

Comparing the Innovative Potential of Leading Food Processing Companies in Shanghai and the Netherlands

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Abstract This paper aims at comparing the innovative potential of leading food processing companies in emerging and developed economies. We asked ourselves how the clearly differing economic and social conditions of two areas that are only comparable in terms of their number of inhabitants (about 16 to 18 million), namely a fast growing emerging economy (the Shanghai area in China) and a developed economy (The Netherlands) affect competitiveness and innovation of their leading prospector companies. Our study population consisted of 31 respondents (CEOs, CTOs and R&D directors) from 18 leading prospector companies in the food processing industry: nine in the Netherlands and nine in Shanghai. We focus on how the combination of external forces exerted by actors in the network (competitors, suppliers and buyers) and internal forces (especially innovation capabilities) affect competitiveness and innovation performance of these companies. A 52-item research questionnaire, based on industrial organization theory and the Resource-Based-View, was designed for this study, including quantitative questions on innovative input and output and business performance, and qualitative questions about competitive pressure and the quality of the innovation process.

Interesting findings are that both innovative as well as business performance are predominantly related to the companies' internal (innovation) capabilities. As expected, clear differences between Chinese and Dutch companies were found regarding the external forces as well as in the internal capabilities they deploy to survive. The pressure from the external environment, especially the power of buyers and the threat of new entrants is clearly felt more strongly by the Dutch companies than by their Chinese counterparts. The Chinese companies report to significantly use more KPI's to monitor the R&D process, whereas the Dutch companies are significantly more active in stimulating an innovative culture. Interestingly, however, neither of these differences leads to significant differences in business or innovation performance between the two groups in our study.

In the introduction we asked the question whether agri-food companies in developed economies still have a competitive edge compared to those in emerging economies, such as China. The answer that emerges from the data collected so far points in the direction of the disappearance of the traditional advantage of the companies from developed economies: no significant differences could be found neither in innovation performance, nor in business performance among the companies from the Netherlands and the Shanghai region in China.

Key words innovative potential, food processing companies, performance

1 Introduction

According to the Economist (2007-11-15) the world is experiencing one of the biggest revolutions in history, as economic power shifts from the developed world to China, Brazil and other emerging economies. Fueled by relative low income levels and economic liberalization (Hoskisson et al., 2000) these emerging economies are growing much faster than the developed ones, there is a widening gap between their growth rate and that of the developed world (see Figure 1). Emerging economies currently account for approximately one-third of the world's GDP and about half of global GDP-growth at market exchange rates. Their exports are about 45% of the world total; they consume over half of the world's energy and have accounted for four-fifths of the growth in oil demand in the past five years.

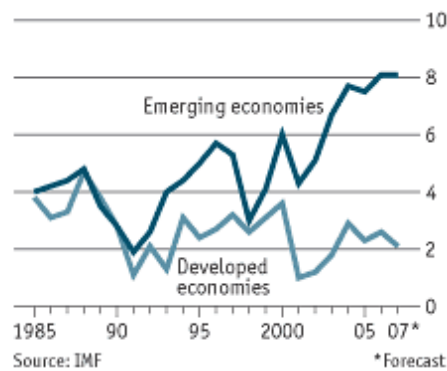


Figure 1 Percentage Increase of GDP Compared to Previous Year

Cheap labor, availability of raw materials, geographical location combined with the possibility of opening new markets were the traditional reasons for multinational companies to invest in production sites in developing economies. However, international investments were accompanied by knowledge and technology transfer to the receiving economies. As multinational companies were involved in direct business contacts with local enterprises (e.g. as suppliers and buyers) their activities contributed to upgrading local business, as domestic companies were forced to innovate in order to survive. Often, domestic companies copied innovations and management instruments of the multinational companies. As a consequence, also the innovation capabilities and the international competitiveness of these economies increased (Hendriks-Gusc 2007).

It is increasingly recognized that innovation has become essential for food processing companies to maintain competitive in the fast globalizing world [e.g. Traill and Meulenberg, 2002, Fortuin *et al* 2007]. Traditionally, innovation activities were conducted in the central R&D labs of the large multinational agri-food companies in the developed world. However, nowadays:

- multinational companies increasingly shift parts of their R&D to countries with emerging economies;
- companies in emerging economies develop their own innovative capabilities and increasingly compete on national and global markets with the established multinationals.

We asked ourselves whether agri-food companies in developed economies still have a competitive edge compared to those in emerging economies, such as China. To investigate this, we conducted a comparative study including nine leading food processing companies in the Netherlands and nine located in the Shanghai region in China. Both locations have approximately the same number of inhabitants (about 16.5 million in The Netherlands and 18 million in the Shanghai region), are both characterized by a strong international focus, with large international airports and the largest (Shanghai) and the second largest (Rotterdam) sea harbor in the world, while the agri-food sector in The Netherlands is generally acknowledged as one of the strongest in the world. Similarly, China is seeing a rapid growth in demand for high-quality food and beverage products as national income increases [Boel 2007].

We have structured this article as follows. Section 2 describes the theoretical foundation of the study. Section 3 presents the conceptual model, its operationalization into the research questionnaire, and the methods of data collection. Section 4 introduces the food processing industry and the study sample in the Netherlands and in Shanghai and a summary of the main results of the study is presented. Finally, in Section 5 the conclusions are drawn, and we elaborate on how they can be used for future collaboration.

2 Theoretical Background

In this paper innovation is defined in the broad sense, as proposed by Schumpeter (1934) ... *any doing things differently in the realm of economic life...* He elaborates this by stating: *The introduction of a new good -that is one with which consumers are not yet familiar- or of a new quality of a good. 2) The introduction of a new method of production, which need by no means be founded upon a discovery scientifically new, and can also exist in a new way of handling a commodity commercially. 3) The opening of a new market that is a market into which the particular branch of manufacture of the country*

in question has not previously entered, whether or not this market has existed before. 4) The conquest of a new source of supply of raw materials or half-manufactured goods, again irrespective of whether this source already exists or whether it has first to be created. 5) The carrying out of the new organization of any industry, like the creation of a monopoly position (for example through trustification) or the breaking up of a monopoly position.'

Essentially, according to Schumpeter, innovation is about change; changes in the products and/or services of a company and in the way the company produces them, but also changes in business models, management techniques, and organizational structures [Hamel and Prahalad, 1994]. There are degrees of change; from only minor incremental improvements, adaptations or refinements of existing products and processes to very radical changes leading to totally new products or new production processes [Tidd *et al.* 1997].

The innovation process is not a simple linear sequence of functional activities. In the '*Fifth Generation*' model, Rothwell [1992] considers the innovation process as an interactive and co-operative phenomenon in which actors from inside and outside the firm participate. Competitive advantage depends on the firm's ability to integrate, build and reconfigure internal and external resources to address rapidly changing environments.

It is important to note that innovation is not the same as invention. In general, an invention refers to the result of research activities (e.g. a patent), while an innovation is a commercial product, process or service. Martin (1985) describes it as follows: *An invention may be viewed as a new idea or concept, but this invention only becomes an innovation when it is transformed into a socially usable product.* In the present study we assess the company's innovativeness in the broad sense of Schumpeter, including innovativeness in marketing, product design, product quality etc. The in-depth analyses, however, concentrate on product innovation, because this came out as the major field of innovation in the investigated companies.

To gain an understanding of the role of innovation in the food-processing industry we turn to the two main theoretical perspectives that acknowledge the important role of innovation for creating competitive advantage: the Industrial Organization Theory and the Resource Based View. Industrial organization theorists [e.g., Milgrom and Robberts, 1990] emphasize the importance of industry forces that provide opportunities for competitive advantage, defined as a positional advantage derived by a firm, which, compared to competition, provides its customers with lower costs or perceived uniqueness. The industry environment can be characterized by its degree of turbulence, complexity, dynamics and (un-)predictability [Lawrence and Lorsch, 1967]. The main forces affecting companies in an industry are summarised by Porter's [1985] 'five-major-forces' framework: (1) rivalry among existing firms, (2) threat of new entrants, (3) threat of substitute products or services, (4) bargaining power of suppliers, and (5) bargaining power of buyers. The interplay of these five forces is thought to determine the boundaries of a firm's competitive strategy. The competitive forces model can help a firm to position itself in an industry so that it can best defend itself or influence the forces at play in its favor.

In contrast to the Industrial Organization perspective, the Resource-Based View (RBV) takes the firm's own resources (including the firm's financial, physical, and organizational assets), competencies (skills and knowledge), and capabilities (management systems) as the starting point for gaining competitive advantage [e.g., Barney, 1991]. This perspective focuses on a firm's internal resources and how these are acquired from factor markets, e.g., the labor and financial markets. In contrast to the industrial perspective that views resources as immediately accessible, the RBV stresses the inherent immobility or stickiness of valuable factors of production and the time and costs required to accumulate those resources [Peteraf, 1993]. This causes firms to be idiosyncratic because throughout their history they accumulate different physical assets and, often more importantly, acquire different intangible organizational assets of tacit learning and dynamic routines [Dosi, 1988]. Competitive imitation of these assets is only possible through the same time-consuming process of irreversible investment or learning that the firm itself underwent [Dierickx and Cool, 1989].

A number of factors have been identified in literature as drivers, cq, barriers, to innovation success. Fortuin [2007] points at the importance of strategic alignment between innovation and business. Strategic alignment is finding the right balance between the relevant contingencies in the business environment and the firm's internal resources, competencies, and capabilities. Innovation can only fulfill its role as a strategic tool when the innovation process is closely linked to the internal competencies and capabilities of the firm and when innovation projects are well aligned with the market needs and technological opportunities. For an effective internal innovation process, its structuring, using stage gates, and key performance indicators (KPIs), is a first priority [Cooper, 1999]. Many studies have pointed at the importance of cross-functional

communication for innovation success [e.g., Little, 1991; Griffin, 1997]. From a study of the American Management Association (AMA) including 1,396 executives of large multinational companies in North America and Europe it was concluded that customer centricity, teamwork, and cooperation, together with the appropriate resources (time and money) and organizational communication are the most important drivers of innovation [Jamrog, 2006]. The ability to select the right ideas and freedom to innovate are other factors that play an important role.

Successful innovating companies, however, do not have to rely on internal competencies alone when it comes to innovation. According to Chesbrough [2003], innovative companies increasingly realize that the 'closed' model of innovation, in which the internal R&D department exclusively provides for new products and processes to foster the company's growth, does not work any more in the current highly dynamic business environment. Indeed, as proven empirically by Caloghirou et al. [2004], interacting with external partners enables a firm to access a variety of new knowledge that increases its innovation performance. Under the paradigm of open innovation, R&D results that otherwise would have gone unutilized are transferred across the firm's boundary, for example, by out licensing to another company or in a joint venture, or by spinning out and launching a new venture that uses the technology. Similarly, a firm may license in technologies created by other firms that are useful to its own core business. e.g., by forming alliances with start-up firms or building own internal venturing groups of senior managers scouting for new ideas, products and processes to fill the R&D pipeline. Huston and Sakkab [2006] refer to this new paradigm of open innovation as 'Connect and Develop', instead of 'Research and Develop'.

3 Innovation in the Food Processing Industry

In the present study we focus on the food processing industry. In this industry, companies increasingly have to compete on the basis of new and more advanced products. Studies show that new food products are more successful in the market than line extensions and me-too products, that generally deliver only short term, low-margin benefits (Knox *et al.* 2001; Van Trijp and Meulenberg 1996; Hoban 1998; ECR Europe 1999). In the past, food processing companies tended to focus on minimizing production costs with little attention for customer benefits [Lienhard, 2004]. Recently, a change in focus can be observed within the industry, which makes it more directed at creating products that match consumer demands. This phenomenon is known as 'chain reversal', a change from a supply-based approach to a demand-based approach. In this process of creating products that align with consumer demands innovation clearly plays a key role.

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 food processing industry, remained largely unexplored. Recently, some empirical work has emerged on innovation in the food processing industry. Batterink et al. [2006] have indicated that successful innovating food processing companies have a strong market orientation, while economic considerations and insufficient innovation competencies are the main barriers to innovation in this industry, which was also found by Garcia Martinez & Briz [2000]. Costa and Jongen [2006] list as major barriers to food innovation a lack of concrete guidelines for the effective implementation of consumer oriented food development, a sequential approach of the innovation process and a lack of intra- and inter-organizational coordination or integration of R&D and Marketing activities and know-how. Customer orientation was also identified as one of the main critical success factors for innovation in a comparative study of over 80 innovation projects in 12 multinational agrifood prospector companies in the Netherlands and France [Fortuin et al., 2007]. Although there is limited evidence on the use of open innovation in the agrifood sector to date, its potential for the sector with its many chain and network ties should not be underestimated.

3.1 Comparing Food Processing in the Netherlands and the Shanghai Area in China

The Dutch food processing industry plays an important role in the Dutch economy. According to the CIAA (2006) report, it comprises about 4500 firms, employing 135,400 people. In 2003, about 66% of the people working in the sector was employed in the 245 largest companies (LEI, 2006). Its contribution to the total Dutch industry in percentage of net turnover in that year was about 27%, and its contribution to the Dutch manufacturing employment amounted to 20% with 95,000 employees. In 2004 the Dutch food processing industry had a turnover of 39 € billion, and a gross value added of € 11.3 billion. The Netherlands is very export-oriented, 46% of net turnover is based on export income. It is the third largest food-ingredients exporter in the world, just after the US and France. Many important

multinational companies have their headquarters in the Netherlands, and several international companies have strong operations in the country. This makes it one of the biggest players in the EU. In 2005 six Dutch companies belonged to the Top-25 of European food processing companies. Unilever is by far the largest Dutch food processor, with an annual turnover of nearly 40 € billion, of which 1.2 billion is earned in the Netherlands. Its total number of employees worldwide is 206,000. Other large firms are Heineken, VION, and Campina-Friesland Foods. Also in terms of innovation the Dutch food processing industry is performing very well, as seven Dutch companies belong to the Top-20 EU companies according to their R&D-investments (CIAA 2006).

In China, the food processing industry is one of the most important industries. In 2002, the food processing industry accounted for € 95.7 billion, being 9.7% of China's total GDP [Walsh and Li, 2004]. From 2000 to 2005, the total gross value, the total industrial added value and the revenues maintained an annual growth rate of around 18%. In some main sectors such as grain, oil, processed meat, and dairy sectors, the growth rates of industrial added values and revenues exceeded 20 % annually (10th five year plan of the Chinese food processing industry). However, the sales and added value of the food processing industry show large regional disparities, the coastal region around Shanghai being one of the best performing ones in China [Walsh and Li, 2004]. This region has a high population density and comparably high income life level in the coast region guarantees a strong market pull for the food processing industry [Walsh and Li, 2004]. Especially after China entered the WTO, the Shanghai region was given priority to form a mature economic market in China. It is said Shanghai covers less than 0.1 percent of China's land mass and nonetheless provides 5.2 percent of the country's GDP and 9.8 percent of the export value [Asia Times, 2003]. Looking at the analysis of the life expenditures in Shanghai, it can be seen that food purchases represent the largest expenditure of consumer expenditure. Urban households currently spend 39% of their annual living expenditure on food purchases.

4 Study Design

4.1 Conceptual Model

In Section 2 we argued, that two theoretical perspectives are relevant to gain an understanding of the role of innovation in the food-processing industry: the Industrial Organization Theory and the Resource Based View. From these theories the concepts relevant for the present study were derived and brought together in the conceptual model, depicted in Figure 2. This model is discussed below.

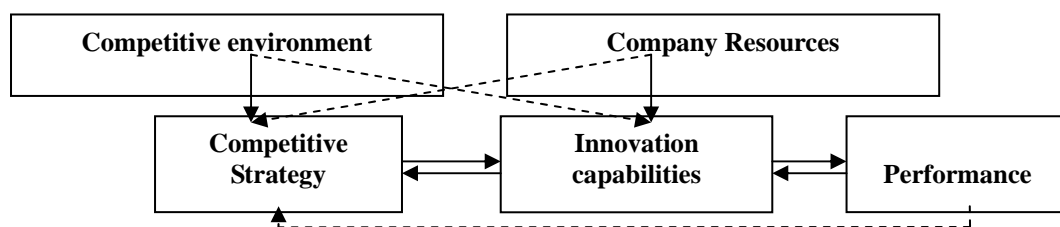


Figure 2 Conceptual Model

From Industrial Organization Theory it is expected, that the company's business performance will be dependent on the opportunities and constraints of its competitive environment. When opportunities become scarcer, and constraints higher, a company will try to find or even create a new environment by developing an innovation strategy. This however, we assume will not automatically lead to new business success. We assume that a company's innovation performance (and ultimately its business performance) is dependent on the way in which it is able to put its innovation strategy into action. Based on the Resource-based View, we expect that this will be dependent on the following factors: the resources it makes available for innovation, whether it is able to make the right choices regarding on which R&D projects these resources will be spent (strategic alignment), and its capability to effectively manage the innovation process. If this is all done well, it will lead to a higher innovation performance, which will in turn raise the overall business performance, and may ultimately change the competitive environment of the company. By selecting leading prospector companies we aim at getting a homogeneous study population of companies that intentionally pursue an active innovation strategy.

The concept of strategy in the present study is investigated using the research variables of prospector strategy, strategic focus and open innovation. Prospector strategy refers to one of the four generic strategy

types as identified by Miles and Snow (1978) namely the one in which companies want to be at the forefront of innovation, in order to be able to reap the initially high profits associated with customer acceptance of a new or greatly improved product. This variable is operationalized as the extent to which the company is striving for market leadership and the importance it attaches to innovation as a tool for achieving and maintaining this goal. We use the research variable of strategic focus to assess how the strategy is operationalized in concrete choices regarding price, quality, speed to market, customers, technology, or product uniqueness. The research variable of open innovation (Chesbrough, 2003) is added to assess in how far a company uses external sources to make full use of its innovation potential. This research variable is operationalized as the percentage of the total R&D budget that is allocated for external research (in universities or research institutes, or in other specialized companies), and the extent to which a company is engaged in strategic alliances and joint ventures

To investigate the *competitive environment* of the company, the research variables of stability, opportunities and constraints are used. Stability refers to the safety of the business environment, as provided by the institutional environment, the predictability of consumer trends and desires and the predictability of competitors (Lawrence and Lorsch, 1967). Opportunities are assessed in terms of market and investment opportunities, and constraints, in terms of the power of suppliers, of buyers, the influence of available substitutes, the threat of new entrants and the number of competitors, as reflected in Porter's five forces framework (Porter, 1985).

The concept of *innovation resources* comprises the tangible and intangible resources that form the inputs for the innovation process. The research variable of tangible resources is assessed by collecting data on the R&D expenditures of the companies as percentage of total sales. The research variable of intangible resources is operationalized as the respondent's subjective assessment of protection that the products and processes of the company receive, and the educational level of the employees, both as compared to the competition.

Strategic alignment, defined as finding the right balance between the relevant contingencies in the business environment and the firm's internal resources, competencies, and capabilities (Fortuin, 2007) is investigated through the research variable of external alignment (operationalized as monitoring of customer needs), and the variable of internal alignment (operationalized as the extent to which corporate and business unit managers are involved in the selection of R&D projects).

Once the resources are available, and the choices for R&D projects are made, the extent to which the company is able to effectively manage the innovation process, in this study termed innovation capabilities, becomes essential. To investigate the *innovation capabilities* we use the research variables of innovation process management, internal and external R&D communication, and human resource management. The variable of innovation process management is operationalized as the respondent's subjective assessment of overall quality of the R&D process, the use of Key Performance Indicators (KPI's) to monitor the process and the extent to which at the end of each innovation project the lessons learned are recorded. Internal R&D communication is operationalized as the extent to which there is a cross-functional screening process for market and technology opportunities, the extent to which market information is passed on to R&D, and the quality of the communication between R&D and marketing, manufacturing, and purchasing. External R&D communication is operationalized as the quality of the communication of R&D with the main suppliers and buyers. The variable of *innovative culture* is operationalized as the presence of efficient reward systems and motivation drivers for innovation, and the extent to which the company tries to lower the burden of administrative regulations and restrictions.

The concept of *innovation performance* is investigated using the research variables of innovativeness, time to market and R&D performance. The variable of innovativeness is operationalized as the respondent's subjective assessment on the level of innovativeness of their company in marketing, product design, product quality, distribution and manufacturing. The variable of time to market is operationalized as the respondent's assessment of their company's flexibility of market response, and the extent to which the new products of their company reach the market before those of competitors. R&D performance is operationalized as how satisfactory the return on R&D investment is according to the respondents.

The concept of *business performance* is investigated using qualitative subjective assessments of the respondents on the research variables of sales volume, financial performance and overall performance. The variable of sales volume is operationalized as the current sales volume relative to competitors and the expected sales growth in the coming three years; financial performance is operationalized as the company's financial position relative to competitors, the profitability relative to competitors and the company's growth rate relative to competitors. Overall performance is operationalized by asking the respondent's judgement on their company's general position as compared to competitors and its reputation in the market.

The research questionnaire, based on these concepts, contains a first section of 10 questions where respondents are asked to provide factual information about their organizations (i.e., total revenues, operating profit margin, R&D spending, number of (R&D) employees). The remainder of the questionnaire contains 43 questions, asking for judgements of the respondents, using seven-point Likert scales, ranging from strongly disagree (1) to strongly agree (7). Structured interviews with at least one respondent per company were used to cross-check the information as well as to gain deeper insight into the innovation management issues covered by the research questionnaire.

4.2 Data Collection

The data were collected in spring 2007. Thirty of the most innovative food processing companies (fifteen in the Netherlands and fifteen in Shanghai) received an invitation letter to participate in the study and a copy of the research questionnaire. For the Chinese companies all questions in the questionnaire appeared in English as well as in Chinese. As an incentive to participate an individualized report was offered to each company, in which their results would be compared to the findings of the entire sample. All companies were then approached by phone in order to confirm their participation. Nine Dutch and nine Chinese companies accepted the invitation to participate in the research. The resulting study population consisted of 31 respondents (CEO's, CTO's and R&D directors), one to three per company. Data were collected not only based on the answers to the questionnaires, but also during on-site interviews with the CTO and/or R&D director of each company.

5 Results

5.1 Base Line Description

Table 1 presents the baseline description of the participating companies. The participating companies from the Shanghai region are smaller than those from the Netherlands, but are leading in their region. They also report a higher operating profit margin. The R&D staff varies from 0.3% to 11%, with most companies having an R&D staff of about 1% of the total number of employees.

Table 1 Baseline Description of the Participating Companies (Range)

Companies	Shanghai	The Netherlands
Sales Volume	20 € Million – 0.7 € Billion	0.1 – 39 €Billion
Operating profit margin	10 - 30%	5 – 13%
Number of employees	80 - 10,000	300 – 200,000
R&D employees	4 – 200	10 – 8,000

Of the nine participating companies in the Shanghai area two produce dairy products, two confectionary, two ingredients and flavor, one company produces canned food, one processed meat and the last produces frozen food. Five companies are publicly-listed, three are privately owned and one is (still) owned by the government. Five companies are headquartered in China, two in the EU and two in Japan and Taiwan. All companies primarily focus on the regional and national market with on average 6 to 7 subsidiaries in other areas in China.

Of the nine companies participating from the Netherlands seven are large multinational food processing companies with a Dutch (five) or USA headquarters (two). The latter two have major operations in the Netherlands. Their annual sales volume (far) exceeds 1 € Billion. The other two are smaller Dutch prospector companies with minor multinational operations. The biggest two companies are diversified food producers, two are ingredient suppliers, the other five are specialized in meat processing, bakery, soups, salads, and dairy.

5.2 Correlations in the Research Model

First the total study sample was used to test in how far the correlations reflect the expectations as laid out in the conceptual model (see Figure 1). To this end two linear regression analyses were performed: one with innovation performance and one with business performance as the dependent variable.

A linear regression analysis over the total study sample using time to market as the dependent variable and predictability of the task environment, external strategic alignment, and internal R&D communication as the independent variables showed that 68% of the total variance of the extend to which these companies are able to have their new products enter the market faster than competitors can be explained by the extend to which consumer trends and desires are easy to forecast; the importance

attached to monitoring in how far their products align to their customers' needs, and the quality of the communication between R&D and marketing (see Table 2).

Table 2 Stepwise Linear Regression Concerning Innovation Performance (R^2 adjusted: 68%)

Dependent variable:

- Our new products enter the market faster compared to our main competitors' products

Independent variables:

- Predictability of the task environment (consumer trends and desires are easy to forecast).
- External strategic alignment (we monitor on a regular basis the extent to which our products and processes align to our customers' needs).
- R&D – marketing communication (there is an excellent communication between R&D and marketing)

A linear regression analysis over the total study sample using the financial position of the company relative to its competitors as the dependent variable and the importance the company attaches to innovation, the systems it has in place to stimulate an innovative climate, and the quality of the communication of corporate R&D with their internal business unit customers and with the external buyers as the independent variables, showed that 58% of the total variance of the dependent variable can be explained by the three independent variables of innovation strategy, innovative culture and communication (see Table 3).

Table 3 Stepwise Linear Regression Concerning Business Performance (R^2 adjusted: 58%)

Dependent variable:

- Our company distinguishes itself positively compared to our main competitors by a strong financial position.

Independent variables:

- Innovation is important in our company in maintaining competitiveness.
- Our company has efficient reward procedures and motivation drivers to stimulate innovation.
- The progress of all R&D projects is communicated regularly to the business units clients
- There is an excellent communication between R&D and our main buyers.

These findings give strong support for the proposed relations in the conceptual model.

5.3 Comparison of the Chinese and Dutch Companies

The comparison of the respondents' assessment of the task environment (Table 5) shows two interesting results. The Shanghai as well as the Dutch respondents assess the predictability of the competitive environment as relatively high, they think that actions of competitors are not very hard to predict. The mean value of both groups amounts to exactly the same 4.4 on the 7 point Likert scale. In the constraints posed by the competitive environment, however, we see a clear difference: the Dutch respondents assess the bargaining power of buyers as significantly higher and number of substitutes for their products as very significantly higher than their Shanghai colleagues.

Table 4 Comparison of the Respondents' Assessment of the Predictability and Constraints of the Competitive Environment (Means, 7 Point Likert Scales).

Question	Shanghai	NL	t-test
Actions of competitors are easy to predict	4.4	4.4	
The bargaining power of our business buyers has a strong influence on the business results of our company	4.53	5.9	**
The number of substitutes for our products is very low (1) to very high (7)	3.23	4.8	*

* $p < 0.1$; ** $p < 0.05$

No significant differences were found in the research variables of prospector strategy and strategic focus (Table 5). There was a strong consensus among all participating companies about the strategic importance of innovation. The answer to the question 'innovation is important to our company in maintaining competitiveness' showed the highest mean of all Likert seven-point scale questions (6.25 for the Shanghai companies and 6.0 for the Dutch ones). The importance of innovation in maintaining competitiveness was also confirmed by the contents of the interviews, with most respondents stating that innovation is essential for the survival of their products and brands. Both groups of companies also

attach high importance to the aim of achieving market leadership (an average of 4.9 for the shanghai and of 5.1 for the Dutch companies). This strategic choice is reflected in the strategic focus of the participating companies: all participants stated that design and launch of new products was the top priority of their R&D investments. Process development was mentioned as the second most important priority, increasing the efficiency of the existing processes as third.

The fact that no significant differences were found in the type of strategy or the strategic focus of the companies under study, indicates that they all fulfill the inclusion criteria, as formulated in section 3.2.

The variable of open innovation Showed a mixed result. no significant difference was found in the percentage of the total R&D budget being used for external research (around 10% in both groups). The answer to the question ‘ Our company uses joint ventures and alliances to make full use of our R&D capabilities’ however, shows a significant difference, with the shanghai companies indicating this was more important (an average of 4.79 on the 7 point Likert scale) than the Dutch ones (3.27). When comparing the dutch sample with Shanghai participants from companies headquartered in china however, the difference becomes smaller and is no longer significant.. Probably the higher score for open innovation through alliances and joint ventures for these companies must be explained as mainly an exchange with the foreign parent company.

Table 5 Comparison of the Strategy of the Participating Companies (Means, 7 Point Likert Scales).

Question	Shanghai	NL	t-test
Innovation is important in our company in maintaining competitiveness	6.25	6.00	
Our firm fights the competition and is directed towards market dominance	4.90	5.10	
Our company uses joint ventures and alliances to make full use of our R&D capabilities	4.79	3.27	**

** p < 0.05

Table 6 shows that the tangible resources available for the innovation process, namely the R&D budget as percentage of total sales is relatively high in all investigated companies: 2.1 % for the Shanghai companies and 1.8% for the dutch ones. This is substantially higher than the European average of 0.24% and the USA average of 0.35% (CIAA, 2005). The high level of resources available for innovation also supports the general characteristic of the sampled companies as prospector companies.

Overall the innovation resources are found to be somewhat higher in the Shanghai companies than in the Dutch ones. Only in one item, namely patent protection, this difference was found to be significant. When splitting the shanghai sample into china based companies and foreign based companies the china based ones are found to report the highest protection (4.33 vs 3.67 on a 7 point Likert scale). Perhaps this should be interpreted as a higher dependency on licences in the chinese companies.

Table 6 Innovation Resources (Means, 7 Point Likert Scales).

Question	Shanghai	NL	t-test
R&D expenditure as percent of total sales	2.5 %	3%	
Our company distinguishes itself positively compared to our main competitors by the protection that our products and processes receive by patents, licensees etc.	3.79	2.55	*
Our company distinguishes itself positively compared to our main competitors by the educational level of our employees		3.82	

In how far a company is able to make the right choices regarding on which R&D projects the investments in innovation resources will be spent depends heavily on the availability of relevant information from the internal as well as the external environment. As can be seen in Table 7, the Shanghai companies seem to put more effort in collecting this information , although the differences found are not significant.

Table 7 Comparison of the Respondents' Assessment of Efforts Made to Secure Strategic Alignment (Means, 7 Point Likert Scales).

Question	Shanghai	NL	t-test
We monitor on a regular basis the extent to which our products and processes align to our customers' needs		4.82	*
Corporate managers and BU managers actively participate in the selection of R&D projects	5.40	4.91	

The results on innovative capabilities presented in Table 8, show that the Shanghai respondents consistently assess the indicators for the variable of innovation process management and for the variable of the level of internal R&D communication higher than their Dutch colleagues. They assess the effectiveness of the overall R&D process significantly, and the use of KPI's and learning from previous innovation projects very significantly higher than the respondents from the Netherlands. The internal R&D communication with marketing is assessed somewhat, but not significantly, higher, the communication with manufacturing is assessed significantly and that with purchasing very significantly higher by the Shanghai respondents than by the Dutch ones. No significant differences were found in the variable of external R&D communication with suppliers and business buyers. The Dutch respondents however clearly rate the level of measures taken to stimulate an innovative culture higher than the Shanghai respondents. This is interesting, because in an international comparative study performed ten years ago, the effectiveness of reward systems in Dutch companies was still assessed lower, and the level of restrictions posed on R&D higher than in other countries (Fortuin, 2007).

Table 8 Comparison of the Respondents' Assessment of Their Company's Innovative Capabilities (Means, 7 Point Likert Scales)

Question	Shanghai	NL	t-test
Our company distinguishes itself positively compared to our main competitors by an effective R&D process	5.05	4.0	*
KPIs are used to monitor the innovation processes	4.90	3.36	**
We consistently codify the lessons learnt at the end of innovation projects	4.75	3.27	**
There is an excellent communication between R&D and marketing	4.79	4.0	
There is an excellent communication between R&D and manufacturing	5.50	4.55	*
There is an excellent communication between R&D and purchasing	4.95	3.91	**
Our company has efficient reward procedures and motivation drivers to stimulate innovation	4.86	3.73	**
Few restrictions are imposed on R&D by administrative regulations (e.g. regarding travel, budget, etc.)	3.57	4.55	*

* $p < 0.1$; ** $p < 0.05$

The research variable of innovation performance showed little differences between the assessments of Shanghai and the Dutch respondents. The innovativeness of their company relative to that of competitors in marketing was assessed somewhat higher by the respondents from Dutch companies (3.65 Shanghai respondents vs 4.27 Dutch respondents), the innovativeness in product design, distribution and manufacturing somewhat higher by the respondents from the companies in Shanghai. They also assessed the flexibility of market response of their companies higher than did the Dutch respondents, although this difference was not significant (4.50 vs 3.65 average). The research variable of return to R&D investment showed no difference between the two groups.

Also for the research variable of business performance no significant differences could be found between the Dutch and the Chinese companies, which is surprising when one keeps in mind the differences found in the external forces as well as in the internal capabilities deployed between the two groups of companies. We will discuss this finding more in detail in Section 5.

6 Discussion and Conclusions

Interesting findings are that both innovative as well as business performance are predominantly related to the companies' internal (innovation) capabilities. Linear regression shows that innovation performance in terms of faster market entrance of new products is positive related to better alignment of new products to customers' needs, combined with the ability to forecast consumer trends and the quality

of R&D-marketing communication. Business performance in terms of the companies' strong financial position is related to the importance the firm attaches to innovation, the systems they have to stimulate an innovative climate, and the quality of the communication of corporate R&D with their business unit customers and their external buyers.

As expected, clear differences between Chinese and Dutch companies were found regarding the external forces as well as in the internal capabilities they deploy to survive. The pressure from the external environment, especially the power of buyers and the threat of new entrants is clearly felt more strongly by the Dutch companies than by their Chinese counterparts. Chinese companies make significantly more use of joint ventures and license agreements with international partners, and report (as a consequence) that their products receive better protection by patents and licenses. In terms of internal innovation capabilities the Chinese companies report to have a significantly more effective R&D process as compared to their competitors. They also report to significantly use more KPI's to monitor the R&D process and make more consistent use of lessons learned at the end of each project. The Dutch companies are significantly more active in stimulating an innovative culture by reward systems and motivation drivers. Interestingly, however, neither of these differences leads to significant differences in business or innovation performance between the two groups in our study.

In the introduction we asked the question whether agri-food companies in developed economies still have a competitive edge compared to those in emerging economies, such as China. The answer that emerges from the data collected so far points in the direction of the disappearance of the traditional advantage of the companies from developed economies: no significant differences could be found neither in innovation performance, nor in business performance among the companies from the Netherlands and the Shanghai region in China. When looking at the internal capabilities, it can even be expected, that in the near future the Shanghai companies might gain an advantage over the Dutch ones, because of their higher scores on a number of internal factors proven in this same study to correlate so strongly with innovation performance.

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