prioritize ?***

**If impact of Regulations (General Food Law) no 1.**

1. More efficient product recall - food safety
2. Facilitates efforts to appoint liability of responsible actor (in case of food safety issues or fraud)
3. More reliable information of product components (i.e origin)
4. Improvement of trust
5. More transparent record keeping
6. Facilitates audits to verify company's performance (traceability, quality and safety checks)
7. Other

**If economical values no. 1**

8. Cost - Benefit
9. Supply chain management
10. Shelflife of products / FEFO v.s. FIFO
11. Less waste - More profit
12. Enhance the image of the company - benefit for marketing
13. Faster and more accurate recall of products
14. Other

**If environmental values no. 1**

15. Environmental labels (MSC / Regional – National)
16. Origin
17. Less waste
18. Sustainability Indicators (Life Cycle Assessment , CO – footprint, Food mileage)
19. Green values
20. Other

**If consumers values no. 1**

21. Cost
22. Labelling
23. Healthy - nutritious
24. Safety
25. Shelf life and quality
26. Sustainable
27. Origin
28. Green values
29. Organic
30. Other

**Barriers**

**7. Can you imagine any barrier(s) that could arise when installing electronically based system that is capable of sharing real time information on traceability data, GPS location, temperature and shelf life. ?**

***Please prioritize the most important factors***

**Trust and communication**

1. Lack of trust
2. Lack of communication between actors in the supply chain
3. Common benefits of actors not clear
4. Lack of commitment
5. Not willing to share information

**Cost**

6. Cost - Benefit
7. Installment cost
8. Operational cost
9. Willingness to pay
10. Time consuming
11. Lack of staff
12. Cost sharing of supply chain actors

**Technical issues**

13. Actors not aware of potential benefits of new technologies and systems
14. Lack of technical knowledge in the supply chain /companies
15. Difficulties in placement of remote sensors /tags on units (pallets – boxes)
16. Difficulties in retrieval of remote sensor / tags
17. Technologies /systems have to be as good or better than current system
18. Accuracy and precision of technologies/systems
19. Technologies need to be validated
20. Have to comply with standards
21. Storage of data that is not processed and exploited is expensive

**OTHER**

## **Appendix III - CHILL-ON –Summary from a focus group study**

Johannesson G.Th. and Gudmundsdottir, H. 2010. CHILL-ON –Summary from a focus group study. Report for Laboratory of Applied Supply Chain Systems, Social Science Institute, University of Iceland, May 2010.



## **CHILL-ON**

### **Summary from a focus group study**

For the Laboratory of Applied Supply Chain Systems

May 2010

Gunnar Þór Jóhannesson

Hrefna Guðmundsdóttir



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## Overview of execution

**Description:**

**Carried out for:**

The Laboratory of Applied Supply Chain Systems at the University of Iceland.

**Aim:**

To gain insight into the experiences of supply chain actors in Iceland of information flows and traceability in fish supply chains

**Method:**

Focusgroups

**Date:**

15 April 2010

**Date of report delivery:**

10 May 2010

**Project managers:**

**Hrefna Guðmundsdóttir and Gunnar Þór Jóhannesson**

## Introduction

This report presents a summary of findings from a focus group interview conducted by the Social Science Research Institute of the University of Iceland for the Laboratory of Applied Supply Chain Systems at the University of Iceland. The study is one part of an EC funded Integrated Project titled CHILL-ON of which the goal is to develop a holistic supply chain management decision support system ([www.chill-on.com](http://www.chill-on.com)). The emphasis in the group discussion was to gain insight on participant's view on traceability in fish supply chains, their experience of information flows between supply chain actors and their attitudes towards novel technologies for monitoring the condition of fish along the value chain.

The report begins with a short description of the objectives of the focus groups interview and the participants. The sections that follow recount the main conclusions of the focus group. They are organized around central themes of the group discussion. The report closes with concluding remarks that summarize significant issues about the attitudes of supply chain actors towards the CHILL-ON technologies.

## Research description

### **Objectives**

One of the key aims of the CHILL-ON project is to provide supply chain actors with an electronic Supply Chain Management and Decision Support System (Ólafsdóttir *et. al*, 2009). This is done through an integrated approach that combines technologies allowing real time temperature monitoring, rapid detection of bacteria (qPCR), shelf-life prediction models and information about geographic location. The overall objective is to provide consumers with improved quality, safety, transparency and traceability.

The goal of the focus group interview was to gain insight into the experiences of supply chain actors in Iceland of information flows and traceability in fish supply chains and draw out their views on the potentials of the CHILL-ON technologies. On the basis of the group discussion a questionnaire was designed that was used to gather data on the view of key actors in the supply chain at the Seafood Exposition in Brussels, 27-29 April 2010 (Appendix II).

## **Method and participants**

The Social Science Research Institute (SSRI) conducted the focus group interview on the 15th of April. The Laboratory of Applied Supply Chain Systems at the University of Iceland provided a list of potential participants that were contacted by the SSRI. Ten people participated in the group apart from moderators. The group of participants was composed of supply chain actors related to all major handover points in a typical value chain of fish except consumers. The interview was held at the University of Iceland. It was based on an interview guide designed by the SSRI in collaboration with the Laboratory of Applied Supply Chain Systems (Appendix I) and lasted for about two hours. All participants received a gift afterwards as a token of appreciation.

The interview was analyzed according to general techniques of qualitative data analysis. As it followed a strict interview guide, the analyzing process was selective from the beginning. Below, a summary of the main findings is presented.

### **The current experience of functionality and condition in fish value chains**

The interview started with a discussion on the current state of affairs within the value chains of fish. According to participants, traceability is crucial for them to run their daily businesses. In general, traceability has improved immensely over recent years, mainly due to a value change among the supply chain actors. It is pointed out that there has not been a legal domestic demand on traceability in Iceland until March this year, although clients abroad have required this for exported foods for many years. Handover points were traditionally critical in this regard and although the situation is much better than before, there is no system in place that ensures that one is capable of retrieving information from all actors in the chain. It is still very time consuming to trace the product along the whole chain and actors are not always willing to share information.

In general, participants felt traceability was important for two main reasons. First, it is of great value to guarantee the delivery of the product. Second, it is essential for securing the quality of the product and mends any problems that come up now and then. If the company in question is not in charge of the whole chain, this may however be problematic as a participant from the insurance sector underlined.

In general, participants were rather satisfied with the current procedure on what information should be available. If they have information on product number, date of production and name of producer, they are confident of being able to trace the trajectory of the products and find and fix potential quality issues. The main reason is of course that the product's unique ID number includes agreements and information that specify the content and quality of the product. Basically, there is no perceived need for more information, but rather a system that ensures that the necessary information can be transferred in a standardized form along the whole value chain.

When asked about the importance of monitoring the temperature of the product, participants said that this was actually already in place, although not in real time. This was not thought to be a huge issue in the case of frozen products since actors had access to this information if something went wrong. In the case of fresh fish chains, the temperature is crucial and checked regularly, yet not in every shipment. The representatives of producers at the table did not think that monitoring real time temperature would add much to the current procedure. A participant from the insurance sector issued a different point. He highlighted that it sometimes costs a great fuss to obtain access to temperature information in case of damages of the product and access to real time temperature information would make it a lot easier to solve disputes and thus save a lot of time and money.

Following this, a discussion came up on electronic traceability, which has been debated about for several years without any obvious solution. Some of the participants had experienced that a potential solution stranded on various complications. Part of the problem is that the parameters defined are thought to be too detailed to be implemented but the problem is also technical in that there is no standardized way to mediate the information as different actors rely on different information systems that not necessarily "talk" to each other. This means that information is mediated both in paper format and electronically. Furthermore, this highlights one of the central problems related to the current state of affairs, which is that the same information is recorded over and over again at different points in the supply chain. If a standardized traceability system is to be established and implemented, it has either got to be so simple and general that all actors are capable of integrating it into their activities or it has to be a top-down political decision. Hitherto, the major mistake has been that standards are too complicated from the outset. Instead of

trying to cover everything from the beginning, one should start with a simple and general framework.

At the end of the day, what matters most is the cost-benefit ratio.

### Novel technologies

The next phase of the interview focused on exploring the potentialities and barriers related to new technology, that would enable real time temperature monitoring and yield, information about geographical location during transportation and thus enhancing electronic traceability.

#### Potentialities

When asked about the potentialities, actors had different opinions. A summary of the most prominent potentialities identified is listed in table 1.

Table 1. Potentialities of an electronic traceability system

Potentialities
Secures transport
Assists insurance companies
Enhances quality control
Could simplify record keeping
Enhances supply chain management

A representative from the transport sector was quick to see the possibilities that the GPS and real time temperature monitoring technology would create. It would better secure the transport, the risk of (human) error in record keeping would decrease and thus it would also save time if something went wrong as it would be easier to trace the trajectory of the product in question.

The representative from the insurance sector was also very positive towards this kind of technology. He was sure that the type of information that this sort of system could yield would make their work much more effective and save a lot of time, and thus ultimately money, for their customers. The most important thing would be the possibility to gain information about where in the supply chain something goes wrong and whether the product is damaged or not. On that basis, it would be much easier to implement effective safety measures.

In regard to transport of fresh fish by flight, an electronic traceability system is already in place, as companies regularly check the temperature during transport. GPS information is not available, but that is not deemed as essential since detailed information on the departures and arrivals of the planes used for shipment, is accessible. However, it seems that this kind of technology would be of use for fresh fish exporters, especially in relation to insurances. Currently, they do not buy insurance for their shipments as the product is very sensitive and the insurances are very expensive. The problem has been that it is difficult to define where the damage occurs.

Other potentialities mentioned were that this technology could simplify record keeping. Recording of information between different handover points absorbs much time. If one could implement a system into which each unit would be registered and that a record would be attached to each unit in the entire supply chain, it would have immense value for the management of the supply chain.

It was pointed out that the value of this kind of system would be different for frozen fish and chilled fish. The frozen products are much more robust and this kind of system would not necessarily add more information than is currently available. It was a common view that a more effective supply chain management system would be needed for chilled products where the transport is often regarded as the weakest link in the value chain.

In the case of consumers, most participants think that they are generally not concerned with all of the information that can be attached to the product. Consumers think first about brand and price but are slowly starting to be concerned about sustainability and responsible fishing. Participants were therefore not sure if a more effective supply chain management system would create an advantage in competition on a retail market. This might be a possibility but in general it can be said that participants doubted that detailed record keeping of temperature, for instance, would influence common consumer decisions. In this context, it was underlined that a rather secure quality control is already in place. Actors in the supply chain have to assure actors at the next level of the chain that the product lives up to a certain standard, based on a common agreement between actors. In this respect, it is not entirely clear what value this type of system would add.



## Barriers

In a discussion on possible barriers for the implementation of an electronic traceability system, various factors were mentioned. The most common are listed in table 2.

Table 2. Barriers for the implementation of an electronic traceability system

Barriers
Could slow down delivery
Practical/technical issues
Definition of "the problem" (is the "problem" a problem?)
Lack of trust between actors
Weak use value for the business
Increased costs
Not much value for consumers

An actor who is exporting fresh fish emphasized that the benefits of an electronic traceability system depend on how expensive it would be. This business is very sensitive for delays and any tracking system should not be implemented if it would slow down the transportation process. Numerous practical issues also came up, such as the actual size of the tracking device, whether it is reusable or not and how much time it would take to retrieve it if it were reusable. If it were light and inexpensive, that would surely make it easier to implement. Even issues regarding airport security were mentioned as a possible barrier.

A major issue is to define what the benefits of the technique are exactly. As one participant stated: "We don't need to fix what is in order". That is, most actors in the supply chain are quite knowledgeable about risks along the chain and try to secure it in the best way that they can. For instance, it was described that in the fresh fish sector, there is already extensive registry work being carried out, although it is all manual. Supply actors do not need confirmation on whether things are in order or not, much rather they need tools to retrieve information if something happens that should not happen. Hence, it is not evident that this kind of technique would be desirable to use on a daily basis, but it could be beneficial when actors need to delimit weak links in the value chain and perform audits on actual chain performance.

Another potential barrier mentioned is the lack of trust between different actors in the supply chain. However, that would highly depend on the design of the system. If it would be open for all actors in the supply chain, then lack of trust would pose a problem. It was pointed out that if the system would be based on an electronic barcode, it would not store any information in itself. Different actors at different levels in the supply chain could however attach different information to the code and use for themselves without risking that competitors could retrieve their internal information.

In regard to implementation of the system, it was pointed out that similar kinds of systems are usually implemented either because of internal pressure between actors in the chain or through a top-down political decision, or “ceremonies” as one participant described it. Some said that too often, the use-value for supply chain actors was unclear in traceability projects. In general, the problem is that immense volume of information is being gathered already. This amount of information would increase through the implementation of an electronic traceability system and it is unclear whether or not people review the information and/or use it in their daily business. The exception is when something goes wrong. Basically, the only information that the actors in the supply chain are interested in concerns the relatively few instances when something goes wrong. The risk is that the management of information will absorb more and more time without yielding much immediate profit. The cost of implementation and running of such a system would always end up with the consumers. Furthermore, it is clear that if the companies do not see the benefits of implementation, they will not implement it.

In a discussion on whether or not an electronic traceability system would be meaningful for consumers, participants expressed their doubts that it would be reflective in certification procedures, etc. Consumers first of all buy brands. Large buyers, for instance retailers, put more emphasis on information about CO<sub>2</sub> footprint and/or a certificate of responsible fishing or sustainable resource management (the MSC certificate was mentioned as important for retailers). They are, for instance, beginning to ask more and more for certificates of origins. Individual consumers are slowly starting to think about the origins of the product, but sometimes that information is way too general to have any real meaning. An example is information stating that the fish is from the Northwest Atlantic! Apart from the Northwest Atlantic being a vast geographical area, the flag of the ship defines originality.

Therefore, the consumer is in a difficult position when making decisions based on this message.

When probing if information on temperature and location of the product has especial value for some specific actor in the chain, by far the insurance companies see the most benefits. It would simplify their work and eventually the cost of insurances would decrease. Some underlined that the answer would depend on who is to use the information and thus what is the practical value of it.

## CHILL-ON

The final phase of the focus group interview revolved around the Chill-On technologies. The project idea was introduced to the participants of the group and they were asked what they thought of the concept.

Participants expressed mixed feelings towards the system. In general, it was clear that top-down initiatives, both from authorities and the research and development sectors, were not necessarily seen as assets for the business. In the context of Chill-On, this was especially vivid in views of those working in the value chain of frozen fish. Implementation of an electronic traceability system is seen as a burden, and although the major share of the cost will end up with the individual consumer, actors worry that every actor in the chain will lose their profits. It was also pointed out that if only some actors would implement the system, and thus increase the cost of the product to end customers, it would make them less competitive on the world market.

While participants saw that the system could be very useful in doing some research, for example to check the value chain process regularly, they did not see it as feasible as a global system that would be part of the daily routine of companies. At current, the cost of implementation would be much greater than the benefits. Hence, the system was seen as having the potential of becoming very important as *a part of* the quality control of every producer.

This was underlined by one participant, who said that the Chill-On technologies were indeed very good and promising in a way. Yet, the smallest part of the things the technology addresses is problematic in their business. According to this member of the group, the risk is that many would think about the system as increasing cost without adding benefit to the

business. An example that was taken was that shelf life prediction models do not add much to the knowledge that is integral to the actors running the business. Actors, in other words, know their product very well. The Chill-On technology would confirm that things are in order and would be fine when used as a check to see whether things are running regularly or not. However, most actors would perceive it as a burden if it were to be put in every shipment.

Some participants did not perceive the technology as anything new. In the fresh fish export, actors are already carrying out a lot of the work that is integral to the Chill-On technology. For instance, registration of information on temperature of the product at different periods and locations is a general practice. Actors were not confident that the technology would save so much time and actually expected costs of production and transportation to increase. The basic work that is involved in shipping fresh fish out of the country would not decrease as such. The rest, i.e. what happens on the way, is historic data that Chill-On could register but would not cut down the fixed cost involved in preparing every shipment. It was stressed that it would depend on how the technology exactly works. Could it for instance be integrated into the high-speed value chain of fresh fish when “every 15 minutes matter”?

It was pointed out that the system could be valuable in the earliest stages of the transport, especially for fresh fish. In this context, a powerful traceability system would be very valuable, at least for being able to track the individual packaged trade units which can often be very expensive.

Furthermore, the insurance sector would greatly appreciate this kind of technology. However, their representative in the group admitted that it could be difficult to implement it due to costs. For instance, it is currently difficult to get actors to buy decent packaging. The transport cost is always pressed down and thus a system like this might be deemed too expensive. Once again, this depends on the design and cost of the technology. One issue that could enhance its possibilities of implementation is if it substitutes barcodes, i.e. if actors along the whole chain would be able to retrieve information about the content and quality of the product. This would demand that different systems could interact and that certain parameters were thus standardized. The major advantage would be that different actors would not need to register and re-register the same information at different handover points as is common today.

The general downside of the project is that it is so broad in its scope that it will be difficult to implement. The project has very high ambitions about conquering the world in one go and solving multiple problems on the way. The risk is that it seems overwhelming for actors to implement. Participants stressed that the start-up needs to be slow, i.e. it has to be integrated into the work processes along the value-chain in smaller steps. Otherwise, the tendency will be to view it as a burdensome add-on. The bottom line for supply chain actors is: “don’t put me in trouble”. If the system can be framed as a tool for helping actors to avoid “trouble”, it would be regarded in positive terms.

## Conclusions

It is safe to say that different views on traceability systems in general and on the Chill-On technology in particular were obtained in the group discussion. While participants could see various benefits related to an electronic traceability system, they were in general not confident that they would implement such a system. Numerous barriers were mentioned with regards to the feasibility and implementation of the system. The largest barrier is the cost. A central question is: Who is to pay? This is related to the definition of the problem that the technology is supposed to solve. Is it really a problem? According to the group, that was not clear, and it was even stated that most of the things that the Chill-On technology addressed were not problematic. However, if framed as a tool to audit actual chain performance and find weak links along the chain, it might have a better chance of being implemented.

The insurance sector stands out as an actor that is particularly interested in this kind of technology. The interests of other actors depend very much on the final design and cost of the technology. They can see some possibilities but currently they do not see any immediate gains for their businesses.

## References

Ólafsdóttir, G., Bogason, S., Popov, V., Bruce, I., Martinsdóttir, E., Hammer, I., Colmer, C., Eden, M., Kück, M. (2009). *Implementation of novel technologies in field trials in fish and poultry supply chains*. Poster at The 3rd TAFT Conference 15-18 September 2009, Copenhagen, Denmark

## Appendix I

## Interview guide

### Markmið með hópunum er að ræða:

- Rekjanleika í virðis\_keðju fisksölu og dreifingu
- Hver er sýn viðmælenda á upplýsingaflæði og nýsköpun í virðis\_keðjunni (í tengslum við rekjanleika).
- Er þörf fyrir nýja tækni til að fylgjast með hitastigi og staðsetningu vöru í rauntíma í allri virðis\_keðjunni?
- Hvaða tækifæri og hindranir sjá viðmælendur við innleiðingu á slíkri tækni
- Hverjar eru væntingar frá markaðnum?

### Tilgangur og markmið:

Við ætlum að ræða hér í dag um reynslu ykkar af upplýsingaflæði í virðis\_keðju sjávarafurða, rekjanleika og nýja tækni sem getur bætt rekjanleika og þar með betur tryggt öryggi og gæði vörunnar í allri virðis\_keðjunni.

Á grundvelli umræðunnar í dag verður búin til spurningakönnun um þetta sama málefni. Þetta er því ykkar tækifæri til að koma skoðunum ykkar á framfæri.

### Inngangur og kynning: 7-10 mínútur

- Velkomin, takk fyrir að gefa mér þennan tíma. Ég kem frá Félagsvísindastofnun Háskóla Íslands.
- Upptaka og sími.
- Slökkva á gsm símum.
- Eina reglan í rýnihópum er að taka þátt. Ég viljum fá að heyra skoðanir ykkar allra og þær eru allar jafn réttháar. Þannig ekki liggja á þeim, þó að þið séuð ekki sammála næsta manni. Það er semsagt ekkert rétt eða rangt.
- Ef þið eigið erfitt með að komast að, réttið upp hönd, ég mun stýra umræðunum og þannig reynum við að tryggja að allir komist að.
- Ég er með gátlista, ákveðin spurningaramma eða þemu sem við förum í gegnum og hvert þema hefur takmarkaðan tíma. Þið skuluð þó ekki hafa áhyggjur af því, það er mitt vandamál☺
- **Ég er ekki sérfræðingur í umræðuefninu og hérna inni hef ég ekki skoðun á umræðuefninu.**
- Umræðurnar taka um 1 til 1,5 klst.
- Biðja þátttakendur um að kynna sig, frá hvaða fyrirtæki þeir eru og stöðu þeirra innan fyrirtækisins.



## Almennt – Upphitun: 15 mín

*Almenn upplifun af virkni virðisikeðjunnar og hugmyndir viðmælenda um hana – fá fólk til að staðsetja sig...*

- Byrjum á að dreifa mynd af virðisikeðju frá veiðum til neytenda og lýsum.
- Ef þið horfið á þessa mynd, hvað skiptir mestu máli til að dreifing á fiskafurðum gangi vel fyrir sig? (fyrir virkni virðisikeðjunnar)
  - Gagnsæi, rekjanleiki?
  - Afhendingar öryggi?
  - Verð?
  - Kostnaður?
  - Gæði afurða?
  - Annað? Hvað?

*Notkun upplýsinga úr keðjunni og miðlun þeirra*

- Eruð þið að að fylgjast með vörunni í flutningum?
  - Hvernig? t.d. Skráningar á rekjanleikaupplýsingum? Hitasíritar?
  - Annað? Hvað?
- Hafið þið fengið upplýsingar frá öðrum aðilum í keðjunni um vöruna?
  - Fannst ykkur það jákvætt eða neikvætt
- Hvaða upplýsingar er mikilvægt að fá með vörunni?
  - Upplýsingar um rekjanleika (veiðistaður, veiðitími, framleiðandi, hvenær pakkað)
  - Hitastig
  - Staðsetning
  - Uppruni
  - Gæði/geymsluþol
- Hafið þið reynslu af því að miðla upplýsingum á milli aðila í keðjunni?
  - Hvernig fáið þið upplýsingar og hvernig sendið þið þær frá ykkur?
    - Sjálfvirkt beint úr upplýsingakerfum
    - Tölvupóstur
    - Pappír
- Eru einhver sérstök vandamál tengd upplýsingamiðlun í virðisikeðjunni eins og þið þekkið hana?
  - Eru þær nægilega ítarlegar
  - Uppfylla þær kröfur til sjálfbærnivottunar
  - Uppfylla þær kröfur neytenda
- Eru allar nauðsynlegar upplýsingar um rekjanleika til staðar?

- Hvaða upplýsingar eru nauðsynlegar að ykkar mati?
- Ef nei: Hvaða upplýsingar vantar?

### Innleiðing og Væntingar markaðar - 30 mín

*Viðhorf til nýrra rekjanleikalausna*

*Nýrri tækni er ætlað að gera það mögulegt að fylgjast með hitastigi fisksins og staðsetningu hans í flutningsferlinu í rauntíma og efla rafrænann rekjanleika í virðiskeðjunni.*

- Hvaða möguleika sjáið þið í slíkri tækni?

*Nota megingildi í hægri dálki til að ýta á*

Tækifæri	
Gildi í markaðssetningu? Eykur samkeppnishæfni? Öruggari sala? Hærri verð afurða Opnar nýja markaði	Markaðsmál – hagræn gildi
Gæðastimpill fyrir neytendur? Trygging á gæðum og ferskleika vöru Betri upplýsingar á áhrifum kælingar á gæði og geymsluþol Kemur í veg fyrir vörusvik Meira traust hjá viðskiptavini / kaupenda Uppfyllir kröfu neytenda Eykur traust neytenda Bætir upplýsingar til neytenda	Gæði og neytendagildi
Betri yfirsýn í allri keðjunni Betri yfirsýn um birgðir Kemur í veg fyrir þjófnað Markvissari ákvörðunartaka í framleiðslustýringu og sölu m.t.t. gæða afurða Auðveldara að innkalla vöru Minni kostnaður við innköllun vöru	Stjórnun virðiskeðjunnar

<p>Auðveldar skráningu</p> <p>Minni sóun</p> <p>Betri framleiðsluhættir</p> <p>Auðveldara að uppfylla lög og reglugerðir</p> <p>Betri stjórnun og virkni í virðiskeðjunni</p> <p>Gagnvart tryggingafélögum ef vara skemmist/stenst ekki gæðakröfur?</p>	
<p>Upplýsingar um sjálfbærni framleiðslu og áhrif framleiðslu á umhverfið - sótspor</p>	<p>Umhverfisgildi</p>

- Hvaða kosti sjáið þið helsta í slíkri tækni? – Hvers virði væri hún?
  - Sjáið þið fyrir ykkur einhverjar hindranir fyrir því að þið tækjuð þessa tækni upp?
    - Hverjar helstar?

*Ýta á eftir með megingildum í hægri dálki*

<p><b>Hindranir</b></p>	
<p>Vantar traust milli aðila í keðjunni</p> <p>Sátt um ábyrgð og mikilvægi hitastigsgagna í allri keðjunni</p> <p>Auknar kröfur um hitaaðstæður í allri keðjunni sem erfitt er að uppfylla</p> <p>Fleiri kvartanir</p> <p>Hræðsla við ábyrgð</p>	<p>Traust / ábyrgð</p>
<p>Tæknibúnaðar of dýr</p> <p>Raunverulegur hagnaðar af innleiðingu verður að vera umfram kostnað</p> <p>Tímaskortur og vöntun á mannafla</p> <p>Upplýsingakröfur um rekjanleika í samræmi við reglugerðir og alþjóðlegar viðskiptakröfur eru íþyngjandi fyrir keðjuna</p> <p>upplýsingar um hitastig er aukið álag á keðjuna umfram rekjanleikaupplýsingar</p> <p>Veldur aukinni vinnu vegna utanumhalds, túlkunar og upplýsingamiðlunar</p> <p>Minni fyrirtæki eiga erfitt með að standa</p>	<p>Kostnaður</p>

undir innleiðingarkostnaði	
<p>Of lítil þekking í keðjunni til að innleiða tæknilausn</p> <p>Of flókið að innleiða í allri keðjunni</p> <p>Vantar skilning og þekkingu til að túlka upplýsingar um hitastigsferla</p> <p>Skortur á fræðslu og upplýsingum mikilvægi þess að viðhalda lágu hitastigi í keðjunni</p>	Þekking
<p>Samskipti milli aðila í keðjunni eru oft erfið – viðskiptahindranir</p> <p>Óttast misnotkun upplýsinga</p> <p>Skortur á samstöðu í keðjunni</p>	Samskipti

- eru einhverjir augljósir ókostir við aukið magn upplýsinga/meira upplýsingaflæði?
  - Hvaða?
- Vinnið þið með eða nýtið þið ykkur upplýsingar um .... ?
  - Líftíma greiningu (LCA life cycle assessment),
  - Sótspor vöru (CO footprint)
  - Umhverfismerki sem fela í sér sjálfbærar veiðar á stofnum sem eru ekki í útrýmingarhættu (umhverfismerki íslenskra stjórnvalda, MSC (Marine Stewardship Council))
- eru þetta markaðsleg gildi sem eru eftirsóknarverð fyrir ykkur?
  - Hvernig þá?
- Upplifið þið eftirspurn hjá neytendum eftir upplýsingum um rekjanleika og/eða þau gildi sem við vorum að tala um?
  - Eftirspurn eftir umhverfissvottun?
  - Svottun um sjálfbærni?

*Sérstaklega spurt úti hitastigsmælingar og innleiðingu*

- Teljið þið að rauntíma upplýsingar á hitastigi og staðsetningu hafi sérstaklega gildi fyrir einhvern einn hóp frekar en annan í matvælakeðjunni?
  - Hvernig þá?
- Segjum að gerðar verði kröfur um aðgengi að hitastigi vöru í allri keðjunni, hver ætti að bera ábyrgð og kostnað af innleiðingu slíkarar tækni að ykkar mati?
- Hvernig þyrfti innleiðing að fara fram?

- Stjórnvöld ( rökin eru að tryggja öryggi og rekjanleika fyrir neytendur og sterkari ímynd íslenskra afurða – með tilskipun)
- Einstaka hagsmunaðilar í keðjunni sameinast um innleiðingu t.d. framleiðendur eða flutningsaðilar
- Neytendur með því að gera kröfu um gagnsæi
- Allir sem koma að virðis\_keðjunni
- Samtök hagsmunaðila

## Chillon – 20 mín.

*Nú er verið að þróa nýja tækni sem gengur út á að fylgjast með hitastigi fisksins og staðsetningu hans í flutningsferlinu í rauntíma. Markmiðið er að bjóða uppá ákvörðunartól við stjórnun á vörufylæði til að tryggja öryggi, rekjanleika og gæði*

Tæknin býður upp á:

- að sannreyna hitastigsstöður í keðjunni
- rauntíma upplýsingar um staðsetningu vöru og rafrænan rekjanleika
- mat á áhættu vegna örveruvaxtar
- útreikningar á geymsluþoli
- viðvörðun ef hitastig fer út fyrir ákveðin mörk  
að sannreyna hitastigssögu vörunnar með “smart labels” (TTI time temperature indicators)

Einnig er verið að þróa

- hraðvirkar örverumælingar
- leiðbeiningar um kælingu

*[Hafa einfalda skýringarmynd á blaði, fara vel yfir hana með þátttakendum.]*

- Hvað finnst ykkur um þessa hugmynd?
  - Kostir/gallar?
  - Flókið/einfalt?
  - Er þetta eitthvað sem ykkur finnst vanta?
- Fyrir hverja er þessi tækni, einhvern einn hóp keðjunnar frekar en annan?
  - Framleiðendur, flutningsaðila, fiskmarkaði, heildsala, smásala, neytendur?
- Fyrir hverja er þessi tækni ekki?
  - Af hverju?
- Bætir þessi tækni einhverju við það sem þið eruð nú að nota?
  - Hverju?
- Gætu upplýsingar um hitastig í rauntíma aukið traust milli aðila í keðjunni?
  - Bætt upplýsingaflæði?
- Hvað höfðar mest til ykkar af þessum atriðum sem nefnd eru? (*vísa í mynd*) Hvar er þörfin mest? (**seinni mynd**)
  - Bættar kæliaðferðir / bestun á kælingu

- Nýjungar í pakkingum (Smart merki - TTI)
- GPS staðsetning (Rauntímastaðsetning).
- Hitastig í rauntíma
- Viðvaranir ef hitastig fer út fyrir gefin mörk
- Ákvörðunartól til að bæta framleiðslustjórnun
- Rafræn umsýsla um rekjanleikaskráningar
- Spálíkön um gæði og öryggi (áhættumat og geymsluþolsspálíkön)
- Hraðvirkar öruverumælingar( PCR tækni 3-5 klst)
- Betra yfirlit um staðsetningu á vörum

#### **Að lokum**

- Eitthvað fleira sem þið viljið koma að í lokin?
- Þakka fyrir þátttökuna.
- Afhenda gjafabréf.

## Appendix II

**Industry Survey developed on basis of the focus group discussions and used at the Seafood Exposition in Brussels, 27-29 April 2010**

# Survey on the view of the key commercial players in the supply chain of aquatic products at the Brussels Seafood Exposition 2010

Date: \_\_\_\_\_

Name: \_\_\_\_\_

## Demographics

**Country:** \_\_\_\_\_

**Size of company:** (no of employees)

**Type of company and products:**

1. Fishing /Auction
  2. Aquaculture
  3. Processing
  4. Transport
  5. Retail /Catering
  6. Services
  7. Other, \_\_\_\_\_
- a. Fresh products/chilled
  - b. Frozen products
  - c. Convenience products/ready meals
  - d. Other, \_\_\_\_\_

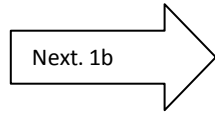
1. large > 250
2. medium-sized < 250
3. small < 50
4. micro < 10

**Position in company:**

1. Sales and marketing
  2. Product Development
  3. Quality Management /Risk Management
  4. Other: \_\_\_\_\_
- a. Management
  - b. Staff

**1a. Do you agree or disagree that trust exists regarding information sharing between actors in the fish supply chain?**

1. Strongly agree
2. Rather agree
3. Neutral
4. Rather disagree
5. Strongly disagree
9. Don't know



**Notes:** \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**1b. Where in the supply chain does the strongest mistrust exist?**  
(Show figure: please choose more than one example if applicable)

Between actors :. \_\_\_\_\_ and \_\_\_\_\_

Between actors :. \_\_\_\_\_ and \_\_\_\_\_

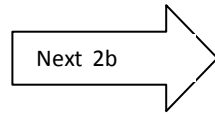
**Notes:** \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**2a. Do you agree or disagree that a real time temperature sharing between actors could enhance trust and commitment in the fish supply chain?**

1. Strongly agree
2. Rather agree
3. Neutral
4. Rather disagree
5. Strongly disagree
9. Don't know



**Notes:** \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**2b. Why would a real time temperature sharing between actors enhance trust and commitment in the fish supply chain?**

\_\_\_\_\_

\_\_\_\_\_

**Notes:** \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_



**3a. Who in the supply chain would benefit from using a real-time temperature monitoring system ?**

*(please choose more than one answer if applicable)*

- 1) Fishing companies
- 2) Fish auctions
- 3) Primary processors
- 4) Logistic services
- 5) Secondary processors
- 6) Wholesale /fish market
- 7) Retailers/catering
- 8) Consumers
- 9) Authorities
- 10) Insurance companies
- 11) Others, who?

**4. How do you share information with actors in the supply chain?**  
*(please choose more than one answer if applicable)*

- 1. E-mail
- 2. Paper form / regular mail
- 3. Fax
- 4. Internet - ERP (enterprise resource planning)
- 5. Traceability system
- 6. Other: \_\_\_\_\_
- 9. Don't know

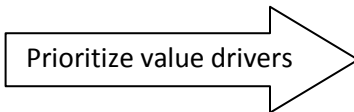
**5. Are the electronic information systems interoperable throughout the supply chain** (i.e. standardized format of key data elements)?

- 1. Yes
- 2. No
- 9. Don't know

**6. Which of the following choices is the key driver for implementing electronically based information system?**

*Please prioritize from list where number 1 is the most important factor and nr. 4 is the least important*

- Regulations
- Economic values
- Environmental values
- Consumer values



*Show list: Please prioritize factors within the most important value driver*

No. \_\_\_\_\_ No. \_\_\_\_\_ No. \_\_\_\_\_ No. \_\_\_\_\_ No. \_\_\_\_\_

Other: \_\_\_\_\_

**7. Can you imagine any barrier(s) that could arise when installing electronically based system that is capable of sharing real time information on traceability data, GPS location, temperature and shelf life?**

*Show list: Please prioritize the most important factors*

No. \_\_\_\_\_ No. \_\_\_\_\_ No. \_\_\_\_\_ No. \_\_\_\_\_ No. \_\_\_\_\_ No. \_\_\_\_\_

Other: \_\_\_\_\_

**3b. Are there any actors that would gain more than others?**

- 1. No
- 2. Yes -> Who?  
No. \_\_\_\_\_  
No. \_\_\_\_\_  
No. \_\_\_\_\_

Notes: \_\_\_\_\_

Notes: \_\_\_\_\_

Notes: \_\_\_\_\_

Notes: \_\_\_\_\_

Notes: \_\_\_\_\_