

Matching Potential Customer Needs to Technology Seeds: Using a Virtual Catalog to Extract Customer Needs in B2B Manufacturing Companies

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Abstract—Effective technology marketing that extracts potential needs from customers and matches them with a manufacturer's core technology seeds is very important in the current global, competitive market. Several methods have been proposed to extract these needs, including rapid prototyping, agile development, and design thinking. However, it is sometimes difficult to apply these methods in Business-to-Business (B2B) products such as industrial machinery because customer needs are complicated and context-dependent. "Virtual catalogs" (imaginary catalogs for future products) have been used by several B2B companies. Using virtual catalogs, product designers can specify their images of future products and use them to extract potential needs from customers. Although several procedures to construct virtual catalogs have been established, the methods for using these catalogs have not been scientifically investigated, and the effectiveness of their utilization depends on individual communication skills. This paper proposes an effective method of utilizing virtual catalogs and verifies the effectiveness by a laboratory experiment as a role-play test of technology marketing using virtual catalogs.

I. INTRODUCTION

In the current global, competitive market, many manufacturers struggle to gain sufficient profit from their products. In addition to traditional marketing [1], new technology marketing for extracting potential needs from customers is necessary to make innovative products earlier than other competitors. Simon describes the importance of matching manufacturer technology seeds with customer needs in highly successful German small and medium-sized companies, known as hidden champions [2]. Technology marketing for extracting potential needs is not easy, especially in Business-to-Business (B2B) products. Leonard notes the limitations of listening [3], and Christensen indicates that marketing that strongly depends on key customers' requirements sometimes has a negative effect on innovation (known as the innovator's dilemma) [4]. A lead user method [5] can be effective for B2B products but only if there exist lead users who can make good requirements for manufacturers. Recently, several methods have been proposed, including rapid prototyping [6], agile development [7], and design thinking [8], for extracting potential customer needs. However, according to our interview to some manufacturers and Japan Management Association Consultants Inc., there faster than competitors are difficulties with B2B products since customer needs are complicated and context-dependent, particularly with B2B hardware

products such as industrial machinery, for which rapid prototyping and agile development are not realistic methods when compared with software products. Design thinking is more suited to products in which user interface is important.

This paper focuses on "virtual catalogs" (imaginary catalogs for future products) as one of the methods for extracting potential needs for B2B products. Using virtual catalogs, product designers specify their image of future products and use them for extracting potential needs from their customers. A virtual catalog can be used for not only software products but also hardware products, including industrial machinery. For this study, we interviewed some B2B manufacturers that use virtual catalogs regarding the effectiveness of this marketing tool. Through these interviews, we see that the efficiency of extracting customer needs using virtual catalogs depends on the characteristics of the target customers. In this paper, we verify our findings with a laboratory experiment as a role-play test of technology marketing using virtual catalogs and a "Value in Action Inventory of Strengths test (VIA-IS test)" [9] to identify the character strengths of customers. As a result, we can find clear relations between some character strengths of customers and the efficiency of the virtual catalogs. Then, we discuss an effective way of using virtual catalogs and determine the type of questions that are effective for extracting potential needs, which we call "solution-pull questions."

Up to now, several procedures to construct virtual catalogs have been proposed and established. However, the methods for effectively using virtual catalogs have not been scientifically investigated; the effectiveness of using them depends on individual communication skills. This paper is unique because it has implications for applications based on scientific verification of their effectiveness by a laboratory experiment and, it includes the proposal of an effective method of using virtual catalogs.

The remainder of the paper is organized as follows. Section II briefly reviews the literature on technology marketing. The efficiency of virtual catalogs and a description of the laboratory experiment to measure the efficiency are discussed in Section III. Section IV shows the results of the laboratory experiment. Section V presents an analysis and discussion of the results and proposes an effective method of using a virtual catalog. Finally, Section VI presents our conclusions.

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II. LITERATURE REVIEW

Simon [2] mentions the importance of matching manufacturer seeds to customer needs. In order to match seeds to needs, he advocates “soft diversification.” Soft diversification is a marketing strategy that consists of expanding core competencies to later introduce the same technologies in different markets. Narver et al. [10] suggest that companies need to conduct not only responsive marketing, which addresses the expressed needs of customers, but also proactive marketing, which addresses the latent, or yet-unknown, needs of customers. They identified that a proactive market orientation is a success factor for new product development and that matching core competencies to customer needs is important. This paper investigates virtual catalogs as a tangible way of matching needs to seeds. Recently, several consulting firms have utilized them for Business-to-Consumer (B2C) and Business-to-Business (B2B) manufacturers [11]. Using this tool, manufacturers can discuss matching seeds to needs for customers from the early planning stage because they can clearly show potential product features to customers, allowing them to develop a product concept with customers. Hence, they can target needs-centered product development. As observed above, virtual catalogs are tools for extracting a customer’s potential needs by presenting products in the planning stage, which utilizes manufacturers’ core competencies. In consequence, manufacturers are able to match their core competencies with customers’ potential needs using the information gained through discussing the virtual catalog.

Olsen and Welo [12] compared four marketing methods to extract customer needs (web survey, observation, interview, and workshop), and concluded that deeper potential needs can be extracted in a “workshop” setting over other methods. Then, they use Markowitz’s hierarchy to set the level of customer needs from explicit to potential needs. A meeting for extracting customer needs using a virtual catalog can be recognized as a workshop.

One way to obtain customers’ potential needs is rapid prototyping [13,14]. In the rapid prototyping method, a manufacturer discusses needs with a customer and then fabricates a quick model of a product for the customer to evaluate. A variation of this, the Minimum Viable Product (MVP), is another method of extracting potential needs of customer by fabricating a product with the minimum desired features to be evaluated. According to Ries [15], “The MVP is that version of the product that enables a full turn of the Build-Measure-Learn loop with the minimum amount of effort and the least amount of development time.”

The difference between these two methods and a virtual catalog is whether the development of a prototype or minimum product is even necessary. In most B2B products, a large amount of money is expended even just to develop the minimum exploratory product, whether a prototype product or a minimum product. Furthermore, because B2B products need to work with other products, it is difficult to guarantee that prototypes or minimum products will work

seamlessly with other products or prototypes. To reduce expenses and potential problems, we look to virtual catalogs as a method of matching manufacturer seeds to customer needs in B2B businesses.

III. EFFICIENCY OF VIRTUAL CATALOG

To set up the research topic, we conducted interviews with B2B manufacturers regarding the current usage and problems with the effective usage of virtual catalogs. Consequently, the respondents suggest that the efficiency of extracting customer needs using virtual catalogs depends on the characteristics of the customers with whom the catalogs are used. We investigated the two research questions shown below:

Research Question 1: How the effectiveness of extracting customer needs using a virtual catalog be altered by the characteristics of the customers with whom the catalog is used?

Research Question 2: Depending on the customer characteristics, what kind of method is suitable to extract customer needs effectively?

In order to investigate the two research questions, we observed a laboratory experiment as a role-play test of technology marketing using virtual catalogs. We used a VIA-IS test to identify the “characteristics” of customers, which was proposed by Peterson and Seligman [9]. The VIA-IS test arranges 24 character traits in the order of strength for each person. They suggest that the recognition of the strength of the characteristics of team members can be used to improve team performance. We expected to understand the importance of the relationship between the effectiveness of extracting customer needs and character strengths of the VIA-IS test. The laboratory experiment is designed as follows.

Laboratory experiment as a role-play test of technology marketing using virtual catalogs

Virtual Catalog

- A target product of a virtual catalog is a knowledge database system [16].

Customer

- The customer company has to install this kind of system within 1 year.
- The number of estimated users is about 1,000.

Role-play Procedure

- The number of subjects (virtual customers) is 15. Subjects are working students who belong to different Japanese manufacturers.
- The experimenter plays the role of the product designer of the system who wants to extract customer’s potential needs.
- Subjects play the role of the company’s employees who belong to the knowledge management department.
- Each interview using the virtual catalog is held for around 30 minutes.
- The experimenter reads a script to conduct the same interview with every subject and then asks the following five questions in each interview.
- Finally, the experimenter counts the number of extracted potential needs from each subject regarding the five questions.



Figure 1. Interview Using the Virtual Catalog in Role-play Test

Five questions in Interview

Question 1:

Are there any unclear points on the explanation of the virtual catalog?

Question 2:

Case1: There is some knowledge database system in your company.

Do you feel the necessity of the knowledge database system?

If you feel it, do you think the proposed knowledge database system is useful for you?

If you do not feel it, could you tell me the reason?

Case2: There is no knowledge database system in your company.

Do you think that the employees feel the necessity of the knowledge database system?

If you think it, are there any places where the proposed knowledge database system is useful?

If you do not think, what is missing functions of the proposed knowledge database system?

Question 3:

Do special features of the proposed knowledge database system become a benefit to your company?

Question 4:

We do not have complete confidence ourselves about the proposed system.

Do you really need proposed features? If not, what kind of features would be necessary for you?

Question 5

We have finished the questionnaire. Do you have any requests or questions?

identified with a VIA –IS test. The result is shown in Table 1, where we can recognize the differences among the correlation factors for each pair. Some of the strengths that show a significant correlation include “appreciation of beauty and excellence” and “zest,” which have a positive correlation to the number of elicited needs. This suggests that extracting needs from people who have these two character strengths tends to be easier. On the other hand, “leadership” and “forgiveness” have a negative correlation. We can infer that it is difficult to extract needs from people who have these two character strengths.

TABLE 1. RESULT OF CORRELATION ANALYSIS OF CHARACTER STRENGTH AND EXTRACTING THE NUMBER OF NEEDS FROM EACH SUBJECT

Characteristics	Correlation factor	Significant value
Forgiveness	-.644**	.010
Judgment	-.438	.103
Fairness	-.465	.081
Social intelligence	-.079	.779
Love	-.239	.391
Hope	.101	.720
Teamwork	-.454	.089
Self-Regulation	.023	.934
Humility	-.290	.295
Honesty	-.317	.249
Leadership	-.619*	.014
Prudence	-.087	.759
Appreciation of Beauty & Excellence	.529*	.043
Love of learning	.439	.101
Bravery	.385	.156
Spirituality	.078	.783
Zest	.658**	.008
Curiosity	.167	.551
Perspective	.219	.432
Perseverance	.017	.953
Gratitude	.471	.076
Humor	.106	.706
Kindness	-.231	.408
Creativity	.478	.072

Correlation factor: Spearman's ρ

*:The Significant value is 5% or less

** :The Significant value is 1% or less

IV. RESULTS OF LABORATORY EXPERIMENT

We conducted a correlation analysis of the character strength of each subject and the number of needs extracted from each subject. The number of extracted needs is calculated by counting the needs from the subject's answers. Here, the definition of a “need” in this experiment is usable information to improve the proposed knowledge database system described in the virtual catalog that was not included in the original features of the proposed system. The character strength of each subject was used as an ordinal scale

V. DISCUSSION

By observing the difference in correlation in the number of needs extracted by various character strengths, we can determine which character traits lead to easy extraction of needs and which character traits are difficult. For efficiency in need extraction, the strengths that have a positive correlation include “appreciation of beauty and excellence” and “zest.” Those with a negative correlation include “leadership” and “forgiveness.” In addition, we observe that the efficiency of extracting needs changes depending on the questions asked. Therefore, we proceeded the study to confirm what kind of questions lead to effective extraction of customer needs from people who have characteristics difficult to extract potential needs. Although all groups with character strengths should be considered and have effective questions made for them, in the present study, we first focused on the strengths with a negative correlation: “leadership” and “forgiveness.” When a product designer using virtual catalogs recognizes that a customer has a “difficult” character, he needs to know how to use the virtual catalog for this customer. Therefore, instead of considering the strengths that have a high efficiency in extracting needs, we prioritized drawing information from customers with characters that have low efficiency in extracting needs.

The data of subjects with the character strengths “forgiveness” and “leadership” (with a strength of level 11 or higher in either) that show low efficiency in the extraction of needs for each question (1 through 5) is shown in Figure 2 and Figure 3. They summarize how the subjects that strongly possess those character traits (each of which is in 11th place or higher out of 24 strengths) show their needs in the questions’ answers. The questions are on the horizontal axis. The number of subjects that showed their needs and the total number of extracted needs appear on the vertical axis. Six subjects had the strength of “forgiveness,” and five participants had the strength of “leadership.”

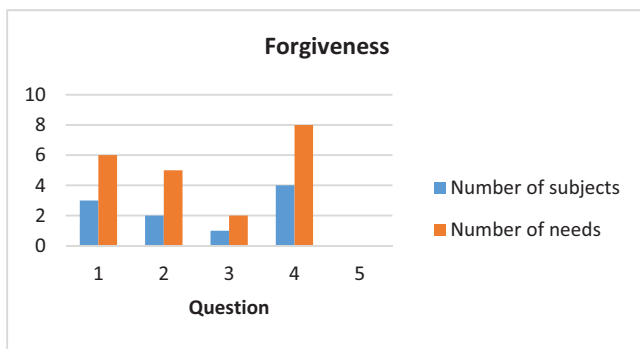


Figure 2. Number of needs exposed upon posing questions to the six subjects with a strong “forgiveness” strength

These results demonstrate that both the number of subjects that answered and the total number of exposed needs is the highest for Question 4 and the lowest for Question 3. Question 5 should be excluded from the discussion since it was designed to check whether the

customer had any requests or questions. It should be also noted that when considering other character strengths, Question 4 remains the most answered question and that Question 3 is the least answered question, but the difference between the results for these two questions is greater when analyzing the strengths of the study.

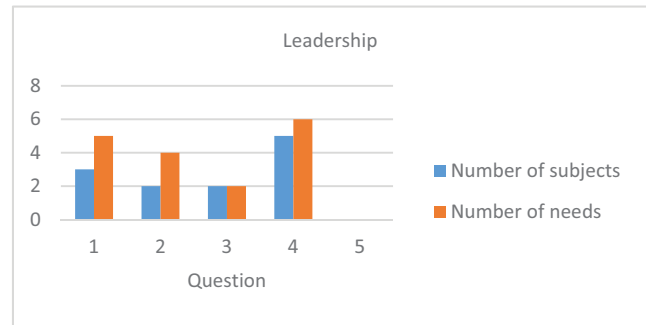


Figure 3. Number of needs exposed upon posing questions to the five subjects with a strong “leadership” strength.

Next, we examined the features of these two questions. The feature of Question 4 is that manufacturers do not fix functions based on their seeds, i.e., functions are changeable. By the use of the words “although we don’t have complete confidence ourselves,” it seems that a customer can recognize the “white space” of the seeds clearly. “White space” refers to the unknown, and in this study, the seeds are not yet fully defined and exist in the white space. In this research, we considered the key point that in order to extract needs from those with a negative character strength, product designer must explain the “white space” clearly to them. Oshio [17] researched two cases regarding product development in the multi-function printer business. In consequence, he suggested that for effective extraction of customer needs in a needs survey of the products have “white spaces”. Oshio defined a “white space” as “a state that exists within the extent to which a concrete example does not fill the whole of the framework.” According to his definition of white space, Question 4 seems to demonstrate the white space of the contents of a virtual catalog. The white spaces promote customers to fill by thinking their solution. In this research, we call this kind of question a “solution-pull question.” A solution-pull question is “a question to extract a customer’s solutions by clearly demonstrating the white spaces of manufacturer seeds.” Question 3 asks the subject necessity and usefulness of contents of the virtual catalog. In this research, we call this kind of question a “needs-pull question.” A needs-pull question is “a question to extract customer needs by pushing the seeds of a manufacturer.”

In the role-play test, Question 3 simply requests a yes or no answer. Nevertheless, usually, a customer would elaborate upon their company’s demand or relate a story to explain their response to the question. For example, if the answer is yes, the customer would explain why he or she felt that way. These two types of questions are explained in Figure 4.

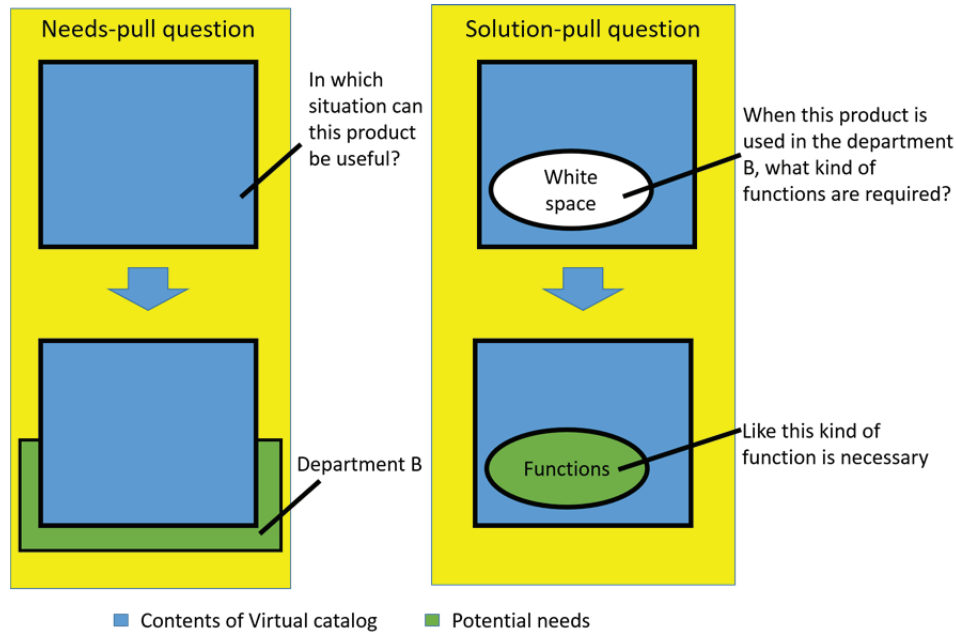


Figure 4. The solution-pull question and the needs-pulled question

There is a difference between these two questions in how they are answered by a customer. When customers answer a solution-pull question, they need to comment on improvement of the contents. In contrast, when the customers answer a needs-pull question, they need to say how they think the product would work in their company. Next, we discuss the reason why a solution-pull question can extract needs from the two characteristics with negative correlation and why a needs-pull question cannot. The traits of “forgiveness” and “leadership” are defined in the VIA test [18] as follows:

- **Forgiveness:** Forgiving those who have done wrong; accepting others’ shortcomings; giving people a second chance; not being vengeful.
- **Leadership:** Encouraging a group of which one is a member to get things done and at the same time maintain good relations within the group; organizing group activities and seeing to it that they are implemented.

The reason why it is easy for customers with strong “forgiveness” to share their needs when answering solution-pull questions is considered attributable to the fact that they tend to have the following features: “they are forgiving of those who have done wrong; they accept others’ shortcomings; they like giving people a second chance; they are not vengeful.” Solution-pull questions confer the main benefit of being able to add an improvement plan for unfinished products. On the other hand, the reason why it is difficult for customers with strong “forgiveness” to expose their needs when answering needs-pull questions is that these questions identify the inadequacies of the providers’ claims. If the customer provides new knowledge to the provider, it is the same as identifying the deficiencies of their offer. People

with the “forgiveness” strength are said to “not have vengeful hearts,” so that might make them refrain from making disparaging remarks about another party. As for people with strong “leadership,” the reason why they reveal their needs in solution-pull questions is simpler. Leadership types are “encouraging a group of which one is a member to get things done and at the same time maintain good relations within the group; organizing group activities and seeing to it that they happen.” Being supportive means that they are comfortable with providing ideas for the improvement of products. In contrast, it is difficult for them to answer needs-pull questions because they make efforts to maintain a good relationship within the group. In order to maintain the harmony of the group, they avoid giving any suggestions that point out the insufficiency of the offer.

VI. CONCLUSION

This paper discusses the effective usage of virtual catalogs as a tool for matching technology seeds and potential needs for B2B manufacturers. B2B manufacturers that have used virtual catalogs in the past suggest that “depending on the characteristics of the customer (the person responsible for purchase on the customer side), the efficiency of needs extraction changes”; this issue led to the creation of two research questions. As a result, we identify character strengths that could efficiently extract the potential needs using a virtual catalog. It was verified in a laboratory experiment as a role-play test in which the customer’s character was analyzed using the VIA-IS test. More specifically, the strengths with a positive correlation for the efficiency of need extraction are “appreciation of beauty and excellence” and “zest,” and the traits with a negative

correlation are “leadership” and “forgiveness.” Furthermore, we find that solution-pull questions are more effective than needs-pull questions because the white space provided by solution-pull questions promotes better matching potential needs with technological seeds. However, we need additional experiments to confirm our findings.

On the basis of this research, we are now applying the proposed virtual catalog method to the real-life marketing of Smart Voice Messaging Systems [19]. After applying it to two customers, we confirm the effectiveness of the solution-pull questions. The detailed results of this application will be reported in the future.

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