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**The Marketing-product Development Interface
- Information Acquisition for Product Development -**

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The Marketing-product Development Interface

- Information Acquisition for Product Development -

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Abstract

In the traditional company marketing approach, marketing people concentrated on how to sell the enormous volume of products, and how to achieve specific quotas based on the human relationships with clients built up by individual salesmen. On the other hand, the main concern of today's leading companies is "intelligent marketing". Here, a "total solution-oriented business" is important, which not only involves selling products, but also gathering information from clients and making business proposals to clients. Here, by focusing particularly on marketing as a link to the market, we shall show that if there is poor interfacing with product development, this marketing strategy will not succeed.

The question and topic addressed by this research was the marketing-product development interface in the context of what product strategy we should introduce in an uncertain market. The hypotheses we introduced were based on two points. First, concerning the hypothesis that "marketing information is useful in product development", the answer was negative. Next, concerning the hypothesis that "the value of marketing information varies depending on the product development process", the hypothesis was corroborated, and we found that the information required for new product development does have different requirements for each process and new product type. We found that new product development processes and new product types are intimately related to the need for acquiring information and the effect of decision-making.

Now, when considering product development in highly uncertain markets, I would like to discuss whether marketing information or information-gathering functions play a useful role in product development, and if they do, what that role is.

Firstly, the topic: "marketing is the link between the market and product development" is discussed here. Let us assume that the role of marketing as concerns the relation between the market and companies, is to bring companies directly into contact with the market [2,17,18]. In this context, the information flow in product development becomes clear, but there are two types of information, i.e., market-marketing that is the flow of information between the market and companies, and marketing-product that is the flow of information within a company. When we consider a company's marketing activities, we often hear the words external marketing and internal marketing. If this internal marketing is marketing-product development, and the external marketing is market-marketing, specific relationships emerge. In the contingency theory¹, if there is a high degree of technical and market uncertainty, the interface between marketing and product development is strongly related to the success of product development, and conversely, in a market with a high degree of certainty, the connection is not so strong [11,12,19-22,26,28,31-35].

In the traditional company marketing approach, marketing people concentrated on how to sell the enormous volume of products, and how to achieve specific quotas based on the human relationships with clients built up by individual salesmen. On the other hand, the main concern of today's leading companies is "intelligent marketing". Here, a "total solution-oriented business" is important, which not only involves selling products, but also gathering information from clients and making business proposals to clients. The marketing is not concerned merely with sales volume, but more with profit that has the highest merit. Here, the traditional mentality gives way to a client-centered approach based on analytical and planning expertise. And in order to implement this "total solution-oriented business" or "proposal-oriented marketing", the most important factor is a company's total combined potential, i.e., an integrated sales and marketing strategy, which today's managers are stressing as the most important factor. Here, by focusing particularly on marketing as a link to the market, we shall show that if there is poor interfacing with product development, this marketing strategy will not succeed [19-22]. Therefore, in "intelligent marketing" for today's world, the importance of internal marketing, i.e., the importance of interfacing with product development, is becoming even greater.

And when we discuss the relationship between marketing and marketing-product development functions of information gathering become more important. There are

two ways of thinking concerning this. One is that the required information is not correctly reflected in making decisions, and that marketing people themselves may not be good at gathering information. According to the research of Gerald Zaltmann², utility information and conceptual information are both required for decision-making [1]. Utility information is information directly related to making decisions. This information is directly related to specific technical policies in product development and product functions. On the other hand, conceptual information is information collected to verify the validity of a particular way of thinking about a problem. For product development, the information will include new product prices, product launch dates and distribution information relating to competitor firms. Whatever the information, its value depends on whether it is directly related to decision-making, so information unrelated to decision-making is considered to be of no value and is discarded. In considering the marketing-product development interface, a company must have the ability to filter information reflected in decision-making from information that is not.

1. The structuralization of problem awareness by the KJ method

We have been looking at several possible clues in order to explore the concepts behind measures to deal with the problems of the market-marketing interface, and market-product development interface. The problem of marketing and product development is very familiar to a company, and as far as concerns the marketing activities of a company, it is a problem that everyone experiences.

Using questionnaires, to analyze the problem of the interface of product development and marketing in a typical Japanese company, we undertook a qualitative study by the KJ method³. According to the Union of Japanese Scientists and Engineers (Nikka Giren), the KJ method is defined as a "method of coordinating language data collected in a haphazard state by mutual affinities in order to clarify problems that should be resolved." In other words, this method attempts to clarify underlying problems and their structure from phenomena derived from experience. The reason we used the KJ method on this occasion is to collect facts or information about the present situation without restriction so as to understand the marketing-product development interface, although this had not yet been properly explained.

We assembled five persons with actual marketing experience in a company, and asked them to fill in cards by summarizing their experience of phenomena where they perceived a problem to exist. In this study, phenomena covering 65 items were identified. Next, these phenomena were classified into small groups according to their

nature, a title was attached to each, each group was expanded into a larger concept, and finally condensed into four problem points. In this way, marketing-product development interface problems were summarized in the following four categories:

- (1) Information gathering by marketing for the purpose of product development.
- (2) The difficulty of paradigm conversion in marketing
- (3) Understanding of intention in marketing and product development
- (4) Egoistic attitudes in the development of new products

Problem extraction by the KJ method can be considered to reflect awareness and dissatisfaction based on the participants' past experience regarding the marketing-product development interface. This can be considered to reflect the gap between the ideal form of the marketing-product development interface, and reality, for each participant. Thus, by looking for each participant's idea of how the marketing-product development interface should be, and identifying how this deviates from the present situation, it is likely that we will discover some clues to solving the problem. This research takes such an approach.

2. Relation of marketing to product development

In recent years, company product development, having experienced a product development rush since the high-growth period, has concentrated on efficiently supplying the market with various kinds of high-value added products in as short a development time frame as possible. Top priority was always given to an efficiency concept wherein the craftsman's traditional work and sensitivity were eliminated as much as possible. A noteworthy example is the quality control organization represented by ISO9000.

In a marketing organization that gives such priority to quality control, product development itself becomes a control target and the acquisition of ISO9000 is itself a marketing target, but this can also be seen to have little relevance to the marketing strategy that makes a product a "hit". For example, the concept behind product development in ISO9000 is built into the marketing system right up to the decision-making process from product planning, the training of people involved in product design, the need to take on the work, qualifications, product plans, designs and test marketing culminating in manufacture and sales. Although it offers effective marketing criteria with the idea of "reducing wastage" and "eliminating errors", it has nothing to do with criteria for determining how to serve market needs and how to make a difference from competitor products. On the other hand, from the market or customer

viewpoint, if a standard like ISO9000 is actually received, it is a guarantee of quality and is the maximum proof of security.

Based on the present situation, I will consider the present product development situation in a typical Japanese company. As mentioned above, the acquisition rate of ISO9000 in major companies is very high, according to which various control items are specified from planning through product design up to product sales under the banner of improved quality. For example, decision-making criteria for drawing up and approval of plans, and who has the final decision, are all specified. From this viewpoint, the product development organization and the decision-making structure in typical companies, have many points in common. This means that there is little room for individuality. Thus, assuming that product development structure, processes, etc., will not change much in each company, how is competitive superiority in product strategy and development considered in relation to the market? Probably, the superiority or inferiority of product strategy in the product planning stage is an important factor [37]. The superiority or inferiority of product development by a company is decided by the speed of each development process, its efficiency, and the quality of the work itself [14,38]. If this is so, by satisfying quality regulations such as ISO9000, the competitive superiority of a product will improve considerably in aspects such as speed and efficiency, but the quality of the work itself remains an element that cannot be copied. Here, a difference will arise in the competitive superiority of those companies acquired ISO9000. So, how does this relate to whether a product is well made or badly made? Here, we have to consider the effect of product strategy, competitive environment and an organization's marketing capability on product development.

Concerning this proposition, Clark-Fujimoto had indicated information marketing to be an important factor. Information value is created, assimilated, selected, nurtured, consolidated and finished during the product development process [3,4]. Thus, this store of information is woven into the physical form of a product, and the consumer who purchases the product will consume this information in the form of experience of using the product.

Thus, within product development there is non-efficient product development, and what determines whether a product will make, or, it will not, i.e. what determines the difference in competitive superiority between companies involved in product development is whether information is correctly passed on from the market (consumer) to product development, or from companies to the market (consumer) through the products [6,7]. The problem here is whether or not marketing is fulfilling its role of acting as a medium for passing information between the market and product

development, and whether or not the fulfillment of that function is the source of a company's competitive superiority. I would now like to discuss this further.

3. Postulation of hypotheses and existing studies

Product development is an ordered process as we already mentioned in the preceding section. In the product development process, interfacing with all departments and functions is important.

In the existing research, some studies have mentioned the interface problem and considering the importance of product development and marketing integration, have interpreted it as a framework for applying contingency theory to product development. Lawrence and Lorsh et al (1967)⁴ considered the integration of product development and marketing as a process that unifies activities between various departments to complete an organizational task, and described the importance of the interface between three organizations (subsystems), i.e., marketing, manufacture and product development [20]. Here, assuming that the efficiency of integration between every two subsystems also affects the degree of integration of the whole organization, we conclude that continuous product development and improvement are important conditions for integration [23]. Within the framework of this contingency theory, marketing and product development are mutually dependent as far as concerns the information flow required for innovatory creation, important decision-making and allocation of development resources, and stressed the importance of organizational integration at the high level of having common objectives and mutual cooperation [31-35]. Concerning marketing and product development, other studies followed on the required degree of integration, the extent to which integration is achieved and the relation between integration and the success of product innovation.

First, regarding the required degree of integration, Lawrence and Lorsh (1969), and Galbraith and Nathanson (1978), said that organizational strategy and environmental uncertainty determine the balance between marketing and product development [13,19-22]. Freeman (1974), and Parker et al (1978), considered a company's product development strategy on six levels - aggressive, defensive, imitative, subordinate, traditional and opportunity, and Miles and Snow (1978) likewise assumed estimation, analysis, defense and reaction [10,24,27]. They said that the need for a degree of integration is determined by these strategies, and the uncertainty of the expected environment such as the strategy of other competitors, customer product requirements, the technology itself, product performance, design restrictions and the appearance of

new entrants [10,24,27]. That is, as product strategy changes from active to passive, the need for integration decreases. Conversely, the higher the environmental uncertainty, the higher the specialization and the greater the differentiation within the organization. If differentiation increases in this way, the uncertainty will become segmented for each differentiated subsystem. However, as specialization proceeds and subsystems become more extended, it becomes increasingly difficult to strike a balance between subsystems. Due to this reason, there is an increased need for integration between organizations as the uncertainty increases.

As to the question of how integration is attained, according to studies by Gupta et al (1985), the specific factors involved are the influence of organizational structure, attitudes and enthusiasm towards marketing integration, and differences between product development and marketing differentiation in new product development [11,12]. They claim that within the organizational structure, a formal organization has less specialization while an informal organization still has some remaining ambiguity of roles, hence the degree of marketing-product development integration is higher, the less the degree of formalization. The extent of power concentration in an organization, and the number of staff involved in decision-making and problem-solving, also specify the degree of integration.

Finally, according to some studies, the relation between integration and the success of product innovation is specifically due to cultural differences between marketing and product development managers. A study by Miller and Wager (1971) et al⁵ showed that the degree of integration is higher, the less the difference between marketing and product development manager awareness, depending on whether a manager is bureaucratic or highly specialized, i.e., whether he has a degree of specialization and puts priority on networks outside the company, and depending on how much he wants to be appreciated within his organization regardless of the overall level difference from the external situation [25]. Moreover, a study by Souder (1988) has also drawn attention to the difference between the product development manager's real and objective intentions, and the marketing manager's penchant for decisive data [31-35]. Lawrence and Lorsh (1969) stated that differences in the degree of time adaptation, i.e., the product development manager makes decisions in a long-term time frame, whereas the marketing manager tends to judge from a short-term viewpoint, determines the degree of integration [19-22].

Above, we have described existing studies on product development and marketing integration. In the existing research, the main theme has been the interface between marketing and product development, but in many Japanese companies, the role of

professional marketing is not fully understood, so in this paper, we shall deal with the interface between marketing and product development [16]. By considering existing studies based on problem awareness by the KJ method, we formulated the idea that, regarding the interface between marketing information and marketing-product development information has a useful role to play in product development, and that the required information is different for each product development process, or in other words, the value of marketing information changes with the product development process. We will perform company surveys based on this theory, but first we shall explain the novelty and uniqueness of this study.

(1) Changes in information needs:

In this approach, we introduce a time frame to the information product development interface, i.e., we divide the product development process into various steps, product planning, design, mass production considerations and market launch and discuss what information is acquired from which media, and who makes decisions for each of these respective processes.

(2) Diversity of information acquisition according to product:

In the studies performed so far, there was no research that could classify product development processes or information acquisition modalities into several patterns for each new product. In the present study, we classify products according to their degree of innovation into novel products (having a high degree of innovation suitable for new markets), model change products (having a level degree of innovation suitable for existing markets), custom made products and OEM products (almost no innovation), and we carry out a survey based on the theory that the role of marketing information is different in the development of different products.

(3) Difference in the value of information in marketing and product development:

In the research carried out so far, there have only been objective studies of information flow. In the present study, we perform the same survey from the two aspects of marketing and product development, and discuss differences in the perception of information value in each case.

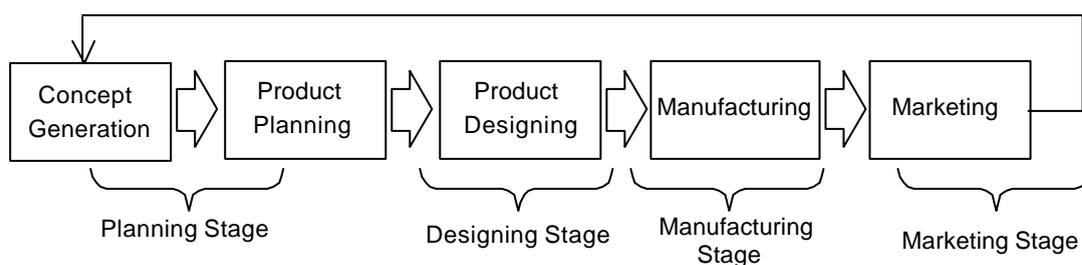
The above three approaches are not found in existing research. By performing a survey with these approaches, we clarify how marketing information is used in product development, what information is used in product development and who makes decisions. From this, we postulate a power structure that affects the marketing and product development interface, and try to suggest a marketing information and information usage strategy for product development within the company.

4. Company survey by questionnaire

The survey items were drawn up based on problems identified by the KJ method, and possible theories. The survey was designed to clarify what information is necessary and what the role of marketing is for each process in product development. Also, the questionnaire was structured so that new products are placed in categories, and detailed consideration can be given to the decision-making process and information acquisition process for each new product. The actual survey was performed from May to June of 2000. For the purposes of the survey, manufacturing industries were selected from some companies listed on the Japanese stock exchange, companies that appeared to be representative were selected, and about 90 firms that had agreed to cooperate in the survey were asked to fill in marketing and product development questionnaires.

For both marketing and product development, 225 questionnaires were mailed out, and replies were received from a total of 54 companies⁶. Of these, there were 63 replies for marketing and 77 replies for product development, i.e. a total of 140 replies and a response rate of 31.1%. The questionnaire was so designed that the respondent could discuss the same question from the aspects of both marketing and product development. A registration system was used for the survey. In the present survey, 66 persons were responsible for consumer goods, 68 persons were responsible for production goods and 6 persons were responsible for both. First, we shall discuss the survey results for items relating to the marketing-product development interface. For this item, we shall consider data that forms the core of the present paper. That is, consider how the marketing-product development interface is related to the success or failure of product development. Regarding the marketing-product development interface, we placed special emphasis on a large number of survey items, in particular the information required for each product development process, the extent of the role played by marketing information at that time, the decision-making person in each process, and the factors upon which decisions were based.

Fig.1 Information Gathering Model for Product Development

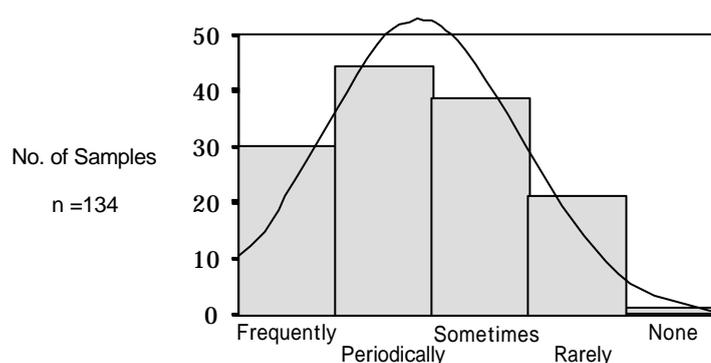


Likewise, we also classified new products into model change products, custom-made products/OEM products and novel products, and considered the role of information and decision-making for each. Further, we examined the hypothesis that the required information changes depending on the product development process. The questions here were so designed as to be answered from the two aspects of marketing and product development. First, Fig.1 shows a model of information acquisition opportunities in product development. The model is naturally different depending on the firm to whom the survey is addressed, or the characteristics of the product developed, but the model has been used to clarify the definition of product development process recognized by the survey respondents. Hereafter, it shall be assumed that the product development processes in the text are based on this figure.

5. The marketing-product development interface

Is there good communication between marketing and product development? In response to this question, respondent companies replied that marketing and product development held frequent meetings (Fig.2), and in product development processes, the importance of marketing information was highly valued in nearly every case (Table 1). Therefore, how is marketing information integrated and by how much, or is marketing information never integrated, into new products? We shall now discuss this question. Using the KJ method, we established a hypothesis regarding the problem of the marketing-product development interface. This is that "marketing information is fully utilized in product development", and we summarized interface problems as "self-centered product development", "the information gathering function of marketing"

Fig.2 Frequency of information exchange between marketing and product development in the product design stage⁷



items. These are "reliability of market information in marketing", "information accuracy when information is required by marketing" and "has marketing information been useful in product development?" From the question items involved, this axis will be designated as "the marketing information reliability axis". The second factor is also composed of three items, i.e., "is private marketing information useful in product development?", "marketing information is more useful than research information in top-selling products" and "the need to reflect marketing information in product development". The axis of this second factor will be designated as "the marketing information usefulness in product development axis". These two axes were extracted

Table 1. The degree of recognition by marketing and product development about the importance of the information⁸

Information contents	Marketing	Product development	Total	Statistically Significance
Competitor's product information	1.50	1.51	1.51	NS
Competitor's promotion information	2.10	2.19	2.15	NS
Opinion from the stores and agencies	2.26	2.03	2.12	NS
Customer reaction and purchasing trend	1.19	1.42	1.32	0.005*
Price information in the market	1.52	1.73	1.64	NS
Campaign information of the company	2.50	2.63	2.58	NS
Defect of the new product	1.37	1.45	1.42	NS

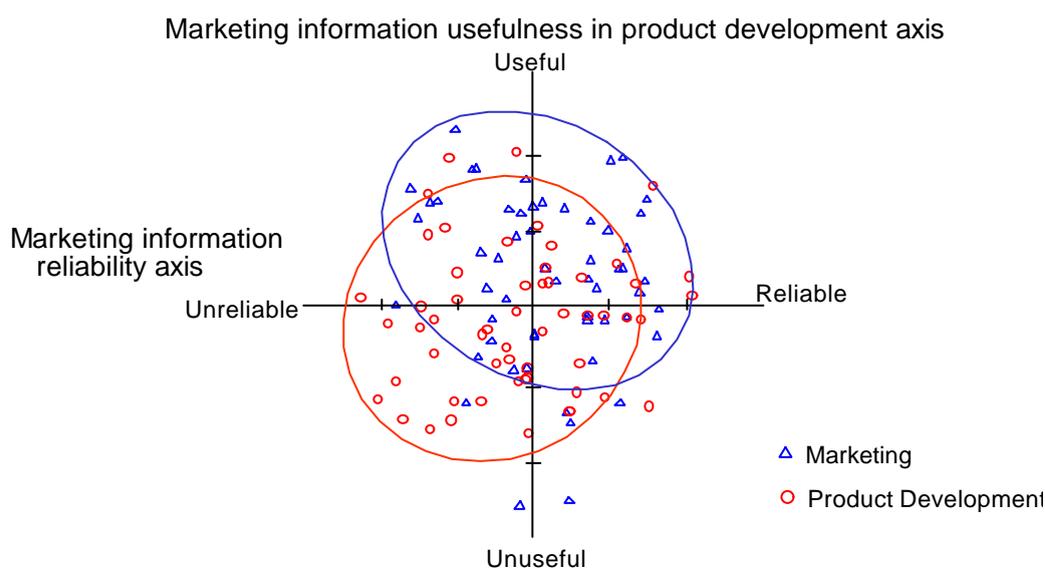
* Probability values are the results of Man-Whitney-U test

Table 2 Factor analysis survey results for marketing paradigm

Variables	Factor 1	Factor 2
Reliability of market information in marketing	0.852	0.022
Information accuracy when information is required by marketing	0.820	0.032
Has marketing information been useful in product development?	0.536	0.572
Is it possible to take out a hit product continuously without market information?	-0.055	-0.267
Is private marketing information useful in product development?	0.025	0.700
Has marketing information been useful for the product development?	0.724	0.282
Marketing information is more useful than research information in top-selling products	0.125	0.745
The need to reflect marketing information in product development	0.042	0.787
Cumulative contribution	27.88%	54.67%

from this factor analysis. The contribution of the first factor was 27.88%, the contribution of the second factor was 26.79%, and the cumulative contribution of the two components was 54.67%. Hence, it was found that the marketing paradigm can be expressed as marketing information reliability and the degree of marketing information usefulness in product development. Next, the factor scores obtained for component items were calculated for each factor respectively, for each valid respondent. Fig.3 plots this information with the first factor on the X axis and the second factor on the Y axis. In the figure, marketing is represented by Δ and product development by \circ . The probability value test was performed for the factor scores plotted⁹. The probability value for the first factor was 0.50 and for the second factor 0.001 with 5% significance for both, so there was a significant difference between marketing and product development. In other words, marketing believes that it can rely on its own information that is useful in product development, but that it cannot rely on product development that is not useful. This result supports the results of the previous item. In other words, from the marketing paradigm, reliance is placed on product development, but information useful in product development is not provided.

Fig3. Factor analysis survey results for marketing paradigm



Next, we analyze the information gathering function of marketing. Here, we likewise surveyed the information likely to be collected by marketing and the recognition of its importance, for both marketing and product development¹⁰. The survey question items are as shown in Table 3. From factor analysis results, after a Varimax rotation, three axes were extracted. The first factor comprises three items, i.e., "own company's promotional information", "importance of brand awareness" and "importance of publicity awareness". This axis is entirely related to publicity and advertising response, and will be referred to as "promotion information". Next, the second factor comprises three items, i.e., "importance of customer response/purchase trend information", "importance of information regarding new product weaknesses" and "importance of information regarding dissatisfaction with own company's products". This axis will be designated as "product power information". Finally, the third factor comprises "importance of retail shop/agent opinions" and "importance of degree of satisfaction of retail shops/agents", and this was designated as "distribution information". Hence, from the survey results for information gathering functions of marketing, by performing a factor analysis, three axes were extracted. These are "promotion information", "product power information" and "distribution information".

Table 3 Factor analysis survey results for marketing's ability of information gathering

Variables	Factor 1	Factor 2	Factor 3
Importance of competitor's new product information	-0.044	0.108	-0.093
Importance of competitor's promotion information	0.377	0.013	0.049
Importance of retail shop/agent opinions	0.210	0.147	0.828
Importance of customer response/purchase trend information	0.361	0.729	-0.064
Importance of price information	0.040	0.095	-0.034
Own company's promotional information	0.639	0.037	0.347
Importance of information regarding new product weaknesses	0.140	0.691	-0.055
Importance of information regarding satisfaction with own company's new products	-0.094	0.552	0.203
Importance of information regarding satisfaction with competitor's new products	-0.072	0.384	0.227
Importance of information regarding satisfaction with price	0.230	0.118	0.094
Importance of brand awareness	0.840	0.088	0.045
Importance of publicity awareness	0.775	0.067	0.302
Importance of degree of satisfaction of retail shops/agents	0.255	0.025	0.869
Importance of information regarding dissatisfaction with own company's new products	-0.101	0.703	0.241
Cumulative contribution	15.68%	30.15%	43.24%

The factor scores obtained for each axis were calculated, and plotted in Fig.4 and Fig.5. When the parent population of the factor scores for the first factor, second factor and third factor was examined for marketing and product development¹¹, the probability value for the first factor was 0.081, for the second factor 0.394 and for the third factor 0.015, with a significance for the first factor of 10% and for the third factor, 5%. In other words, for marketing and product development, the results obtained had a significance of 10% for awareness of the importance of promotional information, and 5% for awareness of the importance of distribution information. From this result, we see that:

- (1) Marketing considers promotional information to be more important than product development.
- (2) For product development, distribution information is considered to be more important than marketing.

We shall now add some discussion of the marketing-product development interface problem.

Fig.4 marketing's ability of information gathering
(Factor 1 vs. Factor 2)

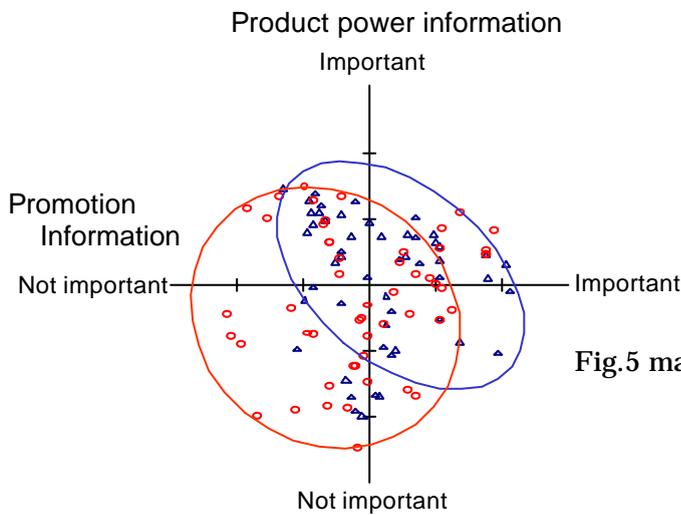
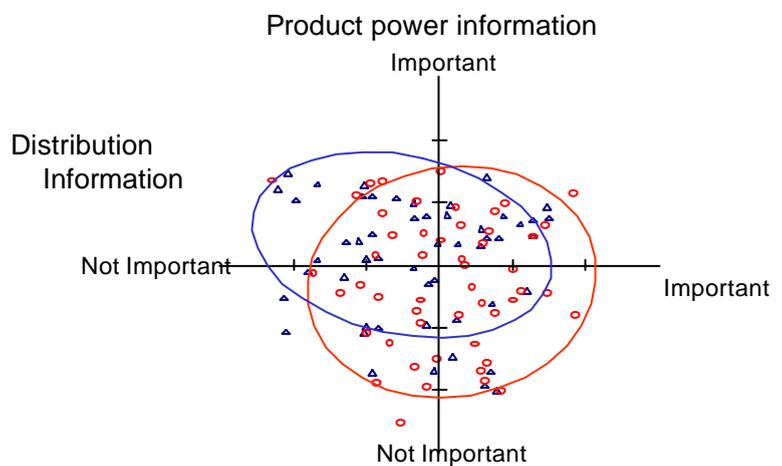


Fig.5 marketing's ability of information gathering
(Factor 1 vs. Factor 3)



First, the hypothesis that "marketing information is useful in product development" is negative. Marketing information gathering/transmission functions are not useful in product development. This point is clear from the results of the present survey. In view of this fact, let us clarify the reasons why there is only a poor interface between marketing and product development, and attempt to represent it by a model. First, let us consider the situation when the marketing-product development interface is poorly constructed. "Marketing does not contribute much to collect information for product development. It is more biased towards marketing information, and there is a lot of local information. In other words, marketing does not understand what information is required for product development. At the same time, product development gives preference to its own way of thinking, and does things the easy way or in other words; it does not expect marketing to collect information. Or conversely, it expects too much". It can be understood that when this situation becomes overwhelming, a functioning interface will not be obtained. Further, regarding the reasons why information gathering by marketing does not work well, it became clear that marketing puts more emphasis on promotional information, and for product development, puts more emphasis on distribution information. This is because marketing thinks that product development is a superfluous matter and although product development is concerned about distribution, i.e. the opinions of the agents and retail shops, they leave market development to marketing, that is why there is a problem regarding information gathering by marketing.

Summarizing the above, the paradigm exists that marketing, due to its ineptness, does not understand what is expected of it and the reliance placed on it regarding information collection, while product development necessarily deludes itself in placing undue trust and confidence in marketing information. Due to the discrepancy between marketing's official idea that product development is necessary, and product development's idea that while customer product ratings are important, the market should be left to marketing, marketing's information gathering functions do not work well. It was thus found, as a result of this situation, that the marketing-product development interface is not functioning correctly.

6. The product development process and product innovation

In the preceding section, we examined the interface between marketing and product development. In order to get more to the root of the problem, we shall now

consider processes in product development, and the hypothesis that "the value of marketing information changes depending on the product development process". In particular, we shall consider the points that, in actual product development, new products may be classified as model change products, custom-made product/OEM products and novel products depending on their degree of innovation, and that the required information and decision-making framework is different depending on the product development process. Looking at the total results obtained from the present survey questionnaire, although the classification of these new products is not necessarily the same for each company, we find that all companies do perform a classification. Due to the generalization of ISO9000 with regard to product development, it is also a fact that product development processes have become an accepted part of industrial standards.

Table 4. Comparison of information importance for new products in the product development stage

Product Development Stage			Model change products		OEM products		Novel products	
			Statistics Value	Rank	Statistics Value	Rank	Statistics Value	Rank
Planning	Internal Information	Average	0.319	1			-0.297	2
		Dispersion	0.840	2			0.972	1
		Average Score	2.73	1			2.27	2
Prototype Evaluation	External Information	Average	-0.002	2	-0.274	3	0.293	1
		Dispersion	0.900	2	0.701	3	1.21	1
		Average Score	2.00	2	1.77	3	2.23	1
	Internal Information	Average	0.004	2	-0.189	3	0.151	1
		Dispersion	0.875	3	0.956	2	1.08	1
		Average Score	2.03	2	1.74	3	2.23	1
Product Release	Market Survey	Average	0.04	2	-0.189	3	0.151	1
		Dispersion	0.875	3	0.913	2	1.17	1
		Average Score	1.98	2	1.73	3	2.30	1
After Product Release	Product power Information	Average	0.04	2	-0.272	3	0.237	1
		Dispersion	0.971	1	0.966	2	0.944	3
		Average Score	1.97	2	1.72	3	2.31	1
	Promotion Information	Average	0.101	2	-0.324	3	0.225	1
		Dispersion	1.079	2	0.354	3	1.419	1
		Average Score	2.12	1	1.80	3	2.08	2

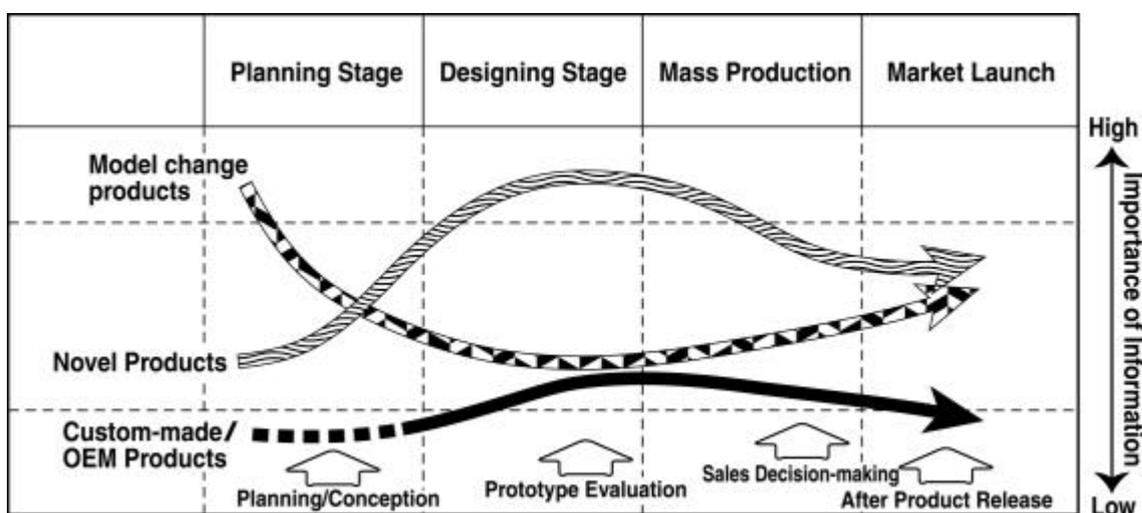
First, four product development processes were specified, i.e., planning, design, mass production considerations, and market launch¹². For each process, we examined what information was acquired and how it was acquired with regard to planning/conception and prototype evaluation after design completion, sales decision-making after mass production considerations, and market launch. The results obtained were analyzed by factor analysis, and plotted for each new product category for the extracted factors. By examining the differences in the various new product categories, we then identified differences in the degree of awareness and importance accorded to new products relative to the information required for that process. Table 4 summarizes these results, and shows, by assigning relative priorities, what information was acquired and how it is used by the classified new products in the product development process. In other words, it performs a factor analysis on survey results regarding what information is acquired for each process and how it is used in decision-making, calculates factor scores¹³ for each new product category relative to the extracted factors, and displays the average values, dispersion and average scores¹⁴. The larger the average value and average score, the higher the information utilization degree and the more importance are accorded. From this table, the following emerged: (1) for model change products/OEM products, the degree of information utilization in all product development processes has a low score and the dispersion of data is also small, hence the degree of information utilization is low, (2) for model change products, high importance is placed on acquiring information in the planning stage, and the most use is made of internal information. In the design stage (market evaluation of prototypes) and mass production consideration stage (sales decision-making), the importance of information decreases, but in a post-sales market survey, the importance of acquiring information again increases. In other words, feedback of market survey results in the planning stage such as degree of customer satisfaction occurs at the beginning and end of product development, (3) for new products, unlike model change products, the utility of acquiring information in the planning stage is low. However, in the design stage (market evaluation of prototypes) and mass production consideration stage (sales decision-making), the importance of information increases. There continues to be a high requirement for acquiring information regarding market survey results after a product has been launched in anticipation of market sales.

Fig.6 is a graphical representation of the above results. From the figure, the information acquisition framework changes in new product development processes. This point has been discussed by hypotheses, but why does the importance of information change? The importance of information for model change products is

highest in the planning/conception stage, the importance of acquiring information decreases as the new product development process proceeds, and the importance again increases in the market survey after market launch. In the case of model change products, past experience is used, and the product strategy proposed for the next model will probably determine the success or failure of that product. Consequently, it was found that the importance increased even for market information after market launch. Also, for novel products, planning/conception relies more on the planner than on market information. Stated differently, the obvious needs of a new product can be learned from market surveys, but a company that has a high probability of designing a revolutionary new product and making it succeed from latent market needs, owes a lot to the creative potential of its organization. For custom-made products/OEM products, information has the highest importance when evaluating prototypes. Further, the overall importance of information is low. This is probably because emphasis is placed on finishing the product according to customer specifications.

In the above, regarding the hypothesis that "the value of marketing information changes depending on the product development process", we showed that the value of information does indeed change depending on the product development process according to our hypothesis. Regarding the next topic, "the required information and decision-making framework are different depending on the new product category, and the product development process", we also classified products into three categories, and showed that information acquisition was different according to type. Thus, we could deduce results in accordance with theory.

Fig.6 Shifts in information importance according to new product type in the product development process



7. Discussion and implementation of research results

Now, I should like to summarize our research results concerning the hypothesis we have introduced regarding the marketing-product development interface, and conclude this paper by discussing their application to their implementation in the real world. The first question and topic addressed by this research was the marketing-product development interface in the context of what product strategy we should introduce in an uncertain market. The hypotheses we introduced were based on two points, i.e., "marketing information is useful in product development", and "the value of marketing information depends on the product development process". Herein, I should like to take an overall view based on these assumptions.

First, concerning the hypothesis that "marketing information is useful in product development", the answer was negative, i.e., "it is not useful". The approach we used to verify this hypothesis was to perform a factor analysis of problems concerning the marketing paradigm and problems concerning information collection functions performed by marketing, calculate "factor scores" relative to extracted "factor axes" respectively for each respondent regarding marketing and product development, plot them on an axis, and conclude by performing a significant difference test on the marketing and product development parent populations. Summarizing these results, we found that, concerning the marketing-product development interface problem, there were two different paradigms, one being that marketing is unaware of reality and cannot understand that product development expects too much of information collection, and the other being that product development mistakenly places too much reliance on marketing information. Next, we showed that, due to the discrepancy between the official view of marketing that product development is a necessity, and the self-satisfied view that although customer evaluation of products is a concern, the market can be left to marketing, marketing information collection functions do not work well. From the above survey results, it can be concluded that the marketing-product development interface is not functioning properly.

Next, concerning the hypothesis that "the value of marketing information varies depending on the product development process", we performed a factor analysis on the importance of information required by each product development process, and the problems involved in decision-making, calculated "factor scores" for new products classified as model change products, customer-made products, OEM products and novel products for the extracted "factor axis", and by performing a significant difference test on the respective parent populations, we defined differences in the information required for each of these processes. As a result, the hypothesis was corroborated, and we found

that the information required for new product development does have different requirements for each process and new product type. In considering product planning, product design, mass production and market launch for product development processes, new products have the following features:

(1) Model change products

In the planning stage, there is the greatest need to acquire information, so information is collected about other companies, customer satisfaction, prices, and product satisfaction regarding own brand products. After product design is complete, business representatives and marketing directors make in-house decisions, and consider whether mass production is possible. After market launch, there is again an increasing need to acquire information by means of market surveys for the next product development stage. In other words, the importance and necessity of acquiring information follows a U-shaped parabola with regard to product development processes.

(2) Custom-made/OEM products

Due to their nature, custom-made products/OEM products often do not pass through the product planning stage. Also, there is not much potential for acquiring information during the overall process. In decision-making, the opinions of marketing and departmental heads such as marketing executives, marketing representatives and business representatives have a large effect on the outcome.

(3) Novel products

The effect of decision-making such as the opinions of company executives in the planning stage are more important here than in the case of other products in the planning stage, and there is not much potential for acquiring information. During product design and mass production considerations, the need for acquiring information increases, and this trend continues in post-launch market surveys. Therefore, the importance and need for acquiring information continues to rise, and follows this trend.

From the above, we found that new product development processes and new product types are intimately related to the need for acquiring information and the effect of decision-making. We have gleaned these results from the research described in this paper, but finally I should also like to discuss information strategy within the company. Concerning the product development battle in the marketplace, product life cycles are becoming shorter, and lead times are becoming ever and ever tighter. There is a demand to carry out product development concurrently, and delivery schedules are strictly observed. Moreover, now that quality standards like ISO9000 have become industrial standards, quality control of product development has become more systematic. The product development structure no longer determines competitive

superiority, and instead it is overall marketing strategy that gives an important competitive edge. In this situation, acquiring information and in particular market monitoring are often a part of a company's know-how, and can be what determines its competitive superiority. Hence, in order that it can fulfill this function, information strategy must work together with product strategy. It is important that information strategy is specified by the intended market and by core technology. In other words, if market and technological innovations do not comply with technological platform vectors, marketing will not function properly in product development [15,29,30,36]. Hence, the current market, the intended market, current technology and R&D must all form a matrix which positions custom-made products/OEM products and novel products as an information strategy, and builds an information acquisition structure accordingly. The product strategy vector means the product platform as determined by the intended market and core technology, and new product types should be planned along the lines of this vector [23]. It follows that not only trends in product platforms but also information, both quality and quantity, will go on increasing in importance.

Above, we showed that the relation between product strategy and information in a company is of considerable importance. The marketing-product development interface uses information as a medium, and there is no doubt that it will become more important in future. Also, in an uncertain market, product strategy will demand even shorter lead times. This means that in order to adapt quickly to market fluctuations, not only product development processes, but also client-centered marketing activities will be required [8,9]. The market and the customer cannot wait for the finished product for ever. And the crux of concurrent marketing activities is the marketing-product development interface. As we already stated, the interface problem does not mean that either marketing or product development is to blame, rather, it must be tackled as an organizational framework problem which includes marketing. Regarding this point, as we have seen from the results of the present survey, Japanese companies still have a lot to learn.

Notes:

- ¹ Regarding to Product Development and contingency theory, see P. Lawrence and J. Lorsh (1965) . Contingency theory is guided by the general orienting hypothesis that organizations whose internal features best match the demands of their environments will achieve the best adaptation". The termed was coined by Lawrence and Lorsch in 1967 who argued that the amount of uncertainty and rate of change in an environment impacts the development of internal features in organizations.
- ² See study by V. Barabba and G. Zaltman (1991)
- ³ The KJ-Method is fundamentally similar to the Snowball Technique. Introduced by the Japanese, it has become one of the 'Seven management (New) tools' of modern Japanese quality management and uses values of Buddhism intended as structured meditation.
- ⁴ In this paper, Lawrence and Lorsh compared successful and unsuccessful companies in the technology sector.
- ⁵ In the paper, Miller and Wager (1971) say that product development tends to be specialized, while Marketing tends to be bureaucratic.
- ⁶ Totally 54 companies, randomly picked up from Tokyo Stock Market, cooperated with the research. The companies are: NSK, Inc., Glorly, Co. Ltd., Otsuka Pharmaceutical Co., Ltd., Kao Co, Ltd., Calbee Foods Co., Ltd., Canon, Inc., Kobe Steel Ltd., Clarion Co. Ltd., Komatsu Ltd., Computer Engineering & Consulting, Ltd., Shionogi & Co., Ltd, Shimadzu Corporation, Sharp Corporation, Charle Corporation, Sumitomo Electric Industries, Ltd. Coop-Kobe, Seiko Epson Corporation, Sony Corporation, Kodan Electronics Co, Daido Steel Co., Ltd., Dainippon Pharmaceutical Co. Ltd., Taiyo Yuden Co. Ltd., Takara Holdings Inc., Tanabe Seiyaku Co. Ltd., Teijin Ltd., Digital Electronics Corporation , Denso Corporation, Toyo Communication Equipment Co., Ltd., Toyota Motor Co, Nitih Corporation, Nissan Motor Co, IBM Japan, Ltd., Nippon Seiki Co., Ltd., NEC Corporation, Hewlett-Packard Development Company, L.P., Philips Electronics N.V., Tonen General Sekiyu K.K., Nippon Lever K.K., Noritz Corp., Hitachi Metals, Ltd., P&G, Fuji Xerox Co., Ltd., Fujitsu Ltd., Mazda Motor Co., Furuno Electric Co., Ltd, Horiba Ltd., Murata Manufacturing Co., Ltd., Matsushita Electric Industrial Co., Ltd., Matsushita Electric Works Co., Ltd., Mitsubishi Electric Corporation, Mitsubishi Chemical Co., Yanmar Co., Ltd., Wacoal Corp., World Co. Ltd.
- ⁷ No. of valid samples in the survey is n=134, and figures in the diagram show the frequency of information exchange. 1: Frequently 2: Regularly 3: Sometimes: 4: Occasionally 5: Never The average value in the figure is 2.40.
- ⁸ The survey was performed on a 4-point scale. 1: Important 2: Necessary 3: Considered 4: Unnecessary Determined to perform the difference of awareness as to whether or not marketing considers the same items to be important, and what information is required for product development
- ⁹ Results of Man-Whitney U test.
- ¹⁰ The factor analysis is the result of responses to 14 questions on a 5 point scale. The no. of valid responses was n=137. The factor extraction was performed by a factor analysis, and the rotation method was the Varimax method with Kaiser Normalization. The results are converged by three rotations.
- ¹¹ To observe the significant difference of respective parent populations in marketing and product development, the Mann-Whitney U test was performed.
- ¹² See Fig. 1 on page9.
- ¹³ To use a newly extracted factor in the scale, the factor scores are evaluation points when samples are fit to the factor. The positional relation of the samples can be made relative.
- ¹⁴ The no. of valid samples was a total of n=132. The 4-point scale is
1: Very important 2: Important 3: Worth consulting 4: Not important.

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