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Executive Summaries

RESEARCH

Key Success Factors of Innovation in Multinational Agrifood Prospector Companies *Frances T.J.M. Fortuin, Maarten H. Batterink and S.W.F. (Onno) Omta*

The Wageningen Innovation Assessment Tool (WIAT) compares the self assessment of the drivers and barriers to innovation at the company level and the critical success and failure factors of innovation at the project level with data of agrifood prospector companies around the world. In total 46 innovation projects, 11 successfully concluded and 6 failed projects, as well as 29 running projects in 12 multinational agrifood prospector companies in the Netherlands and France, two innovation consortia and one knowledge institution are discussed. It is concluded that the innovation process of agrifood prospector companies can be substantially improved by revealing the tacit knowledge of the innovation project team by use of WIAT. The key success factors identified are team communication, product superiority and market potential. It is further concluded that innovation project teams should be cross-functional and feature a heavyweight project leader. Based on the finding that the innovation teams of successful projects show higher awareness of the market characteristics, it is concluded that agrifood prospector companies need to pay extra attention to market and product related up-front activities. The finding that the respondents of both successful and failed projects give relatively low scores for marketing and distribution resources and skills, should therefore be considered as an early warning signal for the agrifood industry as a whole.

A Customer Service Design Case Study: Insights on Customer Loyalty in the Brazilian Food Sector *Ione Lucia Florêncio de Almeida and Luciana Florêncio de Almeida*

Marketing managers of local and international food companies have realized that their offers to customers go well beyond the characteristics and attributes of the products their companies manufacture and market. The present research brings light to a key marketing issue: the connection between the customer service

experience through the use of a customer care team and its impact on consumer satisfaction and loyalty.

Customer service perceived quality, customer satisfaction and customer retention were measured and a positive association among these constructs was established. Also, these relationships were found to vary in intensity, the strongest ones being between perceived quality and customer satisfaction and between intention to purchase the product again and intention to recommend the product to others. These results imply that customer service in the B2C market may have a role in establishing overall customer satisfaction and loyalty from clients that have actually used this service. This research analysis also allowed identifying which aspects of customer service are more influential in determining a better quality perception.

Though providing end clients with one of the key services from food companies, consumer service has been seldom investigated in the service literature. What makes it the main object of this research is its crucial importance, mainly for companies dealing with food quality. This paper examines the extent to which the perception of the quality of this service is truly relevant to customer satisfaction and loyalty. The service management literature was used as a theoretical base, in conjunction with the script theory. The strong relationship between perceived quality and satisfaction supports previous studies like that by Woodside et al (1989) about hospitals and the work by Cronin and Taylor (1992).

Innovation and Governance in International Food Supply Chains The Cases of Ghanaian Pineapples and South African Grapes

Jacques Trienekens and Sabine Willems

The paper reports an exploratory case study on innovation in, and governance of, international supply chains originating in developing countries. Two African fruit export chains are analyzed: the table grape chain from South Africa (a highly developed chain) and the pineapple chain from Ghana (a newly emerging chain). The most important market for both chains is the EU. The two cases present complementary perspectives on international supply chain development. The paper shows that Western demands in these cases lead to innovation at the producer end of the international supply chain and changes in governance structures towards chain coordination and vertical integration.

Measuring Competition for Textiles: Does the United States Make the Grade? *J. Mark Welch and Conrad P. Lyford*

Intensifying global competition in a free trade environment is threatening the survival of the U.S. textile industry. Evolving competitive forces are important not only to U.S. textile manufacturers but to U.S. cotton farmers as well. As suppliers of raw materials for the industry, cotton producers share a stake in the success or failure of what has traditionally been their biggest and best customer. As

competitive forces rise, survival for much of the textile industry in the United States may be at stake. This research provides measures of just how competitive the U.S. cotton textile industry may be relative to major global competitors.

As expected, the findings show that the U.S. cotton textile industry is at a relative competitive disadvantage in the global textile sector. This disadvantage is measured in terms of export market share as well as a price-based comparison of textile products. While trends in both these measures show improvement, important questions remain as to whether the U.S. can continue these trends as the effects of free trade agreements are more fully realized.

Consumer Responses to Food Safety Information from Print Media

Dennis M. Conley and Mark A. Wade

Consumers are overwhelmed by warnings from consumer protection organizations, the media, government, and various scientific studies. They have often received conflicting information. This study shows that the reporting of information can be positive, neutral or negative, and perceived as biased. Focus group insights showed consumers are reasonably intelligent in their evaluation of information. They responded differently to information perceived as biased versus information perceived as objectively reported. In addition, the more formal supply and demand analysis showed that consumers do respond as expected to positive or negative information. Managers need to be aware of public media articles about their firm's food products, and consider selected tactical actions in response.

Quality Management in Supply Chain Networks - The Case of Poland

Jon H. Hanf and Agata Pieniadz

The most striking consequence of the food scares of the last years was the fact that all agribusiness stakeholders assessed food quality as no longer being the responsibility of a single firm. Overall, these incidences have catalyzed the development of quality management concepts that overlap a firm's boundaries. Since supply chain networks now compete with each other, we argue that individual approaches have to cover the whole supply chain. Therefore, chain quality has to be used as a strategic parameter. Chain quality is a result of cooperation, so we further assume that using chain quality strategically leads to more intense relationships among partners. On the contrary if, chain quality is only used to gain parity with competing networks, weaker relationships have to be installed. Thus, chain quality management concepts are expected to significantly differ from each other so that we introduce and elaborate upon two types of chain quality management: strategic and operative.

Based on these considerations, our paper aims to work out the differences between strategic and operative chain quality management concepts and test our theoretical findings using evidence from an emerging industry. We surveyed 19 of the 22 largest Polish dairy cooperatives during February and March 2006. Roughly equal

numbers of semi-structured interviews were conducted across the different hierarchical levels in the co-ops, including chief executive officers, quality managers, and supervisors in the marketing and supply departments. The interviews were conducted by telephone and lasted between 20 and 40 minutes per respondent.

The results show that the firms' activities are generally aligned with current market opportunities for optimal enterprise performance. Thus, we determined that manufacturers of well-branded products create an advanced network structure and apply strategic quality management. Networks that have a focal company acting as an external customer of a processor use operative quality management. Some Polish dairies are still not embedded in any supply chain networks; no chain quality management concepts can be installed in these chains because they have no powerful focal firm. However, one thing is unambiguous: the chosen quality strategy determines the design of the vertical coordination mechanism. Thus, the higher the product requirements, the further quality management systems go beyond a firm's boundaries and the stronger is the shift from operational towards strategic quality management.

EXECUTIVE INTERVIEW

Executive Interview: Lucas Vokurda

*Research Coordinator, School of Agriculture and Technology,
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Education and Knowledge Transfer: A Priority for the Future

Ogundeji Abiodun Akintunde

Education remains the principal means of building capacity which in turn contributes to the development of society. It is also the single most important factor in determining one's standard of living and income potential. The phrase "knowledge is power" holds a lot of truth. On one hand knowledge it is a strong driver for value chain improvement, while contributing to the education system. For an economy to compete in the global marketplace, knowledge transfer and collaboration need to be increased to get research into practice. If knowledge and learning are to be useful they must be applied to areas of life where it can make differences. The focus of this report is on education and knowledge transfer from research or research-related activity. It also discussed the activities of INHOLLAND University in building network with other universities in Visegrad countries with the objective of building capacity in the countries with respect to food safety, quality and chain management.



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Key Success Factors of Innovation in Multinational Agrifood Prospector Companies¹

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Abstract

The Wageningen Innovation Assessment Tool (WIAT) assesses a company's drivers and barriers to innovation and benchmarks the critical success and failure factors of its innovation projects with data of agrifood prospector companies around the world. The present paper discusses its application in 12 multinational agrifood prospector companies in the Netherlands and France. It is concluded that WIAT by uncovering the tacit knowledge of the innovation project team creates opportunities for substantial improvement of the innovation process, and that agrifood companies should specifically pay attention to market and product related up-front activities.

Keywords: innovation, assessment tool, agrifood prospector companies

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Introduction

Given the rapid development of technologies, the fast changing consumption trends and the ever increasing competition in the agrifood industry, even a large multinational agrifood company's competitive advantage can only be temporary. An important strategic option for companies that want to remain in the top of the industry is to pursue a prospector strategy, defined as a strategy to bring a continuous stream of innovative new products to the market or implement new processes before competitors do (Miles & Snow, 1978). As a consequence, a company pursuing a prospector strategy (in the remainder of this paper referred to as a prospector company) has to innovate continuously, and it has to treat the management of innovation as one of the basic business functions (Burgelman, 1988). This implies allocating substantial resources to the innovation process, more in particular to the Research and Development (R&D) function. Although the innovation process involves different departments, e.g. marketing, purchasing and manufacturing, and other actors along the supply chain, the primary locus of long-term innovation lies at the corporate R&D department. The pivotal role of R&D is to monitor the implementation of innovation projects from pilot testing to industrial scale introduction together with the 'development teams' in the divisions. However, a major risk of such a strategy is that the outcomes of innovation efforts are far from guaranteed. From innovation literature it is known, that only a very limited number of innovation projects will turn out to be successful (Cooper, 1999). It is therefore crucial for prospector companies to pick the right innovation projects and redirect or kill the potentially unsuccessful ones in an early stage of development before they turn into costly failures (Cooper, Edgett, & Kleinschmidt, 1999). However, it is very hard to predict success or failure in such an early stage of development. Up till now the methods available to do so had limited diagnostic value for ongoing innovation projects, and were developed and tested in technology-based industries such as the computer, pharmaceutical and aviation industry (see section 2). It is the aim of the present paper to address the problem of effectively managing the innovation process in agrifood companies by Presenting the Wageningen Innovation Assessment Tool (WIAT). Based on data of agrifood prospector companies around the world WIAT provides a methodology, that enables agrifood companies to compare the self assessments of the drivers and barriers to innovation at the company level and the critical success and failure factors of innovation at the innovation project level with comparable companies in their own sector. In total 46 projects, 11 successfully concluded and 6 failed projects, as well as 29 running innovation projects are discussed. Thereafter we focus on one of the multinational companies to show how the WIAT works in management practice.

The objectives of the present paper can be formulated as follows:

1. To develop an assessment tool that provides relevant, reliable and valid management information for business development teams in the agrifood industry.
2. To provide insight in the key success and failure factors for innovation in the agrifood industry

These two objectives combined can help managers to improve the innovation capabilities of their agrifood prospector company in general, and the start-up, go - no go or redirect decisions of their innovation projects. The theoretical contributions lie in the fact that the diagnostic value of existing tools for the evaluation of agrifood innovation projects is greatly improved and that the existing body of knowledge on critical success and failure factors for innovation (e.g. Cooper, 1985; 1992) is now extended from science-based to supplier dominated industries (Pavitt, 1984).

The paper is structured as follows. In section two we elaborate on different aspects of innovation management. A definition of innovation and the innovation process will be given, the innovation drivers and barriers, and the success and failure factors of innovation will be discussed, as well as the stage gate model. This section ends with a discussion of innovation in the agrifood industry. In section three on the research methodology, we elaborate on the WIAT, the constructs, and the methodology that was used to apply WIAT in the participating companies, consortia and knowledge institution. Section four presents the results at the innovation project level, by showing the Key Success Factors (KSFs) of agrifood innovation, and the comparison with of the successful and failed projects with the running projects. In section five the application of WIAT in one of the prospector companies is shown, to indicate how WIAT works in management practice. The final section includes the main conclusions and discussion.

Innovation

Definition of innovation

The economist Schumpeter (1934) defines innovation as a process of creative destruction, where the quest for profits pushes to innovate constantly, by breaking old rules to establish new ones. For Schumpeter, this implies not only the introduction of new products but also the successful commercialization of new combinations, based on the application of new materials and components, the introduction of new processes, the opening of new markets or the introduction of new organizational forms.

The innovation process

In the present paper a process approach towards innovation has been chosen. Myers and Marquis (1969) describe it as follows: *Innovation is not a single action but a total process of interrelated sub processes. It is not just the conception of a new idea, nor the invention of a new device, nor the development of a new market. The process is all of these things acting in an integrated fashion*. Hence the innovation process involves activities and decisions from idea generation to the final launch of the product onto the market. The general steps are depicted in Figure 1. However, as indicated by Fortuin (2006), the depiction of the innovation process as a unidirectional sequence does not reflect its inherently iterative and concurrent nature.

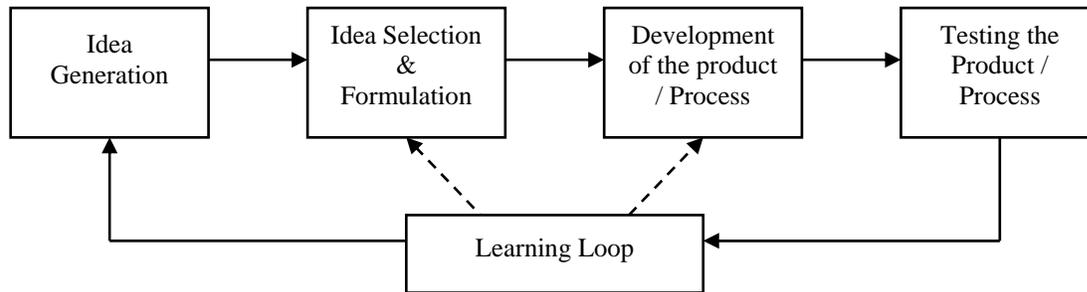


Figure 1: General representation of the R&D process (Tidd, Bessant & Pavitt, 2001)

Most companies organize the innovation process in projects. Innovation projects can be defined as determined plans and routes of development and implementation with the aim to deliver a new product to the market, or new (manufacturing) processes to business. In prospector companies, different functional areas are represented in innovation projects, such as R&D, marketing, manufacturing, and purchasing. As such, so called cross-functional teams are created where the team members cooperate from the early stage of new product development on till the product actually gets introduced to the market. The start of an innovation project is often decided by an R&D committee, and the project itself is led by a project leader who reports regularly to the R&D committee to monitor and keep track of the innovation process. However, the rationale to start an innovation project, as well as the rationale to stop or change it during its execution is not always clear. The go - no go or redirect decisions are heavily build on experience, and there is often no systematic identification of the factors determining success or failure (Cooper, 1999).

Drivers and barriers to innovation

The American Management Association (AMA) conducted a study including 1,396 executives of large multinational companies in North America and Europe and concluded that customer centricity, teamwork and cooperation, together with the appropriate resources (time and money) and organizational communication are the most important drivers to innovation (Jamrog, 2006). The ability to select the right ideas and freedom to innovate are other factors that play an important role. Top management commitment to innovation is a very important driver, as it ensures cross-functional cooperation, and creates an innovative environment. The greatest barriers to innovation are insufficient resources and the absence of a formal innovation strategy. Organizational structures that are not geared to enhancing innovation are also mentioned as hurdles, as well as a company's tendency to continue to invest time and money into unsuccessful projects. A last trap is the one which occurs when a company pursues innovations requiring different competencies than those available within the company (Jamrog, 2006). Successful innovating companies, however, do not have to rely on internal competencies alone when it comes to innovation. Chesbrough (2003) points at the paradigm of open innovation that assumes that companies should not rely only their own R&D competencies, as they do under the closed innovation model, but absorb and utilize knowledge from outside the company by different forms of collaboration with suppliers and buyers or even in some cases with competitors.

Success and failure in innovation

The previous decades have shown a number of studies that identify characteristics and factors leading to innovation success as well as failure. The prominent focus of these studies was to open the black box of innovation and provide in-depth understanding of how products are actually developed within companies (Brown & Eisenhardt, 1995). Some of these studies explicitly compare successful with failed projects and are called Dyadic studies. One of the most commonly known is the SAPPHO study (Rothwell, 1972; Rothwell et al., 1974) in which 43, mainly British, case studies were compared pair wise. Another study was the Stanford project, which was mainly directed to Californian companies (Maidique & Zirger, 1984; Zirger & Maidique, 1990). Perhaps the best known is the NewProd project (e.g. Cooper, 1979; Cooper, 1985; Cooper & Kleinschmidt, 1987, 1993), which was a large study of pairs of product successes and failures. There have been some extensive reviews of these studies (e.g. Brown et al., 1995; Ernst, 2002; Montoya-Weiss & Calantone, 1994). From the reviews we list the most central key success and failure factors:

- Product superiority: the product uniqueness and superiority from the customer's perspective.

- Proficiency of marketing and technological activities: ‘up-front’ activities such as initial screening, preliminary market and technical assessment, detailed market study and/or marketing research, and business/financial analysis.
- Protocol: clear definitions of the target market; the customers’ needs, wants, and preferences; the product concept; and the product specifications and requirements.
- Market potential: market need, growth and size.
- Organizational relations, cross-functional integration, team communication and cooperation.

Stage gate model

Based on extensive studies of successful and failed innovation projects, Cooper (e.g. 1985; 1992) developed a stage-gate model to improve the control over the innovation activities. The stages represent distinct parts of the R&D process where research, marketing, sales and other activities occur. Gates are points where the decision is made to pass the project into the next stage, end the project, or send it back to the previous stage. Most important evaluation criteria in the early stages are technical feasibility, intuition and market potential. Later on the focus shifts to product performance, quality and staying within the development budget (Hart, Hultink & Tzokas, 2003). However, as Syamil, Doll & Apigian (2004) argue: ‘Stage-gate reviews focus on whether the expected outcomes of each stage have been achieved. But, they do not provide a measure of how well the innovation process is conducted. Thus, such stage-gate reviews have limited inherent diagnostic value for identifying what is right or wrong with an on-going innovation process.’

Innovation in the agrifood industry

It is important to realize that most insights in the key success and failure factors of innovation are based on research in high-tech industries, such as the computer, biotech, or pharmaceutical industry, where other industries, for instance, supplier dominated industries such as the agrifood industry remained largely unexplored. An exception is the study of Pannekoek, Van Kooten, Kemp & Omta (2005) of 74 entrepreneurial innovation projects in Dutch greenhouse horticulture. The authors identified product superiority, and cooperation with supply chain partners as the most important success factors for entrepreneurial innovation. Other studies indicated that successful innovating agrifood companies have a strong market orientation (Batterink, Wubben & Omta, 2006), and that economic considerations and insufficient innovation competencies are the main barriers to innovation in this sector (Batterink et al., 2006; Garcia Martinez & Briz, 2000). Costa and Jongen (2006) list as major barriers to agrifood innovation a lack of concrete guidelines for

the effective implementation of consumer oriented food development, the sequential approach of the innovation process and the lack of intra- and inter-organizational coordination or integration of R&D and Marketing's activities and know-how.

Methodology

Wageningen Innovation Assessment Tool

We developed the Wageningen Innovation Assessment Tool (WIAT) to help companies in program selection, project prioritization and execution. As stated in section 1, this tool should be able to provide relevant, reliable and valid management information for business development teams in the agrifood industry. WIAT has tailored insights obtained from earlier studies in the field of innovation (e.g. Booz-Allen & Hamilton, 1968; Cooper, 1985; Hollander, 2002, Jamrog, 2006) to the agrifood industry. Moreover, it enhances the diagnostic value of existing tools by effectively utilizing the rich tacit knowledge of the members of innovation project teams that come from such diverse backgrounds as food science, marketing, engineering and sales and linking these insights at project level to the drivers and barriers of innovation present in the company as a whole.

WIAT starts with structured interviews with a number of top and innovation executives about innovation management in general and the drivers and barriers to innovation. In these structured interviews the following topics are scored using 5-point Likert scales: The importance of innovation to the company; reasons for pursuing innovation; the ability to identify creative people; drivers and barriers for the development of an innovative culture; the external drivers to innovation; creativity and actions taken to support innovation. The scores are then compared with the AMA study discussed in section 2 (Jamrog, 2006).

After the structured interviews about innovation management in general, a number of clearly successful and failed projects are selected, to which the running innovation projects can be compared. Successful projects are defined as projects that not only are a success in terms of engineering/technological accomplishment, but also perform well after market introduction and generate substantial sales for the company. Failed projects are projects that are either stopped before project completion or market introduction, or prove to be a failure in the market. Next, the selected projects are evaluated by the project team members. To this end, first a meeting is organized with the project leader of each project to adapt the WIAT questionnaire to the specific situation of the innovation project at hand. The terminology is checked so that it will be meaningful for the project team, questions can be eliminated that are not applicable for the project, and company specific problem areas can be included in the assessment. Second, the project team members -sometimes extended with external experts familiar with the project - fill out the questionnaire. The project team members are then asked to assess how well

the project performs along a number of dimensions (see below), but also how certain they are about their answer. This implies that for each of the 55 statements the project team members have to provide an assessment between 1 to 10 (1 = I totally disagree with this statement and 10 = I totally agree with this statement), and the level of certainty (1 = I am completely uncertain about my assessment of this statement, and 10 = I am completely certain about my assessment of this statement). Based on the team's response score, the optimism within the team regarding the measured factors can be determined. Based on the team's certainty score, it is possible to determine their confidence in their answers. By looking at the standard deviation among the individual scores per project it is possible to determine the level of consensus within the team. It is assumed that if the team is more certain regarding their assessments, it will have a higher probability of achieving success.

Based on the pivotal work of Cooper (e.g. 1992), further developed by Hollander (2002), WIAT uses the following constructs to assess the change of success and failure of individual innovation projects:

- Two constructs at the company level: project-company fit and project resources. The project-company fit indicates that an innovation project should fit with the company's strategy, if a project is not in line with the company's strategy, the project leader should ask why this project was initiated in the first place (Hollander, 2002; Fortuin, 2006). The project resources construct indicates that success of an innovation project relies on the financial and human resources devoted to it, as well as the technical, managerial and marketing skills of the team members and the company at large.
- One construct at the team level: team communication. Project team members are key to every innovation project, of course. Without them, the best innovation process cannot develop a new product or process successfully. In effect, the project team members all have to line up and work in an integrative way. This necessitates good technical and communication skills as well as sufficient decision making authority.
- Two constructs at the product/process level: product superiority and product aspects. Product superiority indicates that a new product should possess distinctive features compared to competitors' products in order to be successful in the market, such as a higher quality, or unique features. It is assumed that if a new product has a clear economic advantage and meets certain customer demands, it will have a higher probability of achieving success in the market. Furthermore, there are specific product aspects that define the innovation process, such as high product innovativeness and/or technological complexity.

- Three constructs define the market: market competition, market volume, and environment. A new product is developed for a certain market, where volume, size, potential value, and growth of the market determine if a product has possibility to be sold at the numbers predicted. However the new product has to compete with other products or substitute products in the market. The constructs define the level of competition and the market attractiveness as well as the level of hostility of the (institutional) environment.
- Three different time-dependent constructs are used to measure performance: project, product and future performance. Project performance refers to whether the project is within planning, budget, and to which extent the original project objectives are fulfilled. Product performance refers to benefits for end-users and if the project is expected to earn money for the company, and future performance refers to possible spin-off products or processes and the possibility that it improves customer loyalty. The constructs and the individual items are listed in the appendix.

The results of a project assessment along all constructs, including team optimism, consensus and confidence indicate the potentially strong, and, more importantly, weak points of the innovation project. The project assessment results are compared with a database that includes the WIAT evaluation of a growing number of successful and failed innovation projects from the agrifood industry. The results of the WIAT assessment are then the starting point for actions to improve the project.

WIAT application

The present paper shows the results of the application of WIAT in 12 prospector companies in the Netherlands and France, as well as two innovation consortia and 1 research institute closely related to the agrifood industry. All investigated companies were large, multinational prospector agrifood companies, with annual sales ranging between USD\$ 100 Million up to over USD\$ 1 Billion. This implies they allocate resources to innovation on a structural basis, and have a central R&D department where innovation projects are carried out by multidisciplinary teams. Two projects in the ex post analysis were from relatively smaller companies. However, these companies still have relatively high percentage of employees dedicated to research and development. Leaving out those projects from the analysis did not substantially change the outcomes and subsequent conclusions. However, the minor differences found are mentioned when discussing the results. In total, 46 innovation projects, 11 successful, 6 failed, and 29 running projects were assessed. From the 46 projects, 2 projects were conducted by innovation consortia including a number of companies and knowledge institutions and 2 projects were conducted by a research institute. The running projects assessed were all in a development stage. The minimum number of evaluators of a project was 2 (in the

case of projects that were already concluded), the maximum was 11 and the average was 3.6 (see table1 for the details).

Table 1: The number of innovation projects assessed

Innovation projects	Number of projects		Number of respondents	
Running	29	63%	99	60%
Successful	11	24%	35	21%
Failed	6	13%	30	18%
Total	46	100%	164	100%

For the projects assessed ex post, the same methodology was applied as for the running projects. To enable a valid comparison, the evaluators were explicitly asked to evaluate the project as if it was still ongoing. Evidently this does not eliminate the response bias, but this approach has proven to be effective (Cooper, 1985). The statement and certainty scores of each respondent per project were combined in order to calculate the project scores. Then, construct scores were calculated by taking the average of the underlying statements. Some negatively formulated statements in the project company fit and market competition construct were reversed before the statistical analysis started. Both parametric (t-tests) and non-parametric (Mann-Wittney) tests were used. In general, substantive conclusions were supported by both statistical techniques. In this paper, we present the results from the t-tests. The results were checked for the following control variables: company size, number of divisions, innovation history and market position. We found no significant effect of these control variables. It should be realized, however, that this was not to be expected because it are all very large prospector companies, often the market leader in their respective sector.

Results: Key Success Factors

Key success factors at the construct level

The consistency of the different constructs was analyzed with a Cronbach's α reliability test. All constructs show a reliability of Cronbach's $\alpha > .68$, except for the environment factor (Cronbach's $\alpha > .52$). For this type of explorative analysis, a Cronbach's α larger than .6 is satisfying. The results can be found in the appendix. By comparing the average assessment of the 11 successful (35 respondents) with the 6 failed projects (30 respondents), the key success factors were determined. First, KSFs at the construct level are discussed. Then, we focus on KSFs on the individual statement level. Figure 2 shows the key success factors (the red ovals indicate significant differences). Except for the construct 'project-company fit', all construct scores of successful projects are higher than for failed projects. However, not all differences between success and failure are significant. The constructs 'product superiority' and 'project performance' are significant at the .01 level, whereas 'team

communication’ and ‘market volume’ show p-values of $< .05$. Finally, the factor ‘product resources’ has a p-value $< .1$. Figure 2 further shows that the mean scores for the running projects mainly fall between the successful and failed project means. Exceptions are ‘project company fit’ and ‘market competition’. The mean score on the construct market competition of running projects is higher than that of the successful as well as failed projects. We interpret this finding as a signal that the respondents of the running projects perceive the present level of competition in the market as more severe than the respondents of the successful and failed projects do when looking back at the competition level some years ago. The finding that the average project-company fit of the running projects is assessed even lower than that of the failed projects might be interpreted as a signal that the agri-food companies under investigation tend to shift to more radical levels of innovation.

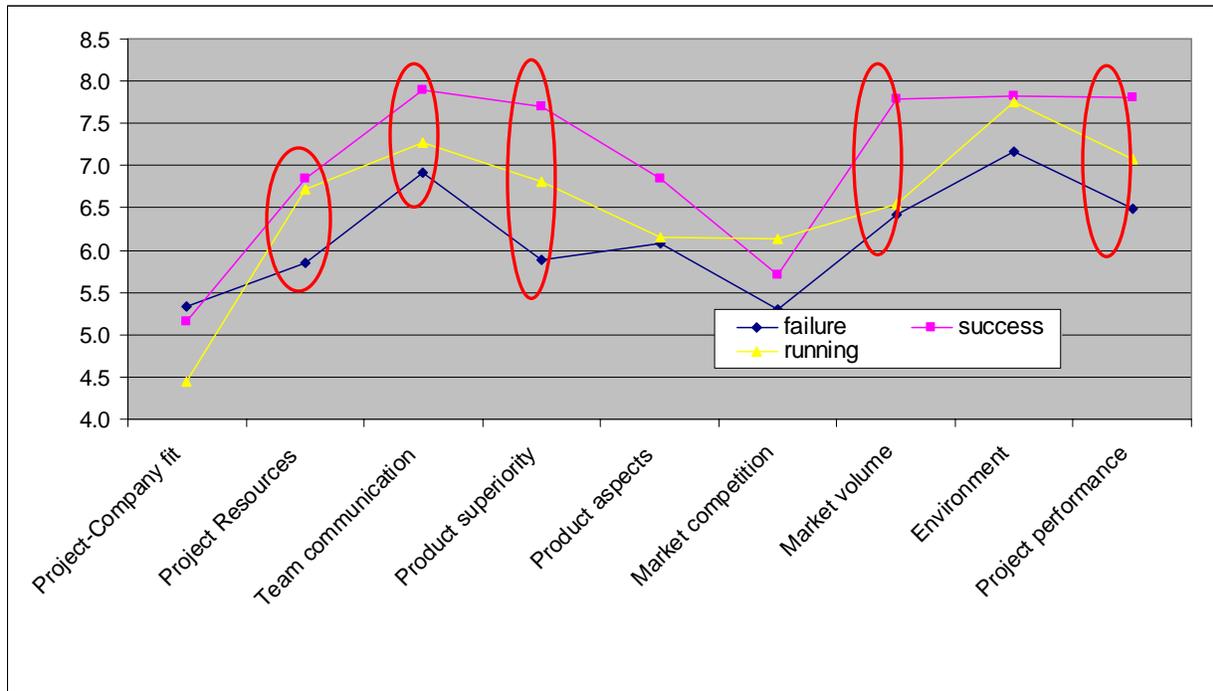


Figure 2: The key success factors in the agrifood industry, including the mean scores for the running projects (statement scores).

In figure 3 the significant construct differences for the certainty scores are highlighted with red ovals. It appears that for successful projects, evaluators are more certain about the team factor ($p < .01$) and the two market factors (market competition and market volume, $p < .05$). Interestingly, figure 4 further shows that certainty levels of running projects are in line with those of failure projects. This might be partly due to the fact that the successful and failed projects were assessed

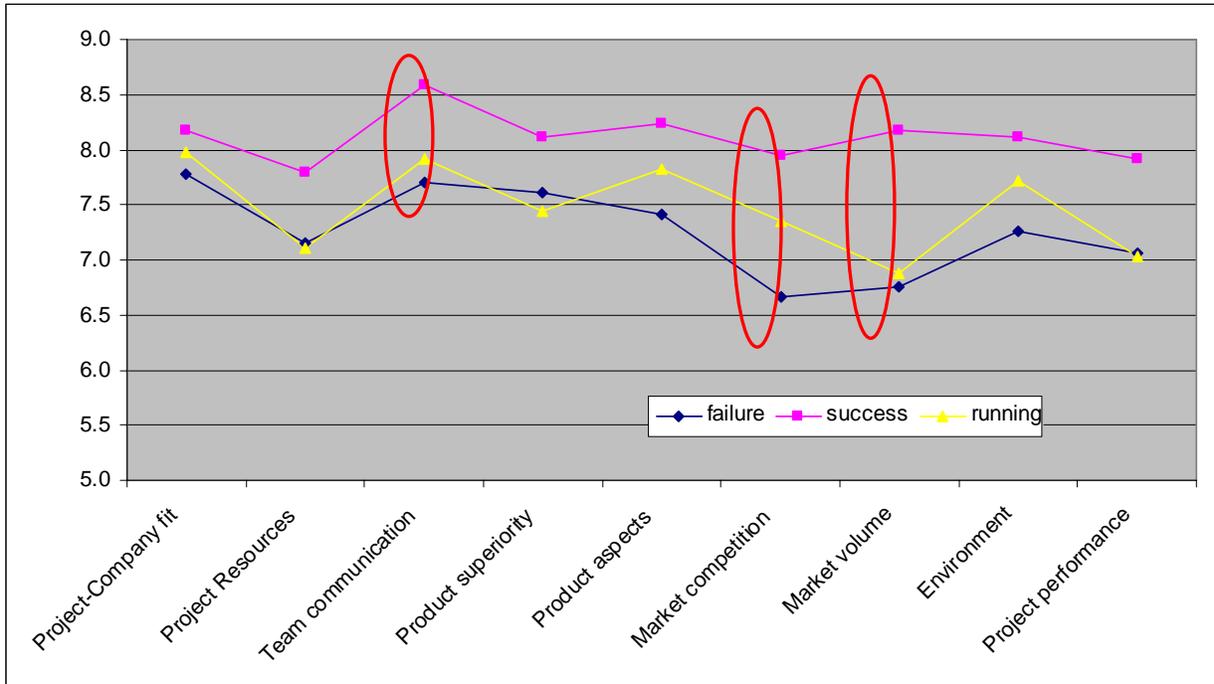


Figure 3: The key success factors in agrifood industry, including the mean scores for the running projects (certainty scores).

ex post, whereas the running projects were assessed ex ante. Hence, in the future WIAT will be further improved by basing the reference values (of successful and failed projects) on ex ante evaluation and ex post performance measurement.

Key success factors at statement level

As the evaluation with WIAT deals with in-depth information concerning the projects, we also did the statistical tests at the individual statement level. In Table 2 the statements showing a significant difference between the means of the successful and failure projects are provided, with the corresponding t-values indicating the level of significance.

Interestingly, three statements concerning the project resources were significant. Successful agrifood projects score higher on sufficient engineering skills and people, sufficient advertising and promotion resources and skills, and a sufficient sales force and/or distribution resources and skills. This result already shows that innovation truly is a cross-functional process. However, surprising are the relatively low scores (also for successful and running projects) evaluators give concerning advertising and promotion and the sales force and/or distribution resources and skills. Apparently, the marketing and sales force of agrifood companies plays an unimportant role in the innovation process in the eyes of the evaluators. The important question here is, if agrifood companies do not underestimate the

Table 2: Key success factors at the statement level

	Failure Mean	Success Mean	Significance Level ^{1,2}
Project - sufficient engineering skills and people	6.54	8.08	**
Project - sufficient advertising and promotion resources and skills	4.43	5.93	*
Project - sufficient sales force and/or distribution resources and skills	5.32	6.81	**
Team - member wants to participate in a new project with the same team again	6.88	8.44	*
Team - member completely understands the potential problems of the project	6.79	8.02	*
Team - member completely satisfied with the product development process used	6.04	7.50	*
Product - superior to competing products customers needs	5.62	8.23	*
Product - higher quality than competing products	6.35	8.57	**
Product - unique features or attributes	6.64	8.34	**
Product - will definitely be used by the customer	7.25	8.33	**
Product - high potential, can create additional products	6.49	8.33	*
Project will stay within budget	5.93	7.23	**
Project will fulfill the product specifications	5.61	7.52	**
The project will generate money	6.46	8.82	**

¹ One-tailed, 15 degrees of freedom; ² * p-value < .05, ** p-value < .01.

importance of the relationship with the customer. Three significant differences with respect to the innovation project team are observed. If a project ends successfully, team members are more satisfied with the project team (they want to participate in the same team) and team members indicate to have a better understanding of the problems that have to be solved, than in failed projects. Clearly, successful innovation projects involve superior products in terms of customer needs and quality. This could be expected as product quality plays an important role in the agrifood industry. Successful projects also score higher on the statement that the new product has the potential for line extension and extra features. Finally, in successful projects, evaluators are more positive about the probability that the project will stay within the budget, fulfill its objectives and that the product will ultimately generate money in the market.

Certainty Scores

Table 3 lists the significant differences for the certainty scores of the different statements.

Table 3: Key success factors at the statement level (certainty scores)

	Failure Mean	Success Mean	Significance Level ^{1,2}
Project - sufficient production resources or skills	7.43	8.27	**
Team - member completely understands the potential problems of the project	7.29	8.48	* ³
Team - member completely satisfied with the product development process used	7.55	8.82	**
Product - mechanically and/or technically complex	7.34	8.43	*
Market - a highly competitive one	6.79	8.54	*
Market - with many competitors	7.17	8.51	*
Market - characterized by intense price competition	5.94	7.71	*
Market - monetary value of the market for product is large	6.20	8.11	**
Market - potential customers great need for product	6.75	8.23	**
Product - will definitely be used by the customer	6.99	8.29	* ³
Product - high potential, can create additional products	6.96	8.43	*
The product will generate money	6.65	8.58	* ³
This product will improve the customer's loyalty	6.50	8.14	* ³

¹ One-tailed, ² * p-value < .05, ** p-value < .01.

³ p-value < .1 for the sample without the two smaller companies

Interestingly, successful projects score higher for the five market related statements. Team members from successful projects were clearly more certain about the market features. This implies that the teams of successful projects were clearly better informed about the market characteristics (e.g. through dedicated market research) than teams from unsuccessful projects. Also, two statements from the team construct turned out to be significant. For instance, team members from successful projects were more confident about the product development process.

Results: WIAT Analysis in a Prospector Company

To show how WIAT works in management practice, we show in this section an example of the WIAT analysis in a multinational prospector food processing company with markets in Europe and the USA. First, the drivers and barriers are given as assessed by three top and innovation managers. These assessments are compared to the AMA study. Then, two running projects are evaluated using the WIAT database.

The sample company is one of the largest multinational agrifood companies with an annual sales volume between US\$ 500 million and US\$ 1 billion. It is a processor company of primary produce, with a strong technology base. It follows a prospector strategy: it aims at staying ahead of competition by introducing new products and implementing new processes faster than its competitors. The sample company is representative for the research population. The selected running projects aim at bringing products to the market in new innovative ways, involving not only new production processes, but also introducing new products that are geared to new ways of food preparation at home.

Analysis of the drivers and barriers to innovation

The scores of the three top and innovation managers of our sample prospector company on the importance of innovation are in line with those in the AMA study (see Figure 4).

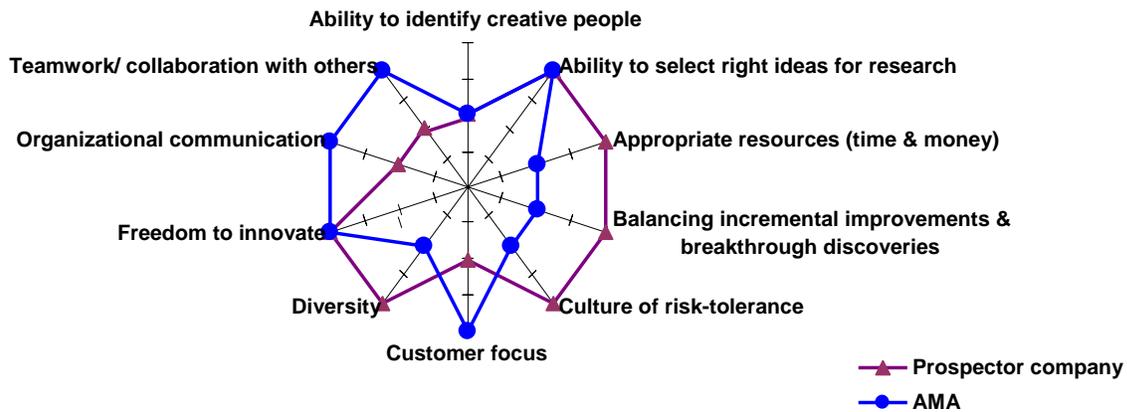


Figure 4: Innovation drivers and barriers of the agrifood prospector company compared with the AMA average

The three top managers recognize the importance of innovation, and have a clear understanding of what innovation means. However, 40% of the AMA respondents and two of our respondents does not have a clear understanding of how the company can become more innovative. Figure 4 shows that the company’s managers are as or even more convinced than the average AMA executive about their company’s culture of risk-tolerance, diversity, ability to select the right ideas, to provide the appropriate resources, and finding the right balance between incremental improvements and breakthrough discoveries. This is not surprising because our sample company is really at the top of its industry, while the AMA-results are based on the average assessment. However, it is therefore extra surprising that regarding customer focus, organizational communication and teamwork and collaboration with other departments, the company’s managers self-assessment is significantly lower than the average assessment of the AMA executives.

The most important barrier to innovation at our sample company, cited by all respondents, is a lack of clear goals and priorities. This barrier were also indicated by more than 50% of the AMA respondents, who rank them in the top three barriers for innovation. Other barriers that were indicated by at least one of the respondents were insufficient resources, company’s structure insufficiently geared toward innovation, lack of management support. These barriers also appear in the top three of more than 35 % of the AMA-respondents. Although the sample company considers itself as a prospector company, this assessment clearly points out that the implementation of their innovation strategy can be improved.

The innovation project analysis

The figures 5 and 6 present the assessments of a potentially successful and a potentially failing innovation project from the sample agrifood prospector company. The figures are presented the way they were shown to the project teams. The zero line in the figures represents the mean construct score of successful agrifood companies.

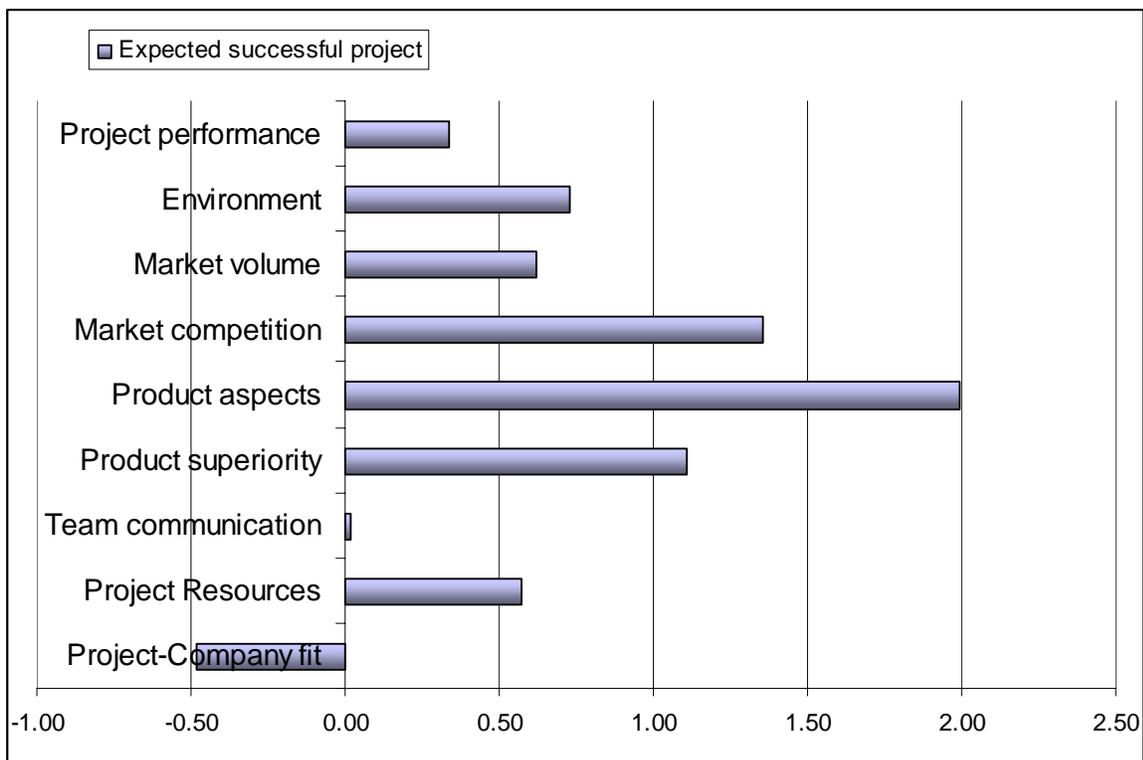


Figure 5: A potentially successful innovation project compared to successful projects¹

¹ The zero line in the figure represents the mean factor score of successful agrifood projects

Figure 5 presents the results for a potentially successful project. This project scores are high compared to successful projects for almost all constructs. Only for project-company fit the score is lower. It is important to note that the high score for 'market competition' is a potential weakness, as this construct represents the expected level of competition this product will face on the market. The team factor is perfectly in line with successful projects, and the team evaluates the product as superior to competing products. This is important because it is the most important success factor. In addition, the high score for 'product aspects' indicates that this project concerns a relatively innovative product, with highly advanced technologies. As this is a comparison with successful projects, the prospects for this project look extremely good. If we would have compared the assessment with failure projects, the figure would even have looked better.

Figure 6 presents the results of a potentially failing project. Most notable is the low score for market volume. Apparently, the team is not very positive about its market potential (below 5 on a 10-point scale!). Moreover, for key success factors such as product superiority and team communication the scores are low. The management should clearly ask itself whether they should continue this project.

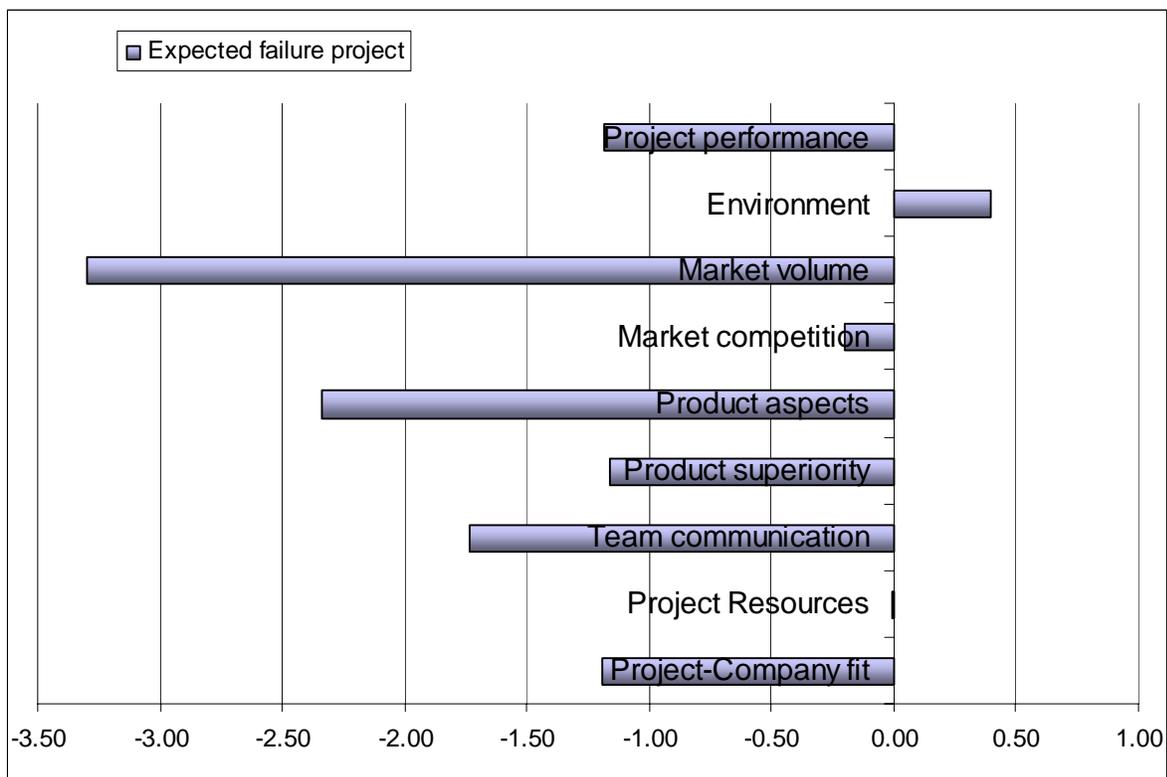


Figure 6: A potentially failing project compared to successful projects¹

¹ The zero line in the figure represents the mean factor score of successful agrifood projects

Conclusions and Discussion

Concerning objective 1: *To develop an assessment tool that provides relevant, reliable and valid management information for business development teams in the agrifood industry*, it can be concluded that the innovation process of agrifood prospector companies can be substantially improved by revealing the tacit knowledge of the project team members by use of WIAT. It provides clear criteria for project selection and project evaluation by comparing running projects with a database of successful and failed innovation projects. Moreover, by comparing running projects with the ex-post insights of clearly successful and failed projects in the same company, the ex-ante predictive value of the tool is greatly enhanced. The tool can therefore provide important diagnostic clues that not only help in the go/no go decisions for running projects, but even more importantly, can deliver critical information on strong and weak points of the project as it is being conducted. As such, it enables managers to interfere at a moment that this is still possible. This enables companies to use their scarce resources for the most promising projects and to effectively steer these projects along pitfalls and threats. By connecting the feedback on project level with information on the drivers and barriers to innovation present in the culture of the company as a whole, the instrument deepens the understanding of managers of what underlies innovation success and failure of the company, and how to manage the uncertain innovation process in a more effective and efficient way.

As a tool under development, WIAT has some limitations. The reference database with successful and failed project still relies on historical data, with an inherent evaluation bias by respondents. But, in a rapid pace, running innovation projects are finished. With future performance measurement, evaluating the stopped projects, and the products introduced onto the market, either successfully, less or even unsuccessfully, WIAT can be increasingly based on the ex ante evaluation of innovation projects.

Concerning objective 2: *To provide insight in the key success factors for new business development in the agrifood industry*. With our study, we identified the key success factors for innovation projects in the agrifood industry, namely team communication, product superiority and the expected high market volume are the factors that make the difference between success and failure. The finding that successful agrifood projects score higher than unsuccessful projects on the construct engineering skills as well as on that of resources and skills in the fields of advertising, promotion, and sales, may indicate that innovation in this sector truly is a cross-functional process. It is therefore concluded, that the innovation project teams should be cross-functional and feature a heavyweight leader, who will enhance team communication and provide for a clear product definition.

From the finding that teams of successful projects were clearly more certain about the market and about the way to conduct the innovation process, than teams from unsuccessful projects we conclude that they are better informed about the market

characteristics (e.g. through dedicated market research) and are more confident to direct the innovation process accordingly. The finding that the level of market competition is assessed significantly higher in running projects than in completed projects may indicate that the level of competition that agrifood companies are facing today has risen dramatically, even compared to only a few years ago. If we combine the above findings we may conclude that agrifood prospector companies that could flourish in the past by counting on their technological expertise as driver for business success, nowadays should realize that they need to pay special attention to market and product related up-front activities, such as detailed market studies and clear product definitions prior to product development. Seen in this light, the finding that nearly all respondents, not only those of failed projects, give relatively low scores for advertising and promotion and the sales and/or distribution resources and skills, might be considered as an early warning signal for the industry as a whole. For knowing the customer needs, wants and preferences in the target markets, translated into product specifications and requirements are of essential importance to transform good quality products into superior and unique products.

One of the conclusions presented to the prospector company that was used to show the special features of WIAT in § 5, was that there was a clear disequilibrium with respect to how the innovation process was conducted in the different regions of the world and for the different product areas. As such, there was a high potential for some regions to adapt best practices developed by the company in other regions. Moreover, one critical element highlighted by the WIAT was that the company lacked a well-functioning marketing function. Innovation team members mainly based their decisions on personal assumptions about their customers, and not on thorough market research, while the final consumer was completely overlooked. As a result of this study, the company reorganized its R&D and marketing functions world-wide.

It can be concluded that the diagnostic value of existing tools for the evaluation of agrifood innovation projects is greatly improved and that the existing body of knowledge on critical success and failure factors for innovation is now extended from science-based to supplier dominated industries and can thus become a valuable monitoring instrument to assist agrifood innovation management.

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Appendix

The WIAT Questionnaire with Cronbach Alphas

Construct name and reliability	Items comprising the construct*
Project-Company Fit statements: $\alpha = 0.69$ certainty: $\alpha = 0.85$	<p>The product type is totally new for our company.</p> <p>We have never made or sold products to satisfy this type of customers need or use before.</p> <p>The potential customers for this product are totally new for the company.</p> <p>The technology required to develop this product is totally new to our company.</p> <p>The nature of the production process is totally new for our company.</p> <p>The distribution system and/or type of sales-force for this product is totally new to our company.</p> <p>The type of advertising and promotion required is totally new to our company.</p> <p>The competitors we face in the market for this product are totally new to our company.</p>
Project Resources statements: $\alpha = 0.81$ certainty: $\alpha = 0.83$	<p>Our financial resources are more than adequate for this project.</p> <p>Our management skills are more than adequate for this project.</p> <p>Our engineering skills and people are more than adequate for this project.</p> <p>Our production resources or skills are more than adequate for this project.</p>

	Our marketing research skills and people are more than adequate for this project.
	Our advertising and promotion resources and skills are more than adequate for this project.
	Our sales and/or distribution resources and skills are more than adequate for this project.
Team communication	I have enough communication with my team members to do my work efficiently and in an effective way.
statements: $\alpha = 0.78$	The portfolio management has explicit expressed its commitment to the project team.
certainty: $\alpha = 0.82$	The performance requirements for this project are clear for me.
	In a new project I surely want to participate in the current team again. I completely understand the potential problems of the project.
	If I doubt the opinion of a team member I will surely confront this member with it.
	All our team members are focused on “collecting” knowledge for our project.
	I am completely satisfied with the product development process used.
Product Superiority	Our product will be clearly superior to competing products in terms of meeting customers’ needs.
statements: $\alpha = 0.76$	Our product will be of higher quality than competing products.
certainty: $\alpha = 0.86$	Compared to competitive products, our product will offer a number of unique features or attributes to the customer.
	Our product will permit the customer to do a job or do something he/she cannot presently do with what is available.
	Our product will permit the customers to reduce their overall costs, when compared to what they use now.
Product Aspects	Our product is highly innovative totally new to the market.
statements: $\alpha = 0.75$	Our product is a very high technology one.
certainty: $\alpha = 0.74$	Our product is mechanically and/or technically very complex.
	Our product will be first into the market.
Market Competition	The market is a highly competitive one.
statements: $\alpha = 0.69$	There are many competitors in this market.
certainty: $\alpha = 0.92$	There is a strong dominant competitor – with a large market share – in the market.
	There is a high degree of loyalty to existing (competitors’) products in this market.
	New product introductions by competitors are frequent in this market.
	The market is characterized by intense price competition.
Market Volume	The monetary value of the market (either existing or potential market) for this product is large.
statements: $\alpha = 0.68$	The market for this product is growing very quickly.

certainty: $\alpha = 0.91$	Potential customers have a great need for this type of product. The customer will definitely use the product. This product has a high potential (i.e can additional products, multiple styles, price ranges).
Environment	This project will contribute to the competitive advantage of the company.
statements: $\alpha = 0.52$	This new product will surely meet the applicable laws (e.g product liability, regulations, and product standards).
certainty: $\alpha = 0.71$	This new product will surely have a positive effect on the environment.
Performance	What is the probability that this project will be completed within the original planning?
statements: $\alpha = 0.96$	What is the probability that this project will be completed within the original budget?
certainty: $\alpha = 0.90$	What is the probability that this project fulfils all its objectives? What is the probability that this project will directly benefit the end-users (either through increasing efficiency or effectiveness)? What is the probability that this project will earn more money for the company than it costs? What is the probability that this project will have a major spin-off or springboard effect, a step in the development of a new generation of products? What is the probability that this project will improve customers' loyalty to the company?

* All items are measured on 1-10 scales. 1 = I totally disagree with this statement and 10 = I totally agree with this statement. For the level of certainty: 1 = I am completely uncertain about my assessment of this statement, and 10 = I am completely certain about my assessment of this statement



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A Customer Service Design Case Study: Insights on Customer Loyalty in the Brazilian Food Sector

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Abstract

Marketing managers of local and international food companies have realized that what they offer to customers go well beyond the characteristics and attributes of the products their companies manufacture and market. Service has become an integral part of the offer (Grönroos, 1993); a high service quality improves the company competitiveness, builds customer trust, supports the company brand and other product attributes (Berry & Parasuraman, 1991, p. 12). This paper seeks to investigate whether customer care service perceived quality in the food sector is truly relevant to customer satisfaction and loyalty.

Keywords: quality service evaluation, consumer service, loyalty, food industry

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Introduction

In recent research, Allen et al (2006) found out that 80 percent of the managers interviewed believed they offer a superior experience to their customers. A contradiction merged, since their customers thought otherwise, i.e, a mere 8% of the companies were found to deliver what their customer expected. In a fiercely competitive world numbers like those raise a question: how can loyalty be build based on a weak experience of consumption? Companies today clearly recognize that their offers to customers go well beyond the characteristics and attributes of the product they manufacture. Service has become an integral part of the offer (Grönroos, 1993), even in consumer goods, directly influencing customer satisfaction (Parasuraman, Zeithaml & Berry, 1985; Heskett, Sasser & Schlesinger, 1997). A high service quality improves company competitiveness, builds customer trust, supports a company's brand and other product attributes (Berry & Parasuraman, 1991, p. 12). Indeed, prior studies support that customer satisfaction is directly linked to customer retention, repeated purchases and customer loyalty (Reichheld, 1996; Corrêa & Caon, 2002, p. 93; Bateson & Hoffman, 2001, p. 363).

One of the main concerns in the food business is to meet consumers' expectations of food quality. Not only do they expect a product in perfect condition for consumption, but also with an extra something that gives them a sense that the product is safe and healthy. In order to keep track of consumers' satisfaction and complaints and also to offer them detailed information and clarify doubts about products, food companies have maintained customer service departments, which establish a link with customers, mainly through telephone contact.

Given that customer care service is rarely investigated and no studies were found establishing a connection between quality perception of this type of service and customer satisfaction and retention especially in food sector, this research innovates insofar as it brings some insights on customer loyalty for food marketing managers.

The investigation integrates two research methodologies: a qualitative study through in-depth interviews with customers from diverse of food companies and a survey on 364 customers who used the customer service of a multinational food company, a historical player in the Brazilian food market. Customer service perceived quality, customer satisfaction and customer retention were measured and a positive relationship among these constructs was established. This implies that the customer service in the food business may have a role in establishing overall customer satisfaction and retention of those clients who actually used the service.

The analysis also allowed identifying which aspects of customer service are more influent in determining a better quality perception. This has significant managerial importance since it can be used to better design new customer service centers or

improve existing ones, linking this activity to the overall company objective of satisfying and retaining customers.

In order to understand the nature of the problem investigated and create a framework to analyze it, next section presents the concept of service and its characteristics, within the scenario of customer care service in the Brazilian food market. Aspects of quality perception and loyalty will be reviewed next. Service management literature was used as a theoretical foundation and, more particularly, the script theory by Woodside et al (1989).

Literature Review

The idea of service has been gradually changing since its initial days, when it was construed as something of a totally different nature from products. But although early literature treats services and products dichotomously, recent authors have tended to see a continuum between services and products (Gianesi & Corrêa, 1994; Sasser, 2002; Fitzsimmons & Fitzsimmons, 2002; Lovelock & Wright, 2001).

Berry and Parasuraman (1991, p.24) indicate that all offers have tangible and intangible elements contributing to the main benefit perceived by the customer. The relative weight of the tangible and intangible elements should determine a classification into product and service.

Four aspects are generally used to characterize services: intangibility, joint production and consumption, greater heterogeneity and perishability. Service is intangible because it cannot be seen, smelled, tasted or touched in the same way as a physical good. The inseparability of production and consumption relates to the fact that services are usually first sold and only later simultaneously produced and consumed, while goods are usually first produced, then sold and subsequently consumed. Heterogeneity regards the potential increased variability in service performance. Perishability concerns the fact that services cannot be stored, thereby appending additional constraints in the attempt to match supply and demand (Parasuraman, Zeithaml & Berry, 1985; Norman, 1993). These authors added the characteristics of heterogeneity and perishability to the set of attributes developed by Grönroos (1978, 1980, 1988) and highlighted the fact that the consumer does not have ownership due to the intangibility characteristic of service.

Customer service in Brazilian food market

Customer service is a support activity to the company's main products and includes replies to doubts expressed by customers about a product and its utilization, taking orders and organizing maintenance and repair. It involves interactions with customers which can in person, by phone, by mail or by any other electronic means (Zeithaml & Bitner, 2000; Lovelock 1983). These transactions aim to improve

operational efficiency and customer satisfaction (Lovelock, 1983). Bowen et al. (1989), Grönroos (1993) and Heskett et al. (1997) emphasized the role of customer service in companies' competitiveness. This activity can attract and help retain customers since it has the potential to modify, positively or negatively, the perceived value of the company offer (Bolton & Lemon, 1999). Customer service can also be a source of valuable primary information about customers (Albrecht & Bradford, 1992).

Besides the strategic aspect of the consumer care service, in recent years it became mandatory for food companies to invest in this type of service in order to respond properly to consumer legislation. In Brazil, the first state agency created to defend consumer rights, named Procon, was implemented in 1976 by the government of the state of Sao Paulo, the most important state in Brazilian economy. Since this initiative combined with the sanction of Federal Law 8.078, known as Consumer Defense Code, in the 90's, consumers' perception of quality and their conviction in their rights have become important issues to all companies.

Since its creation, the number of complaints and consults addressed to Procon has increased steadily. In 1977 the number of requests was 1,542 going to around 368,000 in 2003. From this total, 12% were complaints, which were forwarded to the companies (Fundação Procon, 2004). In comparison to other economic sectors, in first two quarters of 2006 food companies received 220 complaints, being 3,444 for products and 4,910 for services (Fundação Procon, 2006). In essence, consumers' access to this type of institution occurs under two main circumstances: i) when the company does not solve the problem or doubt, or ii) the company does not have a call center to respond to the consumer's requests. Based on the numbers, it might be understood that consumers are accessing more effectively the food companies. Therefore, accessing the call center is just a piece of the service quality perception puzzle.

Quality in complaint management and consumer loyalty

Loyalty is identified as the current currency in the 21st century by Singh and Sindershmkh (2000), once the relationships between companies and their consumers have been more frugal each day. The key questions are: how to convert sporadic consumers into heavy users? How to make them the announcers of the benefits of a product to other potential consumers?

The power of loyalty has been associated to the quality of service delivered by the companies to their consumers (Guns, 2002; Santos and Rossi, 2002; Brei and Rossi, 2005). And given that consumer care is an important service delivered by companies, it is clear to understand the pivotal role it plays in consumer satisfaction. Through a nationally representative survey of 22,300 customers of a variety of products and services in Sweden, Andersen and Sullivan (1993) tested

important hypotheses from the satisfaction literature. Their conclusions assert that “an important component of managing satisfaction is the ability to control the impact of negative disconfirmation through complaint handling and effective customer service”.

Service quality is directly related to consistency in customers’ expectations of what is specified or promised and what is in fact delivered. It is the result of the match or mismatch between customers’ expectations and customers’ perception of what was delivered (Johnston & Clark, 2000, p. 126). Following this line, Zeithaml and Bitner (2000, p. 69) identified the existence of four types of expectations: a) the desired service, or what the customer wants; 2) the adequate service, or what the customer is prepared to accept; 3) the expected service, or what the customer is seeing as the most likely result of the service interaction. The difference between the expected service and the perceived service is the gap to be minimized.

Moller (1997, p. 156) identified that the perception of a service customer is affected by two types of quality: one objective or technical and another subjective, related to the person providing the service. This technical or objective quality is related to the product performance or, more precisely, to the tangible content of the service.

Consumers judge the quality of a service, however, not only by this objective element, but also by the way the service is delivered. Zeithaml and Bitner (2000, p. 81) use the example of an architect who can have exceptional technical knowledge, but limited relationship capability. Another professional with much lower technical level can be regarded as providing better quality service if s/he treats the customer with courtesy, kindness, and proves to be understanding to customer problems.

The understanding of customers’ expectations and their perception of service is the first step to deliver a high quality service (Zeithaml & Bitner, 2000). This reinforces the importance of front line personnel to service quality. They should be chosen and trained to have the capabilities to deal with several types of customers (Fitzsimmons & Fitzsimmons, 2002, p.223; Castelli, 2000, p. 29).

The interaction between customer and service provider determines what Normann (1993) has defined as “the moment of truth”, which for Albrecht and Bradford (1992, p. 28) has become the anathema of service management. Embedded in the moment of truth, complaint management assumes a crucial role in effectively designing a long term relationship (Berry and Parasuraman, 1991; Tax et al, 1998), which is a key driver for loyalty.

The service management

Woodside et al (1989) created a model drawing on the work by Parasuraman et al (1985) and the script theory by Solomon et al. (1994) aimed at relating service quality to satisfaction and purchase intention. Solomon (1996) defined the concept of service script, describing a coherent sequence of expected events during a service encounter. Lovelock and Wright (2001, p. 325) assert that the theories of roles and

scripts are useful to service providers. They regard service as a theatrical experience where both employees and customers act following predetermined roles. The role is a set of standard behaviors, learned by experience and communication, and played by the individual in a certain social interaction to achieve better efficiency. Congruency of roles determines satisfaction to both parties. The more experienced a consumer is with a company, the more familiar the script becomes and so any deviation from this script has the potential to frustrate both customer and employee. Script definition is a good way to elaborate a service flowchart and can help to identify potential or existing problems.

Each type of service must be analyzed to identify related and expected acts and events (Shostack, 1987). The Woodside et al (1989) model tried to establish a relationship between the judgment of each service act/event and the final service quality judgment by the customer. In their original work, service in hospitals was decomposed into acts such as: a) patient admission; b) nursing service; c) meals service; d) cleaning service. For each of these events, the authors identified acts to be evaluated in terms of quality. In the case of nursing service, for example, the following attributes were included in the model: quality of information provided by nurses; convenient scheduling of services and promptness in dealing with requests. Besides measuring each event, the authors proposed a quality evaluation and a customer satisfaction evaluation for each act. Finally, the model integrates this into the overall quality assessment and customer satisfaction, as well as customer intention to use the service again.

This idea of service script was used to define a generic sequence of customer service activities, allowing a more structured way to evaluate its quality. As this generic sequence was not available in the literature, an exploratory research was developed to define it.

Research Method

The research was developed in two phases. Firstly, a qualitative exploratory study was accomplished to understand the process as a preparation for the second phase. Secondly, a quantitative survey with consumers was done.

A convenience sample of ten interviews was selected for the first phase. Consumers who had contacted a customer service department of a consumer food product company during the previous month were interviewed. Interviews tried to identify component elements of the service script. They were taped, content analysis was used to build units of analysis (Bardin, 1977), and a matrix was produced (Denzin & Lincoln, 2000, p. 785) to better understand the subject and develop the final model.

In the second phase, the sample included consumers with different types of enquiries and complaints who had contacted the customer service department of a

large Brazilian consumer food product multinational. Considering the time and financial resources constraint of the research, it was decided to run a random sample of 1600 cases. From this sample, 364 customers responded the interview, providing a response rate of 22,8%. Sample characteristics are shown in Table 1. The respondents were asked to evaluate quality service using seven variables measured through a Likert type scale of five points. This research chose this scale based on McDaniel and Gates (2003) studies on the applicability of scales in phone call interviews. In their cases, the authors evaluated that five points was the maximum that could be successfully handled by the interviewers.

Table 1: Sample characteristics – quantitative study

Origin - State	%	Nature of contact	%	Gender	%
Sao Paulo	61,5	Complaint	51	Male	85
Rio de Janeiro	12,6	Information request	31	Female	15
Parana	6,5	Other requests	4		
Minas Gerais	6,3	Suggestions	2		
Rio Grande do Sul	4,9	Compliment	1		
Pernambuco	4,4	Criticism	11		
Bahia					

Results and Analysis

First phase – qualitative analysis

Following the method proposed by Bardin (1977), our analysis had three different stages: pre-analysis; material exploration; and treatment of results. Categories were established after several readings of the material that would allow interpreting the interviews.

To better understand the concept of service quality in this setting, the three following questions were asked:

What first comes to your mind when I talk about quality in customer service?

What do you expect from a high quality customer service?

What are the elements that make up a high quality customer service?

Responses to these three questions were grouped into typical categories, the results of which are shown in Table 2, illustrated by actual quotes that represent the concepts. The “E” at the end of the sentences stands for the number of the interviewee who made that statement. Drawing upon these results, a questionnaire to be used in the second phase was prepared and pre-tested. After the pre-test, minor adjustments were made to facilitate data collection.

Table 2: Categories related to concept of service quality

	Examples
Having the problem effectively solved	<p>“that actually finds a solution to my problem” E9</p> <p>“so a quality service is the person to know what is happening ... and solve the problem” E10</p> <p>“... is that customer service where you call and have a satisfactory reply to your request” E8</p> <p>“when you call you expect a solution” E2</p> <p>“I associate it to finding a solution...” E3</p>
Kindness demonstrated by the attendant	<p>“ to talk to a kind person” E9</p> <p>“notice that the people are concerned about helping you” E1</p> <p>“people are very friendly when talking to you” E4</p> <p>“to talk with a friendly and kind person” E5</p> <p>“...being polite...” E1</p>
Disposition to listen	<p>“...they listened to me, I think it is important to listen to your customers” E7</p> <p>“That the person listens to you” E7</p> <p>“They have to listen to me...” E5</p> <p>“Quality is having their attention... feel that the company gives attention to the problem ...” E2</p> <p>“...that the person pays attention...” E9</p>
Being well attended to	<p>“...is being well attended to...” E2</p> <p>“...that I will be well attended through this number I am calling” E7</p> <p>“...is to be well attended to...” E3</p>
Receiving a reply from the company	<p>“...the company is explaining to you what happened”. E3</p> <p>“...mainly having a proper explanation concerning what you need to know about the product...” E9</p> <p>“...because you always want to get a reply”. E3</p>
Receiving a follow up from the company	<p>“ ...shows the company cares about you...” E1</p> <p>“... the company must be proactive in making follow up contact to know whether the product was satisfactory replaced...” E5</p> <p>“if it is not possible to get all information once they should call back...” E10</p>
Disposition to replace the product	<p>“...replacing the product.” E8</p> <p>“quality comes with the product replacement” E6</p>
Product improvement	<p>“...product has to be improved...” E6</p> <p>“...make an adaptation in their products so that it improves and evolves.” E5</p> <p>“I think it is quite interesting to know from your own customer why he is not happy with the product.” E7</p>
Quickness	<p>“...good service is something quick...” E6</p> <p>“is the one where you call asking for something and you are dealt with no delay...” E8</p>
Attendant’s knowledge	<p>“is the person to know what is going on...” E10</p>
Consumer rights	<p>“it is important for us to know through the service what rights we have, who is responsible and liable.” E4</p>
Additional services	<p>“we call not only to clarify doubts, but also to get hints, recipes. We end up creating a relationship, becoming friends...” E4</p>
Trained attendants	<p>“trained people...” E4</p>

The qualitative phase allows identifying the main criteria associated with consumer satisfaction when a consumer service is experienced:

- Effectiveness of the service in solving the consumer problem, allied with a prompt response attitude;
- The main role of the attendant in giving attention to the consumer problem, showing commitment in solving it and establishing a connection between the company and the consumer;
- The sense of justice through the perception that the consumers' rights were protected.

Santos and Rossi (2002)'s research concluded that a strong relationship exists between consumer trust, complaint management and sense of justice. The results of their studies indicate that the basis for long relationship might be established through a satisfactory and fair treatment of the consumers' requests, which, mainly in case of conflicts, seem mandatory. They add that "investments in complaint management effectiveness will promote consumer's reliability in the company, improve the quality service evaluations, increase the number of transactions, and finally, strengthen the relationship between the company and its consumers" (Santos & Rossi, 2002, p.18).

Second phase – quantitative analysis

The results can be divided into two groups: i) quality service evaluated through the application of the script model and ii) satisfaction and loyalty aspects analyzed through overall consumer satisfaction evaluation.

In order to evaluate the quality, the service was decomposed in three acts, following the model of Woodside et al (1989). The first act corresponds to initial contact and is evaluated by the attribute easiness of contact. The second act corresponds to the interaction with the attendant trying to understand and diagnose the problem. It is evaluated by the attributes attendant courtesy, disposition to listen and attendant's knowledge. The third act is the final solution and outcome of the interaction; it is evaluated by the attributes received reply/problem solution and time used in the contact.

Table 3 summarizes the results for all variables investigated and shows that all had means higher than four, except for only two variables: received reply/problem solution and product substitution which presented means of 3.97 and 3.85, respectively. The highest scores were obtained for disposition to listen with 4.76 and attendant courtesy with 4.71, indicating that the front line personnel of the company under investigation was achieving a good performance concerning these variables.

Our qualitative study indicated these variables as important elements for the composition of a high quality customer service. Front line personnel is widely recognized as being relevant for service quality in general, thus selection and training are crucial to provide them with capabilities to handle all types of customers (Fitzsimmons & Fitzsimmons, 2002, p. 223).

Table 3: Service evaluation

	Total
Number of responses	(364)
Easiness of contact	4.66
Attendant courtesy	4.71
Disposition to listen	4.76
Attendant's knowledge	4.52
Received reply/ problem solution	3.97
Time used	4.41
Product substitution	3.85

When the means above are analyzed taking in consideration the nature of contact, some differences are observed. As shown in Table 4, these means were subjected to a basic ANOVA analysis. Customers who contacted the service for information and criticism rated attendant courtesy higher than customers who contacted the service for a complaint. Customers who contacted the service for information rated the received reply/problem solution higher than those who contacted the service for a complaint or criticism. It is thus inferred that when the service is contacted for information, the level of emotional involvement is probably lower than if it is dealing with a complaint or criticism.

Table 4: Service evaluation by type of contact

	Total	Complaint	Information	Criticism
	(a)	(b)	(c)	(c)
Total	(364)	(53)	(311)	(164)
Easiness of contact	4.66	4.67	4.65	4.71
Attendant courtesy	4.71	4.64	4.79a	4.78
Disposition to listen	4.76	4.73	4.79	4.78
Attendant's knowledge	4.52	4.56	4.50	4.41
Received reply/ problem solution	3.97	3.95	4.27ac	3.37
Time used	4.41	4.36	4.55	4.46

Note: contacts related to other requests, suggestions and compliments were not analyzed due to a limited number of occurrences.

Prior studies have shown that there is a strong connection between effective complaint management and re-purchase intentions and the real re-purchase act by

the complainers (Kelly, 1979; Gilly & Gelb, 1982; Martin & Smart, 1994). This study corroborate that complaint management appears as key element underlying the consumer-company relationship.

The results obtained for the variables relating to overall quality service assessment, customer satisfaction, intention to re-purchase the product, and intention to recommend the product to others are presented in Table 5. All means were above four, and considering the top two boxes of these grades (five and four), practically all variables had more than 75% of their evaluations within this range, thereby indicating a good performance of the service investigated.

Table 5: Overall customer evaluation

Variables	Mean	Standard deviation	Error	Top two box
Overall quality	4.51	0.87	0.05	88.7 %
Customer satisfaction	4.39	1.06	0.06	82.7 %
Intention to repeat the purchase	4.24	1.29	0.07	78.2 %
Intention to recommend to others	4.36	1.17	0.06	81.3 %

These results were then subjected to a correlation analysis to identify the relationships between those variables. The variables overall quality, customer satisfaction, intention to repeat the purchase, and intention to recommend to others exhibited positive and statistically significant correlations at 1% level as can be seen in Table 6. The strongest correlation is between intention to repeat the purchase and intention to recommend to others (0.77) followed by that between overall quality and customer satisfaction (0.71). Other correlations were also positive, but with a lower R2, - in the range of 0.3 and 0.4.

Cronin and Taylor (1992) found in their investigation that service quality is an antecedent of satisfaction and has a significant effect on the intention to repeat the purchase. The results of our research support this through the strong correlation between overall quality and customer satisfaction, though the correlation found between overall quality and intention to repeat the purchase was much smaller indicating a weaker relationship.

Table 6: Correlations between overall customer evaluation variables

	Overall quality	Customer satisfaction	Intention to repeat the purchase	Intention to recommend to others
Overall quality	1	0.718(**)	.0323(**)	0.348(**)
Customer satisfaction	0.718(**)	1	.322(**)	0.322(**)
Intention to repeat the purchase	0.323(**)	0.322(**)	1	0.771(**)
Intention to recommend to others	0.348(**)	0.322(**)	0.771(**)	1

Note: ** correlation significant at the level of 0.01 (2-tailed).

A summated scale, averaging the scores given to each attribute, was used to give an evaluation of each act. Table 7 presents the correlation matrix between the quality evaluation of each act and the overall quality perception by the customer.

Correlations are again all positive and statistically significant at 1% level. The strongest correlation occurs between the evaluation of the third act and the overall quality assessment, which reaches 0.702.

Table 7: Correlation matrix of overall quality and quality evaluation per act

	Overall quality	Act 1	Act 2	Act 3
Overall quality	1	0.286(**)	0.583(**)	0.702(**)
Act 1	0.286(**)	1	0.371(**)	0.329(**)
Act 2	0.583(**)	0.371(**)	1	0.490(**)
Act 3	0.702(**)	0.329(**)	0.490(**)	1

Note: **Correlations significant at the level of 0.01 (2-tailed).

Conclusion

The present research sheds new light on an important subject of marketing issues: the relationship between the service experienced through the use of a customer care service and its impact on consumer satisfaction and loyalty. The strong relationship between perceived quality and satisfaction supports previous studies like the one by Woodside et al (1989) about hospitals and the work by Cronin and Taylor (1992).

In terms of managerial applications, the results reiterate the importance of the customer care service as a competitive advantage component of food companies. Once the study concluded that the high quality of the service is related to consumer satisfaction and, to a lesser extent, to repurchase, firms should consider customer care as a strategic piece of their marketing plans. As Christopher (1999, p. 10) states, the competitive advantage is no longer founded only on strong brands, corporate image, advertising and price. Service also counts, even the customer service in the consumer products business.

A positive significant relationship was verified between perceived quality and customer satisfaction, and between repurchase intention and intention to recommend the product to others. The strongest relationships were between perceived quality and customer satisfaction and between intention to purchase the product again and intention to recommend the product to others. Those results indicate that the effectiveness of the customer service can serve as an important antecedent to overall satisfaction and loyalty. Although it was not possible to establish a strong correlation between consumer satisfaction and re-purchase, the positive and strong correlation between satisfaction and intention to recommend lead us to infer that loyalty can be perceived through consumer satisfaction related to customer care service and intention to recommend the product to others.

Oliver (1999) asserts that loyalty has not only a behavioral aspect characterized by the repurchase process, but also a psychological element. Therefore, the formation of loyalty encompasses four phases: i) cognitive, ii) affective, iii) commitment and iv) action. Regarding consumer service, it is feasible to state that the cognitive and affective phases are strongly embedded in this type of service due the emotional interaction between the attendant and the consumer, mainly in complaints request, and also the sense of justice, as an ex-ante consumer perception.

Bateson and Hoffman (2001, p.363) also assert that service quality can contribute to repeated purchases and that quality and satisfaction are interrelated concepts, both influencing intention to purchase. The main contribution of this research is thus to confirm these relationships for the case of customer service activity in consumer products.

This study has also contributed to better understand which variables most influence the perceived quality of a customer service activity. An exploratory qualitative research identified the main attributes consumers consider while evaluating the customer service activity. By dividing the service into three sequential acts, using the model of Woodside, Frey and Daly (1989) based on the scrip concept of Solomon (1994), it was possible to analyze the relevance of each act. The last act, or the one related to the actual solution to the problem proved to be the one with the strongest correlation to overall customer satisfaction. Courtesy, easiness to respond and other usual concerns have their weight, but actually solving the problem or producing a solution or compensation is the key element to achieve a high perceived quality by the customer.

This work has clear limitations. Firstly, its analysis focused on only one company, thus resulting in low external validity. Secondly, the statistical analysis presented here is rather limited and should be expanded through multivariate techniques. And, thirdly, additional control variables, like product characteristics, could be explored.

Customer service, nevertheless, is shown to play a fundamental role in producing customer loyalty. Once loyalty has antecedents in consumer satisfaction, and considering satisfaction as a complex process combining several types of contacts between consumers and companies, customer service assumes a partial responsibility for overall satisfaction. Although the present and previous studies have shown that it is mandatory that the service experience should create reliability and sense of justice, the process of conquering and maintaining a client is ceaseless. As Bulton (1998) asserts, when the first experience is no longer satisfactory, consumers will tend to breach the relationship.

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Innovation and Governance in International Food Supply Chains The Cases of Ghanaian Pineapples and South African Grapes¹

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Abstract

This paper reports an exploratory case study on innovation in, and governance of, international supply chains originating in developing countries. Two African fruit export chains are analyzed: the table grape chain from South Africa (a highly developed chain) and the pineapple chain from Ghana (a newly emerging chain). The most important market for both chains is the EU. The two cases present complementary perspectives on international supply chain development. The paper shows that Western demands in these cases lead to innovation at the producer end of the international supply chain and changes in governance structures towards chain coordination and vertical integration.

Keywords: international supply chains, innovation, governance, developing countries.

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Introduction

Developing countries are becoming more and more part of global food chains due to an increase of the demand for exotic products supplied year round to in particular Western consumers. Concerns of Western consumers regarding food safety, environmental issues and social aspects such as wages, working conditions, etc., bring about new demands for producers in developing countries. Consequently, to be able to compete on the world market, producers and traders in developing countries must adapt to stringent quality and safety standards and regulations in these Western markets.

Since the 1990s, Western retailers have increased their demands on suppliers of fresh produce. In 1998, UK retailers cooperating in the British Retail Consortium (BRC) took the initiative to formulate common food safety and quality standards for suppliers of food. The BRC standard and other private 'codes of practice' and standards, like Eurep-Gap (a primary producers standards supported by major retailers) are now applied by supermarkets and importers all over the world to coordinate supply chain activities and control food safety. The introduction of these standards implies that producers and processors have to implement registration systems to record issues such as the use of crop protection agents and fertilizers, production and processing methods and labour conditions (Marsden, 2000).

A range of new technologies has been developed over the past decade to increase the use of ICT and improve logistics and quality management in supply chains. Cross-border supply chains can be seen as vehicles through which new forms of production, (on-farm) technologies, logistics, new managerial procedures and organizational networks are introduced. In this way, technological standards and systems to guide and control processes and flows of goods and information (such as HACCP, tracking and tracing) are becoming increasingly internationalized.

The objective of this paper is to explore how international food chain development contributes to innovation and new governance structures in chains in developing countries: do demands in Western countries induce innovations 'upstream' in food supply chains in developing countries? By innovation, we mean technological and system (e.g. quality) innovations as well as innovations in governance structures. To investigate this question, exploratory research was performed in two fresh fruit export chains from developing countries to developed countries: the pineapple export chain from Ghana and the table grape export chain from South Africa. Both supply chains are characterized by the involvement of a large number of producers who are facing increasing international market demands which have to be fulfilled in order to participate at the global market.

Research Approach

During the past decade there has been extensive theory building in the field of food supply chains (Lazzarini et al., 2001; Gereffi, et al., 1994; Friedland, 1994). The perspective taken in this article is twofold:

The first perspective in this article explores how technology and system innovation takes place in the two cases. Theoretically, we lean on the Supply Chain Management Approach aiming at “Chain Reversal” (Folkerts-Koehorst 1997; Thorpe-Bennet, 2004) in which market demand becomes leading in structure and operations of the supply chain and which focuses on renewal and integration of business systems to improve supply chain planning and balance supply and demand across the supply chain (Bowersox and Closs, 1996; Cooper et al., 1997; Lambert and Cooper, 2000; Stern et al., 1996). This approach includes major attention to innovative information and communication technology that is the backbone of these integrated chains (Lancioni et al., 2000; Porter, 2001). Furthermore, it focuses on integrated quality management and tracing systems that are considered a pre-condition for modern supply chain management (Van der Spiegel, 2004; Humphreys et al., 2004). In this light an important field for study is the (in-)possibility of many developing country farmers to comply with quality standards of Western markets (Vellema and Boselie, 2003; Giovannucci & Reardon, 2001).

- The second perspective concerns the choice of governance structure in these international chains. The choice of governance mechanism is largely dependent on the costs of transactions, investments in business transactions, information asymmetries between parties, and social and cultural elements such as family relationships and village social structures. (David and Han, 2004; Grover and Malhotra, 2003; Ruben et al., 2007). In general we recognize three types of governance structure: spot market (“arms-length”), hybrid (e.g. contract) and vertical (organizational) integration (Williamson, 1985, 1999). Developing countries have a number of specific features impacting on the choice of governance structure:
- developing country business relationships in particular are subject to many uncertainties caused by: poor physical infrastructures (storage/cooling facilities, roads, telecommunication, etc.), weak institutional infrastructures (government support, sanction systems, etc.), unbalanced trade relationships (dependencies, opportunistic buyer behaviour) and unfavourable social and political conditions;
- information exchange between companies is in many cases hampered by large information asymmetries between chain partners, lacking communication infrastructures, and diffuse market channel structures. This makes ex-ante monitoring of transactions difficult.

- uncertainties as mentioned above easily force companies at different stages in the chain to opportunistic behaviour so as to be able to sell their products. (Although, in general, the major incentive for companies to behave opportunistic is profit maximisation).
- transactions may be supported by investments (e.g. in packaging materials, cooling installations, transportation means, etc.). Such investments can strengthen mutual relationships. On the other hand, they require more integrated governance mechanisms to safeguard against opportunistic behaviour. Other important incentives for transaction-related investments in developing countries are the poor (physical) infrastructures that make investments to support business relationships necessary in many cases. (David and Han, 2004; Grover and Malhotra, 2003).

The general question of this research is: do Western market demands induce innovations and new governance structures ‘upstream’ in international food supply chains? This research question is, in line with our theoretical approach, composed of two sub-questions:

Does market demand induce technological and system innovations ‘upstream’ in international food supply chains?

Which governance arrangements are used and how are governance structures and innovation related in these chains?

The methodology used is the case study. The objective of case study research is to enhance understanding and to gain insight, and it is often explanatory, exploratory or descriptive. It is a preferred strategy when ‘how’ and ‘why’ questions are being posed (Yin, 1994). The case studies presented in this paper were performed by interviewing key stakeholders in and around the pineapple export chain in Ghana and the table grape export chain in South Africa in 2003. Both supply chains are export oriented. Producers are targeting different international markets (mainly in Europe) as these markets offer greater opportunities than the local markets. Though, second grade products are marketed at the numerous local markets. The two cases were chosen because they present different stages of chain development the modern advanced South African chain, with its advanced production and distribution technologies and well-developed market relationships, and the emerging but still weakly developed Ghanaian chain, with its low level of technology use and poor developed market relationships. They both originate from developing countries and data on these chains were readily accessible through the authors’ involvement in public-private research projects in the fruit sectors in both countries.

In Ghana, selection of respondents took place in collaboration with the University of Accra and the Royal Ahold (retail) office in Ghana. Furthermore, a Wageningen

University student conducted exploratory research in the pineapple sector in Ghana in the first half of 2003. In South Africa, selection of respondents took place in collaboration with CSIR Stellenbosch (a major South African research organization) and was based on an earlier (2003) research project in the South African table grape sector, in which a Wageningen University student also participated. In both Ghana and South Africa 20 key public and private organizations operating in the export pineapple business and the table grape export business were selected for face-to-face interviews. The same questionnaire was used in both countries. It included questions on changing market demands (quality, price, etc.), evolution of technology and systems (use of pesticides, fertilizers, quality systems, equipment used and investments) and buyer-supplier relationships, horizontal collaboration and credit structures. Face-to-face interviews were held in each country in late September/early October 2003. During the interviews, questionnaires were filled in and explanations and additional information were recorded and later transcribed in interview reports. In some cases where additional information was required, respondents were approached by telephone with additional questions Table 1 provides an overview of the types of organizations represented by the respondents from the two chains.

Table 1: Types of organizations represented by respondents (1 respondent per organization)

Type of organization	Ghana	South Africa
Chain company (*)	5	5
Service provider (quality, logistics, information systems)	4	5
Bank (commercial and development banks)	3	3
Government (ministries, control and promotion boards)	3	2
Research/academia	1	5
NGO	4	
Total	20	20

(*) "Chain companies" in Ghana consisted of 1 large producer, 1 large cooperative, 1 producer organization, 1 exporter and 1 international retailer. In South Africa "chain companies" interviewed were 3 farmers (two also representing farmers organizations) and 2 exporters. All "chain-companies" included were export oriented. Although both case-sectors were in general export-oriented, other respondents were asked to reflect on domestic oriented supplies as well. In Ghana, NGOs play an important role in the development of the pineapple sector; four of these organizations were therefore included in the research. In the South African grape sector, NGOs do not play a role of any significance. However, research organizations and universities play a stronger role in this sector. For this reason 5 representatives from these organizations in South Africa took part in the research.

Background Information on Cases¹

Ghanaian Pineapple Chain

The production of vegetables and tropical fruit for export in Ghana is expanding. With traditional crops such as cocoa, yam and maize coming under increasing pressure due to low world market prices, pineapple is now a crop of great importance to Ghana. Producers have become to realize that the production of pineapples for the export market is a very profitable business and generates a fast return of currency (12 to 15 month's production cycle). Besides that, the pineapple is a relative easy product to cultivate. Pineapples rank first as Ghana's most important non-traditional horticultural export product, contributing around 24% of total horticultural exports (GEPC, 2002). Pineapple exports from Ghana increased from 15,319 tons in 1994 to 46,391 tons in 2002 with a temporary decrease in 1998-1999, due to drought. Most pineapple is exported to the EU, with Germany as the most important importing country (30% of total exports) (Source: GEPC, 2003).

The value of Ghanaian pineapple exports was US\$13,316,459 in 2001 and US\$15,519,989 in 2002. Almost 50% of the total export volume was exported by four large companies: Jei River Farm (8403 tons), Farmapine (6255 tons), Koranco Farms (4147 tons) and Prudent Farms (3420 tons) (GEPC, 2003). The total export value of all agricultural products from Ghana in 2002 was US\$85,730,637, which shows the importance of pineapple for Ghana (GEPC, 2003). A further (major) increase in the production of pineapple was expected for 2003.

It is difficult to provide the exact number of producers cultivating pineapples in Ghana. The main reason for this is that a large number of producers are located in remote areas and sell their harvest to local middlemen who handle the products from the farm-gate onwards. These producers are invisible for the pineapple export organizations (like cooperatives) and are therefore not included in statistics. Furthermore, a number of small-scale producers cultivate pineapples on an irregular basis. Especially after a year in which the European market prices are high, producers tend to start cultivating pineapples in the hope to benefit from these high prices the following year. Because of this, the number of producers differs each year. It has been noted by the sector that the number of small-scale producers has increased since 1995 as a result of the good market prices in Europe.

Infrastructures in Ghana are weakly developed: the transportation infrastructure is weak, a cold chain is non-existent and transportation overseas is irregular and expensive. Nevertheless, the number of pineapple farmers has increased considerably in the last years. In particular because of the recognition of international market opportunities by the local producers.

¹ Data from the period of field research, until 2004

The pineapple production system in Ghana can be classified into the following groups:

Producers

- *Specialized plantations with out-growers*
These large (>500 ha) farms specialize in pineapple production. Farms are often run by farmer-exporters who have integrated production and the export trade. In general, specialized plantations have a vertically integrated business from the farm to the port. They have direct contact with their customers in Europe, their own trucks and their own shaded pack houses, thus controlling all the activities necessary for exporting. To meet export market demands, the large farms buy about 45% of the exported pineapple fruit from small farmers (Sarpong, 2002). Large-scale farmers provide input material, inspection and training to out-growers. Furthermore, they may apply fertilizers and chemicals to the plants of the out-growers and in some cases take care of harvesting. Almost 75% of the total pineapple export volume is exported by these specialized plantations.
- *Medium-scale (diversified) export farms*
These farms often grow a diversified portfolio of crops (mangoes, papayas, pineapples, vegetables). They export these products themselves to the European market or sell them to the local processing industry which exports the processed products. Farms with less than 500 hectares or less than 90% pineapples are categorized as medium-scale (diversified) export farms.
- *Organized smallholders*
In 1998 the structure of the Ghanaian pineapple business changed. With the support of the World Bank, 178 farmers and two pineapple exporters (namely Gabrho Limited and Kokobin Farms) formed a cooperative called Farmapine. The World Bank granted a loan facility to Farmapine, which was partly used to purchase and supply inputs to farmers. Through cooperation in purchasing inputs, the farmers now enjoy lower prices, and through cooperation in exporting they are no longer dependent on other exporters. Farmapine has built a central packing facility for all pineapple exports. Currently, Farmapine has over 200 members, all of whom own between 0.5 and 10-15 hectares.
- *Non-organized smallholders*
These farmers produce normally for the local market, and occasionally for larger farmers when there is sufficient demand. Ghana has hundreds of small pineapple farmers who cultivate up to 4 hectares of land. They have limited access to mechanical equipment and rely on market availability. They buy their own inputs and sell to any willing local middleman. However, if they supply on a more regular basis to a larger farmer, we call them out-growers. Out-growers are often supplied with seeds and in return promise to sell their

crops to the exporter. Sometimes they also receive other inputs or cash in advance but in general there is no written contract, only an oral agreement. The estimated number of non-organized pineapple producing smallholders is 1000.

Middleman

A number of middlemen collect pineapples from, in particular, small-scale farmers for the export to Europe. These middlemen pay the farmers a farm-gate price and handle the products from the farm-gate onwards.

Transportation

We can distinguish two means of transport from farm to port; privately owned trucks and contracted trucks. The contracted trucks are mainly operated by one-man businesses that accept almost any type of load. The trucks are often in poor condition and they don't have a cooling facility. Privately owned trucks are mainly used by export firms and by organized smallholders. Most of these trucks are in good condition and some have a cooling facility (Pegge, 2003). Around 95% of the total pineapple export is transported by boat. Due to the relatively small scale of the Ghanaian exporters, they are often forced to accept the residual space available on ships and airplanes, resulting in delays and extra costs. In this regard, respondents reported a strong increase in transportation costs in the last five years. Lack of cooperation among exporters and inadequate long-range planning exacerbates the problem of managing available sea/air freight space (Pegge, 2003).

Trading and export

There are no longer many traders in Ghana who trade only fruits. Most traders acquired pineapple farms during the past few years to ensure regular and sufficient supply. The number of exporters has fluctuated between 50 and 70 during the last decade, although just 10 companies accounted for 80% of all exports. These 10 larger exporters are the specialized plantations with out-growers and the cooperative Farmapine. The other exporters in 2002 can be classified as medium-scale (diversified) export farms. 16 large producers are members of SPEG (Seafreight Pineapple Exporters association Ghana). Figure 1 depicts the structure of the Ghanaian pineapple export chain.

South African Table Grape Chain

The South African fruit industry has seen some dramatic changes over the past ten years, moving from a fully regulated market environment towards a free market system (McDonald and Punt, 2001). At the same time Global fruit demand has increased considerably offering new opportunities for fruit exports from developing

The pineapple export chain

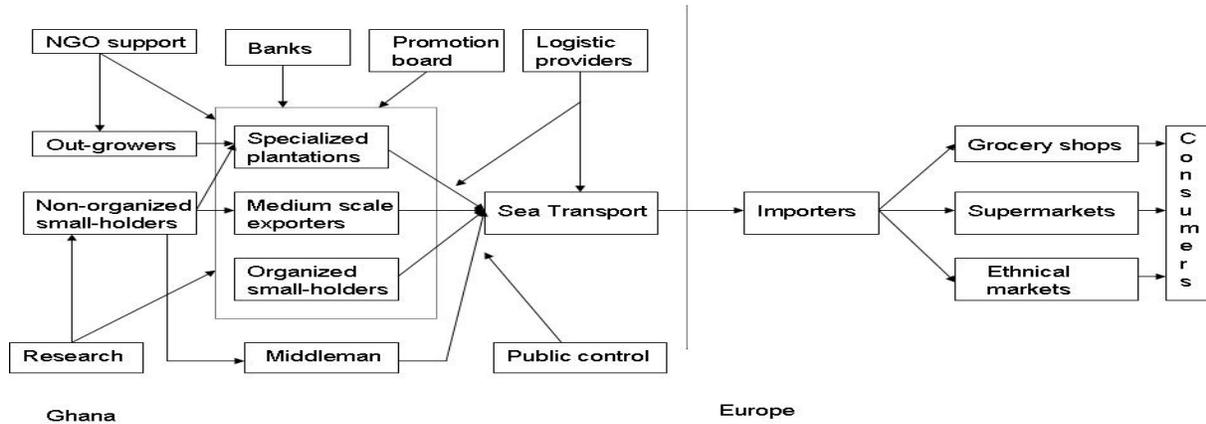


Figure 1: Ghana pineapple export chain

countries. Prior to deregulation in South Africa in 1997, there was one single marketing channel for most of the commodities. This meant that the supply chain was relatively simple and it was relatively easy to manage and optimize the chain, as well as to balance supply and demand (Vos, 2003). The fresh fruit and wine industries have gained the most from the opening up of export opportunities. Between 1995 and 1998 exports of deciduous fruit increased by 32.7 %, from 400,800 to 531,800 tons (PPECB, 1999). Also, the export of table grapes increased from 109,907 tons in 1996/1997 to 190,536 tons in 2001/2002 (DFPT, 2002). Approximately 84% of table grape export is exported to the EU (of which 22% to the UK) (DFPT, 2002).

Currently the South African table grape sector is under high competitive pressure. Market forces threatening SA table grape production mentioned by respondents are oversupply of fruit world wide, the strong currency (Rand), and new competitors (Argentina, Brazil, Peru).

The South African table grape chain can be described as follows.

Producers

In 2003 there were 974 table grape producers in South Africa. Farms are in most cases modern-enterprises that use high-quality input materials and production methods. During the period of Apartheid most workers lived on the farm estates throughout the year. Since the end of Apartheid, labor mobility has increased enormously because of more stringent labor legislation and higher wages (South African Labor and Minimum Wages Act of 1997). According to one respondent (October 2003), 66% of all fruit companies (not only grapes) reduced their labor

forces in the last two years and will keep reducing in the next years. However, even in places where laborers do not live on the farms anymore, the largest part of the population is still dependent on the fruit sector. In recent years, the number of producers has slightly decreased and more efficient production in larger units has developed.

Cold stores

After the harvest, grapes are first stored in cold stores that belong to an individual farmer or are cooperatively owned (e.g. EXSA, approx. 40 producers that export together). Every grape-producing region has a number of cold stores; for example, in 2003 the Orange River region had 40 cold stores, the Hex River region 12, the Berg River region 10 and the Northern region 14. Before deregulation (1997) cold stores were more concentrated. In the near future a further increase of the number of cooling/storage facilities is expected, especially for the Durban region.

Transporter companies

South Africa's transport infrastructure (air, road, rail and sea) is well developed. The road, rail and air transport services are good throughout most parts of the country. The quality of infrastructure in the rural areas varies. Most grapes are destined for export, although some grapes of lesser quality are sold at South African supermarkets or at street markets. Grapes for export are transported to the harbor (Cape Town and Durbin are important harbors) by modern transportation companies with cooled trucks.

Exporters

Since the industry in South Africa was deregulated and the overseas market for fresh fruit opened up for South African producers, the number of exporters has increased enormously to more than 386 registered in 2003 (FPEF, 2003). The most important export organization is FPEF (Fresh Produce Exporters Forum) with 70 members who are responsible for 85% of the export volume.

Markets

Respondents reported a static or even declining market share for Europe, because of increasing international competition, except for the UK because of the good long-term connections with UK retailers and specific demands of these retailers (e.g. for seedless grapes). Asia (especially Indonesia) might become a new market for South African grapes. Indeed, quality and safety demands in Asia are still much lower than in the EU. However, investment, e.g. in a cold chain, is difficult because of political instability in that part of the world. Other potential markets in Asia are India, China and Japan. Figure 2 depicts the South African table grape export chain.

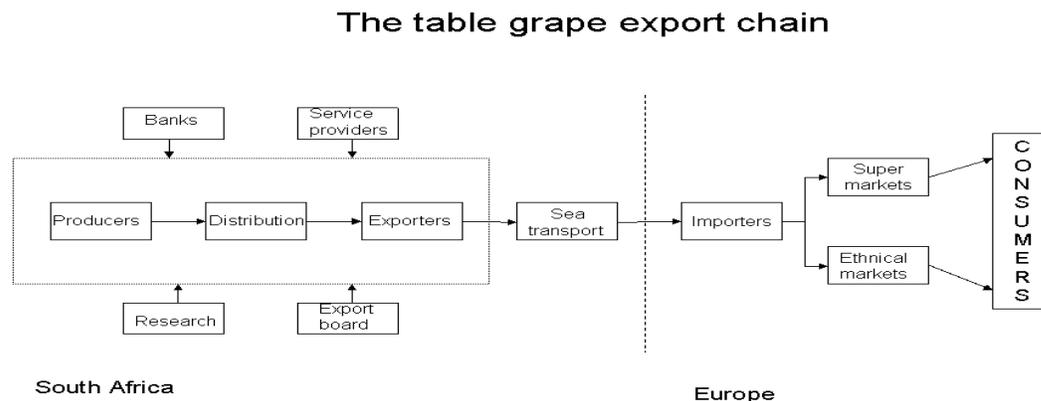


Figure 2: South African table grape export chain

From figures 1 and 2 we see differences between the two chains. The South-African table grape chain has a less complex (more “straightforward”) structure than the Ghanaian pineapple chain, if we include the small-holders in this chain. There are no “middleman” in the South-African chain.

Effects of Market Demands

Technology and system innovations

All respondents in both countries reported a very strong increase of market demands on quality and safety of produce, consistency of quantity, on-time deliveries, traceability, selection of input materials and labour conditions (the average score on a 1-7 likert score of the Ghanaian respondents was between 6 and 7 and of South African respondents between 5.5 and 6). An explanation for the difference in score between Ghana and South-Africa is the higher level of development of the grape sector in South-Africa and the fact that SA grapes already satisfy many demands. Consequently, the grape sector faces fewer requirements to develop the sector according to the increasing demands of the retailers/exporters.

According to the interviewees, farmers are changing their production methods to comply with the changing market demands. A major increase in demand is related to the restricted use of pesticides and fertilizers (Eurep-Gap principles). Both South African and Ghanaian respondents reported a decrease in the use of pesticides over the last five years because of market requirements. In South Africa a decrease in the use of (chemical) fertilizers was also reported. In this respect various respondents stressed an autonomous development toward safer production both

related to cost considerations (chemicals are expensive) and awareness of new, safer, production methods. Further, in both sectors more attention is now being paid to (Eurep-Gap complying) quality systems, cooling facilities (although in Ghana this is restricted to a few cooled trucks), bar-coding, farm equipment (tractors) and harvesting and packaging facilities (sheds). In line with these findings, increases in investment in Ghana were found in land equipment (tractors to prepare the land, plastics to protect produce from bugs and investments in new pineapple varieties), packaging sheds, bar-coding (by a few large producers) and (to a lesser extent) in cooling. South African producers have focused their investments on packaging facilities, cooling facilities (smaller units) and bar-coding, hereby complying with international standards. Respondents in South Africa underlined the importance of manual labour in dealing with the delicate table grapes. In Ghana we see these changes especially amongst the large producers, whilst in South Africa all types of producers are involved.

At the chain level in South Africa we see innovations in packaging and packaging standards (pallets, food safety related issues, carton sizes), IT standards (e.g. traceability), quality standards in general and cooling technology development. A constraint with regard to the development of new packaging materials is that the costs of these innovations cannot be easily included in the product price, because of strong price competition in consumer markets. There is no innovation 'owner' in the South African table grape chain (contrary to the situation before deregulation where Capespan [the exporter] was involved in packaging innovation). In Ghana, except for Eurep-Gap induced innovations, no innovations at the chain level have been introduced so far. Figure 3 gives an overview of innovations in both chains, based on the interviews with different chain stakeholders.

A direct effect of international retail demands on local production systems can be identified in the South African table grape chain. Quality and safety are currently receiving high priority in South Africa, with the export sector taking a leading role in these developments. Compared to the Ghanaian pineapple chain, the investments and innovations in the South African table grape sector are far more advanced, including modern cooling systems, coding technology, etc. An important innovative role in South Africa is played by the exporters, who invest in chain-wide information systems and also perform educational activities for parties throughout the chain.

South Africa had a relatively modern and adequate ICT infrastructure before deregulation in the mid-90s, when there was (in a logistics sense) only one export marketing channel for grapes. Since the deregulation, however, ICT systems have become fragmented. Several organizations (such as PPECB, the export control board, and software companies) are currently involved in the development of standards and interfaces for existing "legacy" systems, in order to support development of supply chain management systems in these chains.

	South African table grapes	Ghanaian pineapple
Exporters	In recent years SA exporters have been investing in chain information systems (from cold stores to harbor facilities) for logistics planning and traceability purposes.	In Ghana basic packing and storing facilities have been constructed in the harbor by various exporters. There is no supply chain system innovation.
Transporters	Modern reefer transportation with advanced cooling technology. Good transportation infrastructure enables frequent and fast transportation. The use of cell-phones in the last decade has greatly improved transportation and logistics planning.	Transportation infrastructure is still weak with old transportation facilities (except for a few modern trucks owned by large producers).
Cold stores	Development towards smaller, sophisticated, cooling units. Development of EDI communication with exporters.	No cold chain present in fruit sector in Ghana.
Producers	Emerging pre-cooling technology, high level of Eurep-Gap certification in SA table grape sector.	<u>Large farmers</u> : first Eurep-Gap consultants were active in 2003; Tractors have been acquired and modern pack houses have just been established. <u>Small farmers</u> : hardly any incentives although out-growers are increasingly pressed to comply with quality demands.

Figure 3: Technology and system innovations in different chain links

Source: interviews

In Ghana development of an export-oriented pineapple sector has just started. MD2 (a new pineapple variety popular on the international market) and Eurep-Gap seem to have ‘woken people up’ (as one respondent stated) and are the driving forces for change. Developments are dominated by a limited number of large producers that are responsible for most of the, still limited, investments in this sector. Large farmers will all be certified in the near future.

An interesting side effect of Eurep-Gap implementation was reported by some large-scale producers. Because of Eurep-Gap, managers have a better overview of the cultivation activities in the field, since these are registered according to Eurep-Gap rules. In this way the new quality systems may support streamlining of the chain. Some of these developments will spread to out-growers. Since out-growers deliver an important part of Ghanaian pineapple production through large producers to the export market, they too will have to comply with chain demands.

Figure 4 depicts governance relationships between different links in both chains.

	South African table grapes	Ghanaian pineapple
EU market parties	<ul style="list-style-type: none"> - Mixed contract and spot-market relationships, related to type of market partner (supermarket or importer) - Some large buyers (e.g. some UK retailers) provide credit to exporters 	Mixed contract and spot-market relationships (large contracts with German importers)
Exporters	<ul style="list-style-type: none"> - Aim at long-term relationships with producers - Provide credits to producers - Investments in cold stores - Slowly increasing collaboration between exporters (through FPEF), e.g. in PR and marketing 	<ul style="list-style-type: none"> - Integration with large producers - Provide credit to large producers - No collaboration between exporters
Transporters	<ul style="list-style-type: none"> - Only short-term contracts between exporters and transportation companies exist - There is a development towards chain solutions, i.e. transportation companies taking care of transportation between different links in the chain 	<ul style="list-style-type: none"> - Integration with large exporters
Cold stores	<ul style="list-style-type: none"> - Cooperative ownership alongside private ownership of cold stores 	
Producers	<ul style="list-style-type: none"> - Opportunistic sales behaviour leading to weak forecasting and logistic planning in the chain - Cooperative investments in cold stores - Moderate collaboration increase in marketing - Development of producer-exporters 	<p><u>Large producers:</u></p> <ul style="list-style-type: none"> - integrated with exporters - aim at long-term relationships with out-growers <p><u>Small producers:</u></p> <ul style="list-style-type: none"> - want to integrate in export chain - are dependent on large producers (for market access, inputs, credits)

Figure 4: Governance relationships between different links in the Ghanaian pineapple chain and the South African table grape chain (source: interviews)

Effects on Governance Structure

Chain integration has been emerging in South Africa for some time now. Increasing demands of Western retailers and (slowly) growing long-term relationships between parties (retailers, exporters – and to a lesser extent producers) are structuring the chain towards hybrid, contract based, governance structures. This form of governance is strongly supported by the exporter-link, where initiatives for information and quality system integration are taken to better attune processes in the chain. Moreover, direct relationships with Western retailers stimulate the

emergence of efficient (fast, responsive) and flexible chains. At the same time chains are being consolidated through reductions in the number of parties in different links, which also may lead to more balanced relationships and strengthening of the chains as a whole. Respondents also expect that more producers will become exporter-producers as a way to try to lower costs and exert control over the supply chain. These developments are enforced by transaction-related investments of exporters (such as investments in cold stores and credits to producers) to ensure deliveries (whereas in Ghana banks are reluctant to finance perishable produce). Transportation is another activity that is developing in line with these integrating developments: respondents expect that transport providers increasingly will become chain service providers, covering the chain from pack house to cold store and from cold store to ship or plane. However, a major barrier to the further development of these integrated chains is the opportunistic sales behaviour of producers, which is also a barrier to increased efficiency in the chain (information asymmetry leads to bad planning by exporters and transporters, according to most respondents).

In general the sector is considered to be conservative and individualistic, which is reflected by the opportunistic behaviour in the chain, in particular at producer level. However, with respect to technological innovation there are differences between the production regions (with a new production region like the Orange River area being more innovative, for example, in using small scale on-farm cooling facilities). Recently, marketing has been taking place at a more regional level, including efforts related to the branding of produce (SA table grapes, ORPA grapes, etc.) and the establishment of joint marketing forums between exporters and producers. Internationally, the entrance into new (Asian) markets reflects a (slowly) growing independence from European importers and retailers – i.e. the relative power of exporters in this chain is increasing. Their position is being strengthened further by the (slow) increase in collaboration at exporter level (e.g. joint marketing, joint access to new markets). To be competitive in the international market, however, exporters and producers will have to evolve more long-term relationships. In this sense, increased collaboration at producer level could strengthen their position in the chain, both nationally as well as internationally.

One large challenge for the South African table grape sector is the still large distinction and lack of trust between black and white employees on the farms. ‘Transformation’ of a black-white economy into an integrated economy is progressing (too) slowly. Greater effort and educational initiatives have to be undertaken.

In the emerging Ghanaian pineapple chain, market demands have led to a fragmented production system, with a few large integrated producer-exporters and many small producers (out-growers). Although many exporters seek long-term relationships with retailers to ensure demand, this is still constrained by weak market opportunities, a very weak infrastructure and the opportunistic behaviour of chain participants. Contrary to the South African table-grape chain there is no

(horizontal) collaboration between exporters. In Ghana many small-scale producers depend on large-scale producers for input supplies, market access and credits. Furthermore, transportation is increasingly organized by exporters. These dependency relationships between large producer/exporters and smallholders lead to chains in which smallholders are forced to find market access through large producers in an imbalanced buyer-supplier relationship. As far as reported, no written contracts exist between smallholders and their customers. Therefore, the existence of a large cooperative like Farmapine, with many smallholder members and out-growers, is promising. Development of niche market production, such as fair trade or organic production could be an opportunity for Ghanaian producers to ensure demand. On the other hand, the limited collaboration between exporters and the weak national and international infrastructure, limit further developments. Respondents reported a very moderate increase in collaboration between farmers, in purchasing and marketing. In general, respondents reported that the sector is not well organized.

With regard to the credit structure, in general, respondents reported that banks are not eager to finance perishable products because of the high risks involved. Small-scale producers need a guarantee from a large-scale producer or an importer to be able to receive credits from banks. Farmers receive credits more easy if they are members of Farmapine. Moreover, because of the high inflation rate, the interest rates for credits are between 29-32% (2003). Twelve out of 19 respondents reported that exporters are becoming more important for credit provision to farmers (particularly in the form of input material). Furthermore, ADB (African Development Bank) provides credits for land preparation (labour costs), inputs (chemicals, tractors) and harvesting (labour costs).

Conclusion and Outlook

In this paper two chains have been explored to gain insight in innovation in international supply chains from developing countries and what governance structures emerge in these chains. Two supply chains with different stages of development were chosen. The South African table grape chain is a mature chain in which concentration and consolidation of parties is taking place. The Ghanaian pineapple chain is a newly emerging supply chain, with many constraints to overcome. Both export chains are constrained by external factors.

From the research reported we arrive at the following findings and hypothesis for further research:

Technology and Systems Innovation

The analysis of the two chains shows that innovation follows international market demand. In Ghana we see business investments by large producer-exporters in quality control, tractors to improve production processes, transportation and pack

houses. In South Africa respondents reported business investments in cold stores (by producers and producer associations), transportation (transportation companies) and infrastructure in general. Especially in the field of quality and safety of produce we see that important changes have taken place in production systems and the use of technology in the past five years. Respondents in both chains reported a strong relationship between Western standards like Eurep-Gap and these developments. It is important to note that investments in both chains focused on infrastructure (e.g. trucks) and product-related improvements (e.g. more environment-friendly pesticides). Less attention has been paid, particularly at producer level, to management systems (information exchange and planning), which is necessary for chain collaboration. Although there are parties (e.g. branch organizations, service providers, packaging industry) that aim at the development of standards and innovations, it is hard to find chain parties willing to support these chain-wide innovations because of the lack of short-term returns.

For many developing country producers it is difficult to comply with Western quality standards (Vellema and Boselie, 2003; Giovannucci & Reardon, 2001). Small producers are in most cases excluded from direct participation in international chains because of high certification costs (for producers) and high monitoring costs (for buyers). Several instruments can be used to ascertain compliance behaviour of producers (Hueth, 2001):

- monitoring of supplier processes
- input control (of suppliers)
- output quality control
- residual claimancy (sanctions)

Mechanisms like output quality control and residual claimancy are common in any food chain. Monitoring of supplier processes and even input control are increasingly applied by Western retailers and large food industries in developing countries, as we see in the application of Eurep-Gap by most South-African table-grape producers. Chain quality management is supported by operational management systems. Most relevant management systems in the context of food supply chains are quality systems and logistics systems, supported by information systems (Lancioni et al., 2000; Porter, 2001; Van der Spiegel, 2004; Humphreys et al., 2004). Logistics systems in food chains concern exchange of planning data (harvesting, storage, transportation), post-harvest storage and transportation (cooling, type of vehicle depending on type of product and distances in time), order-delivery cycle (frequency, demands), use of information and (tele)communication technology (internet, cell-phones, etc.). New communication technology such as cell phones can be used for quality data exchange and strongly improve logistics planning, thereby improving the quality of fresh products. In the South African table-grape chain we see major attention for and application of these technologies and systems, although adequate information exchange between producers and exporters should be encouraged.

Governance

International export chains seem to become more concentrated and more tightly integrated when the numbers of participants decrease, as we have seen in the chain in South Africa and in parts of the chain (exporters/large producers) in Ghana. In South Africa we see the emergence of “integrated” chains with hybrid governance structures in which contracts are supported by sophisticated management systems. These chains are able to comply with international customer demands regarding volume, quality and traceability. Quality and certification schemes lead to increasing control and more integrated governance, such as long-term contracts or vertical integration. At the same time they may lower transaction costs. In Ghana producers and exporters are increasingly vertically integrated; however, the large number of out-growers and small-holders is dependent on large producer-exporters to gain market access. International chains are increasingly efficient and able to concentrate their economic power. This means that it is hard for new and/or smaller producers to enter mature markets. In this situation niche markets, such as those for organic or fair trade products, can be a viable option. In particular, in the modern table grape chain in South Africa we see that chain integration goes together with technological and system innovations. Transaction related investments by exporters (in IT and cooling technology) have led to chain integration on the one hand and innovation on the other. Furthermore, in this chain the introduction of standards in packaging and IT has led to innovations throughout the chain. Exporters, IT-companies and packaging industries play a major role in this respect. In Ghana these developments have not (yet) occurred.

Modern market-oriented chains have the tendency to become shorter as intermediaries between producers and chain downstream parties become superfluous because of the emergence of direct trading relationship between large producers (or producer groups) and downstream parties. An example is the transformation of export-oriented producers to producer-exporters in South Africa. Inter-company relationships in these chains are often enforced by investments of processors or exporters (such as investments in cold stores, seeds, pesticides, credits) to decrease delivery uncertainty and increase quality and quantity consistency of deliveries. In the South African table grape chain we see hybrid governance forms supported (although still emerging) by chain wide quality and information systems. In the Ghanaian pineapple chains infrastructures and management systems are still poorly developed, implying vertical integration, so far at least from exporter to large producer.

Small-scale producers, as in the Ghanaian pineapple chain, depend in most cases on downstream parties in the chain, such as intermediaries, transporters or exporters, for their input supplies, credits and market access. Banks are mostly not eager to finance smallholders in general, and more specifically perishable products because of the high risks involved. However, the embeddedness of these small scale

producers in a network of social relationships can provide them with social capital to support their (vertical) business relationships (Coleman, 1990, Uzzi, 1997). Opportunity for producers to establish collaborative horizontal relationships such as purchasing or marketing cooperatives, may deliver economies of scale that may strengthen their bargaining position and allow for joint investments in production, marketing and distribution, as the example of Farmapine shows. Such collective action proves to be rather effective for linking smallholders with major market outlets.

Further Study

The research is qualitative and explorative in nature. Further (quantitative and explanatory) research may focus on in-depth investigation of the findings/hypothesis stated above.

An interesting research field related to the above study is how supply chain development can be linked to social development. How to bring spill-over effects of chain development to small farmers, out-growers and seasonal laborers is a major point for further study. The question of who benefits (most) from the development of international supply chains originating in developing countries is a very intriguing one.

Another point which has not been fully addressed in the paper is who bears the costs of innovation. As discussed, South African chain companies only were interested in company-related investments, not in, for example, (chain) traceability systems. How costs of these chain-wide systems can or should be divided over various chain parties, national and international, is an interesting question to challenge in further study.

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Measuring Competition for Textiles: Does the United States Make the Grade?

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Abstract

Increasing competition from foreign manufacturers threatens the viability of textile producers in the United States. This paper evaluates the U.S. competitive position in the cotton yarn segment using established quantifiable measures and provides an overall competitive assessment. The measures employed show the United States to be at a relative competitive disadvantage when compared to major international producers of cotton yarn. However, the margin of this competitive disadvantage is shown to be relatively small and in some cases, decreasing.

Keywords: competition, cotton, international trade, textiles

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We can only become more competitive if we know how competitive we actually are and what constrains or enhances our efforts.
—Johan van Rooyen

Introduction

The textile industry is affected by a drastically changing economic environment as global free trade initiatives provide for unrestricted competition. U.S. textile manufacturers face an industry environment in which low cost imports and the elimination of trade barriers decrease domestic profitability. Almost the entire labor intensive cut-and-sew apparel segment has responded to these competitive forces by moving production facilities overseas. The impact on less labor intensive industry segments, such as the textile products sector, remains unclear.

The purpose of this study is to better understand the competitive position of the U.S. cotton textile industry in relation to international rivals. The primary focus of this analysis will be on that portion of the industry which initially transforms raw cotton into cotton yarn. By offering an appraisal of the current competitiveness of U.S. cotton yarn producers, we are able to both evaluate their current effectiveness in meeting the challenges of this evolving competitive landscape as well as gain insight into possible managerial imperatives in such an economic context.

Figure 1 provides a simple schematic of the textile and apparel industry as raw cotton is processed into finished goods. The textile industry has experienced a recent migration, especially to Asian countries, which seems to be following a discernable pattern. First, developing countries are able to attract labor intensive cut and sew apparel industries using imported fabric from developed countries. Fabric production soon follows using imported yarn. Finally, a yarn industry emerges in the developing country based on the importation of raw fiber (MacDonald, 1998).

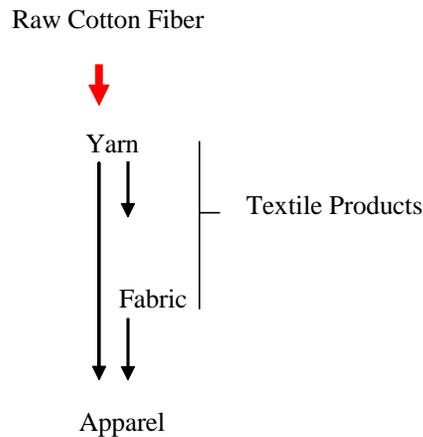


Figure 1. Transforming Fiber into Finished Goods

Source: MacDonald, 1998

The consequences of the movement of virtually all textile production to developing countries will alter the structure of the global textile industry. With the further elimination of quota protection for U.S. producers, trade barriers are falling and competitive forces are intensifying. Analysis of U.S. competitiveness will provide those with an interest in the viability of domestic yarn manufacturing with a key indicator of whether this industry as a whole may follow 'the needle' overseas or whether a future remains for core aspects of this industry in the United States. This study may be seen as a competitive appraisal of the U.S. cotton yarn industry. It evaluated the competitiveness of U.S. manufacturers relative to international rivals by analyzing the current competitive state of this industry and by identifying competitive trends. The two research methods used in this analysis were based on:

1. a comparison of objective measures of market share of textile products and
2. a price-based comparison of goods offered in the market place.

These two methods were intended to provide different perspectives on the issue of textile industry competitiveness. Following is an explanation of the competitive measures used in this analysis followed by a discussion of possible implications of these findings.

Revealed Comparative Advantage

A key aspect of evaluating whether a producer of a given good is competitive in its market offering depends on both a definition and measure of the term competitiveness. Drescher and Maurer (1999) cite Bellendorf's definition of competitiveness as the ability of firms and industries "...to protect and/or improve their position in relation to competitors which are active in the same market" (p. 162). This definition is consistent with that of Sharples (1986) and Kennedy and Rosson (2002) who define competitiveness as the ability to achieve market share. The producer who attains a market share for its product is by definition competitive. A product for which market share is increasing can be said to be increasing in competitiveness and, conversely, a product is regarded as decreasing in competitiveness if the market share for that product is in decline. In the following discussion, market share will both define competitiveness and serve as its primary measure.

In studies such as this, the terms comparative advantage and competitive advantage are often used interchangeably. For the purposes of this analysis, comparative advantage will refer to that situation of unrestricted free markets of Adam Smith and David Ricardo, in which resources are allowed free flow to their most efficient and productive uses. Competitive advantage explains trade as it exists in the real world. This includes the influence of trade barriers, exchange rate variation, product differentiation, and other factors which Ricardian comparative advantage does not consider. "Competitive advantage therefore reflects real

business opportunities within current policy and price distortions” (van Rooyen, Esterhuizen, and Doyer, 2000, p.4).

Market share as an empirical measure of competitiveness is founded on the performance of a given product in the marketplace. Since the focus of this paper is the global marketplace, export shares will be used as indicators of international competitiveness. These relative shares will be analyzed for the clues they may provide as to how and in which direction the competitiveness of a given industry may be changing (Drescher and Maurer, 1999). Balassa (1965) asserts that an analysis of the trade performance of individual countries would indicate the comparative advantage one nation holds over others in the marketing of manufactured goods. This analysis is based on a comparison of “...the relative shares of a country in the world exports of individual commodities and indicating changes in relative shares over time” (Balassa, p.105). Thus, comparative advantage as described by Balassa is consistent with the concept of competitiveness used here. Direct observation of trade performance may then reveal comparative advantage (competitiveness) in the production of that commodity. Balassa introduces an index called “Revealed Comparative Advantage” (RCA) as a means of measuring comparative advantage.

Method of Analysis

The export based RCA index used here is based on an application of Balassa’s RCA by Leishman, Menkhaus and Whipple (2000) and is calculated in three steps:

1. Calculate a country’s market share of exports of a specific good: divide a country’s exports of a good by world exports of that good.
2. Calculate a country’s market share in the export of all manufactured goods: divide a country’s exports of all manufactured goods by the combined world exports of all manufactured goods.
3. Divide the market share of exports of a certain good (step 1) by the market share in the export of all manufactured goods (step 2). Multiply this number by 100 to yield the current RCA index.

The higher the RCA, the greater importance of that good relative to all manufactured exports. For example, an index value of 120 indicates that a country’s exports of that good for a given year are 20% higher than its share in total world exports of all manufactured goods; an index value of 80 reveals that a country’s exports for a given good are 20% lower than its share of world exports of all manufactured goods.

Data

Export data for textile yarn, fabric, etc.(SITC Rev. 3 code 65) and all manufactured goods (SITC Rev. 3 code 6) were gathered for years 1989 through 2005 for the major textile producing nations of China, India, Pakistan, the United States, and Turkey. These nations are ranked as the top 5 in the world according to the production of yarn (Textile Statistics). Figures are available online from the Comtrade database of the United Nations Statistics Division. Data were not consistently available prior to 1989 and trade statistics were not reported for all nations for all years even in the time frame reported here. Data tables are located in the Appendix, Tables A.1-A.3.

Results

As can be seen in Figure 2, in 2004 China led these selected nations in the total value of manufacturing exports and textile exports. The U.S. is second followed by India, Turkey, and Pakistan. As a percentage of all manufacturing exports, textile exports account for the smallest percentage in the U.S. (15%) and virtually all of Pakistani manufacturing exports (92%).

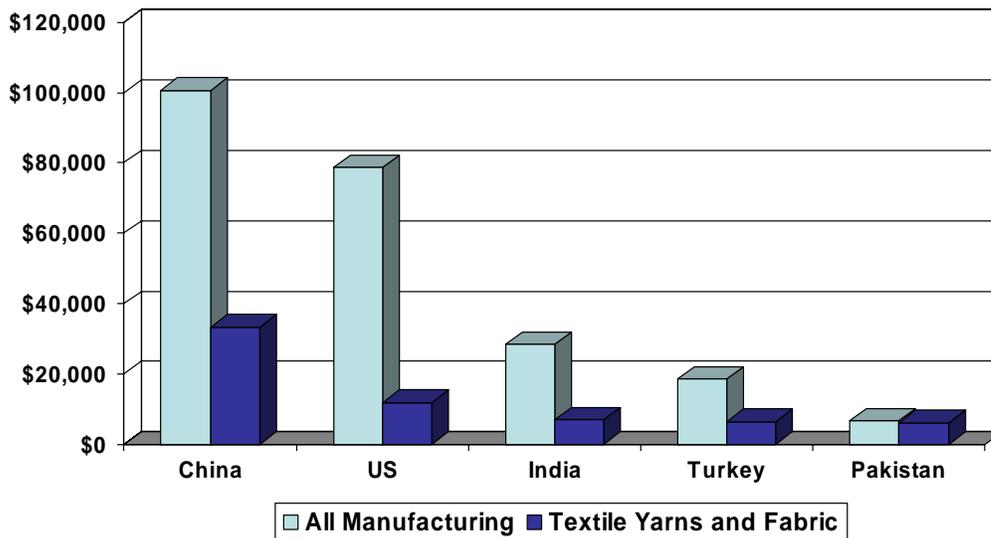


Figure 2. Dollar Value of Exports, 2004

Source: United Nations Statistics Division-Comtrade Database

RCA index values for each of these nations are shown in Figure 3. Not surprisingly, the data indicate that the United States has the lowest RCA among the textile producers reported here. However, the U.S.’s RCA has shown a slight up trend since hitting a low in 1995. The exports of U.S. yarn and fabric was 13 percent lower than that of all U.S. manufacturing exports in 1989, the RCA fell to a low of 68 in 1995 (32 percent below all manufacturing exports), and climbed back to 95 in

2004 and 91 in 2005, almost on par with U.S. market share in the export of all manufactured goods. Pakistan's RCA is trending significantly higher, especially in the last few years. The other nations all hold relative competitive advantages in yarn and fabrics with calculated values all clustering around 200.

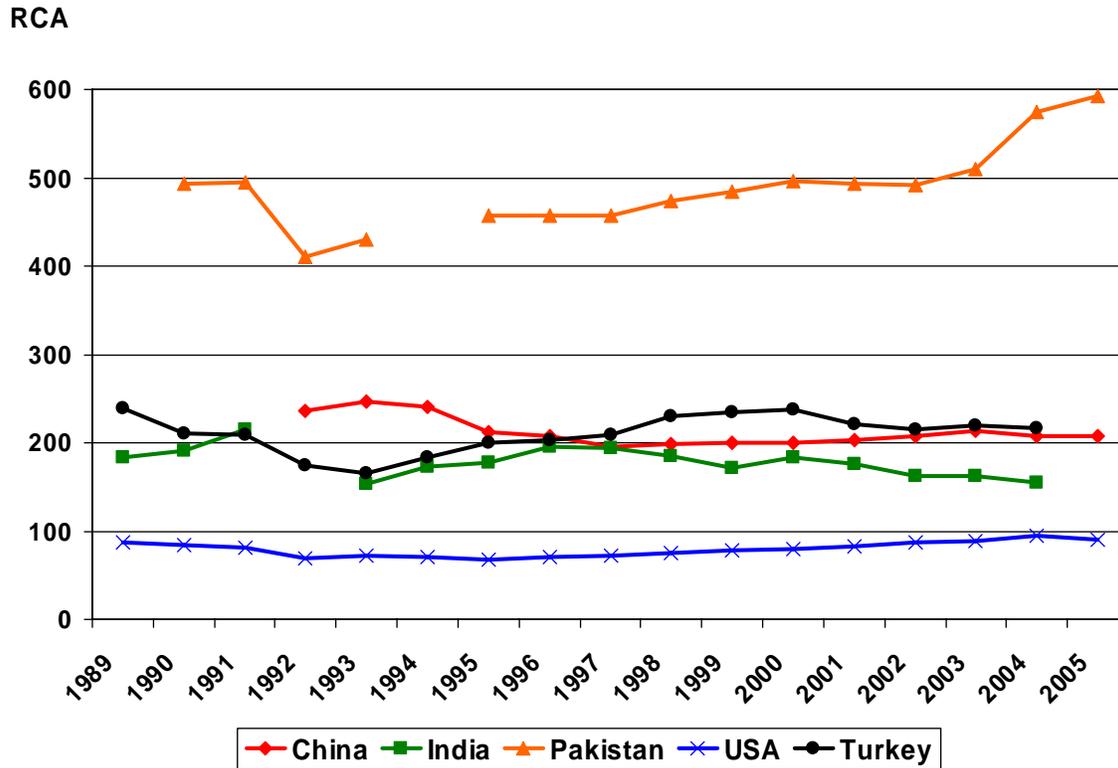


Figure 3. Revealed Comparative Advantage for Textile Trade

From this analysis, two points seem particularly pertinent. First, the export market share of textile products, as a percentage of all manufacturing exports, is much higher in China, India, Pakistan, and Turkey than in the United States. While this result is expected, by using Balassa's RCA, this identified competitive advantage may be quantified and trends analyzed. It would appear that these nations are committed to the development of the textile component of their respective economies and are capitalizing on competitive advantages they may possess.

Second, the U.S. textile sector is no worse off than the rest of the U.S. manufacturing industry. While the RCA had slipped well below the rest of manufacturing sector in the early to mid-nineties, it has regained market share in the last few years to be on par with the rest of the industry.

Price Difference

In the attempt to determine a country's ability to compete in global markets, bilateral price comparisons across nations represent another method of measuring competitiveness among international industry participants. A comparison of the price of goods plus transportation costs to major ports can reveal those nations which are more likely to import goods as opposed to those who will likely supply a particular market (Hayes et al., 1991).

At the time of this writing, the United States is the highest priced producer of cotton yarns compared to Pakistan, India, Turkey, and Indonesia (see Table 1). As referenced in the previous section, these nations represent 4 of the 5 largest competitors in the cotton yarn industry¹. While a simple comparison of domestic prices may be interesting, these prices become more relevant as indicators of competitiveness only when transportation costs between countries are added to the domestic prices. Figure 4 shows how the price of 20-count cotton yarn has compared in the U.S, Pakistan, India, Turkey, and Indonesia from January 2001 to August 2006. This figure shows that the U.S. price has declined from \$3.40 per kilogram to \$2.65, a 22 percent price decline. The average international price as of August 2006 (U.S. excluded) is \$2.20, \$0.45 below the U.S. price. The decline in the U.S. price and gradual increases elsewhere has created some price convergence, but the U.S. remains priced above the rest of the international market².

Table 1. Domestic Yarn Prices, \$U.S. per kg, 20-count, August 2006

Country	Price \$/kg	Ratio of U.S. Price
Pakistan	1.93	.7283
India	2.00	.7547
USA	2.65	1.0000
Turkey	2.62	.9887
Indonesia	2.26	.8528

Source: Cotton Outlook

¹ Absent from this comparison is China. Cotton Outlook, the primary source of this yarn price information, reports prices on the basis of significant export volume and the reliability of price information in any particular country. At the time of this writing, this list did not include any price information from China.

² The authors recognize that prices reported in this time frame are sporadic confounding a thorough analysis of a price trend. Data, time, and cost constraints limit further collection of price data at this time. Additionally, it is important to verify that the price convergence demonstrated is not due solely to a fluctuation in currency exchange rates. Exchange rate history is included in the Appendix, Table A.4 and Figure A. 1, for the currencies of Pakistan, India, Turkey, and Indonesia, relative to the U.S. dollar. The table shows that real currency exchange rates were stable or declining over this time period. This supports the contention here that the observed convergence of prices represents a real, as opposed to a nominal, trend and increasing price competitiveness of U.S. cotton yarn.

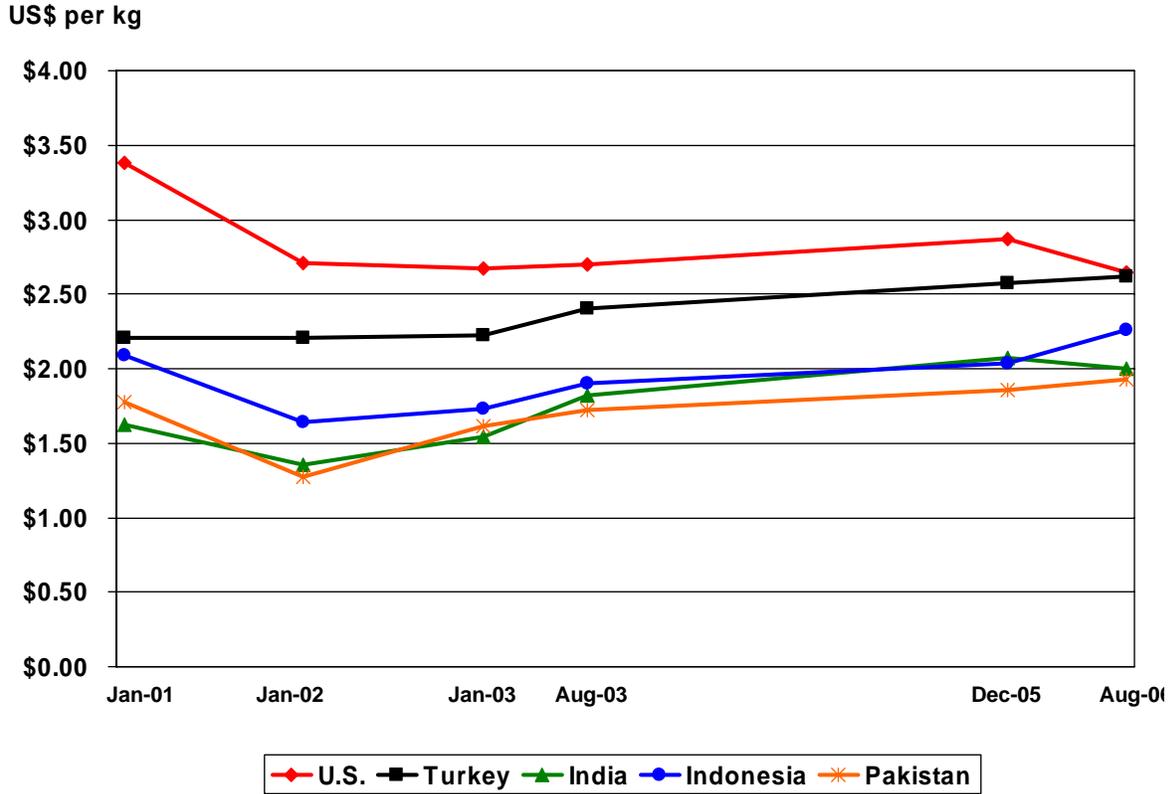


Figure 4. 20-count Cotton Yarn Prices

Source: Cotton Outlook

To allow for the transportation adjustment of the prices in Table 1, a calculation is made for a bilateral price difference. Hayes et al. refer to this as a “tariff equivalent” or “price wedge” as it represents the amount of protection domestic producers of a good enjoy based on the cost of transporting foreign produced goods into a domestic market.

However, the term “tariff equivalent” is commonly used in the context of international trade to refer to the concept of tariffication where “...quotas and other non-tariff barriers to trade were to be converted in tariff equivalents and then bound” (Morath and Sheldon, 1999, p. 2). To avoid confusion, the tariff equivalent of Hayes et al. will be referred to as a “price difference” (PD). Competitiveness of nations will be measured by estimating their respective price differences for cotton yarn.

The calculation of the price difference takes into account the impact of monetary policies that contribute to fluctuations in currency exchange rates and expresses the price competitiveness among producers that exists at a given point in time. Of course, shipping rates play a large role in the calculation of a PD. The rates used for this study are based on publicly available shipping quotations for dry ocean

freight port to port. No adjustments are made for inland freight costs (see Appendix Table A.5). However the calculated PD here does not explicitly include tariff and quota restrictions. This is a pure market-based comparison. PD does reveal the amount of tariff that an importing country would need to impose if it wished to equate world prices to those of its domestic market.

A PD for cotton yarn for a given nation is calculated by combining the domestic yarn price in country A with the transportation costs from country A to country B and comparing this cost to the price of yarn in country B. The difference between the price of yarn in country B and the price of a comparable product from country A being sold in B (adjusted for transportation costs) is expressed as a percentage of the delivered price.

$$(1) \quad \text{PD} = \frac{\text{Price in B} - (\text{Price in A} + \text{transportation to B})}{(\text{Price in A} + \text{transportation to B})} \times 100$$

A negative PD indicates that the domestic price is lower than adjusted import prices. A country with negative PD's with other trading nations would not be a major export market for other producers. Positive PD's indicate the likelihood of a country serving as an export market for other producers since its domestic price is greater than the price of delivered imported goods. As an example, PD's are calculated here for U.S. yarn exports to nations with important textile and apparel manufacturing industries (see Table 2). Of course the higher U.S. price reported in Table 1 relative to each of these potential export markets will result in negative PD's. Figure 5 illustrates these relative PDs and the degree to which the PD or price wedge is closing for the time period reflected here. While U.S. yarn manufacturers are at competitive price disadvantage, the relative proportion of this gap is closing. For the prices reported, the United States has seen its average PD for 20-count yarn go from -47 to -24, an approximate 50 percent competitive price improvement.

Table 2. U.S. Price Difference, 20-count yarn

	January 2001	January 2002	January 2003	August 2003	December 2005	August 2006
	Percent					
Turkey	-38.00	-23.64	-22.22	-16.79	-15.85	-7.56
India	-55.92	-55.08	-48.07	-39.24	-34.60	-32.10
Indonesia	-42.49	-44.68	-40.84	-35.69	-34.71	-22.18
Pakistan	-51.57	-57.74	-45.71	-42.58	-41.24	-34.47

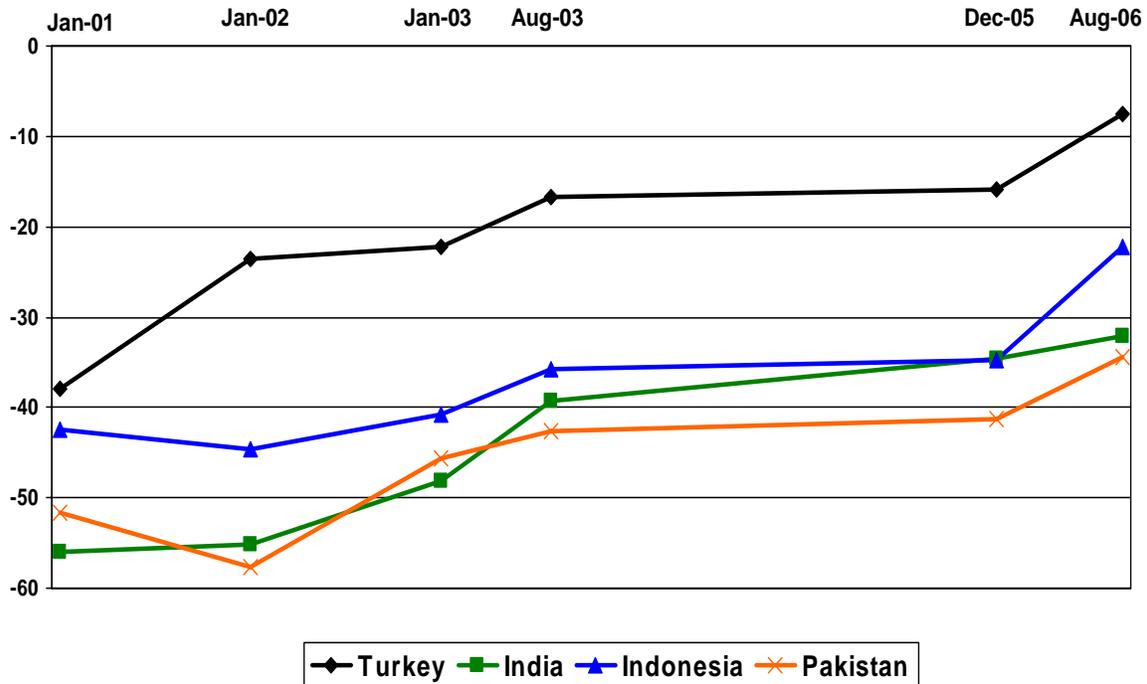


Figure 5. U.S. Price Differences, 20-count yarn

Given that China is the world’s largest manufacturer of apparel (U.S. Trade Commission), this method may be used to measure the price competitiveness which exists between U.S. produced cotton yarn and cotton yarn in the domestic Chinese market. Using prices for 20-count carded cotton yarn reported for China of \$2.30/kg in August 2006 (CNCotton.com, 2006) and the price of U.S. carded 20s of \$2.65/kg (from Table 1), and a weighted average container shipping rate from the USDA Ocean Rate Bulletin, China’s PD with U.S. producers can be calculated as:

$$(2) \quad \text{PD} = \frac{2.35 - (2.65 + .12)}{(2.65 + .12)} \times 100 = -15.16.$$

This PD estimates a 15 percent price-based advantage for domestic producers of cotton yarn in China over competitors from the United States, approximately 10 percentage points better than the average reported for other major textile producing nations.

Conclusions

As is evident from the information presented here, the United States fails to make the competitive grade in several categories but by margins which are narrowing. While the Revealed Comparative Advantage index indicates that the United States is lagging behind China, India, Turkey, and Pakistan in terms of market share in

exports of yarn, fabric, etc., the U.S. textile industry has made gains in market share over the last two years and is currently performing on a market-share based par with the rest of the U.S. manufacturing sector. However, the elimination of trade barriers may further erode the competitive ability of U.S. textile producers to the degree that trade is constrained by quotas and tariffs under the Multi Fibre Arrangement (MFA). Without the insulation from competition by protectionist barriers (with the expiration of MFA in January 2005), a truer picture of the relative competitive advantage of the U.S. textile manufacturer should emerge. Price-based measurements of competition show that the price of U.S. produced yarn is such that it is not profitable for overseas producers to import U.S. cotton yarn. However, yarn price declines over the past three years have reduced the amount by which these producers have a competitive advantage over United States producers. This disadvantageous price difference is based on the fact that the U.S. price for cotton yarn remains above its major rivals, but trends indicate this gap has closed significantly with some of the world's leading textile and apparel producers.

Strategic Implications

These findings may have several implications for managers of U.S. textile companies. First, textile companies seem to be faring about as well as other U.S. manufacturers in terms of export market share, but these findings are for a time period in which protectionist policies were still in place. The U.S. textile industry has historically been one of the most heavily protected sectors of the U.S. economy. Textiles have been excluded from many of the post-World War II GATT and WTO negotiations "...because the subject was considered too sensitive in the United States" (Grennes 1990, p. 3). While the last 50 years have seen trade barriers fall for the rest of the manufacturing sector, U.S. textile producers have continued to rely on a system of quotas and tariffs to insulate them from competitive forces. Under the auspices of the Uruguay Round Agreement on Textiles and Clothing, all textile and apparel quotas were abolished on January 1, 2005 with the expiration of the Multi-Fiber Arrangement (MFA). "After decades of protectionist exceptions, textile trade finally will be subject to the same rules that govern international trade in other manufactured products" (Ikenson, 2003, p. 1). With an RCA of less than 100 with trade protection in place, it seems likely that this measure will fall as trade restrictions are removed completely. This will provide additional impetus for the industry to devise effective competitive strategies in order to survive.

Second, trends suggest that at least in terms of one potentially viable strategy, low cost competition, U.S. firms are responding to this competitive challenge. While the U.S. continues to be at a competitive price disadvantage compared to major international rivals, the differences are narrowing significantly. If industry consolidation, technical efficiency, or other means to lower costs can be achieved, the price difference may narrow to such a degree as to allow the U.S. to compete in the cotton yarn export market.

A strategy of product differentiation in the cotton yarn industry might be difficult given the generic commodity-like nature of the product. But advantages in areas such as dependability and speed of delivery, operational flexibility in production lines, rapid response to changing consumer tastes and fashion trends, as well as an innovative and high-quality product line might carve out a profitable niche for U.S. textile manufacturers.

U.S. textile manufacturers have a long history of adapting to challenging economic conditions. During the U.S. Civil War, one textile mill still in operation today, survived by supplying uniforms to the Confederacy while making tents for the Union. Such innovative and cooperative enterprises might be well suited to the current situation. U.S. producers might leverage their expertise in marketing and distribution and high-end products while allowing partners in Asia or elsewhere produce the bulk of low-cost goods.

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Appendix: A

Table A.1. Export data for all manufactured goods, trade value, \$U.S. million

Selected Classification: SITC Rev.3
 Selected Commodities: 6 (Manufactured Goods)
 Selected Reporters: all
 Selected Years: 1989-2001
 Selected Partners: all
 Selected Trade Flows: Export

	World	China	India	Pakistan	USA	Turkey
1989	\$349,743		\$6,440		\$27,243	\$3,385
1990	\$382,667		\$6,364	\$3,018	\$33,698	\$3,833
1991	\$352,829		\$6,415	\$3,516	\$37,778	\$3,705
1992	\$428,683	\$16,135		\$3,886	\$38,173	\$4,139
1993	\$548,793	\$16,392	\$8,873	\$3,793	\$39,161	\$4,466
1994	\$625,276	\$23,218	\$10,508		\$43,995	\$5,661
1995	\$774,868	\$32,240	\$12,121	\$4,577	\$53,463	\$6,217
1996	\$771,608	\$28,498	\$12,266	\$5,245	\$55,763	\$6,538
1997	\$800,968	\$34,433	\$13,147	\$4,902	\$62,277	\$7,796
1998	\$787,059	\$32,477	\$12,418	\$4,557	\$61,804	\$7,767
1999	\$775,754	\$33,262	\$15,215	\$4,491	\$62,157	\$7,588
2000	\$842,201	\$42,546	\$17,262	\$4,820	\$71,990	\$8,146
2001	\$835,084	\$43,813	\$16,180	\$4,857	\$66,658	\$9,453
2002	\$859,296	\$52,954	\$19,898	\$5,205	\$65,058	\$10,496
2003	\$1,005,716	\$69,018	\$23,203	\$6,501	\$67,688	\$13,205
2004	\$1,257,996	\$100,646	\$28,376	\$6,647	\$78,713	\$18,587
2005	\$1,133,051	\$129,121		\$7,813	\$89,179	

Source: United Nations Statistics Division-Comtrade Database

Table A.2. Export data for textile yarn, fabric, etc., trade value \$U.S. million

Selected Classification: SITC Rev.3
 Selected Commodities: 65 (Textile yarns, fabric, etc.)
 Selected Reporters: all
 Selected Years: 1989-2001
 Selected Partners: all
 Selected Trade Flows: Export

	World	China	India	Pakistan	USA	Turkey
1989	\$57,599		\$1,947		\$3,897	\$1,331
1990	\$68,477		\$2,180	\$2,663	\$5,039	\$1,440
1991	\$64,926		\$2,530	\$3,200	\$5,610	\$1,429
1992	\$96,475	\$8,583		\$3,590	\$5,889	\$1,619
1993	\$118,032	\$8,699	\$2,917	\$3,507	\$6,025	\$1,592
1994	\$132,268	\$11,818	\$3,829		\$6,592	\$2,194
1995	\$157,374	\$13,918	\$4,358	\$4,256	\$7,372	\$2,527
1996	\$158,424	\$12,112	\$4,936	\$4,919	\$8,008	\$2,722
1997	\$164,565	\$13,828	\$5,242	\$4,608	\$9,187	\$3,352
1998	\$156,789	\$12,817	\$4,558	\$4,302	\$9,205	\$3,549
1999	\$151,817	\$13,043	\$5,087	\$4,258	\$9,504	\$3,478
2000	\$159,494	\$16,135	\$5,998	\$4,532	\$10,952	\$3,672
2001	\$157,631	\$16,825	\$5,375	\$4,525	\$10,473	\$3,943
2002	\$161,034	\$20,562	\$6,028	\$4,790	\$10,664	\$4,244
2003	\$182,959	\$26,900	\$6,846	\$6,030	\$10,886	\$5,262
2004	\$201,583	\$33,428	\$7,009	\$6,125	\$11,989	\$6,428
2005	\$173,518	\$41,050		\$7,087	\$12,379	

Source: United Nations Statistics Division-Comtrade Database

Table A.3. Calculated RCA Indices.

	China	India	Pakistan	USA	Turkey
1989		184		87	239
1990		191	493	84	210
1991		214	495	81	210
1992	236		411	69	174
1993	247	153	430	72	166
1994	241	172		71	183
1995	213	177	458	68	200
1996	207	196	457	70	203
1997	195	194	458	72	209
1998	198	184	474	75	229
1999	200	171	484	78	234
2000	200	183	496	80	238
2001	203	176	494	83	221
2002	207	162	491	87	216
2003	214	162	510	88	219
2004	207	154	575	95	216
2005	208		592	91	

Table A.4. Exchange Rate History, Real Values, National Currency per US Currency

	Pakistan	India	Turkey	Indonesia
Date	Rupee per \$US	Rupee per \$US	Lira per \$US 100	Rupiah per 1/100 \$US
Jan-01	58.86	46.91	57.98	91.36
Feb-01	59.71	47.26	64.67	92.71
Mar-01	60.45	47.27	77.05	96.88
Apr-01	61.00	47.30	88.10	106.36
May-01	62.37	47.33	79.26	106.14
Jun-01	64.07	46.92	82.48	105.38
Jul-01	64.24	46.29	87.47	97.37
Aug-01	63.77	45.97	90.00	80.46
Sep-01	64.00	46.79	89.75	84.60
Oct-01	61.98	47.20	91.84	91.07
Nov-01	60.51	46.21	83.39	93.44
Dec-01	60.01	46.25	76.82	91.21
Jan-02	59.95	46.92	68.81	88.29
Feb-02	59.52	47.59	67.36	86.16
Mar-02	58.95	47.69	66.92	83.53
Apr-02	59.07	48.05	64.09	80.25
May-02	59.58	47.81	67.43	76.86
Jun-02	59.23	47.42	73.48	73.88
Jul-02	58.48	46.76	78.54	75.31
Aug-02	58.07	46.42	76.34	74.79
Sep-02	57.82	46.29	74.41	74.90
Oct-02	57.73	46.14	72.34	76.55
Nov-02	57.32	45.94	68.28	74.06
Dec-02	57.17	46.08	66.33	71.86
Jan-03	57.05	46.18	67.85	71.09
Feb-03	57.02	46.22	65.55	71.56
Mar-03	57.20	46.19	65.40	72.45
Apr-03	56.74	45.22	62.40	71.07
May-03	56.80	44.82	56.53	67.73
Jun-03	56.95	44.23	53.88	66.37
Jul-03	56.55	43.78	54.02	65.43
Aug-03	56.41	43.62	52.61	66.54
Sep-03	56.40	43.54	51.64	65.94
Oct-03	55.39	42.73	52.91	65.54
Nov-03	54.62	42.66	53.54	65.27
Dec-03	54.51	42.72	51.92	65.04

Source: ERS

Table A.5. Shipping rates, from foreign port to port of Los Angeles.

	Evergreen	Maersk-Sealand	K-Line	kilograms	shipping/kg
Turkey		\$3,592.79		19500	\$0.18
India	\$5,759.00			19500	\$0.30
Indonesia	\$4,959.00		\$3,950.00	19500	\$0.25
Pakistan	\$5,759.00			19500	\$0.30

Source: Online response from various shipping companies



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Consumer Responses to Food Safety Information from Print Media

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Abstract

A panel of independent judges evaluated a range of articles in popular print media sources for positive or negative bias about pork. From this came the development of an information variable reflecting consumer perceptions about food safety. The primary data from this evaluation was then used to estimate the impact of print media information on the consumer demand for pork.

Keywords: food safety, consumer perceptions, media bias, pork demand

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Introduction

A long-standing policy objective in the food and agricultural sector is the assurance of a safe food supply for the general public. Public awareness of food safety continues to be publicized by events reported in the print media.

Newspaper and magazine headlines such as “Aging Population May Demand Pathogen-Free Food” (*Feedstuffs*, 1993); “Mad Cow Disease Hits Again” (*Sioux City Journal*, 1996); “Hudson Meat Plant Closed: Recall of Hamburger Patties Reaches 25 Million Pounds” (*Sioux City Journal*, 1997); “Spray Kills Salmonella in Chickens” (*USA Today*, 1998); and “Group Finds Meat Safety Violations” (*Lincoln Journal Star*, 2005) notified consumers of a new danger in town - food borne pathogens. These bacteria and parasites exist to some degree in all farm animals, some remaining in meat and poultry products after slaughter. Pathogens can be introduced into meat and poultry products in slaughter plants, processing plants, grocery stores, restaurants, and even at home.

A USDA report (Aldrich, 1999) synthesized research from economics, nutrition education and marketing on the use of information. The report found several themes that emerged including: the importance of motivational knowledge, the value of time to consumers, the changing effects of economic variables, and the high value of enhanced health and life expectancy. Yet, the pace of dietary change has been slow, with many changes offsetting other changes. One explanation of the slow rate of change is the difficulty people have in changing consumption habits and patterns. Aldrich observed that the forces of rising incomes and convenience are outweighing nutrition and health information. Research by Blisard, Blaylock and Smallwood found that 59 percent of those surveyed thought that their current diets were healthy, but many feel they lack the information to change their dietary behavior.

As consumers have become more removed from the farm, they look to the food industry to help them achieve healthier diets; to universities and scientific agencies to evaluate the safety and benefits of those dietary changes; and to the government to enforce and regulate food safety and consistency standards. In a majority of instances information associated with this process is transmitted from those in the scientific and enforcement community to consumers through the media. Whether the message is “nutritionally improved,” “light,” “low fat,” “low sodium,” “packed in water,” “cholesterol free,” or “organic,” consumers receive a variety of messages in their efforts to consume a healthy diet. The consumption of meat items is no exception.

Food safety information can be costly to gather and difficult to understand. Scientific studies are often complex, contradictory and open for interpretation. The public frequently relies on the media for information regarding their food purchases

and consumption. The nation's media agenda may not be strictly informational in nature because most media organizations are profit-seeking entities. As informational reliance on the media has grown, concerns over possible misinformation, or bias, toward food and agricultural commodities have also grown (Jones; Foster). As stated by Jones, "There is a tendency for consumer concerns about food safety issues, however, to be exaggerated by the popular press."

Objectives

The first objective of this study was to develop and define an information variable that captured the extent of positive and negative information about food safety appearing in popular print media sources. This was done to establish an original data set for use in a supply and demand model.

The second objective was to specify and estimate a supply and demand model for pork that included an information variable in the specification. The purpose of the model was to evaluate the role of information in explaining consumer behavior.

This study adds to and builds upon past studies that constructed variables, usually an index, to measure the number of positive and negative articles appearing in medical journals or popular print media. Once the variables were constructed, they were used in models to assess the significance and possible impact of positive or negative information on consumer food demand. Tactical actions by managers can then be considered.

Information Variable

A review of literature covering past research on the development of an information variable is given in Appendix A. Following the groundwork from these previous studies an information variable INFO was defined and data developed for use in this study.

The information variable was defined using primary data generated from the computerized InfoTrac SearchBank. Data for the information variable INFO started as the total number of articles ($N = 114$) pertaining to food safety and pork consumption. The articles were published in the lay press and were accessible to the average consumer. See Appendix B for a sample listing of the newspapers and magazines. Each article was evaluated by a panel of judges and determined to be positively or negatively biased, or unbiased. The information variable was included in the demand equation as direct test of the hypothesis that health and food safety information affected the consumption of pork. Two information variables that were statistically significant, and included one-at-a-time in the demand equation, were as follows:

INFOB4 was a 4-quarter moving average of negatively biased articles.

INFOA3 was a 3-quarter moving average of positively biased articles.

Focus Group Insights

In constructing an information variable, a number of the previous studies reviewed here tabulated the articles containing positive or negative information about a particular food product, such as cholesterol attributes and egg consumption. In doing economic research this was a standard practice that led to the construction of an information variable, the same as done in this study. However, a researcher from the disciplines of marketing or psychology might ask the question, "Did you talk to any actual consumers about their perceptions of the information and how they reacted to it?"

In response to such a question, five face-to-face focus groups, containing six to ten participants each, were conducted in three cities in the Northern Plains region of the U.S. It should be noted that while focus group participants do not constitute a random sample of the population of U.S. consumers, it is expected that they can provide useful insights about consumer behavior.

The focus group results indicated that their information came from a variety of sources, with television being reported by 85.2 percent, followed by magazines (29.6 percent), newspapers (22.2 percent), and radio (14.8 percent). Respondents reported hearing or reading about the health and safety attributes of consuming beef (81.5 percent), poultry (66.7 percent) and pork (51.9 percent) within the past six months. When asked to respond to the general nature of the information received, 51.9 percent of those that received information about beef said the information was negative. Twenty-two percent said the pork information they received was negative, and 33.3 percent said that poultry information was negative. Consumers also reported gaining information from reading nutritional labels, with 92.6 percent having read at least one label in the last 30 days.

Two hypotheses were tested utilizing this data. (See Appendix C for details on the statistical test). The first hypothesis tested was that consumers have not altered their pork consumption levels in response to food safety concerns. The results of this test supported previous research that consumers have changed their levels of pork consumption due to health and food safety concerns (van Ravenswaay; Henderson; Kinnucan, et.al.).

The second hypothesis tested was that consumers respond to information in an identical manner regardless of the presence of information bias. Over 66 percent of those surveyed said that they respond differently to information they perceive to be biased than information perceived as objectively reported.

Model Results

With the insights gained from the focus groups, a more formal analysis proceeded using a supply and demand model. (Details on the supply and demand model, associated statistics and a discussion of the variables are given in Appendix D. The theoretical background for the research is contained in Wade).

In the demand equation, which contains the information variable, all variables were statistically significant. Two versions of the demand equation were estimated – one with a negative information variable, and one with a positive variable to see how consumers responded to both types of information bias.

The INFOB4 information variable represented a four-quarter moving average of negatively biased articles pertaining to the health attributes or safety of consuming pork. The statistically significant, negative sign indicated a direct and negative relationship between the quantity of pork demanded and the negative nature of the information consumers receive.

The information variable INFOA3 was a three quarter moving average of positively biased articles pertaining to the health attributes or safety of consuming pork. The statistically significant, positive sign indicated a direct and positive relationship between the quantity of pork demanded and the positive nature of the information consumers receive.

Results from the supply and demand model and the focus group insights showed that consumers can and do differentiate between biased and unbiased information, positive and negative, and they respond differently to each.

Implications for Managers

Managers in the food manufacturing and marketing segment of the supply chain are acutely aware of the impact that catastrophic news regarding food safety can have on an agribusiness. Whether its salmonella in chicken, e-coli in hamburger, Alar in apples or even suspected mad cow disease, the economic costs to the industry and financial impacts on the firm are enormous. Much effort goes into monitoring, testing and preventing such events.

Less catastrophic for managers but still potentially damaging are the warnings from consumer organizations, the media, government and scientists who believe they are serving the public good by reporting information that is negative about a food product. Three questions confront the manager: a) how reliable is the information, b) how will consumers respond to it, and c) what, if anything, should the managers do?

If a negative report is published in the popular media, managers will first need to make a judgment on the reliability of the information, and that will likely be related to the source of the information. With negative information that appears to receive significant media exposure and public attention, the managers can expect a negative response by consumers as demonstrated by the research in this study.

What to do about a negative report is more complicated. It can be ignored and managers can hope that consumers do not significantly change consumption patterns. However, with significant media exposure managers will most likely be forced to respond. Depending on circumstances, they can question the reliability and the source of the information, and try to persuade consumers that good science is not present and that only selected opinions are being expressed. The source of the information might be a vested interest group with a record of opinionated public statements that tout the groups own values but are not credible to a large segment of the general public. If additional tactical action is deemed necessary, managers can do their own internal investigations and use those findings to make adjustments, if needed. Any adjustments that focus on improving consumers' welfare can be part of a public campaign showing concern for their customers and that the food firm is committed to correcting any real problems.

If a positive report appears in the popular media, again managers have a choice of doing nothing, or starting a campaign that cites the message and appeals to the authority of the source. A purely hypothetical example might be, "the New England Journal of Medicine recently reported on research showing that eating twelve to sixteen ounces of lean pork every two weeks provides an excellent source of protein without any associated negative effects related to heart disease."

In either case of negative or positive reports, once managers have responded with tactical actions, they can use the services of consumer research firms such as Information Resources, Inc. (www.infores.com) or A.C. Nielsen (www.acnielsen.com) to track any changes in sales volume, by geographic location. These services can show whether or not an information campaign by the food firm is effectively reinforcing a positive media report, or countering an original negative media report.

Conclusions

Consumers are overwhelmed by warnings from consumer protection organizations, the media, government, and various scientific studies. They have often received conflicting information. This study shows that the reporting of information can be positive, neutral or negative, and perceived as biased. Focus group insights showed consumers are reasonably intelligent in their evaluation of information. They responded differently to information perceived as biased versus information perceived as objectively reported. In addition, the more formal supply and demand analysis showed that consumers do respond as expected to positive or negative

information. Managers need to be aware of public media articles about their firm's food products, and consider selected tactical actions in response.

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Appendix: A

Literature Review on Information Variables

Consumer research on food products has traditionally focused on the importance of advertising as a primary source of consumer information (Green, Carman, and McManus; Kaiser; Capps, Seo, and Nichols). More recently, time-series demand studies included attitudinal variables and information pertaining to health concerns as possible explanations for changes in consumer preferences (Gao and Spreen; Brown and Schrader; Capps and Schmitz). Each of these models included an information variable, but the structure of that variable received relatively little attention. The studies on advertising are numerous, and the three summarized here discuss time lags and advertising effectiveness.

Previous research has concluded that advertising does influence consumer demand, but has failed to consistently and uniformly address the rate of advertising decay and structural lag. Lee and Brown examined the influence of lag structures on advertising effectiveness. Summarizing previous advertising research on agricultural commodities, the authors classified lag structure assumptions into four categories: (1) zero lag effects, (2) monotonic decreasing lag structures, (3) bell-shaped lag structures, and (4) monotonic increasing structures.

While the structure of the lagged variable was debated, Lee and Brown sought to answer the question as to why the advertising variable was lagged in so many previous regressions seeking to estimate advertising effects. Often, no explanation was given for assuming a lagged structure. Common arguments that were given included the fact that it takes time for advertising to reach its full impact, printed materials may not be read immediately, and frequency of shopping may not coincide with frequency of advertising. For these reasons, distributed lags and/or cumulated advertising variables tended to be used.

Lee and Brown tested the data interval and the necessity of a lagged variable structure using weekly, biweekly, triweekly, and monthly data for the time periods $t-1$ and t through $t+7$, where the period $t+7$ is used in analysis of the advertising decay function. It was concluded that, in general, for frequently consumed commodities, the lag structure of advertising should take the shape of a monotonic decreasing function. More importantly, the authors stated that researchers placing too much emphasis on statistical goodness-of-fit and statistical tests could lead to incorrect conclusions about the length of advertising lagged effects. It was recommended that the nature of the product being promoted (frequency of purchase and use) and advertising frequency be considered in any econometric model.

Reberte et. al. included a “stock of advertising goodwill” variable generated by an advertising campaign in their demand equation for fluid milk. While previous

studies cited by the authors assumed that advertising elasticities were constant over time, the assumption ran counter to the advertising wear out theory, which states that the effectiveness of an advertising campaign will eventually decay. To test this hypothesis, two major milk advertising campaigns in New York City were examined. Results of the study indicated that the first campaign was effective for twice as long as the second campaign, and that it had a higher average advertising elasticity. It was concluded that advertising effectiveness diminishes over time.

Schmit, Reberte, and Kaiser conducted an economic analysis of generic egg advertising in California using a double log functional form. Supply and demand equations were estimated on a per capita basis using quarterly data, 1985 through June 1995. The demand equation contained lagged, as well as current, generic advertising expenditures variables to account for delays in the demand response to advertising. Based on the significance of the lagged coefficients, three lags were included in the final specification. Results indicated that generic advertising had a positive and statistically significant impact on California per capita egg consumption.

While a large amount of research focused on methods that try to measure a consumer's response to advertising, the same cannot be said about non-advertising types of information that come from scientific, government and popular media sources. Six studies are summarized here describing how previous researchers defined and quantified information variables.

Menkhaus et.al. examined the effects of perceived product attributes on the perception of beef. In the empirical model, a variable QUALBF was included representing the consumer's perception of beef quality. The variable was determined by a range of characteristics that could be classified into four broad categories: health, convenience, appeal, and merchandising. As suggested by Capps and Schmitz, the perception of quality depends on information available to consumers at time t . Therefore, the QUALBF variable was included without lag. Data for the analysis was collected via questionnaire in Denver and Los Angeles. The dependent variable in the model was a measure of quality or overall opinion and was coded zero (fair), one (good), or two (excellent or very good). An ordered probit technique was used to take into account the discrete nature of the dependent variables in the model.

Results from the estimated model indicated that high cholesterol content and being high in calories, among other things, significantly and adversely affected the quality perception of beef among survey respondents. These results lent support to the findings of previous research that suggested the importance of assessing the effects of convenience and health related factors in analysis of beef demand.

Menkhaus et.al. utilized an interesting definition of “health” in their study. Health included such things as portion sizes cut too large, high cholesterol, high in calories, containing artificial ingredients, and not well trimmed. Pathogen contamination, antibiotic/other residues, and fat content were not included in the model, yet are indicated by consumer surveys to be of great concern.

In their widely cited article, “Cholesterol Information and Shell Egg Consumption,” Brown and Schrader investigate how information about cholesterol affects U.S. demand for shell eggs. Supply and demand equations for shell eggs were specified. Of major significance was the inclusion of a cholesterol information index in the demand function.

Clinical studies link cholesterol in the diet to an increased risk of heart attacks. Consumers receiving health information from physicians, neighbors, and the popular press, Brown and Schrader argued, would reduce their level of egg consumption in an effort to reduce blood cholesterol levels. An index based on articles in medical journals served as a proxy for information reaching consumers from many sources. Therefore, a cholesterol index was constructed by scanning all articles in English connecting human health to cholesterol. Articles unrelated to cholesterol and heart disease, and those appearing in foreign journals were discarded. The number of articles supporting and attacking the linkage was calculated by quarter. A running total, lagged two quarters, was calculated, with each article supporting the link adding one unit to the total and each article attacking the link subtracting one unit from the total. In essence, a net influence variable was created. The equal weighting of the pro and con articles was justified by including both supporting and attacking articles in the regression. The coefficients were found to be of similar size, but opposite in sign in the directions predicted. The lag was justified, argued Brown and Schrader, because there appeared to be a two-quarter lag before a new article had an effect on egg consumption. The cholesterol information index was then a simple sum, lagged two quarters. When the index was used to predict shell egg demand in a fixed coefficients regression, its coefficient was always negative and different from zero at a one percent level of significance.

Capps and Schmitz also created a theoretical framework in which to empirically identify and assess the impacts of cholesterol information on the demand for meat. In their study, a Rotterdam model was used to simultaneously investigate the impacts of prices, total expenditure, and cholesterol information on the consumption of beef, pork, poultry, and fish. The model was modified by the inclusion of a term corresponding to the cholesterol index developed by Brown and Schrader. Annual data over the period 1966 to 1988 was used.

The coefficients associated with the cholesterol variable were -0.000884 for pork, -0.000219 for beef, 0.000892 for poultry, and 0.00021 for fish. The pork, poultry, and

fish coefficients were all statistically significant at the .10 level. Capps and Schmitz concluded that there existed evidence to indicate that cholesterol information, lagged one-half year, was a statistically significant determinant in the consumption of pork, poultry, and fish.

Chang and Kinnucan examined the roles of cholesterol information and advertising in explaining consumption trends for fats and oils, focusing on butter. An additional hypothesis of importance in this study was whether consumers respond disproportionately to unfavorable information as suggested by previous researchers. Demand equations were formulated for butter, margarine, shortening, and salad oil. Each equation included a measure of consumer awareness of cholesterol - the Brown and Schrader cholesterol information index. While Brown and Schrader used a "net publicity" approach, "total publicity," which is the summation of both positive and negative articles, may be appropriate. In the study, an "effective negative publicity" measure ($INFO_t$) was developed as a hybrid of both approaches, using the formula $INFO_t = \sum K_t NEG_t$. Here NEG_t are negative articles in Brown and Schrader's index, and K_t is a weighting factor that was calculated as the number of negative articles in period t divided by the sum of negative and positive articles in period t . The demand equations were estimated as a system using seemingly unrelated regressions.

The estimated coefficient of the cholesterol information index was significant in the case of butter (-0.75) and salad oils (0.65). The negative sign on the butter coefficient indicates that as information pertaining to cholesterol increases, the demand for butter decreases. Chang and Kinnucan also concluded, based upon advertising and cholesterol elasticity measures, that incremental percentage increases in cholesterol information had a greater impact on demand for butter and salad oils than similar incremental percentage increases in advertising expenditures. Results also suggested that favorable information disseminated by disinterested sources is more effective than favorable information disseminated by sources with a vested interest.

Kinnucan et. al. also utilized Brown and Schrader's cholesterol index in evaluating the effects of health information on U.S. meat demand. A Rotterdam model was estimated using seemingly unrelated regressions with homogeneity and symmetry imposed. Brown and Schrader's cholesterol index was updated through 1993. Following Chang and Kinnucan, the negative and positive data series were combined into a single "net publicity" index using the formula $Z_t = w_t NEG_t$. Here Z_t is the net publicity index, NEG_t is negative articles in Brown and Schrader's index, and w_t is a weighting factor which was calculated as the number of negative articles in period t divided by the sum of negative and positive articles in period t . Kinnucan et. al. concluded that poultry benefited from the dissemination of cholesterol information, largely at the expense of beef. Pork and fish were found to be unaffected by health information.

Robenstein and Thurman studied health risks, the demand for red meat, and their impact on futures markets, employing a similar methodology. Instead of using Brown and Schrader's cholesterol index as a demand proxy for health information, this study utilized cholesterol information from the *Wall Street Journal*. Articles related to cholesterol and red meat consumption were gleaned from the *Wall Street Journal* Index and National Newspaper Index from 1971 to 1990. Irrelevant articles were culled, with the remaining 52 articles being categorized as to either strengthening the link between cholesterol and red meat consumption (33 articles), or weakening the link (19 articles). Articles were further classified as strong, moderate, or weak. Event study regressions were run. Results provided no evidence of immediate futures market adjustments to public information linking red meat consumption and cholesterol or heart disease.

Appendix: B

InfoTrac SearchBank Newspapers and Magazines - A Partial Representation by Category

General Consumer

Redbook
Working Woman
Woman's Day
Parents
Better Homes and Gardens
Family Circle
Good Housekeeping
Consumer's Research Magazine

Agricultural

Successful Farming
Organic Gardening
Mother Earth News

Medical, Health and Fitness

Health
The Lancet
New England Journal of Medicine
Vegetarian Times

News Magazines and Newspapers

Time
U.S. News and World Reports
Newsweek
New York Times

Business

Wall Street Journal
The Economist
Business Week

Appendix: C

Focus Groups

It was hypothesized that (1) consumers have not altered their pork consumption levels in response to food safety concerns, and that (2) consumers respond the same to information regardless of the presence of informational (media) bias. In order to test the two hypotheses, five face-to-face focus groups (Zarkin and Anderson; Newsom, Scott, and Turk), containing six to ten participants each, were conducted in three cities in the Northern Plains region of the U.S. Adult subjects were recruited from three retail grocery locations and the local community college, and were distributed equally across locations. Individuals exiting the grocery stores and the college cafeteria were approached at random (approximately every fifth person) and asked if they would be willing to participate in a study of consumer attitudes about food safety. Those interested were verbally screened to ensure that they were not full-time students, were nineteen years of age or older, and that they were adults with food purchasing (either at-home or away-from-home) responsibility for their households. Participants were not selected based upon gender or ethnicity, but were approached at random. Those individuals meeting the stated criteria were asked to attend a focus group conducted at the local college, where meeting space had been made available. Several alternative dates and times were made available to those interested in participating. Only those individuals that arrived at the focus group meetings actually took part in the study.

It should be noted that while focus group participants do not constitute a random sample of the population of U.S. consumers, it is expected that they can provide useful insights about consumer behavior (Lin, Payson, and Wertz; Sapp, Harrod, and Zhao). For consistency among interviews, the same enumerator conducted all interviews and led all focus group discussions. At the start of each focus group participants completed a brief written questionnaire. The questionnaire was pre-tested in two additional focus groups to ensure respondent understanding. Several questions were modified as a result of the pre-testing.

The questionnaire includes items on meat consumption, perceptions of key food attributes (Food Marketing Institute; Kronl and Lau), nutrition labels, health and food safety information, concerns about food safety, and social demographic characteristics. The questionnaire also solicits information on possible changes in pork consumption based on health and safety concerns.

As suggested by Sapp, Harrod, and Zhao, upon completing the questionnaire, participants were instructed to read two articles pertaining to food safety and pork consumption. Both articles were presented in identical format as retrieved from the InfoTrac SeachBank to prevent biasing the reader. Though the articles are labeled "Article One" and "Article Two," which article was read first was determined

by the respondent. Given the new information presented in the articles, the respondent was again asked the impact of this new knowledge on their consumption of beef, fish, pork, and poultry.

The subjects were then provided the written definition of “bias” used in this research, and were asked whether bias exists in either of the two articles, the type of bias present, and whether the degree of bias indicated would alter their consumption of beef, fish, pork or poultry. The primary data generated via the questionnaire was then summarized. Two null hypotheses were tested using a Chi-Square Goodness-of-Fit test. The first null hypothesis tested was that consumers have not altered their pork consumption levels in response to food safety concerns. Was there a statistical difference between those respondents that answered the question yes and those that answered no? Under the null hypothesis the observed probabilities would equal 0.50 for those answering yes and 0.50, or 50 percent, for those answering no. For the test of hypothesis the expected probability of a yes response was set equal to 0.05 and the expected probability of a no response was set at 0.95. The null hypothesis of not altering pork consumption was rejected at the 0.05 level of significance.

The second hypothesis tested was that consumers respond in an identical manner regardless of the presence of informational (media) bias. Using expected probabilities of 0.10 and 0.90, then the null hypothesis was rejected at the 5 percent level of significance. Survey results were also tabulated for analysis by demographic and socioeconomic characteristics such as gender, age, household size, income level, and place of residence.

Upon completion of the questionnaire, respondents were asked to orally comment on their reactions or perceptions of meat (pork) safety, media bias, sources of consumption information, the two articles, their consumption habits, the questionnaire, or any comments in general related to the subject of study. Discussions lasted anywhere from ten minutes to thirty-five minutes.

A demographic profile of the respondents and the questionnaire are available from the authors.

Appendix: D

Supply and Demand Model

The supply and demand model was made up of four equations describing a static equilibrium situation where price and quantity are simultaneously determined. Key variables were quantities supplied and demanded, prices of pork and substitutes, cash costs of production, technology, income and population, and the information variable.

The model was defined by three behavioral equations and a fourth identity equation as follows:

$$\begin{aligned}
 (1) \quad Q_{st} &= \beta_0 + \beta_1 PP_{t-4} + \beta_2 Q_{st-4} + \beta_3 TCSCST_{t-4} + \\
 &\quad \beta_4 TECH_{t-4} + \beta_5 DUM4 + \beta_6 Z_t + u_{2t}, \\
 (2) \quad Q_{dt} &= \alpha_0 + \alpha_1 PP_t + \alpha_2 PB_t + \alpha_3 PC_t + \alpha_4 YD_t + \alpha_5 POP_t + \\
 &\quad \alpha_6 INFO_t + \alpha_7 DUM4 + \alpha_8 Z_t + u_{1t}, \\
 (3) \quad PP_t &= \gamma_0 + \gamma_1 PP_{t-1} + \gamma_2 PP_{t-2} + \gamma_3 PP_{t-4} + \gamma_4 DUM4 + u_{3t}, \\
 (4) \quad Q_{dt} &= Q_{st}.
 \end{aligned}$$

In the first equation: Q_{st} is the quantity supplied in quarter t ; PP_{t-4} is the price of pork lagged four quarters; Q_{st-4} is supply lagged four quarters; $TCSCST_{t-4}$ represents the total cash costs per hundredweight lagged four quarters. A technology $TECH_{t-4}$ variable was included in the supply equation defined as the percentage of total hog inventories owned by operations one thousand head and greater, lagged four quarters. A dummy DUM variable was used in the supply equation to account for seasonality in pork markets. Z_t represented other explanatory or dummy variables that may have been needed to further explain quantity supplied.

In equation two: Q_{dt} is the quantity demanded in quarter t ; the price of substitute goods are the price of poultry PC and price of beef PB ; YD is disposable personal income; POP is a population variable; and a dummy DUM variable accounts for seasonality in pork markets. The information variable $INFO$ is described in a previous section of this article.

The third equation defined the dynamic relationship between the current level pork price (pp) in the demand equation and the lagged prices of pork (pp_{t-1} , pp_{t-2} , and pp_{t-4}) in the supply equation. The fourth identity equation specified that the quantity demanded must equal the quantity supplied in equilibrium. The two-stage least squares estimation procedure provided consistent, asymptotically efficient estimates of the model parameters.

Estimated Supply and Demand Model

The four-equation model was estimated using the two-stage least squares (SYSLIN option in SAS).

Pork Supply Equation

The estimated parameters and statistics for pork supply equation (1) are given in Table 1.

Table 1. Simultaneous Equation Parameter Estimates: Pork Supply

	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	8	4284453.13	535556.641	37.517	0.0001
Error	23	328327.745	14275.119		14275.119
C Total	31	4612780.875			
Root MSE		119.478	R-Square	0.9288	
Dep Mean		4281.187	Adj R-SQ	0.9041	
C.V.		2.791			

Variable	Parameter Estimate	Standard Error	t-Value	P-Value
Intercept	2500.284	438.355	5.704	0.0001
PP _{t-4}	5.834	1.844	3.164	0.0043
Q _{t-4}	0.168	0.067	2.513	0.0194
TCSCST _{t-4}	-27.356	6.184	-4.424	0.0002
TECH _{t-4}	15.335	3.171	4.837	0.0001
DUM4	265.008	57.097	4.641	0.0001
DUM24	427.287	128.065	3.336	0.0029
DUMQ9	1710.788	124.391	13.753	0.0001
DUM25	329.313	122.683	2.684	0.0132

The seasonal dummy variable DUM4 verifies a higher level of pork production in the fourth quarter relative to all other quarters. The higher production corresponds to higher demand by consumers.

The lagged total cash cost (TCSCST_{t-4}) variable was a significant determinant of pork supply, and is of the expected (negative) sign. This relationship was expected as feed costs, interest expense and capital costs represent major costs of production in the swine industry. The lagged factor may be an indication that producers relate current input costs more heavily in the production decision than they do costs incurred closer to the actual marketing date.

The technology (TECH_{t-4}) variable was significant and positive. Technology has changed as larger producers have come to dominate the swine industry, taking advantage of economies of scale and new production practices that may not be readily available to smaller producers.

The sign on the lagged quantity supplied (Q_{t-4}) variable was positive, indicating the relationship between past and current hog marketings. The level of pork supply is primarily determined by producers' decisions about breeding herd size. Producers expand their herds by retaining gilts or by adjusting the culling rate. Utilization of the breeding-herd determines the placement of pigs on feed that in turn determines subsequent barrow and gilt slaughter. Domestic pork production is derived from the sum of barrow, gilt and sow slaughter multiplied by their respective market weights. As suggested by Hayenga and Hacklander, pork producers tend to expect the most recent price trend to be continued. Consequently, past marketings serve as a realistic measure of production expectations for producers incorporating normal marketing weights, growth trends and seasonality.

If producers' expectations were indeed adaptive, they would make production decisions based on the lagged price (PP_{t-4}) when the decision to breed must be made. Producers expect recent monthly price trends to continue and plan their marketings accordingly (Tryfos). The lagged price (PP_{t-4}) variable was positive and significant statistically.

The estimated price elasticity of supply for pork expresses the percentage change in quantity supplied in response to a one percent change in price, *ceteris paribus*, and is defined for a point on the supply curve. The elasticity of supply is 1.23 which is within the range of previous estimates of pork supply elasticities. Since an increase in quantity supplied is normally associated with a rise in price, the sign of the coefficient is usually positive as it is here.

Pork Demand Equation - Negative Bias

Table 2 gives the estimated parameters and statistics for pork demand equation (2) that includes an information variable reflecting negatively biased articles.

Table 2. Simultaneous Equation Parameter Estimates: Pork Demand-Negative Bias

	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	5	4318702	863740.5	88.32	0.0001
Error	26	254269.4	9779.592		14275.119
C Total	31	4612781			
Root MSE		98.89182	R-Square	0.94440	
Dep Mean		4281.18750	Adj R-SQ	0.93370	
C.V.		2.30992			

Variable	Parameter Estimate	Standard Error	t-Value	P-Value
Intercept	5109.889	280.3904	18.22	0.0001
PP	-13.4349	1.729442	-7.77	0.0001
YD	0.377748	0.044295	8.53	0.0001
INFOB-4	-99.4536	56.31134	-1.77	0.0891
DUM4	443.2112	40.87139	10.84	0.0001
DUMQ9	1864.261	105.2925	17.71	0.0001

The negative sign on the pork price coefficient (PP) reflects the anticipated negative-sloping demand curve. The estimated own-price elasticity of demand is -0.581 which is within the range of previously estimated elasticities. Price elasticity is defined for a point on the demand curve, and hence for most demand curves, the magnitude of the elasticity coefficient varies along the curve.

The seasonal dummy variable DUM4 confirms higher consumption in the fourth quarter relative all other quarters, as it did for higher production. The positive sign on the disposable income (YD) coefficient reflects a positive relationship between disposable income and pork price. Since disposable income has risen steadily over the time period under consideration, the significant positive impact of disposable income on pork prices may reflect a willingness of consumers to increase pork consumption as incomes rise even if consumers have the ability to purchase substitutes to pork that may be more expensive.

The INFOB4 information variable was significant with a negative sign. This variable represents a four-quarter moving average of negatively biased articles pertaining to the health attributes or safety of consuming pork. The negative sign indicates a direct and negative relationship between the quantity of pork demanded and the negative nature of the information consumers receive.

Pork Demand Equation - Positive Bias

Table 3 gives the estimated parameters and statistics for pork demand equation (2) that includes an information variable reflecting positively biased articles.

Table 3. Simultaneous Equation Parameter Estimates: Pork Demand-Positive Bias

	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	5	4404183	880836.7	137.98	0.0001
Error	26	165984.1	6384.002		
C Total	31	4612781			
Root MSE		79.89995	R-Square	0.96368	
Dep Mean		4281.18750	Adj R-SQ	0.95670	
C.V.		1.86630			

Variable	Parameter Estimate	Standard Error	t-Value	P-Value
Intercept	4702.470	228.7166	20.56	0.0001
PP	-10.1348	1.213031	-8.35	0.0001
YD	0.305043	0.025127	12.14	0.0001
INFOA3	465.9944	109.3263	4.26	0.0002
DUM4	432.5332	33.07996	13.08	0.0001
DUMQ9	1863.317	84.98275	21.93	0.0001

The INFOA3 information variable was significant with a positive sign. This variable represents a three-quarter moving average of positively biased articles

pertaining to the health attributes or safety of consuming pork. The positive sign indicates a direct and positive relationship between the quantity of pork demanded and the positive nature of the information consumers receive. These results dispute suggestions by Pember; Robertson and Kassarian; Sapp, Harrod, and Zhao, that negative information received by consumers influence opinions more so than favorable information. These results show that positively biased information does increase the quantity of pork demanded.

The results also contradict conclusions drawn by Khan, Tes and Uhlenhopp that consumers “lump” all information together under one broad category of either good or bad. Results of this study from the focus group and regression analysis show that consumers can and do differentiate between biased and unbiased information, positive and negative, and they respond very differently to each.

Price Equation

The estimated parameters and statistics for price equation (3) are given in Table 4.

Table 4. Simultaneous Equation Parameter Estimates: Lagged Price Relationship

	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	4	5819.005	1454.751	116.823	0.0001
Error	27	336.219	12.453		
C Total	31	6155.225			
Root MSE		3.529	R-Square	0.9454	
Dep Mean		208.172	Adj R-SQ	0.9373	
C.V.		1.695			

Variable	Parameter Estimate	Standard Error	t-Value	P-Value
Intercept	11.356	12.192	0.931	0.360
PP _{t-1}	1.983	0.164	12.052	0.0001
PP _{t-2}	-1.215	0.204	-5.948	0.0001
PP _{t-4}	0.192	0.091	2.118	0.044
DUM4	-10.973	1.970	-5.571	0.0001

All of the lagged price variables were statistically significant. The seasonal dummy variable DUM4 influences the current price of pork relative to all other seasonal time periods. The lagged price variables reconcile the time dimension that exists between current price in the demand equation and lagged price in the supply function. This is consistent with economic theory as pork supplies are fixed in the short-run for any one quarter and can only be adjusted subsequent to the biological lag in production that exists. Current pork prices are a function of past pork prices just as current quantities supplied are a function of previous levels of production and prices.

Description of the Data Set

Estimation of the supply and demand for pork products used quarterly data. Pork, beef, poultry, and corn prices were obtained from the U.S. Department of Agriculture (USDA) publication *Agricultural Outlook*. Interest rates were obtained from the Federal Reserve Bulletin. Commercial pork production levels, Consumer Price Index (CPI), population, and disposable personal income figures were also from USDA's *Agricultural Outlook*. All prices were at the retail level except for farm level pork price. Magazine and newspaper articles used in the development of the information variable INFO were obtained from InfoTrac SearchBank.



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Quality Management in Supply Chain Networks - The Case of Poland

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Abstract

In this article we suggest that rising quality requirements are key factors for the re-design of food chains. We argue that the food supply proceeds through pyramidal-hierarchical strategic networks coordinated by powerful focal firms. These firms choose a quality strategy and employ chain quality management concepts by exerting managerial discretion to achieve the super-ordinate network aims. We introduce and elaborate upon two types of chain quality management: strategic and operative. The theoretical findings have been tested using evidence from the Polish dairy market. Semi-structured interviews were conducted across the various hierarchical levels of the 19 largest Polish dairy cooperatives during the spring of 2006. The results show that the firms' activities are generally aligned with current market opportunities for optimal enterprise performance. Thus, we determined that manufacturers of well-branded products create an advanced network structure and apply strategic quality management. Networks that have a focal company acting as an external customer of a processor use operative quality management. Some Polish dairies are still not embedded in any supply chain networks; no chain quality management concepts can be installed in these chains because they have no powerful focal firm.

Keywords: chain quality management, dairy cooperatives, network theory, Poland

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Introduction

Collaborative relationships in the food chain have been gaining in importance in the agro-food business for many years. Indeed, today's vertical collaborations are as important as the horizontal cooperation that emerged when the first cooperatives were established. Many factors have influenced this development in general, and particular factors are present on every level of the food chain (Duysters et al. 2004, Dyer/Nobeoka 2000, Gulatti et al. 2000). Because many articles have been written on the verticalization of the agro-food business, we refrain from analyzing it once again. Overall, there are two main factors: 1) obtaining higher efficiency due to cost reductions and 2) assuring the demanded food quality and security. In this article, we focus on quality management in vertical collaborations.

As we focus on food quality, we must bear in mind that the understanding of quality differs along the whole food chain. While food safety, freshness, taste, and animal welfare are highly relevant to consumers, retailers and manufacturers are also concerned with functional points such as production specificities and required technological parameters. Because consumers determine the marketing success of goods in saturated markets, their wishes and demands influence the entire production process (Andersen 1994, Hanf 2000). Therefore, we will place special emphasis on certain developments that are steered by consumers.

As people have become more affluent and educated about food over the past two decades, their perceptions and expectations of "good" food have changed. Consumer concerns about food quality and safety have dramatically increased by numerous food scandals such as the Coke scandal in Belgium, the Bovine Spongiform Encephalopathy (BSE) crisis in the UK, and the wine scandal in Austria and Germany (Böcker/Hanf 2000). In this context, the crisis of winter 2000-01 can be regarded as the straw that broke the camel's back. Therefore, consumers perceived BSE and Foot and Mouth Disease (FMD) as perhaps the doomsday of modern food processing. Because consumers have trouble verifying the characteristics of food safety, they, as well as politicians and the press, unanimously clamored for transparency in the whole production process. The most striking consequence of the above food scares was the fact that all agribusiness stakeholders assessed food quality as no longer being the responsibility of a single firm. Instead, it was recognized that the whole food chain needs to work together to deliver the "new quality" (Hanf/Hanf 2005).

Overall, the abovementioned incidences have catalyzed the development of quality management concepts that overlap a firm's boundaries. In recent years, a large number of proposals for "chain quality management" were widely discussed and the first quality management processes have already been implemented. Such concepts are either all-sector approaches - such as the German QS-system - or individual firms' approaches. Because all-sector approaches can only provide a competitive

advantage (if at all) for early adapters, individual approaches have to be used. In this way they can be regarded as strategic instruments for creating a unique selling proposition. Since supply chain networks now compete with each other, we argue that individual approaches have to cover the whole supply chain. Therefore, chain quality has to be used as a strategic parameter. Chain quality is a result of cooperation, so we further assume that using chain quality strategically leads to more intense relationships among partners. On the contrary if, chain quality is only used to gain parity with competing networks, weaker relationships have to be installed. Thus, chain quality management concepts are expected to significantly differ from each other.

Based on these considerations, our paper aims to work out the differences between strategic and operative chain quality management concepts and test our theoretical findings using evidence from an emerging industry. We have chosen Poland because it is a new European Union (EU) member. In that market, the firms' changing environment, including legal and voluntary obligated requirements and ongoing restructuring processes at all stages in the food chain (Pieniadz 2006) may cause unique developments, as far as quality management is concerned. In this respect, our thesis is that quality management concepts are still an emerging field and might be used as a differentiating instrument.

Our article is structured as follows. In section two we will discuss quality and its challenges and consequences for the participants of the agro-food business, and hence introduce the concept of supply chain networks. Section three deals with general demands on chain quality management. Furthermore, we introduce strategic quality chain management as well as operative quality chain management. In the fourth section we will present our empirical survey in Poland and discuss the main findings. A summary and conclusion follow.

Theoretical Considerations

Verticalization of the Agro-food Business

We have recently been able to observe that the traditional mode of exchange has been altered along the food chain. The exchange of products has traditionally been coordinated through spot market transactions; today, more and more transactions are carried out within hybrids or between vertically-integrated firms (Boehlje 1999, Brito/Roseira 2005, Fritz/Schiefer 2002, Neves 2003). Several important factors have brought this development about, such as efficiency gains through collaboration, customer requirements, etc. In this article, however, we will focus on food quality as one of the key drivers for the re-design of food chains.

Because quality is a multi-dimensional construct, different perspectives have to be analyzed (Hanf/Kühl 2004). Thus, some important implications can be drawn: (1)

quality attributes must be recognized by the customers (external customers such as consumers and business customers, as well as intra-firm customers); (2) the whole production process must be included; and (3) the product must fit the relationship-specific requirements (Garvin 1987). For developed countries, food safety can be regarded as a compulsory part of food quality.

However, food crises have alerted consumers to their inability to prove certain food products characteristics. One result has been a sharp reduction in demand for specific food items (Böcker/Hanf 2000). The aforementioned BSE/FMD crisis in the winter of 2000-01 caused a sharp reduction in the consumption of conventionally produced red meat and red meat products. Correspondingly, a sharp increase was observed in the consumption of substitutes such as fish, poultry, and cheese. Consequently, firms, as well as politicians, realized that there is an increased demand for food safety concepts.

It was assumed that the BSE problem was rooted in a malpractice at the farm-supplier level. Therefore, food safety concepts should contain information on the whole food chain, in particular, information should be provided on the monitoring and control of the whole food production process so that increasing traceability can be observed (Schulze et al. 2006, Theuvsen 2004). Furthermore, many factors - such as failing to remember, bounded rationality, asymmetric information, and time constraints - influence consumers' buying decisions. Hence, consumers will not be able, or will not be willing, to intensively and completely prove the quality of food products, although they may continue looking for signals to ease their buying decisions, e.g. for a well-known brand or a quality certificate. Therefore, it is not surprising that branded products outperformed unbranded products (Hanf/Kühl 2005). The demand for organically produced food increased significantly during the BSE/MFD crisis because those products have a trustworthy image and are certified throughout the whole production process. This demonstrates that the reliable transfer of experience and credence attributes to consumers can be used as a basis for creating a unique selling proposition, which is not a matter of food safety (Hanf/Kühl 2005).

Moreover, as there is a tendency for consumers to demand more chilled and fresh food and fruits, the processing time - from harvest to consumption - must be reduced. Thus, the time to market throughout the whole food chain is a strategic element of collaboration. For example, a well-known German discount retailer demands that their lettuce producers harvest, process, and distribute their products nationwide within twelve hours. Today's business customers also demand highly specified goods and commodities for their modern processing machines. The specifications are secured via contracting, as well as requiring specific process standards. Furthermore, total quality management concepts, "kaizen" as well as "six sigma", have shown that applying quality improvement measures along the whole supply chain leads to significant cost reductions, as well as efficiency gains.

Today's food quality demands lead to product and information flows that overlap firm boundaries as well as food chain stages. Thus, food quality is no longer the responsibility of a single firm. Instead, all directly or indirectly contributing actors of a specific food chain need to work together (Hanf/Hanf 2005). In most cases, such systems demand the formation of hybrid organizations.

Management of Vertical Collaborations

Hybrid organizations that comprise more than two firms are called networks (Menard 2002, Omta et al. 2001, Picot et al. 2001, Zylbersztajn/Farina 2003). A more detailed approach to networks is taken by Burr (1999), who classifies four types, i.e., the spontaneous network, the self-organizing network, the project-orientated network, and the strategic network. This typology is derived from the intensity of relation, the coordination mechanism, and the existence of a broker. Because food supply chains can be characterized as pyramidal-hierarchical networks, we focus on strategic networks. A focal company builds the core element of the network; it is either the manufacturer or retailer, and it is also the centralized decision-making unit (Jarillo 1988). Thus, the focal company determines the decisions of all network members, including the choice of measures, to ensure the super-ordinate network aims are met (Wildemann 1997). Because long-term explicit or implicit contracts are commonly used as governance instruments, the network actors are more or less heavily dependent on the focal company. However, the level of dependency is usually higher for vertical than for horizontal ties (Wildemann 1997).

Following the strategic network perspective, all decisions and actions of the participating firms are influenced by the purpose of collaboration, and also depend on each other (Astley 1984, Bresser/Harl 1986, Carney 1987, Edström et al. 1984). Firms can be embedded in the network through a variety of relationships, creating multiple interdependencies and partnerships; there are pooled, sequential, and reciprocal interdependencies among the partners. Lazzarini et al. (2001) propose to exert managerial discretion for sequential (vertical) interdependencies, whereas for pooled interdependencies they recommend the achievement of process standardization, and for reciprocal interdependencies they recommend coordination through mutual adjustments. Inter-organizational cooperation of such a complex network requires a great deal of coordination, and hence, cooperation management (Arbeitskreis 1995, Bogaschewsky 1995, Gulati/Singh 1998, Gulati et al. 2005). Collective network strategies must be implemented to overcome coordination difficulties that arise from the various interdependencies. Collective strategies are defined as systematic approaches by collaborating organizations, which are jointly developed and implemented (Astley/Fombrun 1983, Bresser 1989).

Partnerships are an integral aspect of chain management, especially when designed with upstream and downstream stages and supporting services that are adequate to

the network strategy. Generally, partnerships exhibit a certain degree of continuity and the focus of the relationships extends beyond price (Mentzer et al. 2000). Considering supply chain networks and the heterogeneity of their members, however, it can be expected that the optimal mode of partnerships will vary widely along the whole chain. This means that the focal company must determine partnership design. However, this does not mean that contractual arrangements or different modes of governance must be established to guide a partnership. Instead, literature reveals that the term partnership describes a multifaceted construct ranging from operational to strategic partnering (Mentzer et al. 2000, Webster 1992).

Strategic partnering is defined as an “on-going, long-term, inter-firm relationship for achieving strategic goals, which deliver value to customers and profitability to partners” (ibid. p.550). The aim of strategic partnering is to improve or entirely alter a company’s competitive position through the development of new products and technologies, as well as by creating new markets (Webster 1992). Additionally, strategic partnering should also include exclusivity and non-imitability (Mentzer et al. 2000). There is no set formula for the contracts used in case of strategic partnering. However, long-term oriented, formal and informal contracts addressing partnership-specific and relatively tight agreements dominate.

Operational partnering is defined as a “needed, short-term relationship for obtaining parity with competitors” (ibid. p.550). Thus, an operational partnering strategy seeks to improve operational efficiency and effectiveness, especially by reducing transaction costs. Such strategic orientation is manifested in employing loose contracts containing rather general information on price, quantity, and quality. Operational partnership involves shorter time spans and less organizational resources, and therefore is much easier to implement (and reverse) than strategic partnership.

Additionally, following the work of Das/Teng (2001) we assume that trust and control are inextricably interlinked with risk perception. We argue that minimizing risks such as performance (i.e., quality output) and relational risks is of paramount importance in strategic partnering. Thus, we draw a hypothesis that due to the risks-minimization objective, control intensity and costs will be much higher by strategic partnering than by operational partnering. Furthermore, we argue that as strategic partnering develops, control-based agreements will be increasingly substituted by trust-based agreements. Following the suggestions of the above-mentioned authors, relational risk can be reduced through goodwill trust, while performance risk can be minimized through competence trust.

Quality Management in Supply Chain Networks

In order to elaborate on quality management issues in the agro-food sector, we assume that the food supply proceeds in pyramidal-hierarchical strategic networks. This implies that there is a powerful focal firm in a supply chain network (SCN). This focal enterprise is able to exert managerial discretion so that the chain quality management concept has to be installed by all actors throughout the network. As a result, each must share a homogeneous understanding of quality management, which provides - at least theoretically - the preconditions of the emergence of a collective strategy, and thus collective actions, which address this strategy (Hanf/Dautzenberg 2006).

We have shown that several factors caused the changing functions of food products. However, criteria such as time to market, reliability, maintainability, and cost savings, as well as traceability, are all related to the transparency of the network structure and its business transactions. Theuvsen (2004), in his paper on transparency, divides transparency into historical, operations, and strategic transparency. Historical transparency can be supported by use of tracking and tracing systems and labeling technologies. On the operational level, transparency deals with information exchange through the network's human resources to coordinate the business activities. In this respect, division of labor and principal-agent problems can lead to information asymmetries and therefore imperfect coordination along the supply chain. Both legal and voluntary obligated standards are widely used to reduce these hold-ups. If strategic information, which corresponds to the strategic goals and visions of the SCN, and specific information such as goods in stock, scanner data, etc., are distributed within the network, Theuvsen (2004) speaks of strategic transparency.

Another essential task of quality chain management is developing a positive reputation. This can only be accomplished if the utilized leading and directing mechanism manages to create and disseminate confidence in food beyond credence attributes such as food safety. Because food quality hazards can enter the food chain at any stage, adequate control and communication throughout the network, as well as the loyalty of the supply chain partners, are essential (Das/Teng 1998, Inkpen/Tsang 2005, Uzzi 1997, Uzzi/Gillespie 2002). Therefore, the chain quality management system must be designed to include governance structures in the sense of partnering. However, depending on the internal network objective, the optimal design of the subsequent partnership structure varies for each SCN. Consequently, no discrete phase in the development of partnerships in a market can be distinguished. To overcome this inseparability, we introduce two hypothetical types of chain quality management: strategic and operative. It should be much easier to formulate an integrated and consistent management system with such a division.

We assume that a powerful focal firm in the SCN has consequences for the subsequent interdependencies within the network. In particular, the focal company has to be able to exercise managerial discretion for sequential interdependencies. Because secure food, cost efficiency, and time to market are now considered as competitive requirements (Tuten/Urban 2001, Ulaga/Eggert 2006), all chain quality management systems must address these topics. Thus, the chain quality approaches draw mainly upon standardization systems that primarily address pooled interdependencies. These systems are supplemented by standard approaches to historical transparency and operations transparency requirements. An example of industry-wide vertical standardization systems are the standards designed by the International Organization for Standardization (ISO), whereas the “International Food Standard” (IFS) or Standards of the “British Retail Consortium” (BRC) are examples of horizontal systems.

Operative quality management: This system is designed to ensure that all business operations required to meet the chosen quality strategy are effective and efficient. For this reason, two complementary measures can be used. First, mechanisms addressing historical and operational transparency, e.g. tracing and tracking systems, are used to gain parity with competing supply chain networks. Second, the network is fortified by the selection of partners. Such gains in efficiency and effectiveness are essential because consumers are not willing to pay a premium price for standard products, and the implementation and maintenance of quality assurance systems is costly. Collaborative relationships can be perpetuated over time only if the costs are offset by respective gains. Because this quality management approach aims to cut costs, an operational partnering strategy is used. Hence, the relationships are not so intensive and are not long-term.

Strategic quality management: The focal firm can try to use the operative quality management system to create long-term, enduring competitive advantages by adding strategic components. Thus, these selected partners have to accept additional quality attributes and norms higher than the basic standards. We think that special credence attributes can be used to create additional value propositions. Based on credence attributes, the subsequent strategic partnering concept is hard to imitate and the benefits are exclusive to the members of the respective SCN. A collective quality strategy must be developed to permanently establish strategic quality management. Furthermore, the management concept has to consider the arising interdependencies across diverse partnerships, as well as the strategic transparency. Additionally, trust must be established between the partners and a culture of honesty must be created to develop mutual adjustment when addressing reciprocal interdependencies. Referring to the specificity of strategic quality management, inter-firm coordination in SCN follows unique and well-defined organizational principles that can also be idiosyncratic to the network and difficult to imitate as well.

These considerations suggest that the entire SCN can be sustained and maintained while strategic quality management is practiced. However, building up and maintaining such a network requires the selection of adequate governance mechanisms, the development of inter-firm knowledge-sharing routines, and relationship-specific investments and initiatives for necessary changes in the partnership structure (Dyer/Singh 1998). This all means that any focal actor must first compare the benefits and costs of the alternative quality management schemes and hence network structures. Thus, neither operative nor strategic quality management is better. The critical point is to choose the quality approach which best fits the overall network aims and its performance. Thus, operative quality management is usually the right approach for a cost leadership strategy, whereas a strategic quality management approach is usually best for a differentiating strategy.

Relevance of Chain Quality Management in Poland

In this section, we test our theoretical framework on chain quality management in the Polish dairy sector. Thus, we analyze (i) the type of prevailing quality understanding, as well as which quality schemes are used, (ii) the types of relationships that are present, and (iii) whether firm boundaries overlapping collective quality strategies exist.

Data and Methods

We surveyed 19 of the 22 largest Polish dairy cooperatives during February and March 2006. Roughly equal numbers of semi-structured interviews were conducted across the different hierarchical levels in the coops, including chief executive officers, quality managers, and supervisors in the marketing and supply departments. The sequence of the questioned representatives was the same for each coop. The interviews were conducted by telephone and lasted between 20 and 40 minutes per respondent. Details on the participating firms can be found in the appendix (tables 1 and 2).

The applied technique makes particular sense in view of the abovementioned research questions. On the one hand, chain quality management, as well as networks, concern activities and processes that are not easy to quantify and may even be ambiguous or misunderstood. On the other hand, the topics are particularly sensitive in emerging markets. Moreover, in those markets we expect some unique and relevant developments, which must be first recognized, while at the same time giving the respondents some freedom to explore our general views. Understanding the peculiarities of the investigated sample is crucial, since it allows for refining our theoretical assumptions, and hence a better interpretation of the findings. Following the inductive approach of Patton (2002) we began our analysis by collecting the perceptions of each representative in a dairy regarding the

abovementioned research questions (i-iii). The primary emphasis was on in-depth understanding of each individual case and on defining a set of all possible outcomes before those unique cases were compared and grouped. Thus, to obtain a first insight on the strategic orientation of a coop, we began with the opinions, perceptions and visions of the chief executive officer who represented the decision-making unit. Next, all other respondents of a coop were invited to express their views regarding the general questions (i-iii). However, focus was placed on gathering detailed information concerning the corresponding department. For example, supply department supervisors were asked a number of open-end questions regarding: the design and intensity of relationships at the procurement stage, i.e., duration, stability and sustainability of the supplier-processor relationships; existing forms of commitments (agreements, implicit/ explicit contracts); intensity and topic of consulting and financial assistance (i.e., shared investments), and finally, issues regarding quality assurance (risk perception, control and trust, quality-related payment schemes).

We considered two dimensions of quality management (operative and strategic) as being opposite ends of a spectrum. The applied inductive approach allowed us to identify the indicators of the two poles by complementing the theoretical hypothesis with the empirical findings. Thus, in the second stage of the analysis we clustered the identified indicators and obtained a polar space defined by operative and strategic quality managements.

The key indicator that marks operational quality management is the network aim of gaining parity with the competing networks regarding food quality. This strategic orientation is often accompanied by the aim of achieving cost leadership, meaning that generic products are provided at the cheapest possible prices and all products are non-premium brands. The standardization systems address history and operation transparency requirements (i.e., IFS, ISO 9000). The relationships are short- or medium-term and operational partnering schemes dominate both the downstream and the upstream stages (transaction costs reduction). The parties apply either loose, flexible long-term contracts or detailed short-term contracts. In the case of loose contracts, the agreements fix the duration of partnership, payment schemes and general quality requirements, but leave the amount or composition of delivery, as well as the price, to be ongoing adjusted. Short-term contracts are rather explicit and detailed, covering many specifications, with quality and timely delivery being of paramount importance.

The first identifiable pattern that can be 'generalized' in the case of strategic quality management is the existence of a collective chain quality strategy. This system is designed to create long-term, enduring competitive advantages using quality as a differentiating parameter. Thus, the strategy is indicated by the existence of additional quality attributes (credence) exceeding domestic consumer needs (environmental, social justice) or the creation of premium brands. The applied

quality assurance schemes are higher than basic standards. The parties develop and maintain unique partnership concepts, which are hard to imitate. Some indicators are long-term collaborations, shared and relationship-specific investments, mutuality, strategic transparency, a high level of control/trust to minimize risk, co-marketing (at the distribution stage) and the provision of business angels (at the procurement stage). The applied contracts are long-term and address both partnership-specific and relatively tight agreements (at the distribution stage) or cover rather strategic issues and are not so detailed (at the procurement stage). More details on the corresponding sets of indicators are reported in Table 3, in the appendix.

In the third stage of the research, we identified three groups of coops that shared similar brand orientation or choice of the distribution channel. Furthermore, for each group we determined the chosen chain quality management.

General Findings

Because we analyze the SCN from the cooperative's point of view, we consider it as an integrator in the chain and concentrate on its relationships with the upstream (procurement) and downstream (distribution) collaborators. Thus, we will discuss vertical cooperation in the context of the various strategic settings.

All cooperatives must grow to stay in the market place. However, they apply different strategies. To overcome the competition they modify their production profile, which leads to a kind of market segmentation and mitigates direct rivalry among firms. Basically, they move toward specialization on either the white or yellow production line or they extend their production to offer highly diversified goods of both lines. The interviews indicate that firms use both cost-leadership, and to varying degrees, product differentiation strategies. Because Poland is still one of the poorer OECD countries, cost orientation is regarded as a competitive necessity for all coops. However, because there is an increasing income disparity among Polish consumers, the market segregation process is being strengthened, which leads to an evolution of various marketing strategies among the cooperatives. Thus, on the one hand, the majority of dairies are still rather unbranded, but on the other hand, they hold some of the best-known Polish "fast-moving consumer goods" brands. This variety is also mirrored in the distribution process of the dairy products. Either the products are sold through retailers (supermarket and discount chains and local supermarkets) or they are traded to wholesalers, who distribute them to the retailers. Less often, coops sell their products to industrial customers for further processing or catering services.

Catalyzed by the high pressure of downstream stages, almost all dairies comply with mandatory EU standards such as the hygiene standards currently stipulated in regulations (EC) No. 852/2004 and 853/2004. However, three plants have still not

adjusted to those standards; they were granted a transitional period until the end of 2006 to accomplish all needed modernizations. Procedures based on the concept of Hazard Analysis and Critical Control Point (HACCP) are widely used to minimize the risks of food safety hazards and to facilitate adherence to the mandatory minimum quality standards. All of the investigated plants have already installed the HACCP system, most of them even before EU accession (2004). However, implementing that concept has been compulsory for all food business operators in the EU since January 2006. Thus, the competitive advantages of HACCP implementation have been gained solely by early adopters, who can currently benefit from cost savings and learning experiences. Besides the mandatory food safety standards, voluntary (public and private) quality schemes are used by most of the investigated dairies. Schemes in use are ISO 9001:2000, ISO 14001, BRC, IFS, and some national concepts. Four coops declared ongoing adjustment processes to introduce the food safety management system ISO 22000:2005. Two other firms produce kosher food, which require its own quality schemes. The investigated group outperforms the sectoral average as far as the implementation of the private quality schemes is concerned. However, once the schemes are used throughout the market, they become less relevant as competitive strategies. Furthermore, those schemes operate within the chain, but the consumer may not be aware of their existence at the point of final food purchase. This drives the coops to develop and strengthen their brands. All coops understand quality as a mechanism to reach the needs and wants of consumers. This indicates that food quality in Poland is more than plain food safety and the ability to continuously reproduce an ex ante defined set of attributes.

Relationships at the distribution stage vary from loose or tacit agreements that are almost spot market transactions, to stable, long-term, and trust-based contracts. Usually the partnership between a coop, export companies, wholesalers, and local independent supermarkets or outlets has a strict operational character, whereas partnership with retail chains or manufacturers with foreign investments is a more strategic one. Though relationships to downstream business partners are fairly heterogeneous for each coop, not surprisingly, the relationships with farmers, almost all of them being members, show some similarities among cooperatives. Besides information transfer between the coop and the farmers (consulting, choice of production techniques), the coops offer their members credits or access to credits for investments in growth and specialization of the farms. For example, coops use quality-dependent payment schemes to achieve better raw milk quality. Additional provisions also exist, including a price premium for extraordinary quality (super extra), and direct delivery for veterinary bureau-approved farms, or farms which possess certain breeds of milk cows.

All cooperatives pay a price premium on membership. Consequently, payment schemes differ greatly between firms. However, in all pricing mechanisms, the price increases as compliance with quality requirements set by the purchaser increases.

Although the formal design of the relationships with their members appear very similar, significant differences in the intensity of the relationships were found.

Operative or Strategic Quality Management?

Even though all coops had an explicit corporate strategy, including topics on member's relationships, there is no empirical evidence of an explicit collective strategy covering all stages of the food chain. However, results indicate that there is a link between the chosen quality strategy, the dominant distribution channel, the design of the respective partnerships, and the applied quality management scheme. We define a distribution channel as dominant if a firm sells more than 70% of its product through that channel. In this respect, we were able to distinguish three main groups of firms in the sample: (1) coops that do not have a strong brand and mostly deliver directly to retailers and an industrial purchaser with foreign direct investment; (2) coops with strong brands; (3) coops of non-branded goods or those with weak brands, with wholesalers being the main purchaser. A concrete example of each group can be found in the appendix. And even though these three coops are individual cases, they mirror the particularities of each group.

Group 1:

Because most of the coops do not have strong brands and therefore do not have to carry the chain responsibility, we do not consider them as focal companies. In this case, direct purchasers (retailers and manufacturer) are the focal companies. Therefore, coops regard direct purchasers as the standard-setting entities and adjust their quality strategies and management schemes as required. In these cases, cooperatives have to meet - at least - all mandatory quality standards and schemes.

- a. If a coop supplies a highly-specialized industrial customer, specific quality requirements have to be met (i.e., unique chemical or physical parameters). We found that the partners jointly carried out many of the relation-specific investments, which first concerned quality improvements at the procurement stage, and then the adoption of new processing technologies. Adherence to the specific requirements is ensured by close business-to-business (B2B) relations, including some knowledge sharing routines and enhanced monitoring. Additionally, in such direct relationships the threat of direct and strong sanctions (losing the focal purchaser) limits opportunistic behavior and facilitates cooperative adaptation by the coop. At the same time, the high intensity of unexpected controls and enhanced monitoring suggests that the focal firm either does not trust the partner or must steadily improve its knowledge about the partner's capability, as well as the correctness of the process.

- b. If a dairy sells its products to a retail chain and the retailer then sells them as proprietary private label products, implementing retailer-specific schemes will be required. Thus, processors are obliged to voluntarily implement standards for auditing retailer-branded food products, such as IFS and BRC. Interestingly, retailers are satisfied if those concepts are running but do not need to be certified, which seems to be specific for an emerging market. In this case, quality standards are used to coordinate pooled interdependencies. We found that focal firms prefer control-based relationships rather than trust-based ones to govern partnership behaviors and the maintenance of their specific requirements. In particular, retailers with strong bargaining power apply restrictive control mechanisms, even if the running quality concepts are certified. Adjustment to the retailer-specific requirements involves investing in specialized resources, which increases the coops' dependence on retailers. However, because IFS and BRC are widely used standards, the coops have formal access to alternative institutional customers on the national or international markets.

Contracts and managerial discretion are used to meet sequential interdependencies. The contracts contain specifics on quality and payment. As long as these specifics are met, the duration is prolonged. Additionally, we found some reciprocal interdependencies among the partners in B2B relationships between the coops and the industrial purchaser. Overall, the relationships between the focal companies and the dairies are very intense. Therefore, the type of partnering is more strategic than operational.

Regarding the relationship between coops and their members, we found that the coops encourage growth strategies by intensive consulting assistance aimed at selecting larger farmers. Overall, we conclude that supply chain networks are established and chain quality management is exercised. However, even though the partnering can be described as more strategic in nature, there is a lack of a collective quality strategy. Thus, we would classify the paradigm as operational chain quality management. Because more and more retailers are bringing their proprietary private label products to the market, there exists increasing price competition among the products. For the concerned coops, this means that they face strong pressure on costs, which precludes resource allocation to more sophisticated quality management systems.

Group 2:

When cooperatives dispose of a strong brand they adopt the network position of a focal company. Because Polish consumers appreciate the freshness, taste, and safety and reliability of well-branded food products, credence attributes such as environmental friendliness or animal welfare are of minor strategic importance. Nonetheless, the coops have recognized that they must actively design their

distribution opportunities. For all channels – retail, wholesale, and export – they use medium- and long-term contracts, which contain many details addressing product quality matters. Thus, the coops control, to some extent, quality measurements that are external to the firm.

Moreover, coops use partnering mechanisms that are more strategic in nature, so marketing information such as point-of-sale data is exchanged. Co-marketing is particularly intensive in partnerships with retail chains, because it is based on ongoing negotiations and adjustments addressing sales strategies, promotions, and pricing behavior. Typically, this leads to complex reciprocal interdependencies, which demand well-defined organizational principles and a certain level of management skills to govern the relationships. Such relation-specific systems seem to be unique to individual chains of branded products manufacturers.

All mandatory standards and schemes are implemented because the brands stand for high quality. However, the use of private standards is not as homogenous. While all manufacturers of branded products use intensive ISO quality standards, only three coops have implemented ISO standards on environmental management and possess an adequate certificate that integrates both systems. Respondents of those coops stressed that the main incentive for implementing the voluntary environmental standards was to demonstrate their environmental concerns, and hence to increase their reputation and brand loyalty. However, all of the coops declared an intention to implement the environmental standards in the near future for the same reason.

Interaction at the procurement stage can also be described as intensive. Using incentives to upgrade the quality of raw milk, coops exert a firm boundary overlapping quality schemes. Some of the actions result from the implementation of ISO quality standards, which require objectives for quality to be included in the quality policy and to be leveraged to the upstream stages. Additionally, the coops provide intensive consulting assistance and herd management for their members. One coop even provided business angles as an alternative know-how source (technology transfer) as early as the beginning of the 1990s. In this case we can consider it as a strategic chain quality concept.

Group 3:

This group contains processors of non-branded goods or those with weak brands sold mainly to wholesalers and local independent retailers, such as small supermarkets and outlets. The relationships between coops and those direct purchasers cannot be described as being of a collaborative nature. Instead, arm-length, traditional, spot market transactions dominate. Typically, loose contracts are used for dealing with financial matters as well as some basic quality matters such as the product

expiration date. Therefore, because there is no chain network there is also no chain quality management.

The dairies are usually 'white line' manufacturers and emphasize offering their products at the cheapest price (price leadership). This requires a strong cost orientation, with cost leadership being achieved by economies of scale, producing basic products, and improving the efficiency of all business operations, i.e., by partners' selection. Because there is no dominant standard-setting purchaser, the dairies have some freedom in their choice of quality strategies and measures to guarantee the effectiveness of those strategies. Because of this strong cost orientation, it is not surprising that the processors apply mandatory standards and schemes and restrict their relationships with suppliers to basic commitments and principals as regulated in the cooperatives' act. Nevertheless, the coops' relationships seem to be better developed at the procurement stage than at the distribution stage. We identified operational partnerships between the coops and their milk suppliers, as well as some dyadic actions addressing the chosen quality strategy at this stage, but the recognition of similar interests and initiatives to explore even operational advantages in relationships with their institutional customers is still lacking.

Even though the dairies rely on cost leadership for their competitive advantage, they have to deliver safe and reliable food and differentiate the products at least in a minor way to make them more attractive for the consumer. Because the firms do not possess a strong brand, they use voluntary public quality certifications and labels to signal quality. Dairies commonly use standards developed and assigned by the Polish Center for Testing and Certification (PCBC), such as "Q" (quality) and Eco" (ecological), as well as "PN" (the product and process conform with the Polish norms). Some standards promote national food products of high and reliable quality, such as the "Try Fine Food" standards (PDZ) designed by the Polish Ministry of Agriculture and Rural Development. However, the relevance of those signals is decreasing as well-known retailers establish private labels and manufacturers' brands in the market.

Still, coops belonging to the third group can gain attractive profits, although price competition is increasing. The ongoing development of retailers and wholesalers with strong bargaining power will force the dairies to either join their SCN or take the role of a focal company, and hence to strengthen their own brand. Independent of that, the dairy must first create its supply chain network and develop a chain quality management.

Summary and Conclusions

Nowadays, food is perceived as a complex bundle of characteristics, with an increasing level of importance placed on credence attributes relating to product and

methods of food production (e.g. environmental friendliness). Food processors and retailers must re-design their food chains in such a way that all stages are involved in meeting the requested 'new quality.' Therefore, the coordination mechanisms of existing food chains have to be altered, because spot market transactions are unable to properly coordinate the exchange of credence attributes. These must be substituted by transactions in vertically-coordinated chain organizations. Such higher coordinated chain organizations are either hybrids or vertically-integrated firms. There is evidence that the majority of these agro-food chain systems are organized as vertical networks, i.e., supply chain networks.

Supply chain networks are strategic networks that demand a collective strategy and common chain management. Chain management must incorporate the relationships and interdependencies of the member firms, as well as problems arising at the firm level, the dyadic level, and the network level. In this article, we have differentiated between operative chain quality management and strategic chain quality management.

Operative chain quality approaches address food safety and risk issues as well as efficiency issues. The operative chain quality management systems pursue the paramount objective of minimizing health safety risks caused by food contamination. Chain-adapted standardization systems such as ISO, QS, and IFS are used for this purpose. Operative approaches are mainly tools for achieving parity with competing SCNs, whereas a strategic chain quality system can be used to achieve a qualitative competitive advantage. Strategic chain quality management considers additional quality attributes, which are credence characteristics. However, we do not argue that every SCN needs strategic chain management; rather, only if a SCN has a strategic aim such as being a trusted brand. Thus, the challenge for the focal firm is to choose that quality approach which best fits its overall network aims and performance.

In emerging markets, limited consumer demand for high quality goods, especially for credence attributes, is still the main barrier for upgrading quality management systems. At the same time, firms in those markets face high adjustment costs due to the changing market environment, including legally and voluntarily obliged requirements, and ongoing restructuring processes at the procurement and distribution stage. Both effects facilitate the strong cost orientation of the firms, and hence the tendency to apply and remain with the operative quality management.

The example of the Polish dairy market shows that firms' activities are generally aligned with current market opportunities for optimal enterprise performance. All firms must deliver safe and reliable food and differentiate the products at least in a minor way to make them more attractive to the consumer. Overall, we conclude that in most cases, supply chain networks are established and chain quality

management is exercised. However, this is only the case if there is a focal actor that influences its network structure. The results show that retail chains and industrial purchasers with foreign investment and strong bargaining power usually take the position of the focal firm in the SCN. In those cases, strategic partnering between the individual chain stages dominates. However, because there is a lack of a collective quality strategy overlapping all actors in this case, the quality management initiatives are still operational.

Furthermore, there is evidence that Polish manufacturers of well-branded products can adopt the position of the focal firm in the SCN as well. Thus, those dairies must carry the chain responsibility for quality. For this reason, they apply more sophisticated quality assurance schemes and use governance mechanisms, which are unique for an individual chain and usually strategic in nature. As a strategic center, the processors focus on the chosen quality strategy and clearly guide the partnership in arms-length ties at the procurement and distribution stages. Thus, a collective quality strategy is observed. Overall, we conclude that manufacturers of well-branded products in Poland perform strategic quality management. These findings confirm our theoretical considerations and indicate that the behavior of those firms is universal, and holds for both mature and emerging industries. There are still some Polish dairies that are not embedded in any SCN. These concern processors of non-branded goods or those with weak brands who sell their products to purchasers without a focal position. Because there is no powerful focal firm in the chain, no managerial discretion can be exerted and no chain quality management concepts can be installed. Thus, we could only identify operational partnerships between the coops and their milk suppliers, and some dyadic actions addressing the chosen quality strategy at the procurement stage. In contrast, at the distribution stage we observed that the partners do not share homogenous interests regarding quality issues; there is even a lack of dyadic initiatives that aim to explore the operational advantages of the cooperation.

However, even those dairies not embedded in a SCN have recognized the importance of quality for their market success. Because of the strong cost orientation, the processors continue to apply mandatory standards and often use public labels and certificates to signal their quality. Attractive profits are still possible with this strategy, but the increasing price competition among the basic products and the further development of retailers and wholesalers with strong bargaining power will force the dairies either to join their SCN or to take the role of a focal company and strengthen their brand. Independent of that, the dairy first must create its supply chain network and develop a chain quality management. Our empirical results indicate that a profound diversity of quality management approaches exist among Polish milk supply chains. However, one thing is unambiguous: the chosen quality strategy determines the design of the vertical coordination mechanism. Thus, the higher the product requirements, the further

quality management systems go beyond a firm's boundaries and the stronger is the shift from operational towards strategic quality management.

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Appendix: A

Table 1: Relevance of the investigated sample for the Polish dairy industry in 2005

	Milk procurement	Revenue*	No. of plants	No. of Employees	No. of milk suppliers
Sample	3,537 million liters	1,213 million Euro	42	9,962	71,278
Share in the industry	41%	31%	14%	25%	24%

Source: Interviewed sample of 19 Polish milk cooperatives, ARR (2006), ZPPM (2005), KZSM (2005), GUS (2006).

Note: Data for 2004.

Table 2: Structure of the investigated sample

Distribution structure							
Share of sales for individual channels						Share of retailers' own labels	
Export	Retail chains	Wholesalers	Industry	Small independent outlets			
Minimum	0.01	0.00	0.02	0.00	0.00	0.00	
Mean	0.25	0.26	0.33	0.11	0.50	0.12	
Maximum	0.90	0.58	0.89	0.80	0.25	0.58	
Procurement stage							
Share of direct deliveries to the coops			Share of EU-conforming raw milk at procurement ¹⁾				
	Procured milk	Milk holdings					
Minimum	0.40	0.10			0.90		
Mean	0.44	0.76			0.96		
Maximum	1.00	1.00			0.99		
Quality standards and schemes							
No. of plants adequately certified	Mandatory			Voluntary			
	Hygiene standards ¹⁾	HACCP	ISO 9001	ISO 14001	BRC	IFS	Kosher
	39	24	14	4	1	1	2

Source: Interviewed sample of 19 Polish milk cooperatives.

Note: Hygiene standards and rules for production and marketing of raw milk and milk-based products as regulated in Council Directive 92/46/ECC until 31 December 2005 and in the regulations (EC) No. 852/2004 and 853/2004 since January 2006.

Table 3: Indicators for operative and strategic quality management

	Operative quality management	Strategic quality management
Aim of the SCN	<ul style="list-style-type: none"> - to gain parity with competing networks regarding food quality - to achieve cost leadership & provide generic products at cheapest possible price 	<ul style="list-style-type: none"> - to create long-term, enduring competitive advantages, using quality as differentiating parameters - to provide unique quality/product innovations
Quality understanding	<p style="text-align: center;"><i>basic</i></p> <ul style="list-style-type: none"> - safety, reliability & maintainability of final products - first understanding, thereafter meeting customer preferences - lack of a collective quality strategy 	<p style="text-align: center;"><i>high</i></p> <ul style="list-style-type: none"> - additional quality attributes (credence, tradition) - exceeding consumer needs (environmental, social justice) - generating new demand (market segmentation via new brands development) - collective quality strategy given
Branding/ labeling	<ul style="list-style-type: none"> - no/ weak brand; generic products - public quality certificates and labels dominate, i.e., "PN"-label indicating that the product and process conform with Polish norms or "Try Fine Food" standards (PDZ) 	<ul style="list-style-type: none"> - premium brands, brand management given - investments in brand, reputation and reduction of information asymmetry about product quality (social marketing, TV adverts, food exhibitions)
Quality standards and schemes	<p style="text-align: center;"><i>minimum quality standards</i></p> <ul style="list-style-type: none"> - mandatory hygiene standards as regulated by the EU, i.e., CD 92/46 or (EC) 853/2004 - mandatory food safety programs (HACCP) - standardization systems addressing history and operations transparency requirements (IFS, ISO 9000); the concepts are running, but are often not certified 	<p style="text-align: center;"><i>superior norms/value-adding schemes</i></p> <ul style="list-style-type: none"> - earlier standards-adopter - certificates of ISO standards on environmental & quality management (ISO 14001, ISO 9001) - intention to introduce up-to-date food safety systems (HACCP/ISO 22000) - standardization systems addressing strategic transparency requirements (kosher food, industry outperforming activities regarding processing of GMO-free materials, purchaser-specific concepts)
Relationship design ...generally	<ul style="list-style-type: none"> - short- or medium-term - operating partnering schemes dominate - low intensity of relationships - control-based relationships dominate 	<ul style="list-style-type: none"> - on-going, long-term - unique partnering concept/hard to imitate - mutuality (mutual adjustments, shared relationship-specific investments, knowledge sharing routines, cooperation management) - high level of control/trust to risk minimization, however, trust based-relationships dominate
...at the distribution stage	<p style="text-align: center;"><i>Partnering</i></p> <ul style="list-style-type: none"> - short- and medium-term, unstable - restrictive control mechanisms exercised by the focal company (retailers) <p style="text-align: center;"><i>Contracts</i></p> <ul style="list-style-type: none"> - loose, flexible, long-term, formal (fixed terms: partnership duration, payment schemes, general quality requirements; flexible terms: amount/composition of delivery, price) - short-term contracts (rather explicit, detailed, cover many specifications; quality and timely delivery are of paramount importance) 	<p style="text-align: center;"><i>Partnering</i></p> <ul style="list-style-type: none"> - intensive - co-marketing - ongoing negotiations and adjustments addressing sales strategies (exchange of point-of-sale data, promotions, pricing behavior) <p style="text-align: center;"><i>Contracts</i></p> <ul style="list-style-type: none"> - medium- and long-term, formal, address both partnership-specific and relatively tight agreements
...at the procurement stage	<p style="text-align: center;"><i>Partnering</i></p> <ul style="list-style-type: none"> - basic intensity as regulated in a coop act (consulting assistance, financial support) - short-term economic incentives regarding milk quality improvements dominate (price premium for meeting mandatory quality standards, credits for milking & milk cooling equipment) <p style="text-align: center;"><i>Contracts</i></p> <ul style="list-style-type: none"> - medium-term, formal, delivery contracts (minimum quantity and quality of delivery, payment schemes, basic responsibilities and rights as regulated in a coop act) 	<p style="text-align: center;"><i>Partnering</i></p> <ul style="list-style-type: none"> - sustainable, long-term collaborations (shared investments, well-developed feedback mechanisms, business angels, herd management) - high degree of mutual loyalty (sample out trust level of goodwill and competence, trust) - additional incentives to upgrade the raw milk quality (price premium for superior milk quality, markdown for no valid quality certificates) <p style="text-align: center;"><i>Contracts</i></p> <ul style="list-style-type: none"> - no formal (delivery) contracts or indefinite collaboration contracts covering strategic issues and addressing principles set in the respective coop act

Source: Interviewed sample of 19 Polish milk cooperatives.

Appendix: B

1st group (1a)		Example of SCN performing operative quality management		Survey: Polish cooperatives March 2006										
Competitive strategy Specialisation: yellow line Cost orientation Economies of scale Focus on one product (cheddar) and one business customer Modernisation, mechanisation of the technological process Improving efficiency of all business operations, i.e. by partners' selection No brand management (costs)			Growth strategy <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td></td> <td style="text-align: center;">Present products</td> <td style="text-align: center;">New products</td> </tr> <tr> <td style="text-align: center;">Present markets</td> <td style="text-align: center;">Hard cheese / Germany hard cheese / Poland</td> <td style="text-align: center;">/</td> </tr> <tr> <td style="text-align: center;">New markets</td> <td style="text-align: center;">/</td> <td style="text-align: center;">/</td> </tr> </table>				Present products	New products	Present markets	Hard cheese / Germany hard cheese / Poland	/	New markets	/	/
	Present products	New products												
Present markets	Hard cheese / Germany hard cheese / Poland	/												
New markets	/	/												
Quality understanding of the co-op safety / stability To understand / reach customer preferences To outperform customer preferences To generate the demand ----- X														
Branding														
Retailers' private labels	Co-op's own brand	No-name, single brand												
No	Brand message	Company name and logo, safety, objective quality attributes (i.e. reliability and maintainability of final products, technological parameters of paramount importance)												
	Brand recognition/ spread	Small / regional in central Poland												
Relationships at the distribution stage / dominating business customers														
Industry	80%	Term of contracts	Short-term long-term X unlimited											
7/8 of it → one customer with foreign investment being focal company		Content of contracts	Loose agreements X explicit, high requirements											
		Partnering	Operative	X	Strategic									
Export	15%	Term of contracts	Short-term X long-term unlimited											
Product: hard cheese		Content of contracts	Loose agreements X explicit, high requirements											
Country: Germany, USA, Canada		Partnering	Operative	X	Strategic									
Wholesalers	< 3%	Term of contracts	Short-term X long-term unlimited											
(dominates Makro)		Content of contracts	Loose agreements X explicit, high requirements											
		Partnering	Operative	X	Strategic									
Quality standards and schemes														
	Mandatory		Voluntary											
	Hygiene standards as reg. in CD 92/46 or (EC) 853/2004	HACCP	ISO 9002	ISO 9001	ISO 14001	BRC IFS								
Implemented	2003	2003	No	No	"No, however in far future"	No No								
Certified	2003	2005												
Further standards	Technology specific quality standards of the main industrial customer, i.e. chemical, physical parameters Quality label of the German Agricultural Society (DLG); important quality signal, since Germany is the main export country GMO free: industry outperforming activities in the field of processing of GMO-free materials													
Relationships at the procurement stage / milk suppliers														
Intensity of consulting assistance	Basic as regulated in a co-op act		2	3	large milk suppliers									
credits	Purpose	milk cooling equipment	milking equipment	Operating recourses	Purchase of certain breeds of heifer									
	Financing	Co-op-own capital		Public funds	Strategic partner									
Quality-related payment scheme for raw milk	Basic as regulated in a co-op act	Markdown for no valid/ no possessing of quality certificates	premium for direct delivery	premium for possessing a certain breed of milk cows										
Partnering	Operative	X	Strategic											
However, only with large milk suppliers														
Co-op characteristic	No. of employees	187	∅ Delivery / supplier:		42.000 l milk per year									
	No. of plants	1	Share of direct deliveries:		53% of all milk holdings									
	Milk procurement:	118 million litre p.a.			82% of total milk procurement									
	No. of milk suppliers:	2.800	Contracts: posses 80% of milk suppliers (formal, medium-term delivery cont.)											

2 nd group		Example of SCN performing strategic quality management		Survey: Polish cooperatives March 2006	
Competitive strategy		Growth strategy			
Specialisation: white line		Present products		New products	
Product differentiation		Present markets		New products: hard cheese Product modifications: cottage cheese, crème cheese	
Cost orientation		New markets		/	
Quality production Premium brand Product Innovations Earlier standards adopter		Economies of scale Focus on white line production Cost savings due to early adoption of higher technologies		cottage cheese / Poland	
		cottage cheese / Czech Republic, Slovak Republic			
Quality understanding of the co-op					
safety / stability To understand / reach customer preferences To outperform customer preferences To generate the demand -----X----->					
Branding					
Retailers' private labels 4.5% of the coop's produce		Co-op's own brand Strong, single brand, focal company			
		Brand message Company name, signal for high product quality (i.e. taste, freshness, safety, reliability, environmental friendliness, social justice), and long tradition of high quality production and brand image			
		Brand recognition/ spread High / Poland			
Relationships at the distribution stage / dominating business customers					
Retail chains 50%		Term of contracts		Short-term -----X----- long-term ----- unlimited	
almost all chains in Poland, i.e. Tesco, Real, Auchan, Carrefour, E'Leclerc, Geant, Biedronka		Content of contracts		Loose agreements -----X----- explicit, high requirements	
		Partnering		Operative X Strategic	
Wholesalers 48%		Term of contracts		Short-term -----X----- long-term ----- unlimited	
		Content of contracts		Loose agreements -----X----- explicit, high requirements	
		Partnering		Operative X Strategic	
Export <1%		Term of contracts		Short-term -----X----- long-term ----- unlimited	
		Content of contracts		Loose agreements -----X----- explicit, high requirements	
		Partnering		Operative X Strategic	
Quality standards and schemes					
		Mandatory		Voluntary	
		Hygiene standards as reg. in CD 92/46 or (EC) 853/2004		HACCP ISO 9002 ISO 9001 ISO 14001 BRC IFS	
Implemented		2001 by few production lines 2003 by all production lines		1997 1999 2003 No No	
Certified		2003		1997 2002 2003	
Further standards		Two national public quality certificates and labels, granted for the co-op's cottage cheese: "Q"-label, indicating extraordinary quality, assigned in 2001 by the Polish Centre for Testing and Certification (PCBC) "Try Fine Food" label (PDZ), assigned in 2000 by the Polish Ministry of Agriculture and Rural Development. However, the intention of the co-op is to invest in its own brand in the future rather than to invest in maintaining of those public certificates			
Relationships at the procurement stage / milk suppliers					
Intensity of consulting assistance		Basic as regulated in a co-op act 2 3		4 large milk suppliers are preferred	
credits		Purpose		milk cooling equipment milking equipment Purchase of certain breeds of heifer Direct investment in the dairy holdings	
		Financing		Co-op-own capital Public funds Assistance by application for bank credits	
Quality-related payment scheme for raw milk		Basic as regulated in a co-op act Markdown for no valid/ no possession of quality certificates		premium for possessing a certain breeds of milk cows premium for extraordinary milk quality	
Partnering		Operative		X Strategic	
Co-op characteristic		No. of employees 340		No. of plants 1	
		Milk procurement: 111 million litre p.a.		No. of milk suppliers: 1,800	
		Delivery / supplier: 62,000 l milk per year		Share of direct deliveries: 45% of all milk holdings	
		Contracts: posses 40% of milk suppliers (indefinite collaboration contracts)		76% of total milk procurement	



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Education and Knowledge Transfer: A Priority for the Future

**Executive Interview: Lucas Vokurda, Research Coordinator School of
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Abstract

Education is and remains the principal means of building capacity which in turn contributes to the development of society. It is also the single most important factor in determining one's standard of living and income potential. The phrase "knowledge is power" holds a lot of truth. On the other hand, it is a strong driver for value chain improvement, while also contributing to the education system. For an economy to compete in the global marketplace, knowledge transfer and collaboration need to be increased to get research into practice. If the knowledge and learning is to be useful it has to be applied to the areas of life where it can make differences. The focus of this report is on education and knowledge transfer from research or research-related activity. It also discusses the activities of INHOLLAND University in building network with other universities in Visegrad countries with the objective of building capacity in the countries with respect to food safety, quality and chain management.

Keywords: research, capacity building, knowledge transfer, chain management

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Introduction

Within a modern, knowledge driven economy, knowledge transfer is about transferring good ideas, research results and skills between universities, other research organizations, business and the wider community to enable innovative new products and services to be developed (UK Office of Science and Technology, 2005). In parallel with the governments increasing investments in research, there is a need for an effective two-way link between research and the market to ensure that good research becomes good business. Also for an economy to compete in the global marketplace, knowledge transfer and collaboration need to be increased to get research into practice.

The main business of higher education is to teach students and to create new knowledge through research. However, if the knowledge and learning is to be useful it has to be applied to the areas of life where it can make differences. Investment in research provides much of the foundation for innovation, and the new products and services that result. Knowledge transfer also generates a return on the investment of public funds in the science research base. It has the power to influence policy and to radically improve service delivery and efficiency. Communication is very important in Knowledge transfer. No matter how strong the evidence from a research, it will make no difference to policy or practice if it is not communicated to the right people in the right way at the right time.

Universities and Publicly Funded Research Agencies (PFRAs) are knowledge organizations; their core objectives are to generate, acquire and transfer knowledge. These objectives are realized through the full range of functions performed, including research, teaching and community service or engagement. They are playing an important role in the process of stimulating economic growth. Knowledge transfer is significantly integrated with the academic domains of research, scholarship and learning and teaching, which are themselves overlapping and integrated. World-class research activity generates a wealth of new knowledge and technologies that can be commercialized to the benefit of the economy and the community at large. Two broad trends are reshaping the way that companies are undertaking research around the world. The first is that they are moving away from a system in which most of their research and development (R&D) was done in their own institution, to one in which they are actively seeking to collaborate with others in a new form of open innovation. The second is that business R&D is going global. Multinationals are locating their research centres in their most important markets, especially if those markets happen to contain centres of outstanding research. Knowledge transfer now sits alongside teaching and research as a core function of the University. Examples of knowledge transfer include applied and collaborative research, consultancy, sponsored students, licensing and spin-out of intellectual property, non-accredited taught programs and regional projects. Effective knowledge transfer strategies rely on the capacity of institutions to shape their

knowledge transfer approaches and activities in partnership with their various communities, and to respond creatively to the distinctive needs of those communities. From this perspective, a 'healthy' system of knowledge transfer should demonstrate considerable diversity in knowledge transfer approaches and activities, both within and across institutions and across disciplines and national research priorities.

Executive Interview

What is your understanding of the concept of knowledge transfer?

It is a very broad concept, and there is no single definition for it. Knowledge transfer is when know-how and knowledge are becoming available in a systematic way to those who did not have previous access to it. The concept is still frequently misunderstood and it is very important to communicate the new message. A lot of people still think of it as a sneaky way for universities to make money out of the good ideas of their academics which is rather a narrow and old fashioned viewpoint. That's not to say that research institutions and universities are not going to make money by selling products of their research work. Above all it's about creativity, without which knowledge transfer will be a non-starter. It is an area that attracts creative and can-do people from all sorts of disciplines. Through knowledge transfer research output are able to make impact beyond the walls of the university by making it reach the real world, otherwise what is the benefit to the society? In addition to this, staying in touch with what is happening outside the university helps in developing courses, research projects and initiatives that are timely, relevant and useful for businesses, public services and communities. It represents a major component of the community's return on public investment in universities and should consequently be valued and actively encouraged across all disciplines and all institutions.

In your opinion what are the linkages between agribusiness and knowledge transfer and how is knowledge made available?

Agribusiness is a field where the "know-how" may be more important than empirical knowledge. This field is mainly practice oriented, and driven by experience. The distance between text-books and practice may be very different. This knowledge is not a shelf product (though more and more companies are offering their practice expertise for the right price). If knowledge is not shared, one can expect to re-invent the wheel on many issues that have already been solved. There should be a systematic way to develop knowledge transfer. The vector of knowledge transfer is people. Teachers and students should be exposed in a systematic way to material which is in their field of interest. Knowledge transfer takes place whenever the discoveries or expertise of academics are disseminated more widely. In the academic environment new research ideas are made public

through journals, conferences and papers. You can see IAMA is very important in the agribusiness set up because it provides avenue for knowledge to be transferred. The new ideas can either stimulate new thought or be applied to new uses by other academics. Another very important way is through training that higher institutions and organizations offer to industry.

It is very important for an economy to build capacity. What roles do you think education has to play in capacity building?

Education is and remains the principal means of building capacity which in turn contributes to the development of the society. To build capacity one has to know how to do so. Knowledge is a strong driver when building capacity. For example, if a university in a developing country will benchmark the course level and materials of a certain program to the level of a leading university, the graduates should have the same skills and competences. These go to the workforce and practice what they have learned. This is one way of capacity building.

There is a general belief that education in developing countries is not as developed as that of the developed countries. What do you think are the key challenges of education facing developing countries?

Obstacles which hinder education in developing countries include those of access and retention. They also include obstacles in the quality of education and those which arise as a result of lack of relevance of curricula. These issues are interrelated and are intensified by the worsening poverty levels and conflict situations as well as inadequate funding by governments. Access to education is a key concern. The underlying causes can be traced to severe shortage or complete absence of schools as well as difficulties with teacher supply. Apart from access, another key education issue is that of educational quality. Quality education is conceptualized as education which develops the mind, instils problem-solving skills and the ability to think creatively. Quality schools are characterized by good-quality teachers, quality instruction and a good evaluation system. The challenge for developing country education is how to arrive at progressive improvements in teaching/learning interaction through improved teacher training, proper motivation of the education work force, relevant textbooks and other education materials. The issue of adequate funding cannot be overemphasized, as funding remains the bedrock of success in any of the essential initiatives I have mentioned. To ensure successful implementation and sustainability of educational programs, Developing countries would need to devote a proportionately significant portion of their annual budgets to education. This will be used to fund payment of teacher's salaries and to procure current and relevant equipment and teaching aids.

The developed countries have roles to play in the development of education in the developing countries. What are the contributions of developed countries to the developing countries in terms of education and knowledge transfer?

To the best of my knowledge there are many NGOs that support these sorts of activities, as the World Bank, FAO, UN, and the European Community. Most of the developed countries have special departments which are responsible for helping developing countries in various fields. Knowledge sharing is one of the fields supported. I am sure that there are more frames that help and support, however I do not know them.

Lucas, you are a member of IAMA Task Force on Education and Knowledge Transfer. You are also involved in IAMA central Europe Task Force for a case project titled “Agro – food value chain development in Visegrad countries.” Can you tell me what the project is about and what you intend to achieve through the project?

Knowledge is a strong driver for value chain improvement, while also contributing to the education system. The project is dealing with analysing food value chain within the Visegrad counties. For a start we are working on a case per country and creating a module of knowledge–industry–government bond to improve the value chain. The approach of knowledge sharing and joint projects will be practiced for this project. These activities will be presented in IAMA conference 2009 as case studies. We are all looking forward to see this happen and all the stakeholders are making valuable contributions. Through this project we would be able to improve working relations between important stakeholders, promote sustainable development through knowledge sharing, value chain improvement and form bond with knowledge bodies. In addition to this we will be able to build network between INHOLAND University and other Universities in Visegrad countries and there are possibilities for student and teachers joint projects. You can see it’s all about knowledge sharing and transfer, food safety, quality and chain management.

This is a very big project Lucas, but how do you intend to achieve all the goals that you have set for the project?

We are going to create individual project units in each Visegrad countries. Each of the units will be independent and contain a working team of important stakeholder of the investigated value chain. These project units will act independently with advice and support of the project coordinators. The project coordinators will orchestrate the project units and will interact between them when needed. The coordinator will assist in applied research and other needed activities. To ease the orientation, it is suggested to divide the project into two main concepts. The first one is the macro environment and the second one is the micro environment. The macro environment is the general frame which describes the general interaction of

units within the project. The micro environment is the interaction within the organizations and countries.

You mentioned two important concepts, macro and micro environment. Can you elucidate these concepts?

Let me start with the macro structure. The project is mentioned to run parallel in the four Visegrad countries, while each country forms a project unit. The coordination is the main communication facilitator of the project, and act in a horizontal and vertical way. Each project unit is expected to act in a generic way, however contents may vary. The interaction between different project units is made mainly via scheduled meetings and conferences; however it may be possible to develop horizontal communication channels, if needed. The role of coordinator is to facilitate communication and establishments of knowledge networks according to needs. These steps are designed to facilitate presenting the results in an effective way in IAMA conference 2009 and of course facilitate the added values of such activities.

The micro schedule is the schedule within a country and between same country organizations. These project units are expected to work together and define together value chain to be examined under this project. The value chain must be of high interest to the stakeholders. Through meetings the group should analyze and describe the value chain and define bottlenecks and problems, and through consultation with the coordination, form and action plan for further analysis and improvement. The results and processes are presented in general project meetings. The project units are expected to pass a report to the coordinator, in order to keep good communication for the project. To facilitate the analysis of the value chain, a questionnaire will be produced, to help analyse methodically the value chains. If needed, other tools will be developed to assist project units in evaluating and working the project. Consultancy services may also be given to project units if needed.

What are the case topics to be considered in this project?

At the moment there are five cases. Hungary is proposing four cases: Two from the poultry sector i.e. changing consumer values and the behaviour, the second one is about the effect of avian influenza. From the pork sector we want to look at the development of traditional pork and lastly economic and market connection of production and trade of organic foods and value added increasing effect of rural development in fruit and vegetables sectors. Czech Republic is proposing a case on meat and meat products based on pork. Slovakia prepared a case about the wine industry and Poland will give their case project topic in the near future.

This is indeed another section of knowledge transfer. Although I am conducting an interview but you have added a lot to me. All you have been saying sounds so interesting, but what are your achievements so far?

We have commitment of our partners in Central Europe to help in executing this project. We plan in the near future to have a meeting with some project stakeholders and take it a step further. IAMA has been able to provide the frame and stage, Universities provide the knowledge and know how, value chain stakeholders provide the content material, INHOLLAND University provides the coordination and cooperation and we are getting good progress reports from our coordinators.

Conclusion

The global economy is becoming increasingly more competitive and education is one of the key drivers. In order for society to advance the people must be educated. The importance of education is quite clear. One can safely say that a human being is not in the proper sense till he is educated. Education is the knowledge of putting one's potentials to maximum use.

Knowledge is one of the most important resources of an organization. Knowledge and knowledge creating skills in particular are important, as these capabilities are essential in the creation of new products and or enhancement of existing ones In order to compete in knowledge intense and globalize world an institution must continuously acquire, absorb, and transfer knowledge. These in turns leads to the creation of new knowledge. Institutions that are capable of producing a continuous stream of new knowledge are better positioned to achieve a competitive advantage. Institutions cannot create knowledge without the actions and interactions of individuals because knowledge is created by and resides within individuals. New knowledge is created when individuals solve problems by combining and exchanging information and know-how with others.

Knowledge transfer is not merely communicating or sharing information or making it accessible to people who need them. It comprises both dissemination and assimilation. Knowledge is effectively transferred when the recipient understand it well enough to use it effectively and efficiently. Knowledge transfer forms the primary intellectual conduit between the University's academia and the wider non-academic society. Knowledge transfer is the development of intellectual capital through a two-way mutually beneficial interaction between the university and non-academic sectors with direct links to teaching and learning and research, and informed by social and global issues.

It is therefore not an overstatement to say that education and knowledge is the priority for the future. It is an important tool for nation building and development. Knowledge transfer is not only from business to university and vice versa but there

is also a big involvement from the government and other knowledge bodies and they should become partners in policy making. Governments of developed nations are actively involved in education and knowledge transfer and this is helping a lot in the transfer of skills to young professionals. It would be of great help if the developing nations can be carried along in some of the projects. This will make a lasting impact on the development of the developing countries. Education and knowledge are important tools for capacity building, food safety, quality and chain management.

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