Are all industries headed towards the same organizational structure in Product Development?

Cases in Operation Management

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Abstract

This paper discusses organizational changes in development projects in various process industries due to new product development. What brings this change forward and what kinds of problems need to be solved for companies so that they can carry out this change**.**

The companies in the study are in various kinds of process industries, from ore to dairy industries. The research is based on telephone interviews with 50 respondents. The purpose is to give implications of what kind of organizational change that can be appropriate for what industry. Can process industries take the same path as the automobile industry did for two decades ago?

It is indicated that process-oriented industries like ore, steel, and paper, are heading towards a more customer-oriented view in product development projects. The role of supplier and customer in product development projects has changed today and this influence the role of a product developer.

Introduction

Within the last decades, the rapid rate of technological change, shortened product life cycles, and increasing global competition have made product development a critical concern of a great number of companies in a range of industries.

In this competitive environment, suppliers and customers are an increasingly important resource for manufacturer. Research shows that building bridges between functions and to suppliers and customers increased the likelihood of success for the company (Neale & Corkindale, 1998; Song, Montoya-Weiss & Schmidt, 1997). These bridges can take the form of cross-functional teams, partnerships (Magrath & Hardy, 1994), and co-development company (Neale & Corkindale, 1998). In addition, suppliers can have a large and direct impact on cost, quality, technology, and speed (Ragatz, Handfield & Scannell, 1997).

There is a substantive research into factors determining success and failure in product development. Two factors, which are significant in discriminating between success and failure, are *1) Understanding user need* (Griffin & Hauser, 1993), *2) Good internal and external communication in product development projects* (Griffin & Hauser, 1996). These factors have a great impact on internal and external collaboration. But most of the research literature concentrates on one single industry. Therefore, the main purpose of this paper is to compare multiple industries dealing with product development, specifically the main similarities and differences between industries in adopting suitable integration mechanisms that links e.g. suppliers and customers to the product development team. What make the organizational changes successful and what kinds of obstacles need to be solved?

In general, process industries have had stable markets and have just been concerned with process development with a focus on economy-of-scale, i.e. to manufacture products at as low price as possible. But, today, these industries are also affected by the rapid changes in both their markets and in their technology. Many companies focus on different niches and must find a specific product or combine a service to the physical goods to be competitive.

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The focus in this paper will be on the current trend in a range of different industries, the similarities and differences, in Swedish companies that have development projects.

Specifically, the following questions are addressed:

- *What are the main similarities and differences between industries in adopting suitable integration mechanisms that links e.g. suppliers and customers to the product development team?*
- *What make the organizational changes successful and what kinds of obstacles need to be solved?*

The main purpose of the paper is to make a comparison between companies in a range of process industries, from ore to dairy industry. Some of theses industries, like ore, steel and paper, have a tradition of being production-oriented in their product development projects, i.e. the production process states the limits within where products can be developed. The main ideas to product development have traditionally come from the production process.

In this paper, the definition of process industries, is a type of business that has a focus in material/metallurgical/chemical properties and production process in product development projects, i.e., product and process development are close interrelated.

Industries that are compared are dealing with ore, steel, pulp/paper, chemical, rubber, plastics, and dairy products. So why is it interesting to make this comparison? Since these industries are quite different from each other concerning the tradition of being production-oriented or customer-oriented in product development projects, it is of interest to study if this has changed and how and why this has changed in some cases.

However, there are some similarities between the studied industries. Take the aspect of the product, they all deal with products of lower technology. In general, they do not have a design phase in the product development process as other manufacturing industries have. Instead, they focus on development of material or metallurgical properties.

Production or Customer-Orientation

Steel, paper and chemical industries have traditionally had a production-oriented view in development projects where *product* development has often been the result of major *process* development. High investments in machines and equipment have promoted economy-of-scale and production of bulk products. Product development has not been of primary interest due to quite low value-added.

However, what this paper will discuss is the changed interest in product development issues that has increased for some traditional production-oriented process industries. This suggests that there is a change from a traditional perspective on product development towards a more customer-oriented view. Competition and customer needs have today changed for these industries and the demand of higher value-added products has increased. Therefore, it is increasingly important for all kinds of industries to keep contact with markets and customers. This change is reforming the companies' organization and activities. The need for internal and external communication will therefore grow in product development projects. Choosing customer-oriented perspective also mean that the companies need to develop their integration mechanisms. It can range from bureaucratic approaches to more decentralized participatory mechanisms (Olson & Walker, 1995).

However, they can not completely abandon their traditional process-oriented view due to high investments in their production processes. instead they tend to balance between the two perspectives: process versus customer-oriented development.

Many studies demonstrate that cross-functional integration improves product development performance (Song, Neeley & Zhao, 1996; Griffin & Hauser, 1992).

A large body of research indicates that good technical communication within the R&D organization itself is essential for R&D productivity. Face-to-face communication with colleagues working on projects other than one's own has shown a clear relationship with R&D performance in general, and new product development in particular (Allen, 1977). As a consequence, the importance of communication networks in the R&D environment for successful innovation and new product development is already well acknowledged by both practitioners and researchers.

Frequent communication and exposure to a variety of perspectives also stimulate creativity and increase the likelihood of generating valuable new knowledge, and in turn increase the likelihood of producing more successful new products.

Integration between R&D and marketing are of interest in a number of studies. A number of researchers have found a positive relationship between new product success and the integration of activities of two of the functional units involved in the new product process. Some studies conclude that R&D and marketing need to be involved at all stages of the new product process (Gupta & Wilemon, 1996). But is this true for all industries?

Interaction with Customers

The marketing literature has emphasized the importance of the role of the customer in the product development process. But, the customers' role has changed during the last decades, from the traditional role limited to just a consultative one to a more active participant (Gardiner & Rothwell, 1985).

An early and clear definition of the product in product development is identified as one of the key success factors (Cooper & Kleinschmidt, 1993). A close cooperation with customers can play an important part in assisting the early identification of applications and benefits provided by a new technology thus making the early and clear definition of a technology. Customer involvement can be desirable throughout the product development process, not only in the role of refining the technology but also as a test of marketability. This strongly supports co-development, which is where the customer takes a very active role as a team member in a joint development process (Neale & Corkindale, 1998).

The main reasons for developing the closer bonding with customers can be to improve quality, reduce costs, and achieve product satisfaction. Partnership with customers can be an option to create close cooperation. It engages most parts of the company in the crucial role of satisfying and interacting with customers. For example, partnering often requires customer service, transportation, and materials management personnel to have a more direct influence on deliveries, product availability, and order service.

Partnership collaborations usually speed communications, problem solving, and decision making between partners. In any customer partnership, buyer and sellers may try to improve the exchange of transactions, perhaps through computer-to-computer ordering systems or electronic data interchange. However, exchanges of people and ideas can be just as crucial (Magrath & Hardy, 1994).

Interaction with Suppliers

A considerable amount has been written documenting the integration of suppliers in the new product development process (Ragatz, Handfield & Scannnell, 1997).

Highlighted in the literature is the importance of integration with external parties. Here, R&D collaboration with competitors as well as co-development with key suppliers and close involvement of key customers in the development process can be optimal.

Product development teams must today find the means for speeding time to market while also improving product quality and reducing product costs (Song, Montoya-Weiss & Schmidt,

1997). Cross-functional teams have proved effective for meeting these challenges, and such teams may extend beyond company boundaries to include key materials suppliers.

Effective integration of suppliers into the product development can yield such benefits as reduced cost and improved quality of purchased materials, reduced product development time, and improved quality of purchased materials, reduced product development time, and improved access to and application of technology. It is clear that supplier involvement in product development is happening, and at least in some cases has significant potential benefits as significant performance improvements and competitive advantages though not all integration efforts are successful (Ragatz, Handfield & Scannnell, 1997).

Process Industries

Industries like ore, steel, and paper are today faced with a more customer-oriented view of product development. Therefore, there is a need of a closer cooperation with customers. In comparison to chemical and dairy industries, who traditionally focus on the customer in their product development projects, what differs in the cooperation with customer and suppliers? Can they all adopt the same procedures, structures and means, or are there other factors that must be considered?

In process industries, there are other factors that matter in product development than just time-to-market. Because development concerns material properties like metallurgical, chemical or biochemical, the time factor may not be so essential. However, it is important that the customers want the "new" properties. Compared to other consumer goods, process industries goods are often a link in the value chain consisting of raw material (e.g. wood fiber, raw steel), semi-finished products (e.g. liner, steel bars) and finished products (e.g. cartons, plates). These products are converted into more higher-added products.

There are several conditions that distinguish process-based companies from manufacturing industry (Tottie & Lager, 1995). Some are:

- Process industry is often a part of a long chain of customer/suppliers who do not always have access to information from end-user.
- Suppliers often deliver material, not components.

New product project that feature high-quality marketing actions, as preliminary and detailed market studies, customer tests, field trials, and test markets, as well as launch, will have more than double success rates than those with poor marketing actions. But does this apply to all industries?

Research

The main purpose of this paper is to investigate the change of organization of product development in various industries, e.g. the occurrence of collaboration with customers and suppliers in product development projects.

Method and Interviews

This paper accumulates the results of two studies. The studies investigate companies in industries that are here called process industries and they all have some kind of development projects, with the focus on the product or the production process.

Product development is to a great extent context dependent (Trott, 1998). Trott points out that the management of the process is dependent on the type of product being developed. A way of looking at this is to divide the wide range of activities involved in the development of a new product into technical and marketing activities. *Figure 1* shows the product

development activities divided into the two categories. Against this are placed a variety of industries to illustrate the different balance of activities. It becomes clear that industrial products (products developed for use by other industries), such as paper or raw steel products, have many different considerations compared to those of a new diary product. In the latter case there will be much more emphasis on promotion, launching and packaging, whereas the steel product requires technical meetings with customer concentrating on the aspect of material properties.

Figure 1. Classification of new product development activities across different industries, (developed from Trott, 1998).

The two studies include one exploratory study that includes four case studies and the other study has a more quantitative approach with 50 companies participating. The focus in both studies is on product development projects or in some cases process development.

Due to few research attempts on product development in process industry companies, personal and telephone interviews were considered to be best in this stage of the research. This is due to the fact that it is an area of little knowledge. Semi structured interview technique was applied with a focus on some issues, e.g. organization of product development, competence supply. In this paper, the main focus of the analysis is on the development project and its implication on a company level.

General Findings and Implications

- *What are the main similarities and differences between industries in adopting suitable integration mechanisms that links e.g. suppliers and customers to the product development team?*

The trend today is that the companies in following industries; ore, steel, paper, chemical, rubber, plastics, and food industry, are to some extent interested to find links to their customers and suppliers. This mean that (product) developers have to change their relationship to their suppliers and customers and find suitable integration mechanisms. They have to build new networks, find partners etc. The change requires other kind of information to the development projects, and this change has implication on how to require and distribute the information.

The main similarities between the industries are that

- they work with cross-functional teams
- they experience faster changes in the markets today
- they work more closely with customers or /and suppliers today
- they need to systematize information to development projects.

The study shows that there is no difference in how to organize product development projects between the industries. The difference is mainly due to the product the company manufacture. All industries work with cross-functional teams where R&D and marketing play an important role. However, the cooperation between R&D and the rest of the development team, especially to marketing, could improve.

Today, the product, that a company manufactures, is no longer just the physical product. It can contain a great deal more. It can be a package of the both the goods and

service that accompanies it. A company that is characterized to be a process industry has two major strategic choices to make in order to be competitive today.

One choice is to be bought or incorporated in a global corporation. Then the company can maintain to act on economy-of-scale, i.e. they can focus on their production processes, reduce costs, and focus on efficiency.

The other choice is to maintain single and to find its niche product. This choice require that either the product is so special that it can obtain a high price or that the product is transformed to include both the goods and the service around it, i.e. a whole concept is the product. This can mean that the company, for instance, is a partner of the customers' development work. It is not just a supplier, it is also a partner and have an increased

In summary, there is no major differences in adopting suitable integration mechanisms to enable closer interaction with customers or suppliers. For ore, steel, paper and some chemical products it is essential for product developers to be able to show the benefits of the product, the material properties. Therefore they need to visit customers to ensure that the customers' process can operate the product efficiently. Then there is also an opportunity to discuss the product's advantages more thoroughly.

Building synergies between interesting partners and collaborating with both suppliers and customers will increase in the future.

- *What make the organizational changes successful and what kinds of obstacles need to be solved?*

Due to the fact that there is a turbulent environment for all companies in all kind of industries today, the study indicates that to be successful and competitive on the market today a company needs to break with all traditions evaluate the current position the company has on the market. Should the company be production-oriented or customer-oriented, i.e. reduce costs or find its niche product?

However, the study show that to have a production or customer perspective on development projects does not matter today. The company must have close links to some key customers or key suppliers to be successful today.

In summary, from a number of studies we know that integration is often crucial to carry out product development work successfully. This study shows that traditional industries like ore, steel, paper, chemical and dairy industries in some aspects are taking the same path as the manufacturing industry, especially the automobile industry, did for two decades ago.

The results show that there is a trend that all industries are dealing with some organizational changes today. Companies must either make a strategic choice to grow, by incorporation of a global group, acquisition etc. or make the choice to niche its business, e.g. develop specific properties in their products or change the product concept, i.e. offer a specific service around the goods.

The current change in product development projects for industries like steel and paper is due to the changes in the industries' markets. The product development time is decreasing and the concept of the product is changing. Product developers have a changed role today compared to 10 years ago. They must work in networks and have a greater understanding and knowledge of a greater span of the products place in the value chain. They must have knowledge about the raw material, customers product and processes, and in some cases, have knowledge about end-customers.

Future Research and Limitations

Understanding market and customer needs is one of the key to successful innovation. This holds true for both commodity and specialty chemical companies, even though their disparate markets and operations naturally lead to different approaches to innovation. Because of the usually high investment and long lead times required to scale up commodity chemicals and plastics, market needs and trends should be more clearly understood over a long time horizon. Ideas are often generated internally and may be related to product and/or process improvements.

This paper only scratch on the surface of the organizational changes in process industries. The research area need deeper analysis. It is a neglected area.

References

Allen, T.J., *Managing the flow of technology*, MIT Press, Cambridge, MA.(1977).

Cooper, R.G. and E.J. Kleinschmidt, *Screening new products for potential winners*, Long Range Planning, **26**(6), 74-81 (1993).

Gardiner, P. and R. Rothwell, *Tough customers: good designs*, Design Studies **6**(1), 7-17 (1985).

Griffin, A. and J. Hauser, *Patterns of communication among marketing, Engineering and manufacturing – a comparison between two new product teams*, Management Science **38**(3), 360-373 (1992).

Griffin, A. and J.R. Hauser, *The voice of the customer*, Marketing Science **12**(1), 1-27 (1993).

Griffin, A. and J.R. Hauser, *Integrating R&D and marketing: a review and analysis of the literature*, Journal of Product Innovation Management **13** (3), 191-215 (1996).

Gupta, A.K and D. Wilemon, *Changing patterns in industrial R&D management*, Journal of Product Innovation of Management **13**(6), 497-511 (1996).

Magrath, A.J. and K.G. Hardy, *Building customer partnerships*, Business Horizons **37**(1), 24-27 (1994).

Neale, M.R. and D.R. Corkindale, *Co-developing products: involving customers earlier and more deeply*, Long Range Planning **31**(3), 418-425, (1998).

Olson, E.M. and Jr O.C. Walker, *Organizing for Effective New Product Development: The Moderating Role of Product Innovativeness*, Journal of Marketing **59**(1), 48-62 (1995).

Ragatz, G.L., Handfield, R.B. and T.V. Scannell, *Success factors for integrating suppliers into new product development*, Journal of Product Innovation and Management **14**(3), 190-202 (1997).

Song, X.M., Montoya-Weiss, M.M. and J.B. Schmidt, *Antecedents and consequences of cross-functional cooperation: a comparison of R&D, manufacturing, and marketing perspectives*, Journal of Product Innovation Management **14**(1), 35-47 (1997).

Song, X. M., Neeley, S.M. and Y. Zhao, *Managing R&D-marketing integration in the new product development process*, Industrial Marketing Management **25**(6), 545-553 (1996).

Tottie, M. and T. Lager, *QFD-linking the customer to the product development process as a part of the TQM concept*, R&D Management **25**(3), 257-267 (1995).

Trott, P. *Innovation Management and New Product Development*, London Pitman (1998).

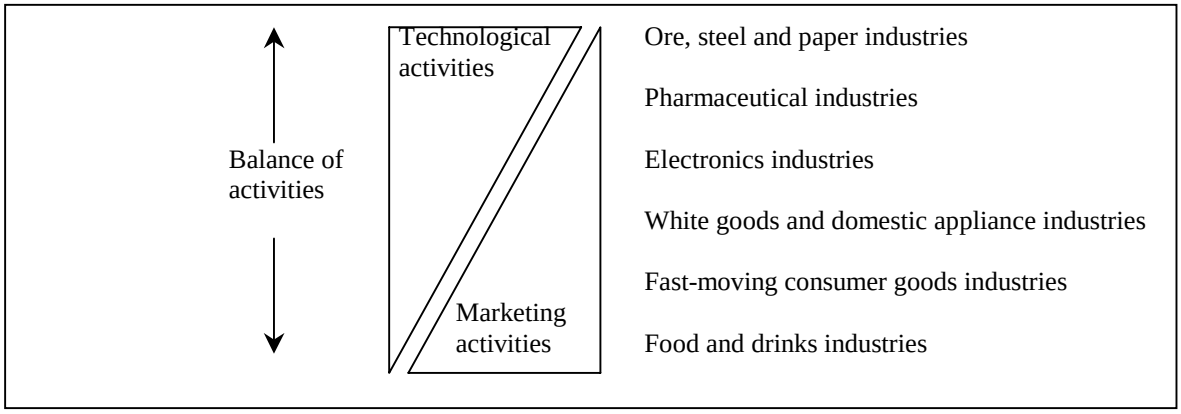

Figure 1. Classification of new product development activities across different industries, (developed from Trott, 1998).