Core Technology Strategy from a Long-term Perspective

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In recent years, many manufacturers are faced with the commoditization problem. The key to overcome this is to create new value dimensions. However, it is difficult to practice value dimension creation, there is a tendency to remain in the idea of improving "QCD" in existing paradigm. So, this paper introduces the idea method using the tool. The important things are to understand the ability of the element technology value-neutrally, and set an attractive social value which the company pursues through their business. Thus, the company is able to practice the core technology strategy from a long-term perspective.

***Key Words**: MOT (Management of Technology), Core technology strategy, Value dimension creation, VBridge, Category branding*

1. Introduction : A Chain of Negativity that must be Severed

In recent years, Japanese manufacturers from all industry types are facing the problem of commoditization head on. Commoditization is when it becomes difficult to differentiate between the true essence of products and services and customers can hardly tell one from the other, leaving price the only criteria for competition[1]. It is believed this is a result of homogenization[2] due to higher technical standards of manufacturers across the board and the lowering of obstacles to market participation through the advancement of modularization[3), 4)].

The author conducted an open-response questionnaire targeting the management of executives of various manufacturing companies in order to confirm the actual state of affairs of which those companies are facing to. It was apparent that, for many industries, a chain of negativity was occurring consisting of, as shown in **Fig. 1**, "intensification of cost competitiveness → response to cost reduction → organization management with no leeway therefore an inability to produce attractive products → further worsening of cost competitiveness due to increased commoditization." It can be said that, in order to sever this chain of negativity, there is a pressing urgency to newly create a point of focus unrelated to price that attracts consumers due to offering new value, thus escaping the commoditization issue. This paper discusses MOT (Management of Technology) as an important means to creating attractive value by using technological capability as an asset and briefly describes a method of conceiving ideas that leverages the unique characteristics of a certain core technology.

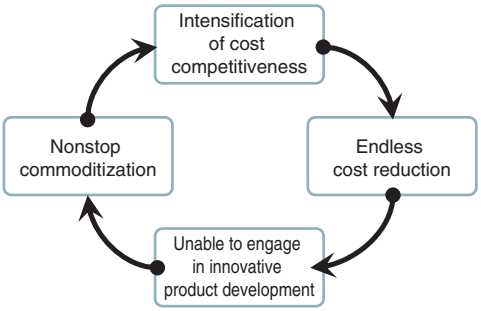

Fig. 1 Negative chain should be cut off

2. The Importance of Value Dimension Creation

2. 1 The Importance of MOT and Issues with its Implementation

After the importance of value creation was recognized, MOT has been attracting much attention since the turn of the 21st century. MOT is "management by a technology-driven corporate or organization based on identifying the potential of technology to achieve sustainable development, converting this to new business and creating economical value" and it is also a popular theme in Japan[5]. One aspect particularly recognized as a core

technology strategy is the importance of increasing ROA (return on assets) by utilizing a company's proprietary technology for a wide-range of products.

The university with which the author is affiliated, Nagoya Institute of Technology (NITech), was the first in Japan to offer an MOT major in 2003 and the author was a professor of the graduate school subject, MOT Exercises, for 13 years. The components of this subject were to present the class with the core technology for consideration that year at the beginning of each session for the first semester, then have the students divide into teams and complete the following activities over the course of six months; (1) Examine the nature of the relevant technology (2) Investigate new applications for the said technology. To date, various core technologies, including RFID (radio frequency identifier) and photocatalyst, have been the subject of these groupwork exercises, which adopt a PBL (problem-based learning) approach.

The MOT Exercises subject is the drawcard of this major and an annual success. However, despite new students enrolling each new year and different core technologies for consideration, the author was perplexed by the same problem. Specifically speaking, most of the ideas which utilized the core technologies being considered could not exceed the scope of merely achieving "higher efficiency" by honing the existing paradigm of QCD (quality, cost, delivery). In the overwhelming majority of cases, ideas either (1) focused on existing problems (or problems that were clearly imminent) or (2) aimed at improving QCD using more sophisticated methods to achieve products which are lighter, thinner, shorter, smaller, increase efficiency or productivity, achieve labor-saving, automation, unmanned production, prevent human errors and so on. This phenomenon is not only relevant to the exercises targeting graduate school students, but is also quite prevalent at the companies the author conducts training at. This type of idea is nothing more than an improvement based on an existing paradigm and therefore it is difficult to produce new attractive values such as the creation of innovative work styles and lifestyles, or obtainment of entirely new competitive factors for corporate customers.

Japan is grappling with many issues it must find solutions for, such as global warming, energy-related issues, and an aging society, and no one can deny ideas to "better realize solutions for existing problems apparent to all (or problems foreseeable by all)." However, the relationship between "QCD improvements (higher efficiency)" and "the user benefiting from effectiveness" is not linear and it has been pointed out that an increase in efficiency exceeding a certain level may trigger problems such as "indifference quality" and "excess quality[6]." A typical example of this can be found in the compact digital camera market which fell into a state of extreme commoditization as a result of endlessly competing for better quality images due to customer demand. If price-related pressure continues to intensify in the market despite improved QCD, something needs to be sought to replace value creation reliant on increasing efficiency within an existing paradigm.

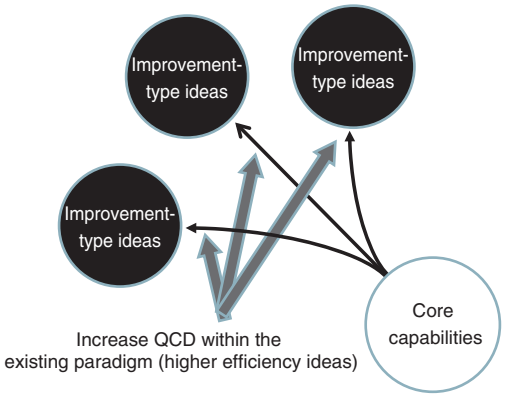

Fig. 2 Current state of value creation

2. 2 The Difference between Value Creation and Value Dimension Creation

The importance of value dimension conversion is a much theorized topic and statements include; "the essence of innovation is about changing the performance dimension[7]", "existing competition can be rendered meaningless by converting those value dimensions widely established in society to new value dimensions[8), 9)]" and "converting value from a competitive axis already existent in the market to a new competitive axis[10), 11)]". Some examples utilizing the forged component manufacturing method include diverting from the conventional competitive axis for golf clubs of "hitting the golf ball far" to a new value dimension of "hitting the ball with ease." Likewise, hair dryers could focus on a completely new value by diverting the existing competitive axis of "drying hair without creating damage" to "create beautiful hair from the inside simply through everyday hair dryer use." Another example would be ICT construction machinery in the construction machinery sector which had previously competed on physical performance factors such as durability and fuel economy. However, ICT construction machinery offers the new value dimension of "managing progress of the overall construction site in real-time" in the form of a package comprising of a hydraulic pressure shovel equipped with a 3D stereo camera and a construction management system (**Fig. 3**).

	Former value dimension	New value dimension	The core capabilities supporting new value dimensions
Golf club	Hit the ball far	Hit the ball with ease	Forged component method
Hair dryer	Dry hair without damaging	Firm hair from within	Nanoe technology
Hydraulic shovel (+ construction management system)	Efficient fuel consumption (fuel-saving)	Real-time management of overall construction site progress	3D stereo camera

Fig. 3 Conversion of the value dimension

In order to escape commoditization, it is necessary to clarify the difference between value creation and value dimension creation. Excluding new markets, competitive axes already exist on markets in some way, shape or form. The improvement of achievement levels on an existing competitive axis is a matter of OE (operational effectiveness), which is something separate to innovation[8] (**Fig. 4**). In this context, no matter the extent of technological innovation to realize "better fuel efficiency" or "lightweight products", it cannot be considered true innovation. Attention must be given to the point that the emphasis is on "value dimension creation", not simply "value creation."

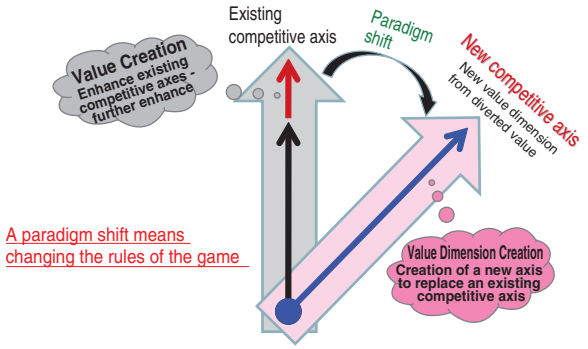

Fig. 4 The difference between "value creation" and "value dimension creation"

But the creation of value dimensions is not as easy as it sounds. As mentioned in the previous section, the reason why Japanese are inclined to approach ideas from the perspective of "fixing something that is not right (i.e. a problem)" can be traced back to our origins as a farming civilization. The line of thought that ongoing improvement within existing paradigms is right could be our implicit set of values. As such, this paper will introduce a tool called "VBridge" (Value Bridge), which was jointly developed by the research teams of the author and his colleague, Osamu Eryu (current NITech Vice-Chancellor) with the aim of eradicating ideas bound by the perspective of "fixing something that is not right (i.e. a problem)".

3. VBridge: The Execution of Core Technology Strategy through the Visualization of Thought Processes

VBridge is a technical expression for the visualization of thought processes. It was independently developed by NITech not in order to better achieve existing items, but in order to refine the ability to conceive new ideas with emphasis on discovering new areas. The VBridge method is used when teaching the MOT Exercises subject at NITech, as well as when the author holds training sessions for companies. This section will examine the example of nanoe technology developed by a certain electric home appliance manufacturer and discuss the thought process sought of core technology strategy utilizing VBridge.

3. 1 Case Study Overview

The core technology used for the case study is electrostatic atomized water generated by cutting-edge nanotechnology. By applying a high voltage to airborne moisture, nano-sized ions are created, including OH radicals (highly-reactive components) which are easy to use in various substances. In general, OH radials are not believed to last long due to being highly oxidant, however in the case of nanoe technology, the OH radicals are encapsulated with water, thus they have an extended life and can be utilized across a wider scope. The main features of nanoe technology are (1) approximately 1 000 times more moisture than regular negative ions (2) up to 480 billion OH radicals generated per second (3) a lifespan around six times longer than regular negative ions, (4) weak acidity.

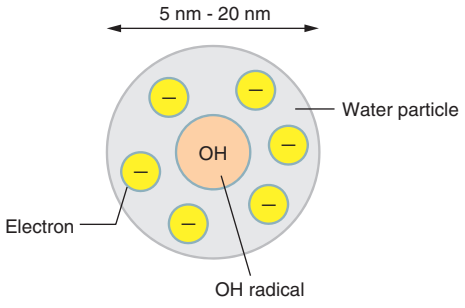

Fig. 5 Schematic diagram of nanoe technology

To focus on antimicrobial action as one benefit of nanoe technology, bacteria is minimized by (1) the nanoe water particles reaching the bacteria, (2) the OH radicals removing the hydrogen in the bacteria, then (3) changing the hydrogen of the bacteria into water. Bacteria

can be replaced to dead mite bodies/excrement, pollen antigens and ammonia. Meanwhile, nanoe technology is also effective on viruses such as seasonal influenza viruses and new virus strains. In short, it is a technology which removes hydrogen from matter. A wide variety of products utilize this unique characteristic of nanoe technology, including air purifiers, air conditioners, dryers, washing machines and refrigerators, therefore it serves as a fine example of core technology strategy.

3. 2 Points Leading to Value Dimension Ideas

Here, the author would like the reader to consider a new idea utilizing the unique characteristic of nanoe technology. Typically, this is done using recursive ideas based on a categorical conceptual structure which asks questions such as "What kind of allergens could hydrogen removal apply to apart from pollen antigens and dust mite bodies/excrement?", "What kind of virus could hydrogen removal apply to other than seasonal influenza viruses, new influenza strains, avian influenza viruses and pet viruses?" and "What kind of malignant substance other than allergens and viruses can you think of?" (**Fig. 6**). These types of ideas are core technology strategy ideas. However, as long as one thinks within this paradigm it can be easily predicted that the conclusion will be an idea along the lines of "nanoe technology to tackle something bad." It would be difficult to conceive an idea such as the hair dryer introduced in **Section 2. 2**.

One point to effectively conceiving an idea is to capture the unique characteristic of the core technology with a value-neutral expression of capability (**Fig. 7**). In contrast to value-laden expressions with concrete applications such as "removing hydrogen from allergens" and "removing hydrogen from viruses", a value-neutral, variable type expression would be "addition or subtraction of hydrogen molecules from the subject matter", and this expression is an abstraction of the aforementioned concrete expressions. This type of value-neutral representation of a technology's capability increases the conceptual degree of freedom and gives a person more leeway to discover new value. For example, "forming disulfide bonds" is an inspiration which clearly differs from the existing set of values. The important point is to conceive new value from a variable. If a new value was conceived from an existing value, the character of the existing value would have a strong impact. In the case of pollen antigen and dust mite corpses/excrement, these words themselves are negative, therefore any new ideas based on these concrete values would naturally only invoke a framing effect which would lead to new negative elements.

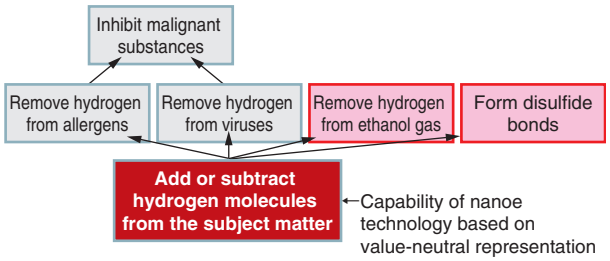

Fig. 7 Idea based on value-neutral representation of characteristics of core technology

However, it is not easy to inspire ideas from merely increasing the degree of freedom. Whether or not a person will conceive an innovative idea is up to that person's gut feeling. Even if the idea of "forming disulfide bonds" mentioned earlier *should* be conceived, there is no *reason* for it to be.

Here, another point emphasized by the author is the social value theme which companies aim for through business. The new idea of "forming disulfide bonds" could be conceived by investigating a new way to leverage the value-neutral representation of "adding or subtracting hydrogen molecules from the subject matter" by focusing on hair maintenance as part of the daily routine from the perspective of the social value theme of "helping busy working women to stay beautiful" (**Fig. 8**). From here, the idea of "forming ion bonds" can be conceived by focusing on weak acidity as another unique characteristic of nanoe technology. From here, a hair dryer was developed which offers the new value dimension of "strengthening one's hair structure to create beautiful hair from the inside simply through the everyday act of drying one's hair." Aside from the abovementioned "helping busy working women to stay beautiful", let us now contemplate the social value theme of "turning *ordinary* into *special*".

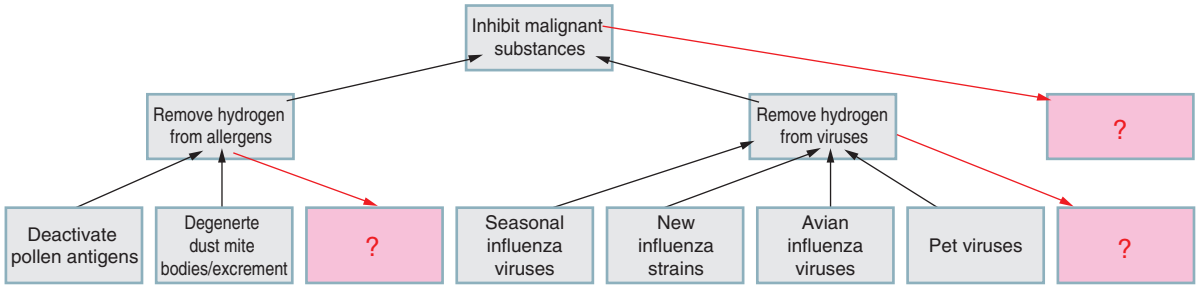

Fig. 6 Idea based on the categorical conceptual structure

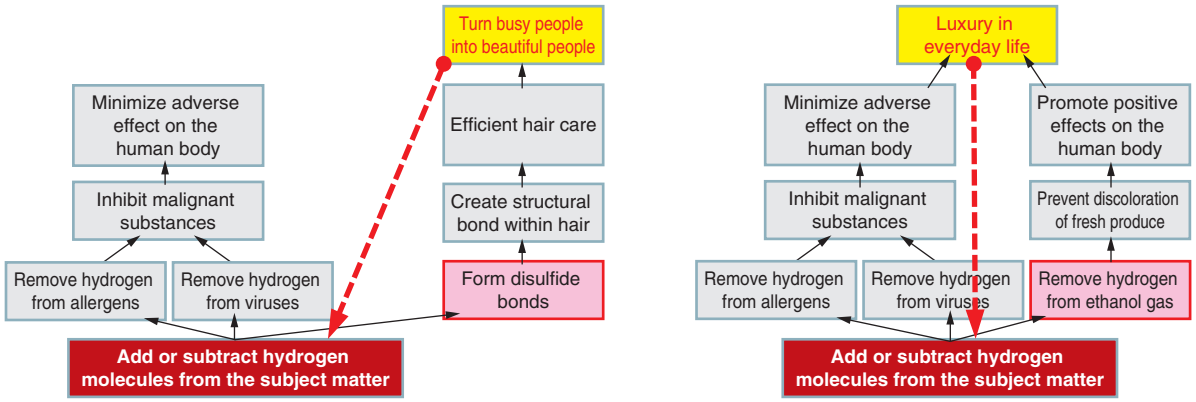

Fig. 8 Idea of starting from the social value theme

From the perspective of this social value theme, if ways to leverage nanoe technology's unique characteristic of adding or subtracting hydrogen molecules from matter are investigated, a new value dimension for refrigerators of "protecting food by breaking down ethylene gas, the cause of deterioration and discoloration (thus extending the period for which fresh fruit and vegetables can be enjoyed)" are conceived of.

To summarize the above, two points for the effective implementation of core technology strategy are (1) interpreting the core capabilities of a company from a value-neutral stance and (2) using the social value theme which companies aim for through business as the starting point of ideas. The previous chapter touched upon people's tendency to become preoccupied by solving problems when investigating ideas to leverage a company's core capabilities. The key to abandoning this status quo is to grasp "technological capabilities represented in a value-neutral way" in one hand and "social value theme which companies aim for through business" in the other hand. Then, if we put both of our hands together, we can expect to conceive an attractive idea and become a step closer to realizing the theme being aimed for (**Fig. 9**).

To that effect, "VBridge" was jointly developed by the research teams of the author and his former colleague, Osamu Eryu (current NITech Vice-Chancellor) as a conceptual tool (**Fig. 10**). VBridge is designed to thoroughly convey market orientation to people working in R&D departments (who tend to think inside the box in the technical world) as well as ensure people working in sales and marketing departments (who are market savvy) become conscious of their company's core capabilities.

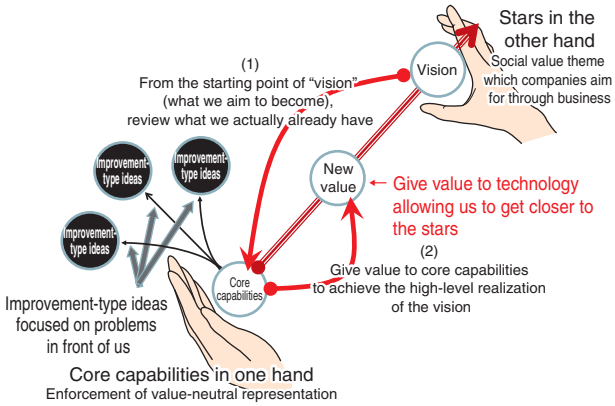

Fig. 9 Core technology strategy from a long-term perspective

VBridge also serves as a communication tool to facilitate understanding between the R&D department and business departments who sometimes have trouble understanding one another due to their unique language styles. R&D departments have a rich vocabulary in regards to the bottom half of the VBridge framework (component/mechanisms, autonomous functions [functions possessed autonomously] and heteronomous functions [functions generated when a technology is used for a particular application]), however they have a tendency to lack vocabulary and understanding regarding the top half, i.e. the requirement layer and higher. In contrast, business departments tend to be well-apt at the top half of the VBridge framework but weak at the bottom half. The two department types converge at the quality element layer and VBridge serves to promote dialogue between the R&D department and business departments.

In this way, VBridge is a tool to nurture engineers attuned to marketing and sales/marketing people with a solid understanding of their company's core capabilities. VBridge is also a tool to facilitate communication between R&D departments and business departments. Recently, the author uses the following explanation when explaining the significance of utilizing VBridge to companies.

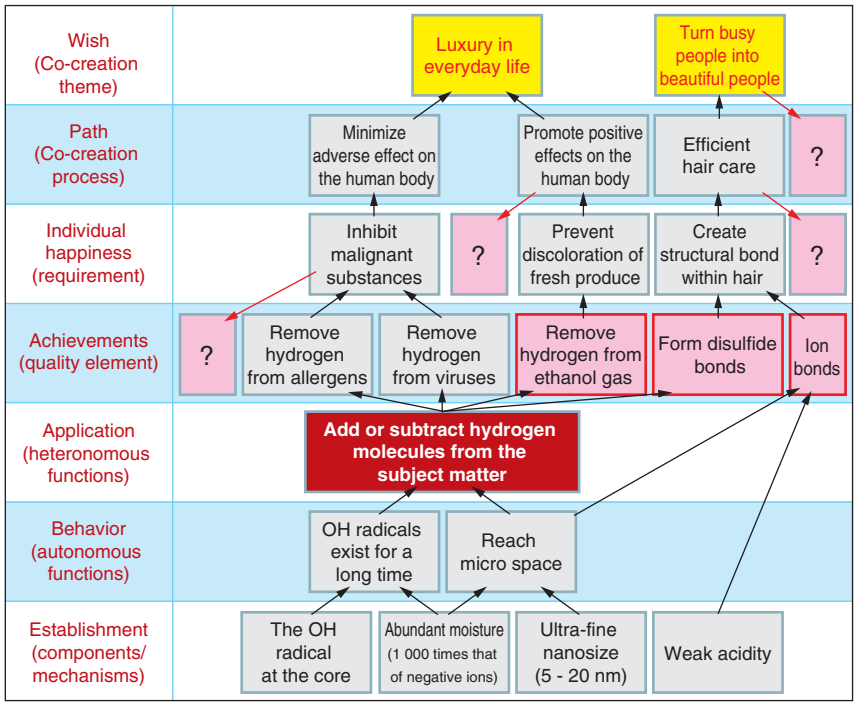

Fig. 10 VBridge

3. 3 The Essence of Utilizing VBridge

The essence of utilizing VBridge is the expansion of the problem-solving scope. A problem is when there is a gap between the target and the current status, while problem-solving is identifying the cause of the gap and implementing a countermeasure. It is a well-known fact that Japan's manufacturing industry has extremely high problem-solving capabilities. However, it has been pointed out that the Japanese also tend to prioritize solving problems based on objective data and set the problem-solving scope too narrow. To put it bluntly, we often tend to only find localized solutions for a problem with a much wider overall scope. Concepts within the scopes shown in the abovementioned **Fig. 6** can be considered typical examples.

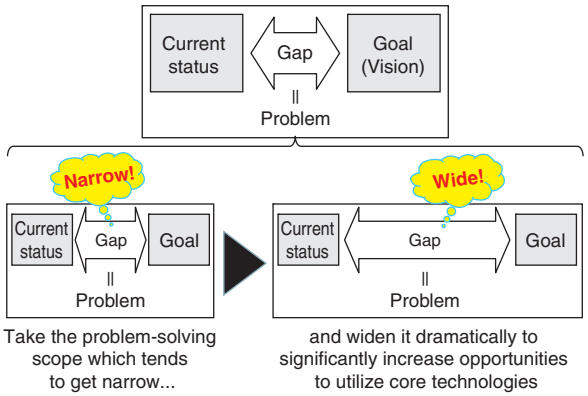

Fig. 11 Expansion of the problem-solving range

Ideas utilizing VBridge expand the ability to think by making "social value theme which companies aim for through business" the ultimate goal (**Fig. 11**). Avoid stopping at a narrow problem-solving scope and broaden the breadth of core technology strategy. The core technology strategy which can be expanded out to a wide-range of products can be implemented from a long-term perspective by utilizing VBridge. It can be said that the ability to create happiness that never before existed (creation of joyful things) in addition to solving problems (solving troublesome matters) depends on one's ability to utilize VBridge (**Fig. 12**).

4. "Social Value Themes Aimed for by Business" as the Key to Ensuring Long-term Success

4. 1 Dawn of an Era in which Long-term Customer Relationships are Difficult to Obtain with CS Alone

These days, the cost of obtaining new customers is said to be around five to 20 times the cost of maintaining existing customers. Against this backdrop, forming long-term customer relationships is said to be of grave importance in the marketing of today. In the past, the strength of loyalty meant the same as the strength of a customer's intention to continue purchasing (ongoing purchase intention). However, an accumulation of marketing research from the 1980s onwards shows that, in addition to ongoing purchase intention, loyalty is a concept which indicates overall intentions of behavior

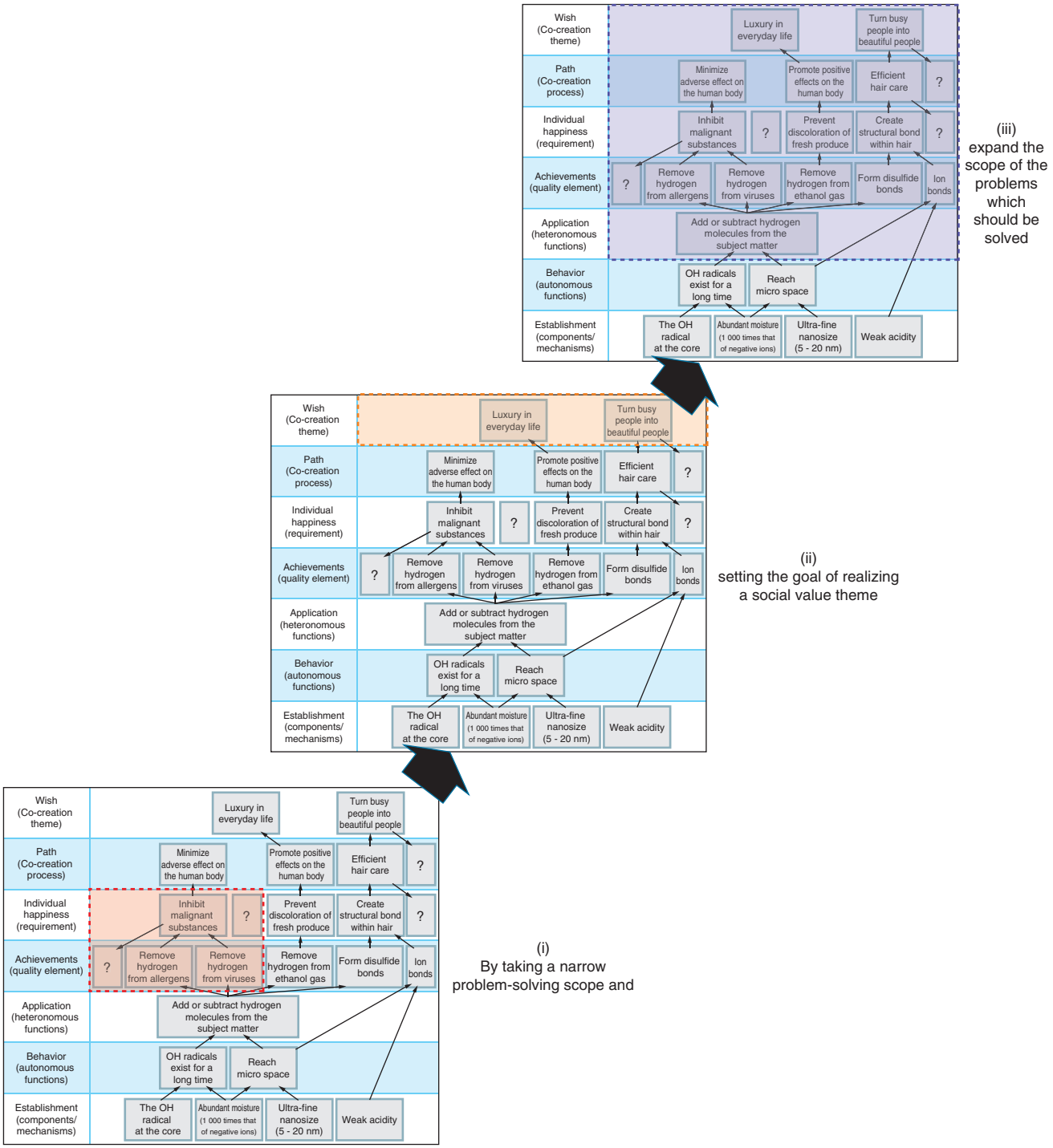

Fig. 12 Expansion of the problem-solving range in VBridge

towards a brand, including intention to cooperate, intention to interact and intention to recommend[12] (**Fig. 13**).

Interestingly, it seems that the formation of loyalty is not only affected by the level of satisfaction towards the product or service a consumer is currently using, but also strongly impacted by the consumer's empathy towards the brand vision. According to Matsumura and Kato, if the formation of customer loyalty purely depended on CS (customer satisfaction), the consumer would attempt to obtain more items other than the one he or she is currently using (intention to expand items) however this is not the case (**Fig. 14**). This means that the line of thinking which overemphasizes CS will not improve customer share. It can be said that we have entered an era in which it is extremely important to consider the social value theme of "what are we aiming to realize together with customers through our business" in order to build a good customer relationship spanning the long-term and ensure customers accept a high number of a company's products and/or services.

4. 2 Breaking the Mold of "Single-Product Competition" through the Social Value Theme

In the previous chapter, it was stated that the social value theme of "helping busy working women to stay beautiful" affected the core technology strategy of nanoe technology, which resulted in the emergence of an innovative hair dryer. However, other products can be associated with this theme. These include night steamers, leg massagers, scalp care, eye area care, warm beauty roller and products other than the hair dryer that have created a "beauty home appliance category" bundling the realization of many different themes under the wider social value theme of "helping busy working women to stay beautiful".

Single-product competition (the practice of competing on a single-product level) is a thing of the past. As long as individual product performance is the focus, the problems of differentiating between specifications and price with competing companies' products will persist. If companies with technological capabilities unanimously practiced single-product competition, there is no doubt

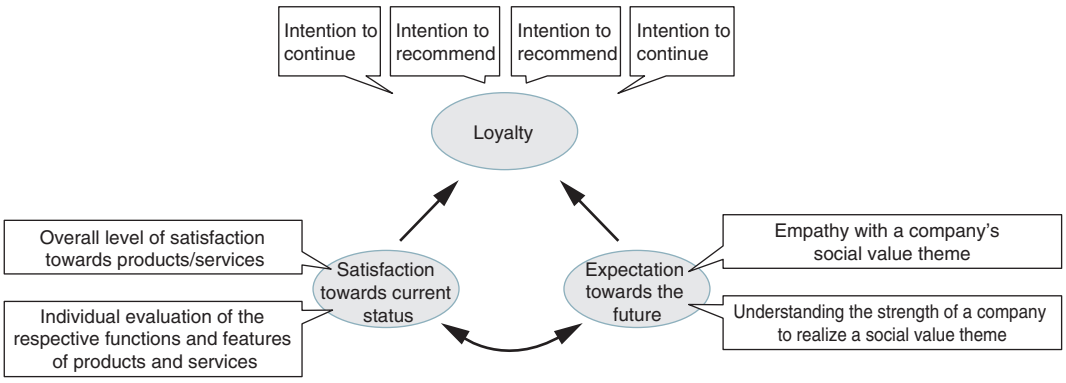

Fig. 13 Formation of customer loyalty

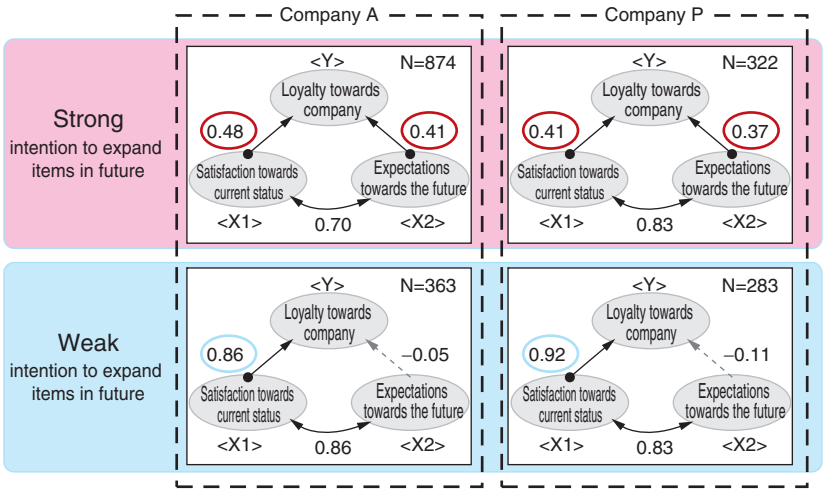

Fig. 14 Influence of social value theme on customers' intention to extend products

that a price war would follow. A critical key to breaking out of this trap is to form bundles of goods and services based on social value themes. "Category branding" is the name given to the concept of forming bundles of multiple different products or services which tie back to an attractive social value theme. Category branding is not only effective in the context of B2C. Construction machinery manufacturer, Komatsu Limited (Komatsu) established the value theme of Smart Construction and created a business model offering a bundle of assets which had been offered on an individual basis up to that point in a "Construction Management Package" and this is a symbolic example of B2B category branding[13] (**Fig. 15**). The point here is that multiple mutually-complementary measures are connected under a single goal and the assumption is not that these means will be used by multiple different users, but rather by the same customer who will collect them all as means to realize a certain value. The development of products and services as tools to achieve future *koto*, or "states" (contextual value) for customers not yet in existence and offering them in a bundle as a category brand rather than individually will prevent the commoditization created by single-product competition and can be expected to give a company a sustainable competitive advantage.

Fig. 15 Examples of category branding

4. 3 Representation of Social Value Themes

Since the emergence of service dominant logic in 2004, the common understanding amongst marketing professionals has been that products and services are merely means to achieve values and do not hold any intrinsic value themselves[14]. This marketing perspective claims that the key is what customers become able to do with the product or service a company provides, therefore it is important to take up a new perspective on product development as a means to create new customer behavior.

At the depths of customers' needs lies "Be" needs, which are universal, and "Do" needs as means by which to satisfy the "Be" needs. Furthermore, as a means to realize the "Do" needs, there are "Have" needs which is "Want to have means to realize XX". In this way, the customers' acceptance of products and services depends on the hierarchical relationship between goal versus means by which the Be, Do and Have (**Fig. 16**). The focus since the emergence of service dominant logic has been the important of creating new "Do" needs of these three layers which constitute customer needs.

Let's now focus on the point that the new value dimension creation examples discussed in **Chapter 2** of "hitting the ball with ease", "drying hair without creating damage" and "managing progress of the overall construction site with just one piece of construction machinery serving as the central control tower" are all creating new "Do" needs (new customer actions). In light of the new service dominant logic concept discussed above, attention is gathering around Koto-Marketing as a new theory for product development which focuses on creating new customer actions (creation of "Do" needs)[16]. The following is a summary of the Koto-Marketing concept.

The development of products and services as tools to achieve future koto, or "states" for customers not yet in existence and offering them in a bundle rather than individually in order to prevent the commoditization created by single-product competition. The longer the period of use is, the more apt the customer becomes at using a tool and the more they begin to desire new "Do" needs. Companies revise tools (products and services) to suit the customer's level of knowledge and skill and look

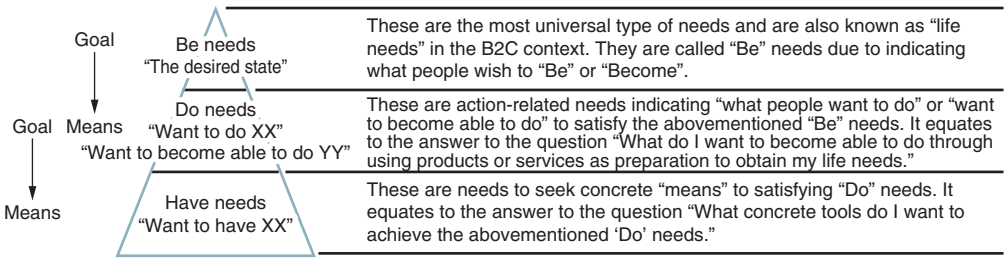

Fig. 16 Structure of customer needs

ahead to the next "Do" needs that will emerge due to the existing ones being fulfilled then developing new tools accordingly. In turn, this helps to form a healthy customer relationship for the long-term (**Fig. 17**).

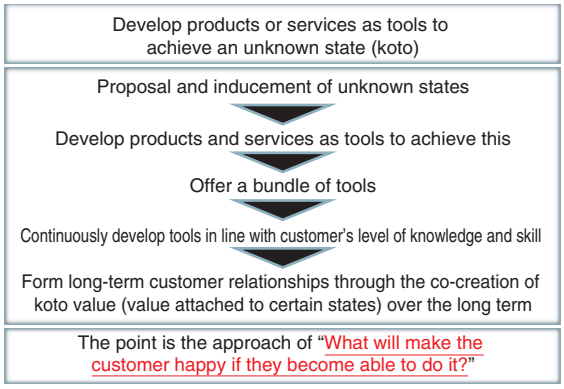

Fig. 17 Procedure of Koto-Marketing

In other words, it can be considered that Koto-Marketing is implying "the ongoing provision of tools supports customer development". Therefore, a matter of "First, I will become able to do this. Then, I will become able to do this, and then this…" It can be argued that the key to forming a good customer relationship that will be long-lasting is the company proposing a process for the customer to evolve, then continuously providing the tools to achieve this process (the products or services as means to achieving the social value theme) (**Fig. 18**).

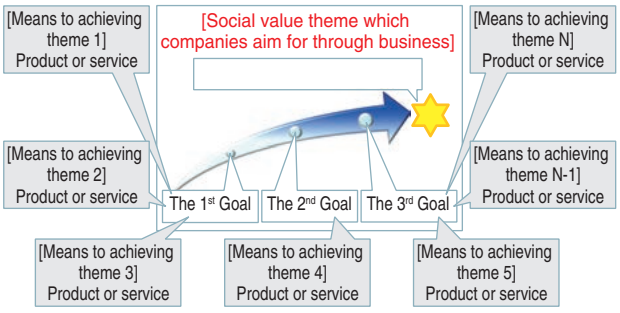

Fig. 18 Category Branding: Bundling products and services as means to achieve the social value theme

As a result of consideration by project members in a Value Creation Working Group held by JTEKT Corporation's Bearing Operations Headquarters in 2015, the attractive concept shown in **Fig. 19** was proposed. It is believed that if the R&D department also becomes involved and discusses this concept proposed by a business department it will lead to the creation of new products and services and have high potential to result in the acquisition of new business opportunities exceeding existing business categories.

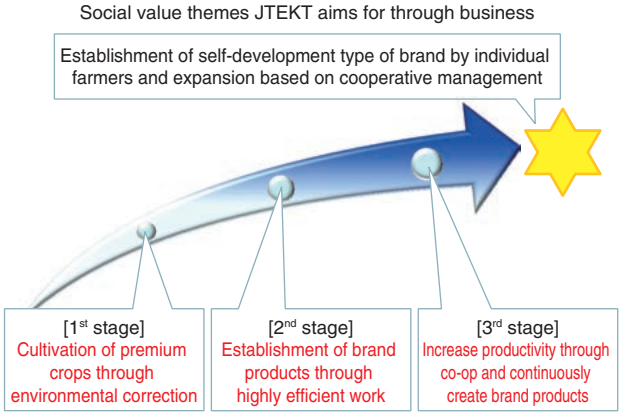

Fig. 19 Consideration by the project members of the bearing business headquarters of JTEKT

5. Conclusion: The Importance of Forming an Organizational Culture whereby all Individual Members Participate to Create Knowledge based on Organization-wide Communication Development

This paper has provided an outline of core technology strategy from a long-term perspective and introduced VBridge as the concept tool to implement such strategy. Based on the author's experience to date, if a person unfamiliar with the core capabilities of a company attempts to establish category branding it results in nothing more than a medley of existing products and in fact an extremely high number of cases prove such an approach does not result in ideas for new products and services which leverage the company's proprietary technologies. A business department well-versed in the company's core capabilities, or an R&D department well-versed in market and social trends, can be predicted to produce results through planning in isolation. However, it is quite often the case that the former, (the business department) does not sufficiently analyze the elements of the company's core capabilities, therefore is unable to gain thorough insight. In regards to the latter, the R&D department, it is often the case that members are primarily concerned with achieving their respective research goals thus are not particularly aware of external environmental trends affecting the company. Regarding implementation of core technology strategy from a long-term perspective, it is desirable that the business department and R&D department promote investigation using VBridge.

Furthermore, by including the ICT (Information and Communication Technology) department and service department in this study, it is possible to cover new products and services which do not only take advantage of a company's core technologies, but also all its management resources. VBridge is a tool used to devise new value from a specific core technology (in other words, a management resource). Komatsu has expanded

the scope of VBridge and developed an original tool called the "Customer Relationship Chart" aimed at devising new customer value through combining all of its management resources[17]. Investigations into finding new value with the involvement of all departments and based on the Customer Relationship Chart can be expected to achieve "category branding through the execution of core technology strategy from a long-term perspective."

Regarding specific projects using VBridge and the Customer Relationship Chart, rather than be projects whereby specific members are selected, it would be ideal to establish a system similar to the "20% Rule" promoted by Company G where employees use a certain percentage of their time for projects of their preference, rather than for their regular work. Then, it is desirable that the investigation results of each project team are not only shared with management, but also with other project teams to trigger mutual inspiration. A fine example of this is Komatsu's annual BM (Brand Management) conference. Komatsu aims for organization-wide knowledge creation and has established this conference as an occasion where a dozen or so mixed-department teams are formed to establish hypotheses based on regular considerations such as "What is happening in the external environment influencing our company? How will it change moving forward?", "How should we adapt to such environmental changes?" and "How should we embody such policies to adapt to external environmental changes as organization operations and internally adapt?" The answers to these questions are then presented in the form of recommendations to Komatsu's management executives, as well as the heads of all major departments. These recommendations are effectively utilized as material when Komatsu's management team investigates the company's future business strategies and can be considered one way of promoting companywide core technology strategy from a long-term perspective. One symbolic example is the category branding of "Smart Construction", which was publicly announced in January 2015.

It is said that large-scale corporations compartmentalized for the sake of operational efficiency now face the issue of vertical department and are unable to create organizational knowledge as they would like in order to adapt to the changes in the external environment influencing the company. As long as the mission of each department is to achieve its own milestones, it is only natural that this will take first priority. In the same way that it is the capillaries which support the individual organs which make up the human body, the key to organically connecting the respective functions of the departments which make up a company is "organizational communication". To companies aiming to shift towards the service sector from a manufacturing base or monozukuri (Japanese-style manufacturing) from value chain business and solution focuses, it can be said that the creation of organizational knowledge through cross-departmental communication is essential. One of the three most basic concepts of TQM (Total Quality Management) is getting all members involved to bring together an organization which has been compartmentalized then leverage all management resources owned by a company through cross-departmental communication and create a competitive edge.

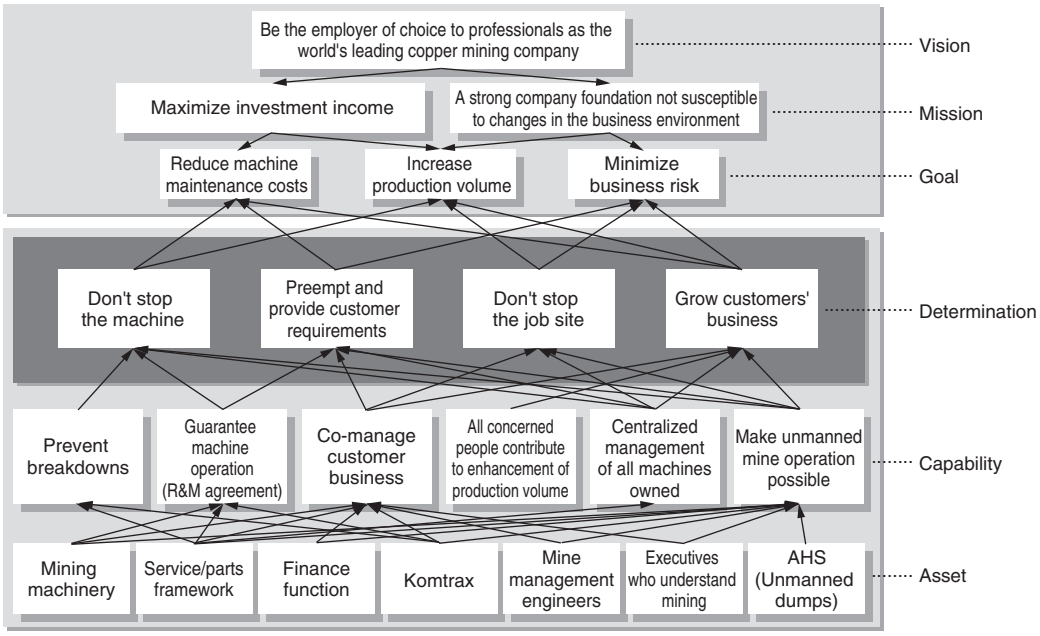

Fig. 20 Customer relationship chart developed by Komatsu

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