Supplier involvement in food development

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Abstract

Rapid technological change, shortened product life cycles, and increasing global competition make product development gain in importance every day. As a result of this, purchasing and supplier involvement as one possible explanatory factor of product development success has been gathering more and more attention from both managers and researchers. Involving suppliers in product development is supposed to have a positive effect on for example development time and product quality. The food industry is a typical example of an industry that could possibly benefit from supplier involvement in product development; it has seen increasing levels of outsourcing yet, at the same time, new product development failure rates are substantial.

This article uses an existing framework to study four cases of food and packaging development in Sweden and the Netherlands. The framework creates insights into the processes and conditions that are critically important for successfully involving suppliers in product development, not only in the short but also in the long term. As the framework has mainly been developed on the basis of case studies in (electro-)mechanical engineering industries, the aim of these particular case studies is to investigate the framework's possible application to the food industry, and to identify particular problems in this industry.

Supplier involvement in food development

Introduction to the analytical framework

In an ever-increasing competitive environment, suppliers can contribute to product development in several ways. Involving suppliers in product development is supposed to have a positive effect on development time, development and product cost and product quality (Ragatz, Handfield, and Petersen, 2002; McGinnis and Vallopra, 1999). However, this turns out not to be true for all situations (Birou, 1994; Hartley, Zirger, and Kamath, 1997). Therefore, some authors argue that the way supplier involvement in product development is managed is important in explaining the amount of success of this involvement.

Based on literature, a conceptual framework was developed for analysing supplier involvement in product development. This framework aids in designing and managing processes related to purchasing- and supplier involvement (from now on referred to as "supplier involvement") in product development. This framework posits that in order to be successful, the involvement of suppliers needs to be embedded in the wider context of bringing a purchasing perspective to the development process. Such a perspective looks at the availability and suitability of external resources (i.e. the knowledge and skills of suppliers) for integration in the development process under conditions of timely availability and appropriate or optimal costs and quality of the input items (parts, materials etc.) embodying those resources. This integration of purchasing and product development processes and considerations is what is meant by Integrated Product Development and Sourcing (IPDS) (Wynstra et al., 2001; Van Echtelt et al., 2004).

The framework is partly an enhancement of two models by Wynstra (Wynstra et al., 1999, 2000) and Monczka, Handfield, and Scannell (2000) and is structured according to an input-throughput-output logic, where:

- inputs are the starting conditions in terms of structure and capabilities of both the customer and the supplier. A distinction is made between *drivers* and *enablers*. *Drivers* are factors that drive a company towards a specific form and extent of IPDS processes. These factors can be both internal as well as external to the company and may exist on three different levels of analysis: the business unit level, the project level and the level of the individual buyer-supplier relationship. *Enablers* are the conditions, whose presence can help a company to organise the required IPDS processes. These enablers can be present internal or external to the buying organisation or in the specific relationship between buyer and supplier.
- throughputs are the project-related processes to set-up and manage supplier involvement in product development from a buying firm perspective. The Strategic Management Processes use a more long-term horizon of preparing and developing a supply base in selected technological areas, while the Operational Management Processes are more short-term focused, within the context of a specific project and specific supplier involvement.
- outputs are the (potential) short-term and long-term results of involving suppliers in product development. Examples of short-term effects are reduced development time and cost, reduced product cost and increased product quality. Examples of long-term effects are access to critical supplier technologies, better/ increased alignment of technology roadmaps and more efficient and effective collaboration.

Figure 1 presents a schematic representation of the framework.

Insert Figure 1 about here

The core of the framework consists of the strategic and operational management processes. The Strategic Management arena contains seven processes that together provide long-term, strategic direction and support for adopting supplier involvement in individual development projects. These processes also contribute to building up a *willing* and *capable* supplier base to meet the current and changing future technology and capability needs. The Operational Management arena contains nine processes that are aimed at planning, managing and evaluating the actual collaborations in terms of their intermediate and final development performance in a development project. The success of involving suppliers in product development as a strategy depends on the firm's ability to capture both short-term and long-term benefits. If companies spend most of their time on operational management in development projects, they will fail to 'leverage' the effect of planning and preparing such involvement through strategic management activities. Also, they will not be sufficiently positioned to capture possible long-term technology and learning benefits that may spin off from individual projects. Long-term collaboration benefits can only be captured if a company can build long-term relationships with key suppliers, where it builds learning routines and ensures that the capability sets of both parties are still aligned and are still useful for new joint projects. To obtain such benefits, companies need a set of strategic decision-making processes that help to create this alignment.
Having established explicit and extensive strategies, a company obviously still needs a set of operational management processes to identify the right partners and the appropriate level of supplier involvement for the various suppliers in a specific project, using the support from the strategic directions and guidelines. The two arenas are both distinct and interrelated, as the interplay between short-term project interests and long-term strategic interests are managed in these arenas.

While the previous versions of the model have been developed on the basis of case studies at more than 20 firms, across 6 different industries (Wynstra, 1998), the IPDS framework in its current form has not yet been broadly applied beyond the context of an office automation manufacturer, where the framework was used to analyse several case studies in terms of the way suppliers have been involved in product development and the amount of success associated with the involvement (Van Echtelt et al, 2004a). Since the development of the framework took place within the context of a technically complex (e.g. high number of components, different technologies, and/ or interactions between components/ technologies) company, it is interesting to investigate the applicability of this framework in other companies and other industries. The food industry forms a particularly interesting study object, since it in many ways differs from the industries, which have been studied traditionally when it comes to (supplier involvement in) product development, such as electronics and automotive.

The food industry
The food industry is composed of very diverse firms. For the larger part, the industry in Europe exists of small to medium sized enterprises, supplying local or specialist niche markets (Traill and Grunert, 1997: p. 53). Large companies and multinational enterprises complete the industry. Whereas large food companies supply a limited range of national brands and processed foods and increasingly produce private-label products for national retailers, multinationals are additionally engaged in exports or other multinational activities. The food industry is well known for its large variety of products, which vary in size, packaging, flavour, et cetera. Most of these products are sold through retailers to large numbers of consumers throughout the world, and margins are relatively low.

Recently, a number of trends can be identified in the food industry. Among the major determinants are economic factors, consumer concerns, demographic factors, and the availability of food products (Traill and Grunert, 1997).
First of all, consumer buying-habits are changing (Ruigrok, 2002). Demographical changes, such as an increase in the number of single households, the increase in the number of people over 45 years of age, the increase in the number of double-income family, result in increasing attention being drawn to high-quality food products that are easy to prepare and are more durable. Negative advertising due to, amongst others, animal diseases (e.g. mad cow disease, swine fever, food and mouth disease, and fowl plague) and errors in production causing companies to withdraw large amounts of finished product from the market (e.g. bacteria in baby food), strengthens the growing attention for the quality of food products. An additional result of these demographic changes is a change in consumer preferences (e.g. 'grazing' in stead of three meals a day, expanding use of convenience foods, increasing importance of environmental and health aspects, and the upcoming demand for foreign foods like for example exotic fruits).
As a result of increased consumer awareness, consumers impose more and more demands on food processing companies. Consumers have more money to spend, but also expect higher product quality in terms of freshness, storage life, et cetera. There is a growing interest in convenience products due to changes in lifestyle (going out more, working longer hours, women working in addition to men or instead). The market situation is one of consumer pull; consumer buying patterns direct product development. In addition to that, retailers buy and assign shelf space based on consumer buying patterns; since shelf space gives retailers strong bargaining power when negotiating with food companies, the power in the supply network is also largely in hands of the retailers.
Another trend is the continuous growth of retail chains, whereby the retailers increase their power over food producers. More and more retailers switch to operating under the flag of an established brand name (e.g. ICA or Albert Heijn), and more and more chains go together in consortiums like Ahold or Carrefour. But also new players enter the market still (ref), addressing niches and thereby increasing competition. Food processing companies need to position their products well in relation to their competitors in order to get in favour with the retailers and with the consumer, especially with regard to the rather strong brand orientation, which consumers display.

The specific characteristics of the food industry and the trends discussed above bring growing pressure upon food and beverage companies. In their struggle to obtain shelf space in supermarkets, food companies must know which products to offer to the final consumer, as to initiate a customer-pull situation at the retailers (Ruigrok, 2002). This means that much attention has to be given to researching consumer wishes on the one hand and developments in supplier offerings on the other. The latter can bring about ideas for new food products, after which the consumer has to be convinced that he or she wants or needs that product. Obviously, marketing plays a very important role here.
The continuing changes in consumer buying patterns also require speedy development from food companies; what consumers buy today will probably not be bought tomorrow. Retailers practically force food companies to either innovate, or loose shelf space to the competitor that does. New developments need to take place in rapid succession. However, very few of the newly launched products are successful. Rudolph (1995) estimated that during 1993 well over 8,000 new products were introduced to US retail markets, some 80 to 90 per cent of which failed within one year. Hollingsworth (1994) substantiates this by expressing the view that thousands of food products, which are introduced to the retail market every year, are almost certainly extinct soon after.

The costs of developing and launching of these unsuccessful food products are high. According to Rudolph (1995), the costs of failure can become manifest in missed sales targets, lost revenues and postponed profits in addition to wasted development resources. Urban and Hauser (1993) assert that many of the new products that enter the marketplace are only the tip of the iceberg; many projects even fail before launch! It seems unlikely that any food processing company is able to sustain itself. The fact that the food industry has to cope with issues like for example capacity of machinery, capabilities of machinery, health issues, and combinations of ingredients that either "mix" or "don't mix", makes innovation in this industry quite complex. External resources are necessary to keep up with the high pace of innovation needed. Suppliers of ingredients, machines and packaging materials can make a valuable contribution to efficient and effective product development, by bringing in expert knowledge in all kinds of relevant areas.

The IPDS framework may provide us with an opportunity to analyse manufacturer-supplier collaboration in product development in the food industry in a way that systematically combines attention to strategic and operational processes, while explicitly studying the context of such collaboration in terms of contingencies affecting the appropriate extent and form of these processes and the pre-conditions for carrying them out.

Methodology

In a recent benchmark study, the IPDS framework was used to look at eight product development projects submitted by four Dutch companies, one of which operates in the food industry(Van der Valk, 2003; Van Echtelt et al, 2004b). Each company submitted two product development projects to be analysed in this study. Parallel to this study, two projects were studied coming from a large Scandinavian food corporation (Fällene, 2003). A description of these studies and the results obtained follows hereafter.

In the Dutch studies, data was collected by means of structured questionnaires and interviews. The questionnaires were used to quickly obtain some insights in the projects under study by means of quantitative ratings of how the people involved perceived the project. Predominantly, the purchasing and the R&D departments were involved. One of the questionnaires was mainly concerned with a strategic perspective on supplier involvement in product development (applies to multiple product development projects). This questionnaire was sent to the companies' purchasing managers and R&D/ development managers. The other questionnaire concerned operational issues with regard to a specific product development project. This questionnaire was sent to the people that were directly involved in the product development project under study, e.g. the project leader, the project purchaser and any other participants in the project that were thought to be relevant and important to the project by the participating companies.
All people that filled in a questionnaire have been interviewed afterwards to discuss the projects in more detail, to clarify uncertainties and to elaborate on outstanding characteristics. In addition to that, the Dutch company was requested to –in consultation with the researchers- select an important supplier for each project to be involved in the study. These selected suppliers were approached to render their assistance to interviews: one person involved from a commercial point of view was interviewed, as well as one person involved from a developmental point of view.
In the Swedish studies, the analysis was carried out from the buying firm's perspective only. Because of the limited time frame available in this project, these studies comprised only interviews with the purchasing manager, the development manager, the project leader and the

project purchaser. The interviews and were transcribed, after which they were returned to the interviewees for a validation check. The complete case study descriptions followed the same procedure (Yin, 1994).

The projects were then described in terms of the IPDS framework. The qualitative data from the interviews were used to score each element in the IPDS framework. In the Dutch studies, the questionnaires were kept alongside to check the scores; however, the researchers' observations were leading in the assessment.
There are three different outputs to measure; short-term project execution effects (STPEE), short-term supplier effects (STSE) and long-term supplier effects (LTSE). The STPEE are measured as the actual outcome compared to the target set at the beginning of the project. The STSE are measured as the actual performance of each supplier compared to the targets set in the beginning of the collaboration. A three-point scale is used to rate STPEE and STSE: 1) worse than target, 2) equal to target and 3) better than target. The LTSE are measured as expected effects: does the project team think the collaboration will lead to better access to knowledge and technologies in the future? A three-point rating scale is used with the measures 1) effect is not expected to occur, 2) effect is likely to occur, though not strongly and 3) effect is expected to occur strongly. The operational and the strategic processes were rated on a five-point scale. Based on similar scales used for process benchmarking, the labels were defined as follows:

1) Absent: The process is not carried out,
2) Reactive: The process is carried out in an ad-hoc way, as a result of occurring events;
3) Pro-active: The process is carried out following an implicit structure or set of activities,
4) Systematic: As in "pro-active", but supported by systems, procedures and guidelines,
5) Intelligent: As in "systematic" but able to critically review the processes in the light of the project and to adapt (incidentally or more permanently) when necessary.

On the input-side of the framework, again a three-point scale is used. For the drivers, the numbers correspond to: 1) low/ green; 2) medium/ yellow; 3) high/ red. The drivers are the factors that drive a company towards a specific form and extent of IPDS processes. The higher the drivers score, the higher the need for well-performed management processes. High scores on drivers represent unfavourable circumstances/ input factors and therefore take on a red colour.
For the enablers, the numbers correspond to: 1) low/ red; 2) medium/ yellow; 3) high/ green. The enablers are conditions whose presence can help a company to organise the required IPDS processes. The higher the enablers are, the easier it is to score high on the management processes and the easier it is to reach the desired outputs. High scores on enablers represent favourable circumstances/ input factors and are therefore coloured green.
After the individual framework elements had been scored, a graphical representation was created of the current situation. Based on the scores, colours were assigned to the different elements as follows: green for high performance, yellow for medium performance and red for low performance (Table 1).

Insert Table 1 about here

The graphical representations have been used to identify opportunities for improvement, after which company-specific recommendations were developed. The results of the studies were presented to the companies by means of a written management report, which in the Netherlands was combined with an in-company presentation as to provide the people that contributed to this research project with feedback about their company's performance. Apart

from some minor differences, both companies recognised the patterns laid out in the reports. The analyses provided a good starting point to identify good performance and areas where improvement is needed. In addition to that, the companies stated that the framework broadens their view on supplier involvement: the fact that good pre-conditions and resources are just as important to product development success as the management processes was an eye-opener to the companies.
The results of the case study analyses are presented in the following sections. The sections start with a short company description, after which the projects under study are described in more detail. Then, the results of the case study analyses are presented graphically, based on which conclusions are drawn about the way they involve suppliers in product development.

Results of the Scandinavian development projects
The Scandinavian studies were carried out at BCG, a leading supplier of branded consumer goods to the Nordic grocery market. Its food business is a leading developer, manufacturer and marketer of pizzas/ pies, sauces, snacking products, ready meals, fruit and berry products, pickled vegetables, seafood, processed potatoes and baking ingredients. Two divisions of BCG each submitted one project for the study. The development of a fish spread in combination with a new package was submitted by division A, which is the leading manufacturer and marketer of chilled and preserved fish and shellfish products in the Nordic region (primarily fish roe in tubes and jars, pickled herring, anchovies and fish balls). Division B is one of the leading producers and marketers of food products in Sweden (primarily pizza, ready meals, pickled vegetables, fruit and berry products, sauces and potato products). This division submitted a newly developed concept in the area of take-away sandwiches.

Fish spread & package
In the first project studied, a fish-spread was developed in combination with a new package. The product was new to the company as well, since its durability was much shorter than for their other products. This short durability at the same time caused the need for the new package. The product was released in 2003 (some six months later than planned) and is selling better than expected. Two package suppliers were involved; one for designing the package and one for setting up the production line. Also, many ingredient suppliers were involved since the company needed ingredients they were themselves unfamiliar with. For this project, four internal interviews were conducted (the functions of the people interviewed can be found in Appendix A).
Figure 2 shows the graphical representation of the fish-spread & package project. The structure of the representation of the results is similar to the structure of Figure 1. To the far right, the reader can find the Short-term Project Execution Effects (STPEE), directly preceded by the Short-term Supplier Effects (STSE) and the Long-term Supplier Effects (LTSE). The bold borders in the column of the supplier effects represent the distinction between the ingredient and the package suppliers. Together, the last two columns (STPEE and STSE) comprise the outputs. The column in front of the outputs lists the processes: the rectangular shapes concern strategic processes; the parallelograms represent the operational processes. At the far left, the reader can find the inputs, whereby the drivers and the enablers are represented by rounded rectangles and ovals respectively.
As mentioned earlier, red areas represent low/ negative scores (score 1 for enablers and outputs and scores 1 and 2 for throughputs). Yellow areas represent medium/ average scores (score 2 for inputs and outputs and score 3 for throughputs). Green areas represent high/ positive scores (score 3 for enablers and outputs and scores 4 and 5 for throughputs).

The drivers are marked with a coloured border. A driver with a red border (score 3) should be interpreted as a factor increasing the need to carry out certain processes, while a driver with a green border (score 1) should be interpreted as a factor decreasing the need. Evidently, a driver with a yellow border (score 2) is not discriminating.

Insert Figure 2 about here

The project took six months longer than planned and the development did cost much more than was budgeted. The company is however very satisfied with the product and it is selling better than expected. The package might need reviewing due to bad visibility in shops.
The ingredient suppliers performed on target. It should be noted however that the targets were set quite low since the risk involved with the project was perceived to be quite high. The package suppliers had a difficult job developing the package, since the company's ideas changed several times. In addition to that, the collaboration between the two package suppliers was sometimes difficult, because of different company cultures and working methods. This resulted in longer development time, and thus higher development cost.
With regard to the processes, four of the strategic processes and four of the operational processes scored low. These low scores contribute to the low scores on outputs. For example: the fact that timing of involvement was not very well determined is likely to have led to exceeding the time schedule.
The drivers score relatively high, thereby increasing the complexity of the environment within which the project was carried out and putting higher demands on the extent to which the processes are carried out. The scores on enablers are quite diverse. The lack of high-scoring enablers makes it all the more necessary to perform well on the processes, as to compensate for the high scores on drivers.

Take-away Sandwich

This project concerns the development of a machine that can put together and serve a food product (for example: a sandwich) on customer-order. The project was not yet finished at the time of the study. Due to the high secrecy of the project, only limited information was made available to the researchers. The diagnosis has been based on the available information. For this project, four internal interviews were conducted (the functions of the people interviewed can be found in Appendix A).
This was the first project where division B worked closely together with their suppliers. One supplier was responsible for the development of the machine. After starting the development with a technical supplier with a lot of engineering experience but with little knowledge about the food industry, division B found out that they did not want to own the machine. In addition to that, the development was getting too expensive. The new machine supplier had been working with the company before and has much knowledge about the food industry.
A spice expert company developed a new meat taste. From this supplier division B has learned about spices and how to combine them, as well as a lot about meat and how it can be processed.
Figure 3 shows the graphical representation of the Take-away Sandwich–project.

Insert Figure 3 about here

So far the suppliers have performed on target for all output criteria. According to division B, the development took longer than planned for two of the total of seven suppliers, thereby increasing development cost.

The machine development has provided division B with knowledge they did not have access to before. The division even discussed future developments and market trends with some of the involved suppliers. As this is the first project with intensive supplier involvement, the division has had some valuable learning experiences with regard to collaboration.
Two of the seven strategic processes score very low. The other strategic processes score somewhat higher. Again, the scores on the operational processes are quite varied. Whether the scores on the processes have contributed to a successful project cannot be said, since the project had not finished yet at the time of the study. However, considering the scores on the inputs and the throughputs, we would expect a similar end-result for this project as in the project submitted by division A.
The drivers again score relatively high, although the scores have shifted somewhat between different drivers. The enablers in this project do not score very differently from the enablers in the fish-spread & package project.

Conclusions
Comparing the two projects does not show any substantial differences. The two divisions display similar working methods. However, both the Strategic and the Operational Management Processes scored slightly higher in the take-away sandwich project than in the fish spread & package project. A likely explanation lays in the fact that division B had never before collaborated closely with suppliers. Since the company was inexperienced with regard to supplier involvement, they made an effort in order to make it a success. This could explain the higher scores on the processes.
It is important to note that the IPDS framework does not distinguish between different suppliers. Therefore, the scores on supplier-related drivers and enablers (e.g. component development complexity, supplier project management capabilities, et cetera) are an approximation of the overall collaboration with all suppliers, just as the supplier effects are an approximation of all suppliers' overall contribution to a project. However, when comparing the package suppliers with the ingredient suppliers, we can see that the former score lower on the short-term effects than the latter. Apparently, different suppliers achieve different effects. It is reasonable to assume that their inputs are not equal either. The suppliers should therefore be regarded separately with regard to contribution they make.
In this case, the suppliers were divided into ingredient, production capability and package suppliers. This has consequences for the scores on supplier related outputs, inputs, and processes. Dividing the suppliers into these still gives an average, but only between similar suppliers. Scoring each supplier individually would give even more exact information, but it would also require much more work and make the framework difficult to manage. For this study, a categorisation on the basis of product type seems to be a good compromise.

There seems to be a lot of room for improvement in both of BCG's divisions. To start with, there does not seem to be a pre-determined frame for supplier involvement present in the organisation. Additionally, BCG seems to make rather ad-hoc outsourcing decisions. Without the frame for supplier involvement in place, other activities like scanning supplier markets and pre-selecting suppliers are not carried out in a structural manner.This results in the absence of a solid basis for development projects. Much of the activities that would normally be carried out in advance of projects now have to be carried out within projects.
Finally, it should be noted that the enablers could be enhanced. BCG's divisions should find collaboration partners that have some sort of fit with them in terms of working methods, operating style, culture and trust. Also, employees could be trained in project management

and managing supplier involvement. The pre-determined frame in the form of guidelines and blueprints will enable the divisions' human resources.

Results of the Dutch development projects

QMS is a global provider of processed food products and nutritional services with operating companies on all continents. QMS recently acquired MCS (a relatively small manufacturer of chocolate sprinkles and sweet sandwich spreads), the company under whose flag the projects under study were actually carried out. At QMS/ MCS we studied also two projects: Ready-to-drink Soda and Fruit-Flavoured Sprinkles.

Ready-to-drink Soda

The first project concerns a slightly carbonated ready-to-drink soda in PET bottles of 33 cl. The drink was developed and filled in collaboration with a Spanish subsidiary of a Dutch filling company. The project was highly innovative, since the method of preparation in combination with the packaging material and the manufacturing technology was new for QMS/ MCS. The project was realised from scratch within a time period of five months. For this project, three internal interviews and one external interview were conducted (the functions of the people interviewed can be found in Appendix A).

After the individual framework elements had been scored, a graphical representation was created of the current situation (Figure 4).

Insert Figure 4 about here

The graphical presentation leads to the conclusion that project performance is well controlled. Both the supplier's performance and the people from MCS' project team contributed to that. The project is also expected to result in more long-term effects with this supplier (e.g. roadmap alignment for drinks technology).

The processes contribute directly to the well-controlled results. All processes are carried out well to very well. MCS has invested a lot of time and energy to give shape to these processes, and it pays off. In addition to that, the presence of high enablers has a positive effect on the fact that these processes are carried out the way that they are. Nearly all drivers score high, underpinning the importance of carrying out the management processes well. From this case study can be derived that all the right circumstances are present.

MCS aims for a very open relationship with their suppliers, thereby cultivating a learning environment. MCS is well on their way with regard to continuous improvement of supplier involvement in product development. Every project is evaluated from both the manufacturer's and the supplier's perspective. These evaluations result in ideas for improvement for future projects. At MCS this is an ongoing cycle.

Fruit-flavoured sprinkles

The project concerns a line extension; a new flavour for fruit-flavoured sprinkles. The project was conducted with the assistance of a former sister organisation of MCS and was less innovative than MCS' previous project. MCS regarded this project as an outsourcing project and thus treated it that way. The former sister organisation owns the production line for the original version of the fruit-flavoured sprinkles. Four internal interviews and one external interview were conducted with regard to this project (the functions of the people interviewed can be found in Appendix B). The graphical representation of the Fruit-flavoured Sprinkles-project is shown in Figure 5.

Insert Figure 5 about here

The graphical presentation leads to rather the same conclusions as the graphical representation of the ready-to-drink soda project. Supplier and project performance are well controlled, which is a direct result of the way both the strategic and operational processes are carried out. In addition to that the presence of high enablers has a positive effect on the fact that these processes are carried out the way that they are.

Conclusions
MCS performs very well when it comes to involving supplier involvement in product development. During the years, MCS employees have worked very hard at creating the right conditions to foster product development, constantly looking back on their actions and continuously improving the way they collaborate with suppliers. Since the outputs are measured against targets set in advance of the project, it may seem that the suppliers perform 'just on target'. But, MCS themselves claim that this has to do with the fact that they set high expectations and so the yellow colour actually represents high performance from the side of the suppliers. We conclude that the efforts invested in obtaining the right inputs and in carr ying out the processes to the right extent have resulted in high supplier performance in product development. This contributes to successful project outcomes in the form of well-selling products.

Comparing the Dutch and the Swedish projects
When comparing the two companies on the way that they approach and conduct product development activities, it is striking to see the difference in project performance.
QMS has invested much effort its processes and in the creation of proper development conditions, paying off in good project results. In the cases where the framework elements were not assigned the green colour, this was not due to a lack of attention for that particular element, but rather to the fact that this specific project situation allowed a somewhat lower score without dramatically impacting the project and its results.
BCG on the other hand, seems to perform much more ad hoc, lacking a clear structure for involving supplier involvement in product development. The absence of a strategic perspective on supplier involvement in product development results in problems (delays, misunderstandings, mistakes, et cetera) within the individual development projects. Consequently, BCG's project results are not as good as those of QMS. It seems that creating suitable product development conditions and actively carrying out the relevant management processes provides a good guarantee for successful product development.
Bear in mind that by successful product development we mean projects of which the outputs meet or exceed pre-determined targets. Whether the project is also successful in terms of market variables as sales, market share and profitability is outside the scope of the framework. Marketing is responsible for market research, as a result of which management tries to prioritise the 'right' projects. The actual development is unrelated to this project portfolio management.
From the project descriptions, the image emerges that BCG is much more involved with the actual development of the final product than QMS is. While QMS in consultation with the supplier(s) decides on feasible targets for both their counterparts and themselves, after which the development itself is largely outsourced, BCG seems to concern itself with nearly all sub-developments taking place within the project. Both companies' attitudes to supplier involvement in product development differ somehow. This nature of this difference was nicely expressed by the European Purchasing Manager of packages and packaging materials:

"We do not excel in developing food products, we excel in building strong brands." As mentioned before, one of the most important characteristics of the food industry is the fact that consumers more or less dictate new food product development. Preparing market introduction and marketing products well is one important aspect, but developing the right products is even more important, as has been indicated earlier in this article. This increases the need for thorough market research. Well performing food companies focus particularly on these issues, while product creation (which corresponds more or less to brand appearance) is almost entirely outsourced to (a number of) suppliers of ingredients, developers of flavours, designers of packaging materials, machinery engineers, et cetera.

Conclusions, implications and recommendations

Implications for research

This article has used an existing framework to study four cases of food and packaging development in Sweden and the Netherlands. As the framework has mainly been developed on the basis of case studies in (electro-)mechanical engineering industries, the aim of these particular case studies was to investigate the framework's possible application to the food and beverages industry, and to identify particular problems in this industry.

In our opinion, the case studies and their analysis demonstrate that the framework can usefully be applied for describing, analysing and partly explaining failures and successes in product development also in the food and beverages industry. We do find that both strategic and operational processes have an impact on development results. We also find that enablers at the business unit, project and relational level have an impact on the possibilities of effectively and efficiently carrying out these processes. Finally, the case studies support the notion that contingency factors, such as the level of project innovation, have an impact on the required form and extent of the strategic and operational management processes.

Apart from its relevance per se, we also need to consider the framework's relations to other product development related models developed and or applied to the food industry. Traill and Grunert (1997) have evaluated the ideas of six new product development (NPD) theorists and their associates. Some of these theories have been developed with particular reference to the food industry and the development of new food products. These ideas are contrasted with non-food specific theorists, who are interested in the management of new products and who have recognised the important role that NPD plays in any business. A further viewpoint is taken from theorists who are interested in NPD per se and who use food, on occasions, to illustrate their ideas. They found that there is little consensus as to the right and wrong way to manage the process of product development. They therefore advocate that an organization should not be tied to one particular model, but should take on board the basic fundamentals of a food-based model (theory) and adapt and amend it to their particular situations as and when they develop new food products. The approaches of Fuller (1994) and Graf and Saguy (1991), who have experience of research and development in the food industry, are considered to be most appropriate among the approaches studied. The latter decided, somewhat arbitrarily, to divide a typical project into five steps and then proceeded to divide them into several sections. They also take into account the particular activities and skills required for each project. This model is comprehensive and deals with food in an informative way. The model could be better served by breaking down the five stages into several more stages that may enable them to be managed effectively (Graf and Saguy, 1991).

When comparing the approach of Graf and Saguy to the IPDS framework, we believe however that the IPDS framework provides a more comprehensive approach to product development issues, which can definitely be transferred to the specifics of the food industry. The framework puts special emphasis on work in advance of any specific project, e.g. creating the right conditions to foster idea generation and realisation (enablers) and doing thorough preliminary work on a more strategic level (developing guidelines, making the make-or-buy decision explicit, (supply) market research, et cetera). This can make the difference between failure and success.

Managerial implications

Based on the above, we pose that there are two important processes that food companies have to carry out well in order to sustain competitive advantage in the long term: innovation and outsourcing. With regard to innovation, companies should acknowledge that added value for consumers/ customers can be created anywhere in the organisation (f.e. through brainstorming and eye-opener sessions) and not only within the R&D department. Companies should first of all invest their resources in deciding which projects can and should be done, and which ones not. It may be enlightening to look at some (best) practices applied at QMS/MCS:

At QMS/ MCS, a lot of effort is put in defining and communicating the business strategy, in order to make sure that the direction, in which MCS wants to take her brands, is clear to everyone in the organisation. External developments are shared among people participating in product development (a 'core team' consisting of marketing, product development and purchasing, complemented by people from finance, sales, production, et cetera) by means of meetings. In brainstorm sessions, these people try to interpret the external developments in terms of realising the internal strategy. The results of those meetings are also shared within the organisation.

MCS only produces in case of being world-class in either cost or technology. In all other cases, production is outsourced. The make-or-buy decision has been put down on paper. There is a process in place to make this decision; the core team gives input to the people deciding.

After the management team has decided which ideas should be followed up, a new product development project is started, in which the functions of marketing, product development and purchasing are always represented. This core team is responsible for the entire development process, starting with the concept and ending with introduction to the market.

The concept is the starting point for determining the playfield, after which the best approach to achieving the end goal is chosen. The final product determines the technology; a risk analysis is carried out for this technology. Based on the technology, the supplier is chosen. If none of the preferred suppliers has the desired technology, MCS tries to get them into developing it. The supplier thus has the choice to go along in the developments with MCS.

With regard to outsourcing, food companies should seek to use expert knowledge of suppliers. A good way to achieve this is to involve purchasing early in the product development process. After all, purchasing has expert knowledge on the supply market. Also, since one supplier can impact another supplier's performance, suppliers should not only collaborate with the outsourcing party, but with each other as well. In other words, make suppliers responsible for product creation/ realisation, but manage them well! Again, let us look at some practices at QMS/MCS.

At MCS it is very important to have everything as clear s possible at the start of the project, this positively affects the efficiency of the project. In advance of the project, responsibilities for both parties are determined and documented (quality check, inbound check, et cetera). These issues are incorporated in the development contract. Before the project starts, a project plan is also laid out by MCS containing milestones, timing, et cetera. All relevant disciplines are involved in creating this plan. From the end of the line, MCS calculated back at what point in the project the supplier should be involved. The plan is then discussed with the supplier, to see if it complies with their estimates and ways of working.
MCS takes on a coordinating role throughout the project for all parties involved (the strictness of this coordination depends on the impact of each supplier's contribution to the final product). Timing and other operational issues are subject of every project meeting. The core team holds an internal project meeting, but sometimes the supplier is (and should be) present. In advance of the project, both parties agree to some sort of regularity (for example: once every two to tree weeks). Based on the number and type of action points, a (number of) new meeting(s) is planned at the end of the meeting. Milestones are passed based on 'gut'-feeling. The product (for as far as it actually exists) can be tested sensorially, and consumer tests can be carried out (both quantitatively and qualitatively).

Limitations and suggestions for further research

Thusfar, we have limited ourselves to identifying critical decision-making activities and conditions primarily from a customer perspective. However, supplier involvement is not a process that can be unilaterally managed by the customer. Additional and complementary perspectives have not explictly been used in this study such as network and interaction approaches (Håkansson, 1987; Von Corswant and Tunälv, 2002). Still, the framework – and in particular, the processes it encompasses – are originally based on four basic underlying processes that signal a 'meaningful' managerial involvement of the customer. These processes (*prioritisation, mobilisation, co-ordination* and *timing)* are derived from a resource-based view of product development, and are in particular based on the work of Bonaccorsi (1992) and Håkansson and Eriksson (1993). Nevertheless, a useful extension of our framework would be to consider a set of analogous processes, enablers and drivers but then from the perspective of the supplier. Combined with the current, customer-focused framework this could result in a more complete, *dyadic* framework.
Furthermore, we have not focused in-depth on the change processes in these companies that allow to buyer and supplier to improve their collaboration in product development. This means that naming and examining the change processes could be a next possible extension. Further investigation is also needed into the appropriate informal and formal mechanisms that enable effective learning across different departments and with suppliers in the context of higher supplier involvement in product development. In the current study we observed that one of the potential benefits of starting to involve suppliers in product development is the potential for learning, making future collaborations less resource-consuming and more effective. Still, many companies make the same mistakes over and over again. We therefore argue that visible evaluation processes need to be in place at different organizational levels to allow learning experiences to be passed on.

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Appendix A Interviewees per project

Fish spread & package-project

	Functions:
Internal interviews	Project Leader
	Project Purchaser
Internal interviews	R&D Director
	Purchasing Director

Take-away Sandwich -project

	Functions:
Internal interviews	Project Leader
	Project Purchaser
Internal interviews	R&D Director
	Purchasing Director

Ready-to-drink Soda-project

	Functions:	
Internal interviews	Marketing/ Project Leader	
	Project Purchaser	
External interview	**Supplier**	Technical engineer
Internal interviews	New Business Development Manager Europe	
	European Purchasing Manager Co-pack	

Fruit-flavoured Sprinkles project

	Functions:	
Internal interviews	Development/ Project Leader	
	Project Purchaser	
External interview	**Supplier**	Product Developer
Internal interviews	New Business Development Manager Europe	
	European Purchasing Manager Co-pack	

Figure 1: The IPDS framework

Inputs			*Throughputs*		*Outputs*		
			Processes		*Supplier Effects*		*Project Effects (short-term)*
Drivers	*Business Unit*	Market/ technological uncertainty	*Strategic*	Formulating and communicating guidelines for IPDS	*Short-term*	Building block performance	Product Quality
		R&D Dependence		Determining internal versus external provisioning of technology			
		Supplier dependence		Surveying supplier markets for technological developments		Building block cost	
		Company size		Pre-selecting suppliers for product development collaboration			
		Production complexity		Leveraging suppliers' existing skills and capabilities		Building block development cost	Product Cost
	Project	Degree of innovation		Motivating suppliers to develop specific knowledge and/or products			
		Project objectives priority setting		Evaluating guidelines and processes for IPDS		Building block development time	
	Relationship	Component development complexity					
		Component technological uncertainty					
		Component contribution to system functionality					
		Degree of limitations on supplier availability					
Enablers	*Business Unit*	Cross-functional orientation of purchasing and R&D departments	*Operational*	Determining project-specific develop-or-buy options	*Long-term*	Better alignment of technology roadmaps	Development Cost
		Recording and exchange of information		Suggesting alternative suppliers/ products/ technologies			
		Quality of human resources		Selecting suppliers for project involvement			
	Project	Cross-functional orientation of development team		Determining the extent and moment of project involvement for selected suppliers		Improved access to critical supplier knowledge	
		Recording and exchange of information		Jointly determining the development work-package			
		Quality of human resources (team)		Designing the coordination interface manufacturer-supplier			Time to market
	Rela-tionship	Supplier capabilities (Technical, Projec Management, Costing)		Co-ordinating design/ engineering activities customer-suppliers			
		Relevant past collaboration experience		Evaluating product designs		More efficient and effective supplier collaboration	
		Compatibility in culture and operating style		Evaluating and feeding back suppliers' development performance			
		Trust/social climate					

Table 1 Scores and colour ratings

Framework element:	RED	YELLOW	GREEN
Drivers	3	2	1
Enablers	1	2	3
Processes	1, 2	3	4, 5
Outputs	1	2	3

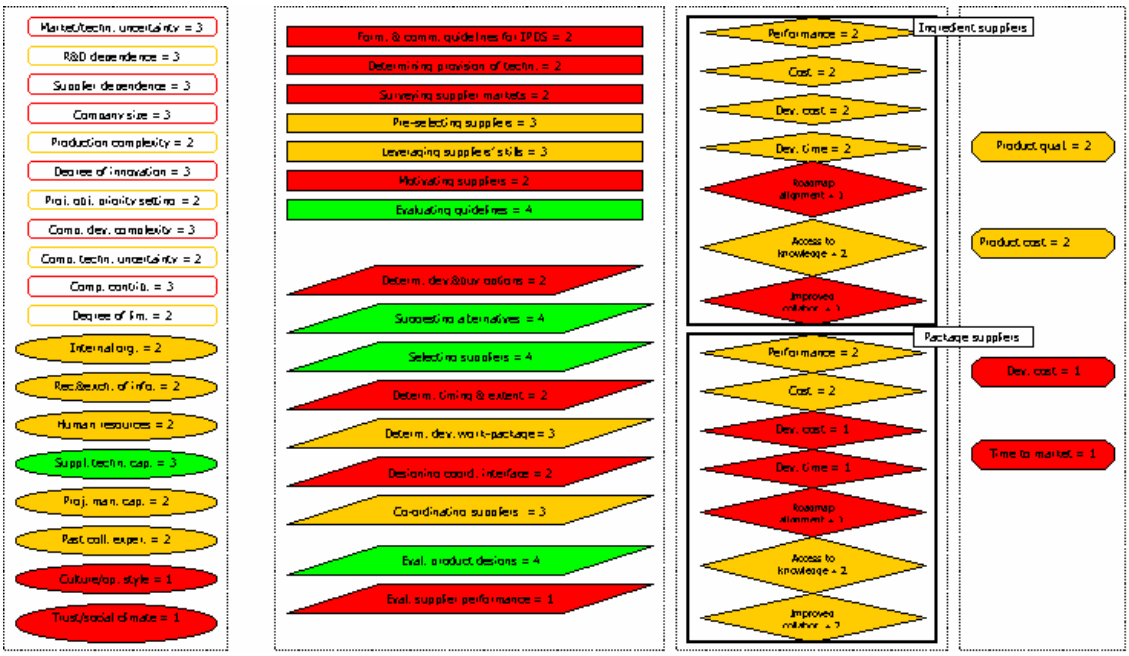

Figure 2 Fish-spread & package project results

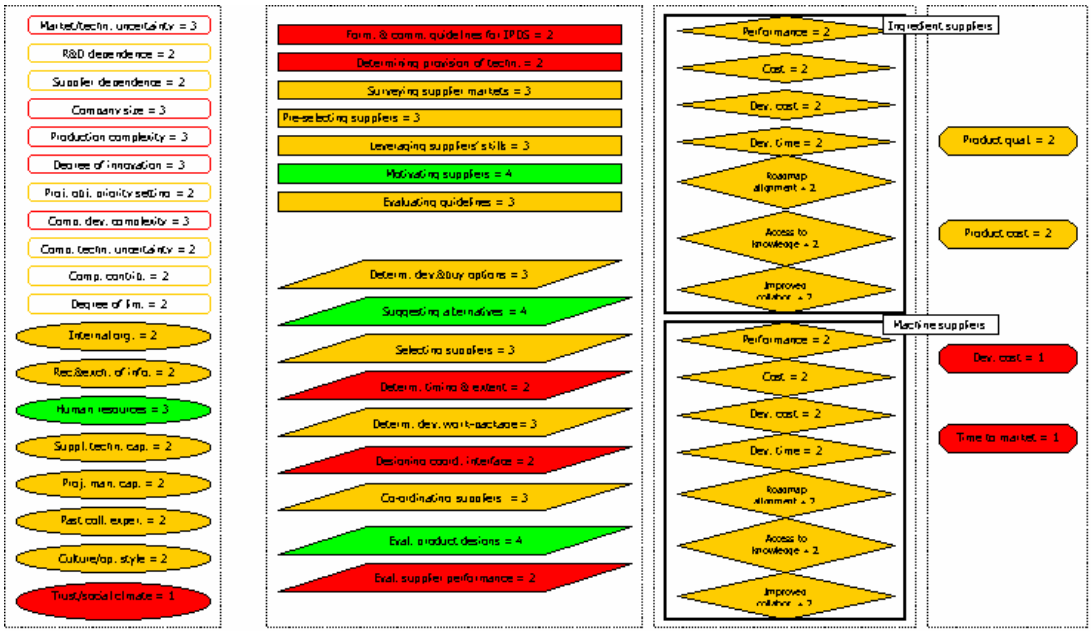

Figure 3 Take-away sandwich project results

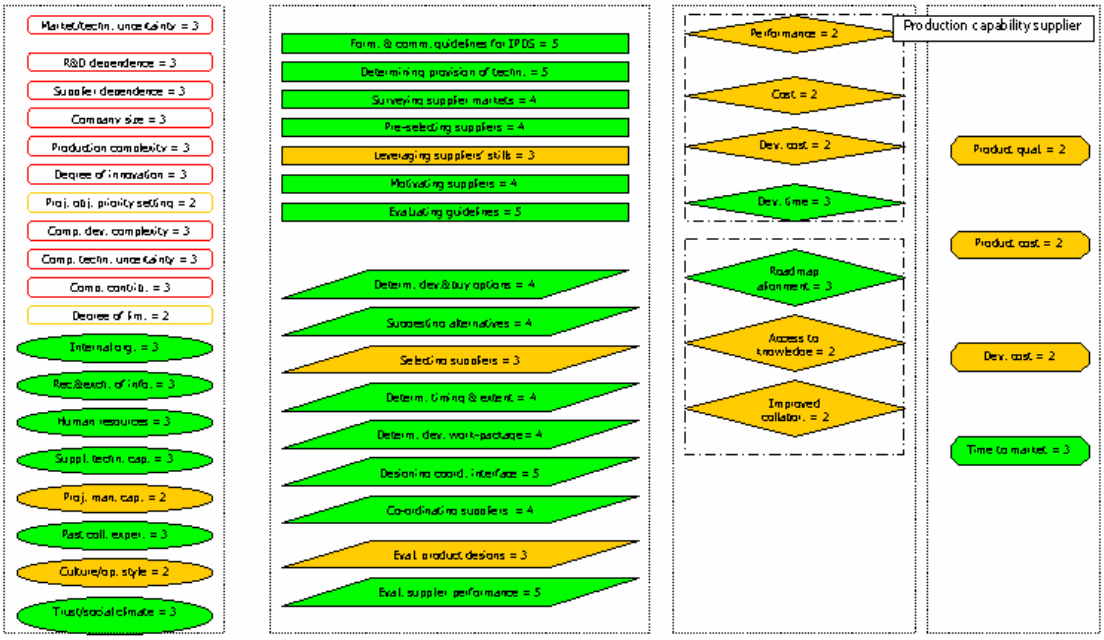

Figure 4 Ready-to-drink Soda-project results

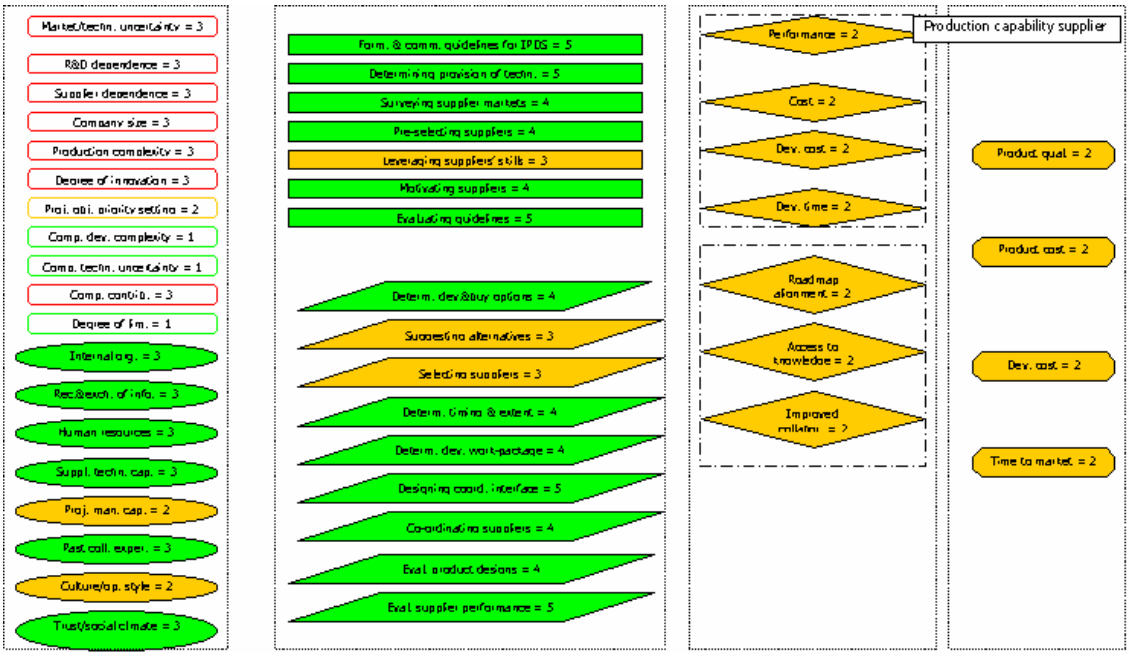

Figure 5 Fruit-flavoured Sprinkles-project results