COMMUNICATION IN PRODUCT DEVELOPMENT
PROJECTS IN STEEL AND PAPER INDUSTRY

Diana Chronéer and Sven-Åke Hörte
Luleå University of Technology, Industrial Organization
S-971 87 Luleå, Sweden

Abstract

The information and communication flow in product development projects, for companies dealing with paper and steel products, are discussed in this paper.

Today, paper and steel industries face a more customer-oriented view in product development issues. Keeping contact with markets and customer is getting increasingly important for these industries. A total of 20 respondents at four companies were interviewed to achieve an understanding of how these industries keep their contact with their R&D and their customers. The study indicates that customers’ feedback into the product development projects is significant for paper and steel industry. But that there is a need of a more systematized way of gathering this information. Another issue is that centralized R&D should take more responsibility in using market information more effectively, i.e. as input to future products.

I. Introduction

This paper discusses how communication and information flow, especially between R&D and marketing should be managed concerning product development issues in steel and paper industries. These industries deal with products that have other attributes than that of the traditional manufacturing industry, i.e., the properties of the material, and they may today face a more customer-oriented view, where the importance of right communicative links to the markets have come to grow. But how should this communication and information flow be managed? Is there a difference between these industries and the traditional manufacturing industry, in organizing this R&D/marketing/customer interface?

It is the interface R&D/marketing and the link to customer that are at focus. How product development issues are dealt with in companies dealing with products of lower technology. Traditionally, these industries have been very production-oriented but now there is a trend towards a more customer-oriented view.

A. Communication and Information

The importance of marketing’s and R&D’s role, in product development projects, are discussed in various research studies [6, 9, 11, 12, and 14]. The application of information technology to sales and marketing has brought tighter coordination between sub functions [2]. But how important is this interface between R&D and marketing for paper and steel industry? Can more specific guidelines, on how to receive and gather information in this interface, increase valuable information into product development projects?

Understanding customers’ wants and needs is close connected with the marketing and R&D disciplines. Information gathering and sharing and well-functioning communication links are often stated in the literature as success factors of product development projects [3, 4, 5, 6, 8, and 9].

The relationship between organization structure and the quality and quantity of information exchange and sharing are indicated in the literature to contribute to a project’s success [9, 11, and 12].

To have technology that enables a more structured information gathering and sharing give benefits in the process of product development. QFD (Quality Function Deployment) is one technique to enhance communication between functions.

QFD was developed in 1972 at Mitsubishi’s shipyard and is today used in some companies to encourage more communication with members of the organization external to the development team. Its relationship matrix translates customer needs, the language of marketing into more technical terms. But is it enough to implement a technique as QFD to improve information gathering and sharing from the customers to product development issues? However, alone it might not reap its full range of benefits [7], but in conjunction with other means or techniques it may offer great advantages.
II. Paper and Steel Industry

Paper and steel industries are today faced with a more customer-oriented view of product development. This has led to the issue of changing their traditional procedures and structure of organization when dealing with product development. These industries may be entering a new era, as the manufacturing industry entered a decade ago. But how do and should these industries create suitable communicative links to their markets and especially to the customers? Can they adopt the same technologies and means as the manufacturing industry?

In paper and steel industry there are other factors that matter in product development than just time-to-market. If development concerns material properties, the time is not so essential, but if it concerns new product appearances or application areas the time-to-market is more important. But still, to be able to predict future needs and to develop new products, "the voice of the customers" has to be heard.

Paper and steel products, compared to other consumer 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.

A. The Paper Industry Context

Paper is a substance manufactured from wood fiber in the form of sheets, used for writing, printing, wrapping, packaging and so on. Paper is an intermediate industrial material that is used for further manufacture, becoming part of a final end product. Some of the most important characteristics of paper are low cost, high performance to weight, and convenience of use.

There are different grades on paper developed. These are:

- Bulk products, standardized products, with a competitive emphasis on product price and with a focus on cost reduction. Process development plays a significant role.
- Specialty papers, where the value-added is high and the markets small and heterogeneous. The competitive emphasis is on many other elements than price. Product development is more important.
- Semi-bulk products, where the markets are quite large and cost competitiveness are significant. The products have a relatively high added value and quality requirements are high. Product development, focused on quality differentiation, and process development, focused on quality improvement and cost reduction, are important.

1) The Product Development Process

Until 1980s, product development has had a minor role in the paper industry. Today, this has changed and development of new products has increased. The main development work is performed at individual paper mills.

The product development process can be visualized as a three-phase model: conceptualization, investment, and start-up.

This process begins with a conceptualization phase, where an exploratory work and idea formation is initiated by the paper mill with a particular new product in mind. This phase contains idea generation, market research (analyses of customers, markets, technical issues), pre-planning. Laboratory research of material properties is also conducted in this phase. It is perceived that early market research is an extremely important activity. Before the next phase can start, decisions at several managerial levels have to be carried out. This phase is not well structured, there is an uncertainty of the project’s existing.

If the management gives its approval, the second phase, investment, starts. This phase comprises the implementation decision, equipment acquisition, construction and installation, test runs, test marketing and feasibility demonstration, and initial quality development. This phase is more structured with time schedules etc. It is more defined as an investment project, in the paper industry.

The third phase, start-up contains a more detailed planning of product development, optimization of several parameters in the process, market introduction. It covers the process from the start-up of commercial production to the point of time where the new product established itself technically.

2) The Project Development Team

Who is involved in product development project in the paper industry? Usually, the core team is the same during the whole product development process. These members are situated at the individual paper mills. Technical support personnel or process engineers often come up with ideas of new product concepts.

A core project team consists mainly of product developers (technical support), process engineers and laboratory personnel at the paper mill. Marketing is mainly part in the beginning and the end of the product development process. Additional, suppliers of chemicals and machines give significant information in the conceptualization and investigation phases. Suppliers of such chemicals as starch, caolin and carbonate used as coating are necessary players within development work. The industry also supports a joint pulp and paper research laboratory, which also gives valuable information in product development projects. Its tasks are mainly focused on basic research issues.
There are today many different types of thickness and breadths, diameters, quality requirements on industrial paper. Therefore, more consumer-directed products need to be developed. Today, customer is more buying properties in the paper, i.e. they want certain strength, printing properties etc. So the trend is that the market has more influence on products.

Customers, as potential development participants within paper industry settings, are seen as a more natural choice today. Interaction with key customers is perceived to be most intensive during, especially, trial print routines of the market development activity stage of the development process.

B. The Steel Industry Context

The Swedish steel industry concentrates largely on special purpose products, which require very high quality. The industry’s continuing competitiveness entails substantial investment in research and development.

Research and development of different steel qualities has focused almost exclusively on the demands placed on the finished product. Little has been done in the way of improving steel properties that can help to cut costs in the chain of production: from steel semi-finished to finished products.

One major factor for steel product producers is machinability. It is often the most important cost factor in production, but it is also a complex matter. Machinability is a measure of how easily a material may be worked in different cutting operations (e.g. measure of tool life). Machinability depends on the interplay of other factors, especially machines, tools, skill, and material. Good machinability means that customers are able to increase their production efficiency and reduce the cost for the finished product. They can reduce set-up times and increased production flexibility.

Quality is an aspect that is important for steel products. That a company can guarantee quality is an absolute necessity in the light of the ongoing integration between producers and customers.

1) The Product Development Team

The core of product development teams consists of members from development, marketing and production. These develop the product concepts. Institutes and universities can be consulted, if the competence is not in-house and to obtain objective analyses of test runs.

Customers are a source of valuable information. Sales administration can have a key role in the interplay between the steel company and the customers. Future improvements will largely be a result of increased understanding of the customers’ problems. Where new demands on productivity as well as material properties such as breaking and fatigue strength, and so on, will increase the market for new steel products.

Steel is a special product requiring know-how by both sales people and customers. It is important that the people who sell steel are knowledgeable about technical features. In order to get the best benefits from the steel the customers need to study the technical data and test results that have been gathered. The link between marketing and production is development department.

2) The Product Development Process

The product development work in steel industry can involve different levels of development. It depends whether it concerns material properties, the product qualities or the application areas. It can also concern complete new products or just modification of existing products. Today it is important for companies to be able to solve various customers’ problems. This has led to that development work can comprise of complete systems and parts.

Many investment projects have been carried out in the last years.

The base for development work is good knowledge about the market and technology development. The knowledge about the market is developed and maintained with daily contacts with the marketing department and through direct contacts with customers.

Product development process is different if development concerns new metallurgical properties or the actual product; e.g. plates, rounds bars or bulb flats rails. Development of metallurgical properties involves a much more time consuming process with metallurgical departments (it can take 20 years). The project focus will then be on marketing the new steel property.

Major projects, for steel products as plates for construction, can be described with the three-phased model consisting of: conceptualization, investment and start-up/introduction. The start-up phase will be more characterized as introduction of the product. The project becomes well structured when there is a decision of investment in the process. Minor projects, concerning modification of existing products, are often performed without a formalized plan. It is achieved after different priorities, given by the marketing.

To be a fully integrated producer with a control over their products from start to finish, is privileged to just few companies. There is an advantage if all production units are situated next to one another. This simplifies short communication lines with internal logistics.
III. R&D/Marketing Interface

Approaches to new product development are dependent on the industry, which defines to a large extent the environmental uncertainty faced by individual firms. Paper and steel industry is today oriented towards both market and production. Seeking a balance between them is appropriate for the organization’s strategy and environmental is the key.

Is there any difference in the importance of knowing and gathering customers' wants and needs and how R&D and marketing are involved in product development in comparison to e.g. the automobile industry?

In order to keep market shares and to keep up with the rapid change of technology in their markets, paper and steel products must today be processed with greater care to gain higher value added. This leads to a higher degree of interest in product development in these companies. Following issues are of interest in this study:

- How do companies in paper and steel industries gather information to their future product development projects?
- How is the link to customers constituted for these companies?

Many studies have focused in one way or another on the factors, which contribute to successful product development [1, 9, and 10]. But there is a scarcity of research on paper and steel industry product development.

IV. The Study

The purpose of this study was to investigate how paper and steel industries deal with issues like communication and information in product development projects.

Four companies were selected to participate in this study. The criteria for these were that they would represent the type of industry, which is here called process industries. Here, the definition of process industries is a type of business that traditionally has a focus in material properties and production process in product development projects.

Two companies dealing with pulp and paper and two dealing with steel products participated in a study concerning product development issues. These four companies are selling products that might be further developed by their customers.

Due to few research attempts on product development in process industry companies, interviews were considered to be best in this stage of the study. 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. cooperation and integration. A total of 20 respondents were heard, including managers and project members with varied backgrounds (marketing, technical, production, engineering).

A. NUD*IST

To be able to structure the interviews in a proper manner, and then to analyze the material, a software program, NUD*IST (Non-numerical Unstructured Data Indexing Searching and Theorizing), was used. It is a computer package designed to aid users in handling non-numerical and unstructured data in qualitative analysis, by supporting processes of coding data in an index system. NUD*IST simplifies text search. Searching patterns of coding and theorizing about the data are other qualities of the software.

V. General Findings

A. How do companies in paper and steel industries gather information to their future product development projects?

It is clear that the companies studied are concerned about the link to customers in an attempt to increase the information to their product development. To be able to show benefits of the product, the product properties, visits to customers are required. The product can then be converted in the customer’s own workshop, with their machine qualities.

There is a dialog between the R&D center and the paper mills about different development issues, but there is no structured feedback or exchange of information of possible new product ideas. R&D centers do not really come with pure ideas of product development issues. They are often more concerned about cost efficiency and research issues around the world.

There is indicated in the study that there is no formalized link between R&D and marketing. Suitable integration mechanisms, that will enable communication between them, are missing. The information sharing has a more informal character.

B. How is the link to customers constituted for these companies?

The link to customers is often through technical support and sales personal. They are the one who can gather important information from customers that is needed in development of future products.

Technical support services play a significant role in the contact with customers. But it is, however, preliminary in complaints of existing products that they obtain information about e.g. the misfit in quality, not obtainable printing qualities. Otherwise, they are suppose to obtain information from customers.
about their problems so that product and process development can be based on their aspects. So visits to customers, studying their production process is of great importance to achieve understanding of a product's limitation and possibility. These visits are summarized in reports, but to achieve a holistic view of future product development, these reports should be structured and shared in a suitable way.

It is important for sales personnel to have a deep knowledge about both technical issues and material properties. This material and technical competence at sales personnel enables deeper discussions with users/end-users of the products. Further, it leads to the fact that more valuable information can be obtained from the customers. So it is essential that sales personal obtain a thorough education about the product/s. They are the one who get the first feedback from customers. Today, there is no systematic way to gather this information. There is a great deal of information stored at sales personal, but how should it be documented and structured so that it can be of help to developers? To increase knowledge about customers problem and how solutions should look like? This information should be shared with R&D and developers so that it will be a source for future product ideas.

VI. Implications

The companies studied require a more systematic way to structure the feedback from their customers. This systematization of the feedback will then enable a more long-range perspective on product development work. Due to sparse resources, however, it is easy to just plan for a year or two in product development issues.

The information that reaches various development groups is more of an informal character (e.g. discussion with customers at trial runs). Therefore it can be difficult to obtain a holistic view of various customers wants and needs. A simple but effective technique, as e.g. QFD, may be of aid for product development teams to achieve ideas for future product development. The use of QFD can help to strengthen the product development process. Tottie and Lager report that this tool have been successfully applied in a company that is a supplier of advanced iron ore products [13]. This indicates that a technique as QFD can be applied in various types of industries and be an effective tool in systematization of customers' wants and needs.

It is indicated in the study that there is a lack of managerial support for integration mechanisms for companies in paper and steel industries. Due to the indicated new trend, towards a more customer-oriented view for these industries, management should review their organizational structure and links between various disciplines. There is no indication that paper and steel industries should differ in this aspect of importance of information gathering and sharing, from e.g., other manufacturing industries.

Suitable integrating mechanisms should be outlined. Examples can be:

- Joint meetings of marketing, R&D personnel and product development members can encourage open discussion and debate different viewpoint.
- Procedural guidelines at the planning phase of the product development process can establish formal lines of communication and exchange that will support the establishment of informal communication.

Management should be involved in designing communication strategies so that barrier to communication will diminish.

Customer preferences may not be known by the customer themselves, so therefore it is of significance that information from market analysis are gathered and shared so that no misunderstandings due to language or cultural differences occur.

VII. Conclusions

Communication is identified to be a critical integrative facilitator. But the frequency of communication is not important as the quality of the communication [11]. So understanding customers' wants and needs ultimately comes down to a company's capabilities for gathering and using market information. The gathering and sharing of information are important, but only if the information is used effectively. Just gathering information is not enough; sharing market information across functional areas is also critical to finding future product development projects.

Structured tools, such as QFD, appear to be most important in terms of providing a forum for sharing information. Integration mechanisms must be put in its right place to be able to modify information flow. Then it can move from group to group throughout product development phases rather than just to some selected individuals. Process industries, like steel and paper, are suggested in this paper to find suitable means to structure their information gathering and sharing to facilitate their future product development work.

It is indicated that market information processing is equally important in these industries studied and that information usage can come to play a significant matter for future product development. So to facilitate communication and interaction, between R&D and marketing, extra efforts need to be made to review the current organizational structure.
It is clear that the input and the feedback from customers are not satisfactory documented and spread within combines and disciplines. There is no systematic way to gather all the information about customers’ views and problems, this to create ideas about the products of the future.

Marketing should, in these industries, play a supporting role to R&D, like in other industries. A critical part of marketing’s coordinating role is managing the flow of information into the company and between departments. Implementation of sales, marketing, and management information tools can help the marketing function to assume a more powerful and effective role.

A unified platform should facilitate the discussion of the feedback from the customers in regular meetings concerning future developments. This platform would enable a forum where documents are structured in a simple system so that all information from the customers is stored in similar pattern for the whole company and combine.

Several limitations of this study should be identified. First, the result should be considered as exploratory by nature because of the low number of firms participating and the low number of interviews. Second, the interviews were limited to one occasion at each respondent. No follow-up interviews were done.

The study is of an exploratory character and the author has just scratched the surface of an area that merits further in-depth research. Deeper insights of suitable means and techniques for paper and steel industries will be gained by a more effective investigation of the communication interface between R&D, marketing and other product development members.

VIII. References