The Role of Purchasing in Product Development: A Summary of Four Years Research

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Abstract

The role of purchasing in product development has increasingly become a popular subject both with researchers and practitioners. However, much of the available research has important shortcomings. Most importantly, it fails to address explicitly the role of purchasing in areas related to product development other than single development projects. We argue that there are five separate yet closely related areas in which purchasing related activities can be distinguished with respect to product development processes. These activities can all be related to a limited number of key processes across the different areas, which form the essence of purchasing involvement in product development. This framework of areas and activities has been developed on the basis of two series of case studies. In order to get some indications on the universality of this framework, a survey has been carried out, as well as a third series of case studies.

Introduction

Over the past decade or so, the role of purchasing and suppliers in product development has increasingly received attention both from researchers and practitioners 3. The problem is that most of the available research in this field is mainly based on experience from the automobile and electronics industries and only focuses on the short-term issues related to the management of individual development projects. Our study, started in 1994, has been aimed to deal with these shortcomings. Based on empirical studies in a variety of industrial sectors, it has been designed to develop a basic framework of the various activities that can be distinguished at the intersection between purchasing and product development. More specifically, the research objectives of the underlying study are twofold:

- **To develop an integrated set of activities that constitute purchasing involvement in product development**, which can help firms to implement, improve and to audit the involvement of purchasing in product development.
- **To develop preliminary knowledge regarding the application of this set of activities** in terms of the factors that determine the extent to which the activities should be carried out (i.e. driving factors), and the factors that determine the extent to which the activities can be carried out (i.e. enabling factors.)

The empirical research has been carried out in two countries, The Netherlands and Sweden, and across different industries. The empirical studies consist of four main parts:
1. nine case studies of manufacturer-supplier relations across five different industries;
2. nine case studies of Dutch manufacturers;
3. a mail survey under purchasing and development managers, in both countries; and
4. three in-depth case studies at one Swedish and two Dutch manufacturers.

The four different parts each have had a specific goal within the research project, and that brings us to the research methodology. Step one in our research has been to select from available literature a number key

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processes in inter-organisational product development, and identify the main management areas that purchasing involvement in product development consists of. Together, these form the conceptual framework for studying purchasing activities related to product development. In step two, this conceptual framework has been used to analyse 9 cases of product development collaboration between a manufacturer and a supplier. The main goal of this step was to identify specific activities that can be seen to contribute to the key processes, and group them according to the management areas identified in the first step. In step three, based on the findings from a second series of case studies of Dutch companies, the initial framework has been adapted. The revised framework has then been tested in step four, which consists of a mail survey under 254 Dutch and Swedish purchasing and development managers. This survey seeks to identify the driving and enabling factors for performing purchasing-related activities in product development. Additionally, it examines the fit or possible overlap between the activities of development and purchasing departments. Step five of the research consists of three in-depth case studies, in which the set of activities developed in the previous steps of the research is used to analyse what kind of problems arise due to the way or why specific activities are being carried out, and to study the underlying factors that explain the way or why specific activities are (not) being carried out. In this paper, we briefly describe each of these five steps and present the major findings.

Step one: Developing a conceptual framework

Primarily, the involvement of purchasing in product development seems to focus on managing (early) supplier involvement in the development process. In order to conceptually define managing supplier involvement in product development, it is helpful to consider the underlying processes. Bonaccorsi (1992, pp 35-37) talks about incentive, search and co-ordination as being the three key processes or objectives in structuring and managing the supply network for product development. In order to involve suppliers in product development the manufacturer has to create incentives for two interdependent areas: the involvement in current development activities and the long-term alignment of technology strategies. To carry out development activities, suppliers have to invest in (at least partly) dedicated assets, which are at risk since development always carries some uncertainty. This incentive problem is closely related to the process of resource mobilisation. By search, Bonaccorsi refers to the exploration, experimentation and testing of alternative technical solutions (1992, p 36). Too little attention to developments outside the relationships with current suppliers may entail the risk of getting 'locked-in' into obsolete technologies. This objective of keeping options open may sometimes be at odds with the goal of incentive, which often requires dedication to a specific option or supplier. Co-ordination, finally, involves the synchronisation and mutual adjustment of development activities both in the short run, within a specific project, and the long run in terms of research and development investments.

Håkansson and Eriksson (1993) use similar terms to describe the general processes of managing supplier involvement in product development. They present four key issues in dealing with technological cooperation with suppliers. These are prioritising, mobilising, co-ordinating and timing. Prioritising concerns the choices the manufacturer has to make how and where to invest his resources. This involves not only the choice of the actual collaboration partners, but also the choice for a specific form and intensity of supplier involvement. Companies have limited resources to handle supplier involvement, which means that companies have to set their priorities regarding the technical areas or specific suppliers they want to work with. Without prioritising, supplier involvement may cost more time and effort than it saves. Mobilising involves convincing or motivating suppliers to start working on a particular development. Without mobilisation, for example by creating financial or technical incentives, suppliers may not be interested and willing to make the necessary commitments and efforts. Co-ordinating involves the adjustment and adaptation of development activities and resources between suppliers and the manufacturer. Without co-ordination, joint development will result in ill-fitting components, double work, incompatible technical solutions, etcetera. This need for co-ordination grows with increasing specialisation and the fragmentation of

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3 Actually, the authors use the words prioritising, mobilising, synchronising and timing respectively. We have chosen to replace synchronising with co-ordinating because of the potential confusion between synchronising and timing.
development activities. Timing is a special kind of co-ordination, which involves the co-ordination and adaptation of development activities and resources in time. Without timing, product development will suffer from unexpected bottle-necks, unnecessary delays, and missed deadlines. These four processes - prioritising, mobilising, co-ordinating and timing - form the basis for our analysis of managing supplier involvement in product development.

Apart from a conceptualisation of managing supplier involvement in terms of key processes, it is important to acknowledge explicitly that managing supplier involvement is not limited to single development projects, as one of the shortcomings of the main body of existing research we pointed at is its almost exclusive focus on periodic tasks within specific development projects. Therefore, we have distinguished three different areas of activities in managing supplier involvement: Development Management, Supplier Management and Project Management. Development Management is concerned with the division of work between the firm and its suppliers in the development of technical knowledge and competencies. In that sense, it includes decisions that set the stage for the other areas of managing supplier involvement. Supplier Management, handling individual supplier relationships but also the total supplier network of the firm as a whole, goes further than Project Management as it is a more permanent and ongoing activity. Project Management involves managing or contributing to product development projects; tasks which per definition have a limited time-frame. Across these different areas, the four key processes have to be effectuated in order to achieve effective supplier involvement in product development. Together, the three different management areas and the four key processes form the conceptual framework that has been developed in step one of our research. In step two, this framework has been used as a reference tool for identifying more specific activities that are associated with purchasing involvement in product development.

Step two: Identifying specific activities

The second step in the research has consisted of nine case studies of pairs of manufacturers and suppliers in five selected industries, both in the Netherlands and Sweden (Wynstra, 1997, pp 85-135). In these case studies, we identified specific activities (decisions, processes) that represented (at least) one of the four key processes, and these were attributed to one of the three management areas, as in Table 1.

It is important to note that not all of these activities were actually being carried out in each of the nine cases. Rather, the framework is an 'eclectic' collection of all activities carried out in the different cases, and should be tested and refined in the following steps of our research.

Step three: adaptation of the framework

In the third part of our research, we have taken a further step to adapting and refining the framework or set of activities, by distinguishing different levels of responsibilities. This distinction has been developed in a series of 9 ‘mini’ case studies carried out in the Netherlands (Wijnstra and Van Stekelenborg, 1996). From these case studies, it has become apparent that besides a distinction into various management areas of activities, a categorisation can also be made into different levels of responsibility: from operational to strategic.

Starting at the operational level, purchasing’s involvement in product development involves a design or rather specification responsibility: contributing to the development of the actual product by communicating criteria, norms and (im)possibilities regarding the development of new products (materials, components, assemblies) by suppliers. Some of these activities may be carried out by suppliers themselves. We distinguish between ‘restrictive’ activities, aimed at limiting the number of alternative specifications, and ‘extending’ activities, aimed at increasing the number of alternatives (Erens and Van Stekelenborg, 1993). The second level, operation responsibility, includes tasks like the planning and co-ordination of development activities of suppliers during a development project; preparing and starting such a development project is regarded as a preparation responsibility. The fourth level, structure responsibility, includes the permanent tasks related to the management of a base of preferred development suppliers and, finally at the most strategic level, policy responsibility regards the formulation and communication of guidelines and
policies regarding the role and tasks of the different departments and suppliers in product development, and the determination of develop-or-buy strategies.

One reason for distinguishing these different levels or layers of responsibilities is that they regard different management levels. Specification and operation activities will normally be performed by purchasers or engineers. Preparation and structure activities usually fall under the responsibility of purchasing managers or their development colleagues, while policy tasks will generally involve the highest purchasing, development and general management levels. When comparing these five different levels of responsibility with the three management areas identified in the first step of the research, it becomes clear that they overlap to some extent. Policy responsibility closely resembles Development Management, structure responsibility resembles Supplier Management, and the responsibilities of preparation and operation relate to Project Management. Only specification responsibility has no real overlap with one of the three areas, as it is actually focused at a different ‘object’: the new product itself. Because of the overlap, we decided to integrate the two aspects, management areas and levels of responsibility, which resulted in a framework consisting of four management areas: Development Management, Supplier Interface Management, Project Management and Product Management. Within Project Management, we make a further distinction between Project Planning and Project Execution. Now, in this adapted version of the framework, the areas differ both with regard to the time-horizon of the different activities involved (varying from strategic/long-term to operational/short-term), and the object they are concerned with (technologies/supplier/project/product).

At the same time, however, it became clear that the four key processes related to managing supplier involvement (prioritising, mobilising, co-ordinating and timing) that have been defined earlier do not completely cover the role of purchasing in product development. Purchasing involvement is more than only managing supplier involvement, such as purely product oriented activities in the area of Product Management (specification responsibility). The essence of these activities that do not concern actual supplier involvement consists of the collection and dissemination of information. This relates to what has previously been introduced as ‘search’ (Bonaccorsi, 1992, p 36). Search refers to the exploration, experimentation and testing of alternative technical solutions, and is primarily oriented towards investigating and maintaining different technical options. However, in our opinion, the experimentation and testing of alternative technical solutions is not a key task within the functional domain of purchasing. It is a task that lies much more in the domain of the design or development function. What does form part of purchasing’s responsibility in product development is the identification and first exploration of technical solutions provided in the supplier market. O’Neal (1993, p 6) describes this process quite aptly:

‘As marketing is scanning the environment for unfulfilled needs, and R&D is developing/acquiring new technology, purchasing is actively acquiring, assimilating, digesting, and sharing information on new and forthcoming supplier developments.’

These are activities not directly related to managing supplier involvement, which refers to tasks like supplier selection performance monitoring, but activities that take place prior to (and in parallel with) selecting and working with particular suppliers, like carrying out market research, evaluating different alternative component designs in terms of availability and costs. We group these kind of activities under the key process of ‘informing’, which refers to both acquiring information and sharing it. The involvement of purchasing in product development thus relies on five key processes: prioritising, mobilising, co-ordinating, timing and informing. Based on that, a short definition of purchasing’s role in product development would be:

‘acquiring and sharing (technical) information with regard to supply markets and individual suppliers with regard to products and processes, and co-ordinating and/or managing collaborative product development between the supplier and the manufacturer’.

Table 2 lists all the different activities that we see as the constituent ‘elements’ in the involvement of purchasing in product development, according to the revised framework.

**Step 4: Driving and enabling factors**
In the fourth phase of the research, a survey has been carried out among Dutch and Swedish purchasing and development (design engineering) managers at manufacturing firms. The survey resulted in complete responses from 127 firms (84 Dutch and 43 Swedish), consisting of a questionnaire for the purchasing manager and one for the development manager. For each of the activities listed in our framework, the manager had to indicate whether or not he or his department was carrying out that activity. Actually, the response rate for both countries is very low (11%), which means that the results have to interpreted carefully: they can certainly not be considered representative for Dutch and Swedish purchasing and development managers in general. A cross-country comparison is therefore not possible.

The first objective of the survey was to establish whether and to what extent the various activities from our framework are actually being performed and, more specifically, whether any differences exist in this respect between individual activities or management areas. The framework and its activities has been developed by taking different elements from literature (the five key processes and the five management areas) and specific examples of activities from two series of case studies. In that sense, the framework is rather eclectic, combining different building blocks from different empirical and more theoretical sources. However, we assert that the framework regards an integrated set of activities, which together constitute purchasing involvement in product development. Therefore, it is interesting to investigate to what extent each of the activities is actually being carried out and, specifically, whether any differences exist in this respect between individual activities or complete management areas. In the survey, Project Execution scores relatively low among the five different management areas, both with purchasers and engineers and in the two countries. This may indicate that both purchasing and development departments are relatively little active in project related, co-ordinating activities. Project Planning scores rather high for all four manager groups. Of the individual activities, purchasers and engineers from both countries score low on co-ordinating development activities between different first tier suppliers and co-ordinating development activities between first and second tier suppliers. Except Dutch engineers, all managers also score relatively low on co-ordinating development activities of the supplier and manufacturer. Perhaps, some of these co-ordinating activities are not performed by the manufacturer, but by suppliers.

The second objective was to investigate which department or manager, purchasing or development, is responsible for or active in particular areas or activities. The activities from the framework concern tasks within the domain of the purchasing function, which does not mean that they should be performed by the purchasing department. Some activities may be carried out by purchasing departments while other activities may be carried out by development departments. The findings indicate there is no area where for both countries, the same kind of manager scores higher than the other. There is also only one activity in which development managers in both countries are clearly more active: taking part in develop-or-buy decisions. Purchasing managers from both countries, on the other hand, are more active than development managers in motivating suppliers to build up specific knowledge and communicating design changes with the supplier. For the rest, there are no differences or the difference is not the same for the two countries: often for the Dutch companies, the development manager is the most active, while for the Swedish companies, the purchasing manager is the most active. At most of the respondent firms, purchasing and development departments seem to have shared responsibility for the various activities and management areas.

In the third place, the survey aimed to identify and analyse a number of driving and enabling factors for performing specific activities. Differences between firms regarding activities being or not being performed may be related to different factors. It is possible that of the different activities in the framework, not all are equally important in all situations. In other words, there may or may not be particular driving factors present in a certain situation. It is also possible that specific activities are important, but not or less possible to carry out due to a lack of enabling factors. One important aspect of driving factors is that within the context of managing supplier and purchasing involvement in product development, they are given. Enabling factors, on the other hand, can be manipulated - they are a ‘decision variable’ - within the context of supplier and purchasing involvement. As driving factors we have chosen to focus on four aspects:

- company size, measured in turnover;
production type or technology;
the overall dependence/reliance on suppliers measured as purchasing share in turnover; and
the importance of product development, measured as R&D expenditure related to turnover.

Company size has been selected as the first possible driving factor, primarily because it is a good indication of overall organisational complexity. The more complex an organisation, the more important it may become, for example, to develop and communicate guidelines for supplier involvement. If an organisation is small, the few people concerned may simply agree on doing things a certain way, without labelling and communicating it as guidelines or policies. Additionally, the larger and the more complex an organisation, the more likely it is that development projects involve a variety of internal departments and external suppliers. Co-ordination of development activities between the manufacturer and the supplier, and between different suppliers, may hence become an increasingly relevant task. Production type has been selected as the second possible driving factor, mainly because of the initial observation that nearly all prior research is limited to large series production industries, such as automotive and electronics. With the survey, we aim to provide some indications whether the specific activities and the management areas apply equally to companies with different production types. Ordering and chasing prototypes, for example, is probably more relevant for firms with series production than for unit and process production firms.

The third possible driving factor regards the overall dependence/reliance on suppliers, measured as purchasing share in turnover (purchasing ratio). The more a company is dependent on suppliers for producing its final product, the more likely it is to be dependent on suppliers for developing that product. The higher the supplier dependence, the more likely purchasers are, for instance, to motivate suppliers to build up specific knowledge in areas the manufacturer needs the most. However, the purchasing ratio is a purely financial ratio: it does not provide information on how important supplier products are technically speaking. The fourth and final driving factor considered in this survey regards the importance of product development, measured as R&D expenditure related to turnover. The higher the expenses on research & development, the more likely product development is to take place. Other things equal, more product development means more need for purchasing involvement. Although there is no direct linear relationship between R&D expenditure and product development (some expenses may be related to process innovation and research does not always lead to new products), expenditure does give an indication of the degree of the 'innovativeness' of the company and its products.

As enabling factors, we have focused on two aspects: the technical knowledge of purchasers, measured as the relative amount of purchasers with technical education/experience; and the (formal) participation of purchasers in development teams. Technical knowledge is thought to enable purchasers to better participate in discussions with development engineers, for example, regarding possible part standardisation and simplification. Purchasers' technical knowledge may also have an indirect effect on their level of involvement, as development engineers perceive the involvement of these purchasers as adding value to the product development process. In other words, the perceived capability grows and development engineers will more often facilitate or even request the involvement of engineers (Anklesaria and Burt, 1987; Atuahene-Gima, 1995). The second enabling factor studied in the survey regards formal participation in development teams, an organisational parameter. Team participation may promote cross-functional contacts and collaboration between purchasers and development engineers, and may lead to a more structured and extensive involvement in product development.

The investigation of the four driving factors seems to reveal that none of them has a consistently strong impact on the frequency at which purchasing and development managers perform certain management areas or activities. Company size as measured by turnover does not seem to have an important influence on the general involvement of the purchasing department, and certainly not in a straightforward (unidirectional) way, as far as Dutch purchasing managers are concerned. Neither does there seem to be an effect of turnover on the activity pattern of Swedish purchasing managers other than that those at the largest companies seem to be more active than others. The effect of company size on the activities of development managers seems to
be only slightly stronger than in the case of their purchasing counterparts. Production type neither seems to systematically influence the pattern of activities being performed. For example, Dutch purchasing and development managers at large series production firms seem, relative to other firms, little active, but this does not apply to their Swedish colleagues. Also the third driving factor, supplier dependence (measured by purchasing ratio) does not seem to have a consistent, strong impact. While Swedish purchasing managers at high purchasing ratio firms are relatively active in Project Execution, this does not apply to their Dutch colleagues. Similarly, while Dutch development managers at high purchasing ratio firms are relatively active in Supplier Interface Management, this does not apply to their Swedish colleagues. Finally, changes in firms’ R&D expenditure do not seem to have a strong impact. This applies especially to development managers.

Of the two enabling factors that have been analysed, the impact of technical expertise within the purchasing department on activity patterns seems very limited. For the purchasing managers, increasing technical expertise does not systematically result in more frequent involvement in various activities and management areas. In the case of Swedish purchasing managers, more expertise even seems to decrease the frequency of involvement for some areas. For development managers, the Dutch and the Swedish respondents show different patterns: the Dutch engineers at firms with high technical expertise in purchasing are rather active, while the Swedish engineers at low expertise firms are rather active. On the other hand, purchasing’s participation in development teams does seem to enable purchasing departments to become more involved in the different management areas and individual activities. Additionally, development departments at firms where purchasing does participate in development teams score higher, if only slightly, than those where purchasing does not participate. This would seem to indicate that the participation of purchasing in development teams does not lead to development departments becoming less active: instead, purchasing’s team participation would signify a greater overall emphasis on purchasing and supplier related activities in product development.

The influence of driving and enabling factors, based on the data we have from this survey, thus seems rather limited. There may be several explanations for that. First, the findings may correctly reflect the true (near) absence of these driving and enabling factors. However, this true absence of any impact of five of the six factors considered in the survey does not imply that there are no other driving or enabling factors: the survey may simply have investigated the wrong factors. On the other hand, the findings may also be incorrect, in the sense that in general, these driving and enabling factors do play a role but that their influence is just not evident in the response to our survey. One explanation for that could be that the interplay of the different factors has mitigated their apparent impact. With the relatively simple ways of analysing the data as used in this chapter, it is not possible to fully separate the influence of individual factors. The positive effect of company size on activity levels, for example, may be compensated by the fact that large companies have relatively low purchasing ratio’s. A second explanation may be that the driving and enabling factors do play a role, but that the wrong measures have been taken. For example, the intensity of product development could perhaps better be measured by the number of product development projects per year than by R&D expenditure. A third possible explanation regards potential non-response bias. This bias may be important, considering the low response rate (11 %). Unfortunately, we have no data for the distribution of the initial (convenience) samples of Dutch and Swedish companies with respect to, for example, company size or purchasing ratio. If the respondents only include the very ‘active’ companies from each of the classes that have been distinguished for the different driving and enabling factors, the actual levels of activity for various classes of firms in general may be quite different. Finally, there may be a fourth explanation for not finding influences of the driving factors while in fact they do increase the need for performing the activities as distinguished in our framework. This concerns the possibility that those respondents which are expected to be very active in the various activities based on the presence of driving factors (large turnover, large series production, high purchasing ratio, high R&D expenditure) are in fact too little active, and consequently less successful in terms of product development lead time and costs and new product costs and quality than the other respondents. This possible explanation does not regard enabling factors: if the presence of an enabling factor does not effectively result in higher levels of involvement, this does not impact the results of involvement (directly).
The survey does not provide information on these kinds of effects of the activity pattern at the respondents. In other words; we cannot determine on the basis of outcomes whether the actual activity pattern fits with the driving factors. Therefore, one key aspect in the analysis of the case studies in the final step of our research is to study this relation between driving factors, activity patterns and the problems and successes experienced in product development projects.

Step five: Activity patterns, problems and successes

In the final stage of the research, we have carried out in-depth case studies at business units of three firms:

- **SweTel** - a Swedish telecommunications equipment manufacturer;
- **NedFood** - a Dutch manufacturer in the food industry; and
- **NedMed** - a Dutch manufacturer of medical diagnostic equipment.

Each of these companies has been studied for a period of nearly two years, though not continuously, by means of a substantial number of interviews with purchasing and development managers, document research and by supervising students' master's theses.

At SweTel, we found that in:

- Development Management, purchasing has developed some policies and guidelines but these have not been integrated with product development procedures and are not well-known at other departments;
- Project Management, initial and operational purchasing tasks are carried out by (physically) separate groups, and lack of information often leads to problems in the co-ordination of production start-up;
- Product Management, a separate department maintains a 'library' of standard components for development purposes, but the lists are difficult to access and often contain outdated or incomplete information.

At NedFood, where we studied several packaging development projects, we found that:

- Development Management is largely absent, since develop-or-buy is not an issue, and policies and guidelines regarding internal and external involvement in product development are virtually non-existent;
- Supplier Interface Management and Project Management are carried by everyone, hindered by a lack of communication and co-ordination structures, saved by improvisation, flexibility and personal relations;
- Product Management is carried out mainly by the development department, often limiting the purchasing department in its possibilities to bring their commercial and market knowledge to bear on the project.

Efficient collaboration in product development at NedFood, both internally and externally with suppliers, is hampered by an extremely decentralised organisation, (perceived) differences in terms of background and attitude between marketeers on the one hand and purchasers on the other, and a look of a good infrastructure for the recording and exchange of information related to product development. Nevertheless, NedFood has been able to turn out quite some new products over the past few years, despite several delays. The problems seem to affect the efficiency more than the effectiveness of the development process.

At NedMed, we studied one development project in detail, at a time in which the company was planning to rely increasingly on the involvement of suppliers in product development. At this company:

- Development Management is not sufficiently performed, as the lack of guidelines for supplier involvement leads to obscurity not only for the internal departments but also for suppliers, which reduces their ability and willingness to collaborate;
- Supplier Interface Management is an area with new demands, since NedMed is trying to change its interface with suppliers by giving them more complex products to develop and to manufacture, requiring more emphasis on market research;
- Project Management seems the most problematic area, with many activities being performed on the basis of personal insights and ad-hoc considerations; and
- Product Management tasks are hardly carried out: engineers see these as the responsibility of purchasers, but the latter are involved too late in the development project and have (still) too little market insight.

At NedMed, the internal organisation seems rather suitable for cross-functional collaboration in product development, with purchasing represented in the development team and special supplier selection sub-teams. However, this formal structure does not guarantee actual and efficient collaboration, partly because the
moment when these teams are formally established is rather late. Another complicating factor maybe the development department’s feelings regarding the company’s strive for increased supplier involvement, which it perceives as partly threatening to its own work. The purchasing department may, in this context, sometimes be seen as an ‘advocate of the devil’ rather than as colleagues.

In each of the three case studies, the problems experienced in product development with regard to purchasing and supplier involvement can be described in terms of the management areas or specific activities. The case studies also show that most of the problems can be traced to underlying barriers or a lack of enabling factors, the most important of which are: functionally-oriented, fragmented internal organisations, lack of (access to) information, and differences in personal attitudes between departments.

Conclusions

Our research suggests that the issues or main activities concerning purchasing’s involvement in product development can all be related to a limited number of underlying processes and are spread over five different management areas (or ‘objects’). This provides a differentiated yet structured view of the role of purchasing in product development. The results of the survey seem to indicate that firms in different situations perform the various activities to nearly the same degree, which illustrates that our framework may be useful in implementing, improving and auditing purchasing involvement in product development in a variety of circumstances. On the other hand, the case studies show that problems may exist in different areas and that companies also focus on different activities or areas. This would indicate that there are factors, other than the driving factors we studied in the survey, which make that an efficient and effective ‘activity profile’ may not be the same for each company. Further research, preferably in-depth case studies of firms that are very similar in terms of their development processes and supplier relations, could provide more insight into these factors.

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<th>Activity</th>
<th>Area</th>
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<tr>
<td>• Provide information / take part in decisions which technical competencies the company should control itself, and what to leave to suppliers (Develop-or-Buy questions)</td>
<td>Development Management</td>
</tr>
<tr>
<td>• Motivate suppliers to develop products the firm needs</td>
<td>Supplier Management</td>
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<tr>
<td>• Exploit the capabilities of suppliers</td>
<td></td>
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<tr>
<td>• Co-ordinate the development activities of different suppliers ('horizontally' and 'vertically')</td>
<td></td>
</tr>
<tr>
<td>• Determine which suppliers to involve, at which moment, and to what extent</td>
<td>Project Management</td>
</tr>
<tr>
<td>• Co-ordinate development activities of the internal organisation and suppliers</td>
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<th>Prioritising</th>
<th>Mobilising</th>
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Table 2: Revised framework

<table>
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<th>Areas</th>
<th>Activity</th>
<th>Key processes</th>
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### Development Management
- Determining which technologies to keep/develop in-house and which ones to outsource to suppliers
- Formulating guidelines for the involvement of suppliers
- Formulating guidelines for purchasing related activities of internal departments
- Communicating policies and procedures internally and externally

### Supplier Interface Management
- Monitoring supplier markets for technical developments
- Pre-selecting suppliers for product development collaboration
- Motivating suppliers to build up/maintain specific knowledge or develop certain products
- Exploiting the technical capabilities of suppliers
- Evaluating suppliers' development performance

### Project Management

#### Planning
- Determining specific Develop-or-Buy solutions
- Selecting suppliers for involvement in the development project
- Determining the extent ('workload') of supplier involvement
- Determining the moment of supplier involvement

#### Execution
- Co-ordinating development activities
- Co-ordinating basic design activities
- Co-ordinating engineering activities
- Co-ordinating proto -typing and production start-up between manufacturer and supplier(s), between first and second tier suppliers and different first tier suppliers

### Product Management

#### Extending activities:
- Providing information on new products and technologies being developed or already available in supplier markets
- Suggesting alternative suppliers, products and technologies that can result in a higher quality of the final product

#### Restrictive activities:
- Evaluating product designs in terms of part availability, makeability, lead-time, quality, and costs
- Promoting standardisation and simplification of designs and parts

* P= prioritising, M= mobilising; C= co-ordinating; T= timing; I= informing.

### References


