FROM VISION TO IDEA:

THE COGNITIVE PROCESS OF VISION-DRIVEN IDEA

DEVELOPMENT

Makoto Isono

Tottori University of Environmental Studies, Tottori, Japan,

m-isono@kankyo-u.ac.jp

ABSTRACT

The concept of visioning is proposed as a promising idea generation approach for technology-based radical innovation by O'Connor & Veryzer (2001). They define visioning as "the imagination that comes from how a problem is approached technically, and an ability to identify and characterize compelling benefits of that technology in terms of a future market." They claim that one of the main players in an organization who practices visioning is what they call the ruminator, who spends time thinking about the future, and is able to connect disparate pieces of information, by seeking far afield from their present businesses. Reid & Brentani (2014) show that visioning depends on creative individual thinking consisting of divergent thinking and idea-generating behavior. Focusing on the creative aspect of visioning, this research aims to understand how a vision, or a future context, is imagined and how it leads to product ideas in an innovation project, by applying insights on imagination discussed in the creative cognition research. According to Finke et al. (1992), imagination, although it is the generation of totally new idea or a thing, is predictable by knowing the mechanism, which is essentially structuring of existing knowledge one has. In addition, with this focus, the research defines visioning as imagining a future market as a vision, identifying ideas of benefits of a product in terms of the market for innovation in general,

which is not limited to tech-based innovation.

The author drew findings from case studies addressing fifteen projects including eleven that applied the visioning approach: (1) Vision-driven idea development consists of two stages of imagination, i.e., imagining visions, or future contexts, followed by imagining products idea that can bring the vision to life. (2) Mental syntheses of knowledge are the main cognitive modes that take place in each imagination process. (3) The innovativeness of an idea developed can depend on an individual's: (3a) knowledge of the vision as a source of mental synthesis in the process of product idea imagination and (3b) knowledge of insights from research on market and technology development or on their beliefs as a source of mental synthesis in the process of the vision imagination. (4) Visions can be classified into the insight-driven type or the belief-driven type depending on the vision content, and the scene or story type depending the vision style. (5) The insight-driven type of visions could lead to generation of ideas new to both the markets and/or technologies and the firms. Findings (3b) and (5) are in line with Lindgren & O'Connor (2011), who show that, in projects with a high future-market focus, the ideas come from visioning.

This research contributes to the stream of visioning studies through understanding the cognitive process of how a vision is imagined and how it leads to ideas. The findings suggest managers who intend to develop ideas that lead to innovation: (1) should use divergent thinking to explore a wide range of knowledge in the process of imagining visions and product ideas, (2) examine the knowledge of the vision used for imagining the product idea, (3) examine the knowledge of insights from research on market and technology development or on their beliefs bolstering the imagination of the vision. (4) Also, managers should refer to marketing and technology research insights when imagining a vision, in order to generate the ideas that are new to both the market and

technologies, as well as the firm.

INTRODUCTION

Since ideas are the sources of new products or services that firms develop, the proper management of idea generation is considered to be one of the crucial issues in NPD (Ende et al. 2014; Markham 2013; Khurana & Rosenthal 1997; Cooper & Kleinschmidt 1987). The approaches to product-idea generation that attract attention today include visioning: the imagination that comes from how a problem is approached technically, and an ability to identify and characterize compelling benefits of that technology in terms of a future market (O'Connor & Veryzer 2001), or backcasting: imagining a story of "the future that has come" and gaining strategic insights from the imagination (Nishimura 2010). These approaches share commonalities of imagining a vision or a future context and identifying or generating the strategic insights, technical benefits, or product ideas that can bring the vision to life. These concepts are considered worthy of exploration because their application may be able to link advanced technologies to future market opportunities (O'Connor & Veryzer 2001), or improve project success rates by allowing the firm to move from the broad idea search effort to a more-converging process that focuses on a specific market target (Reid & Brentani 2014). Visioning or backcasting is based on imagination, and this study views them as an application of imagination described as creative cognition which is part of cognitive psychology, examining how these approaches bring about ideas and how they can be managed. Finke et al. (1992), creative cognition researchers, define imagination as the generation or experience of ideas or products that go beyond what is presently known, and also involves cognitive activity directed at some goal. They argue that imagination is, just like other creative processes, not random but a rather highly-structured activity

that can often result in surprising and unexpected outcomes. Because of its structured nature, how one generates a novel idea through imaginative processes is predictable to some extent. According to the definition, the approaches of visioning or backcasting, the present research's focus, may be featured as a form of imagination where a vision or a future context is imagined, and product ideas are generated based on that vision. By taking the imagination aspect into consideration, how may one understand the cognitive process of visioning or backcasting as bringing about ideas, and how may managers influence the process? Previous NPD studies have dealt with visioning or backcasting by examining how to use these approaches practically, they also inquire about what influences project performance, identifying the organizational or environmental conditions that project teams need to take on these approaches, rather than how these approaches bring about ideas. But understanding that fact can help project teams apply such approaches to their development practice more effectively. Accordingly, this research conducts case studies to examine how these approaches are used in actual NPD projects by interviewing practitioners involved in such projects, in order to understand how these approaches can bring about ideas, and to consider how managers can influence them.

IMAGINING THE FUTURE

Imagination-based new product-idea generation

In terms of approaches of future context imagination for idea generation, previous NPD studies have accumulated insights on the concept of visioning. Visioning is a concept proposed by O'Connor & Veryzer (2001). They claimed that, under the problem of how to link the latest technologies to market opportunities of the future, an

organizational capability they called visioning was crucial in bringing about radical innovation. Based on Jolly (1997), Hamel & Prahalad (1994), Davis (1987), etc., visioning is explained as "imagination underlying all successful technology-based innovations that comes from how a problem is approached technically and an ability to identify compelling benefits of that technology and characterize those in terms of a market that may not exist presently (O'Connor & Veryzer 2001)." They found that one of the main flows of visioning is that a particular view of the future drives development and acquisition of new core competences. This can be restated as identifying a goal and then finding a way to reach it. Their vision development process consisted of three stages: motivation, insight, and refinement. During the motivation stage, combinations or leaps of pieces of thought took place. The visioning was mainly driven by three players: the ruminator, champion, and implementer. Here the ruminator, backed by broad experience, was to spend time thinking about the future and be able to connect disparate pieces of information, looking far beyond their present businesses.

Reid & Brentani (2014) took the concept of visioning as a kind of organizational competence, which they call market visioning competence. They claimed that visioning competence consists of divergent-thinking, including human networking and market learning and convergent thinking, including idea promotion and market orientation, and that the competence is driven by individual divergent-thinking behavior, idea-generation behavior, and the organizational structure that promotes individual divergent thinking. O'Connor & Veryzer (2001)'s argument on the process of vision development and Reid & Brentani (2014)'s argument on the construction factors of visioning suggest that it is a kind of creative process where a vision is developed by combination or connection of information gained from market learning through divergent and convergent thinking.

Lindgren & O'Connor (2011) claimed that ideas were driven by visioning when the organization had higher future-market focus (the extent to which an organization focuses on future customers and competitors as opposed to present customers and competitors). Reid et al. (2014) focused on technology vision and showed that project performance created by visioning included the attractiveness of ideas to customers, gaining a technological competitive advantage, and gaining internal resources. They showed that an antecedent of visioning, bringing about ideas, includes future-market focus and a consequence of the use of visioning includes customer attractiveness of ideas.

So-called backcasting, which O'Connor & Veryzer (2001) depended on to depict the visioning concept, is a thought approach used not only for technology-enabled radical innovation but also for general radical innovation including innovative idea generation or organizational structure innovation. According to Davis (1987), backcasting is needed to grasp the reality of a firm's present context and their future context in x years and to think about what change is needed to transform the present to the future context. Or, according to Nishimura (2010), backcasting is needed to draw a possible future scenario and to gain strategic insight. Drawing a scenario here is meant to include imagining "a future that has come to life (Nishimura 2010)." Visioning by O'Connor & Veryzer (2001) and backcasting by Davis (1987) or Nishimura (2010) have the commonality of orienting toward the future context beyond the present and imagining them. On top of that, visioning is about featuring the latest technologies to bring the future context to life, while backcasting is about generating strategic insights or ideas to bring the future context to life. Therefore, both visioning and backcasting can be viewed as having the aspect of imagining a vision or a future context and then generating product ideas or developing core competences.

The principle of imagination in creative cognition

How then is a vision or a future context imagined and how does it lead to generate product ideas? As stated earlier, it is a creative process characterized by the combination or connection of information gained from market learning. On top of that, imagination may be explained as a kind of creative cognition (Finke et al. 1992; Ward 1995). In this section, imagination is considered from the viewpoint of creative cognition theories, in order to understand the principle of imagination underlying visioning or backcasting used in NPD.

Finke et al. (1992) observed that imagination involves the generation and experience of ideas or products that go beyond what is presently known, and also involves a cognitive activity directed at some goal. They argued that imagination, although tending to be viewed as a mysterious process through which new ideas are generated, is influenced by one's existing knowledge framework. Specifically, based on categorization models, they claimed that a new idea is the product of the restructuring of existing knowledge of characteristic attributes of category exemplars (e.g., a pigeon, a penguin, etc. belonging to the bird category). For instance, an idea for a new category exemplar may be generated by retrieval of existing knowledge on two or more different known category exemplars and mental synthesis of their characteristic attributes, or by retrieval of existing knowledge on a category exemplar and mental transformation of the characteristic attributes (Finke et al. 1992).
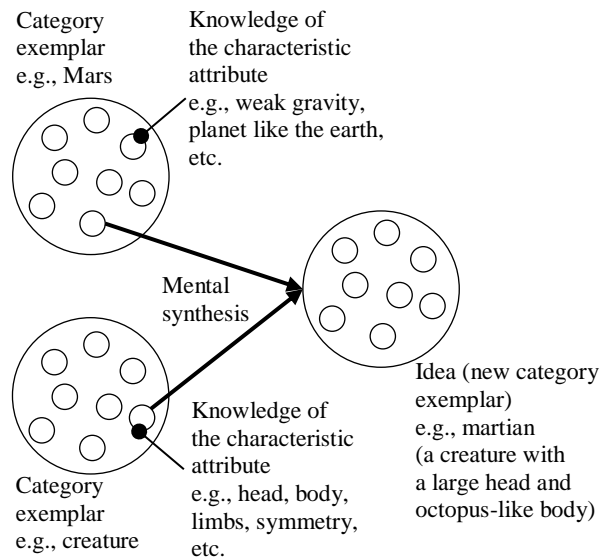
In the process of imagination, mental representation of a new exemplar is generated by a mental synthesis or mental transformation being interpreted in meaningful ways. The cycles of generation and interpretation are repeated until a satisfactory resolution is obtained (Finke et al. 1992). People tend to have a common knowledge structure for a

category, i.e., judgment of what category members are included in what ways in the category and what are the characteristic attributes of the category exemplar (Murphy & Medin 1985; Finke et al. 1992). Ward & Rebecca (2002) showed that, for imagination, one tends to use knowledge that is easier to retrieve, making the generated knowledge is easier for others to retrieve, too. That means that one's initial trial of imagination toward a certain goal can be something similar to what others imagine toward the goal, ending up with less creative resolution. Therefore, Finke et al. (1992) argued that one should make sure that the knowledge used for imagination is truly effective for creative idea generation, rather than just relying on knowledge that one may easily retrieve. As a means to overcome the limitations imposed by the use of an existing knowledge structure, Finke et al. (1992) suggested mental models to be used. Holland et al. (1986) defined mental models as mentally-created models comprising the knowledge structure against an object; it is something driven to make predictions against environment. For example, one might predict that a piece of paper will tear when it is placed under tension or that of a cup will break when it falls (Holland et al. 1986). They claimed that the use of mental models can promote a combination of one schema related to a certain state and another related to a different state. For example, one can imagine a new function for a piece of paper by modeling its combination with a cup (Holland et al. 1986).

The review of insights regarding the principle of imagination suggest that, in the cognitive process of visioning or backcasting, the mental syntheses and/or transformation of knowledge on characteristic attributes of the category exemplars could be taking place. Obtaining a creative resolution may require repeated generation and interpretation of new category exemplars through the mental synthesis and/or its transformation. The following case studies deal with practitioners designed to examine

how ideas are generated through the process of visioning and how they may be influenced.

Figure 1 An example of cognitive process in imagination: mental synthesis of knowledge pertaining to the characteristic attributes of category exemplars

Category exemplar e.g., Mars

Knowledge of the characteristic attribute e.g., weak gravity, planet like the earth, etc.

Mental synthesis

Knowledge of the characteristic attribute e.g., head, body, limbs, symmetry, etc.

Category exemplar e.g., creature

Idea (new category exemplar) e.g., martian (a creature with a large head and octopus-like body)

RESEARCH DESIGN

Research question

The literature review has drawn the following research questions: what cognitive process works in visioning that contributes to innovative idea generation in a NPD project? How is it different from the cognitive process in an NPD project where visioning is not used? How is a vision imagined and set? How are ideas generated based on the set vision? In this research, the idea-generation approach is driven by visioning and is defined as the approach where a vision or a future context is imagined, set and then ideas are generated against a problem based on the vision. This approach is contrasted against the approach where ideas are generated against a problem without

referring to any vision or imagined future context.

In terms of the project performance, although O'Connor & Veryzer (2001), Reid & Brentani (2014), etc. deal with visioning for radical innovation that links advanced technologies to market opportunities, this study deals with projects that used visioning for general innovation including not only technological innovation but also marketing innovation. That is because this study focuses on a vision's imaginative processes, which may underlie not only on projects that intend to develop innovation by means of advanced technologies but also on projects that intend to develop innovation by creating semantic value with existing technologies. In that sense, this study deals with projects that used backcasting, too.

The innovation typologies listed by Garcia & Calantone (2002) were used to assess the type of innovation as marked by project performance, i.e., whether the project developed market newness, technology newness, or newness to the firm.

It mainly focuses on an understanding of individuals instead of organizations as O'Connor & Veryzer (2001) and Reid & Brentani (2014), who claimed that vision imagination mainly relied on individuals' efforts.

Research methodology

Case studies dealing with projects where visioning was utilized were conducted to address the research questions. The focus was on understanding and developing a hypothesis about cognitive processes through which managers may set a vision and generate innovative ideas based on it. The case study method is suggested for development of theoretical hypothesis (Yin 2009).

Selection of research subjects

The research subjects were innovation projects featuring a visioning approach for idea generation. To understand the significance of the use of visioning, a research subjects should be involved both in projects where visioning was used and where it was not. Accordingly, eleven managers were interviewed, who appeared in the academic papers, business books, internet sites for business practitioners, or were suggested by other researchers as those who were involved in innovation projects using visioning or backcasting. Three of these managers were involved both in projects utilizing visioning and those not using it. The remaining eight managers were involved in only projects utilizing visioning. One manager out of the eight was involved both in a project using the story type of vision and one using the scene type. Fifteen projects were analyzed in total. All the managers interviewed were in a lead position for the visioning processes in their projects. Three of them were marketing directors, two were engineering directors, and six were design directors. All of them were at a senior level with more than 15 years' experience. The industries of these projects involved included household care products, food products, beauty care, AV equipment, apparel, interior goods, industrial machinery, local products, banking, and food & beverage services. The interviews were conducted from August 2015 to December 2017. An overview of the interview is given in Appendix (Table 1).

Interview protocol

The semi-structured in-depth interview method was used for the research. 1.5 to 3 hours were spent for each interview. Specific questions asked had to do with project outlines, development processes, reasons for the use of visioning when it was used and project performance judgment. Insofar as project performance was concerned, most projects reviewed were at the stage before or just after their market introduction.

Therefore, a manager's judgment with respect to their project performance was noted. The interview notes were sent to managers interviewed and checked by them to ensure validity.

RESULTS

The cognitive process of visioning

The cognitive process of visioning in idea development

Project teams were found to use visioning when it was vital for them to agree on the ultimate goal of the project, i.e., to what part of society the project would contribute, to what future would the project contribute, or to make sure they would realize a holistic customer's consumption experiences, not part of them. However, project teams did not engage in visioning when these were perceived to be relatively less important.

On the one hand, the cognitive process of visioning-driven idea generation was confirmed to be such that a vision or a future context on the project problem was imagined and set and then products as things to bring the vision to life were imagined. In other words, it was the process consisting of two steps of imagination, i.e., imagining visions followed by imagining products as vision constituents. On the other hand, the cognitive process of idea generation where visioning was not used was such that ideas were generated by directly imagining potential products, whether collected internally and/or externally, as possible solutions to address the project problem. For example, in case N° A2, ideas were generated for the project problem dealing with the next generation dish-washing product line-up development, using a new grease-removal

technology through brainstorming by the project team etc., which entailed implementing the process of imagining products against the project problem.

The observed generation mode of visions and product ideas as vision constituents can be summarized as the mental synthesis of knowledge on the characteristic attributes of two or more category exemplars (i.e., category knowledge). The mental synthesis of two or more category knowledge elements is said to be a basic cognitive pattern taking place in one's imagination (Finke et al. 1992). Hence, the observed vision generation and idea generation processes are restated below.

The vision generation process

   The author observed that visions were mainly drawn from the mental synthesis between category knowledge of insights from research on market and technology development, or from category knowledge on something that personally interested managers, and category knowledge on present contexts or customers.

For example, in case N° G1 where the project problem was set to identify next generation system kitchen products, the vision of "active seniors express their originality using IoT and AI technologies" was drawn up and set as a main future customer figure over the next 10 years, based on their research findings regarding technology development, such as IoT or AI technologies, and their original market research findings. Furthermore, the mental synthesis may be viewed as having taken place between the category knowledge of insights from research on market and technology development and the category knowledge placed upon the elderly as their present customers.

In case N° B, the manager, who led the project aiming to explore proximate business opportunities for a large audio and visual equipment firm, took a personal interest in

the earth's value or preserving the natural environment. He came up with the vision of "life with the earth's beat felt" based on his interest regarding the future ideal state of people's daily lives. The mental synthesis may be viewed as having taken place between the category knowledge pertaining to the manager's interests or beliefs about the earth's value and the category knowledge corresponding to people's daily lives at present.

The product-idea generation process

   Product ideas as vision constituents were observed to be drawn from mental synthesis between category knowledge on the vision and on the project problem. For example, in case N° G1 where the project problem was set as to identify next-generation system kitchen products, the idea of AI embedded in the UD-system kitchen as a cooking partner was drawn from the mental synthesis between category knowledge (e.g., seniors, traditional design, Porsche, yacht, wine, jazz, universal-design, AI/IoT technologies, etc.) on the vision of "active seniors express their originality using IoT and AI technologies" and category knowledge (e.g., dining, tableware, cooking, etc.) on those system kitchens identified as the project problem.

In cases N° B, the idea of a delivery service of forest sounds was drawn from the mental synthesis between category knowledge (e.g., earth, natural sounds, forest, water, bird, etc.) on the vision of "life with the earth's beat felt" and category knowledge (e.g., audio equipment, net delivery service of music, etc.) on the audio and visual equipment as the project problem.

In many cases (cases N° A1, C, D1, E, G1, H, I), the process of product-idea generation or product imagination was not straight-forward, although it was run based on set visions. Instead, trials of mental synthesis with various category knowledge on the set visions were repeated. In some cases (cases N° A1, G1), even the once-set visions were

revisited and more appropriate visions are explored when the ideas generated were judged not satisfactory enough after the effort of idea generation based on the set visions. Vision and idea generation processes in other cases were described in Appendix (Table 1).

<u>Individuals who conduct vision imagination and product imagination</u>

The author confirmed that imagining visions and products was both conducted by individuals. In terms of who in the project team conducted the imagination, at least in some cases, visions were imagined by multiple individuals on the project team and then the best vision options generated were chosen. Likewise, products were imagined or product ideas were generated with multiple individuals in the project team and then the best of all the idea options was chosen. In these cases, the individual who imagined the vision and the individual who imagined the product or generated the product idea were often not identical. In other cases, the same individuals imagined and identified both the visions and the products. In those cases, the individuals were the ones who initiated the projects, or who were pre-determined to take on the role of vision imagination and idea generation on the team.

Vision typology

The visions observed can be classified by their content and style. In terms of content, the visions can be classified as (i) insight-driven type, (b) belief-driven type, or where (ib) is a mixed type, depending on the extent the visions are imagined, relying on insights from research on market and technology development, or a manager's beliefs. In terms of style, it can be classified as (sc) static scene type, or (st) dynamic story type, depending on the extent the visions are imagined in terms of time-frame (Table 1).

In terms of vision content, on the one hand, (i) there were observed to be the type of visions that were imagined based more on insights from research on marketing and technology development. Projects dealing with branding of household care products or food products (cases N° A1, C, D1) or projects that set the target customers (cases N° G1, I) tended to fall under this type. On the other hand, (b) there were observed to be the type of visions that were imagined based more on the managers' beliefs or aspirations. In these cases, insights from market or technology research were not deliberately used, but the managers' own beliefs or aspirations from their experiences were heavily relied upon in imagining the vision (cases N° B, J, E, F2). (ib) There were observed to be the type of visions that were imagined based on the mix of insights from market and technology research, along with the manager's beliefs.

In terms of vision style, (sc) there were observed to be the type of visions that were static, not including story development, as if it were one scene of a story (cases N° A1, D1, H, B, J), and (st) there were observed to be the type of visions that were dynamic, including story development, as if it were a kind of story (cases N° C, G1, I, F`, E, F2). The story type of visions ranges from those akin to a short cartoon (case N° F2) to those akin to a drama (case N° E). All managers who utilized a story type of visions stressed the effects of imagining their vision as a story in identifying innovative product ideas.

The relationship between the types of visions and the types of innovations

The vision types and the innovation types of project performances were compared. It was found that the visions that were insight-driven tended to lead to newness for both the markets and/or technologies, as well as the firms. The visions that were belief-driven tended to lead to newness for the firms but not for markets nor for technologies. No clear relation between the vision style and the innovation types was found.

Table 1 Vision typology

	Visioning-driven project		Project without visioning
	(sc) Scene type	(st) Story type	
(i) Insight-driven type	A1 (MN/-/FN) D1 (MN/-/FN) K (-/TN/FN)	C (MN/-/FN) G1 (MN/TN/FN) I (MN/TN/FN)	A2 (MN/-/FN) D2 (-/-/FN) G2 (-/-/FN)
(ib) Mixed type	H (-/-/FN)	F1 (MN/-/FN)	
(b) Belief-driven type	B (-/-/FN) J (MN/-/FN)	E (-/-/FN) F2 (- /-/FN)	

MN: Market newness   TN：Technology Newness   FN: Newness to the firm

DISCUSSION

The cognitive process of visioning

   Reid & Brentani (2014) have shown that visioning is a competence related to organization's divergent and convergent thinking. Reid, et al. (2014) showed that the use of visioning leads to customer attractiveness of ideas. This study findings support the preceding research findings from the view of a managers' cognitive processes. The author confirmed that the visioning-driven idea generation was the process of imagining visions followed by the imagining products (product-idea generation) as something that brought the vision to life. Indeed, it consisted of two steps of imagining.

Specifically, first, a new vision is imagined and set as the future context related to a project's problem. The vision (i.e., the new category exemplar (Y)) is drawn from the mental synthesis between category knowledge of insights from research on market and technology development and/or category knowledge on manager's beliefs (i.e., knowledge of the characteristic attribute (x) of category exemplar (X)), and category knowledge on present customers or contexts (i.e., knowledge of the characteristic attribute (a) of category exemplar (A)). Second, product ideas as the vision constituents (i.e., new category exemplar (Z)) are drawn from mental synthesis between category

knowledge of the vision (i.e., knowledge of the characteristic attribute (y) of category exemplar (Y)) and category knowledge of the project problem (i.e., knowledge of the characteristic attribute (b) of category exemplar (B))(Figure 2). It makes sense that category knowledge (y) of the vision is used for mental synthesis in imagining a product (i.e., product idea generation) as the intention behind visioning is to generate ideas efficiently with a set vision as a guide for the idea search.
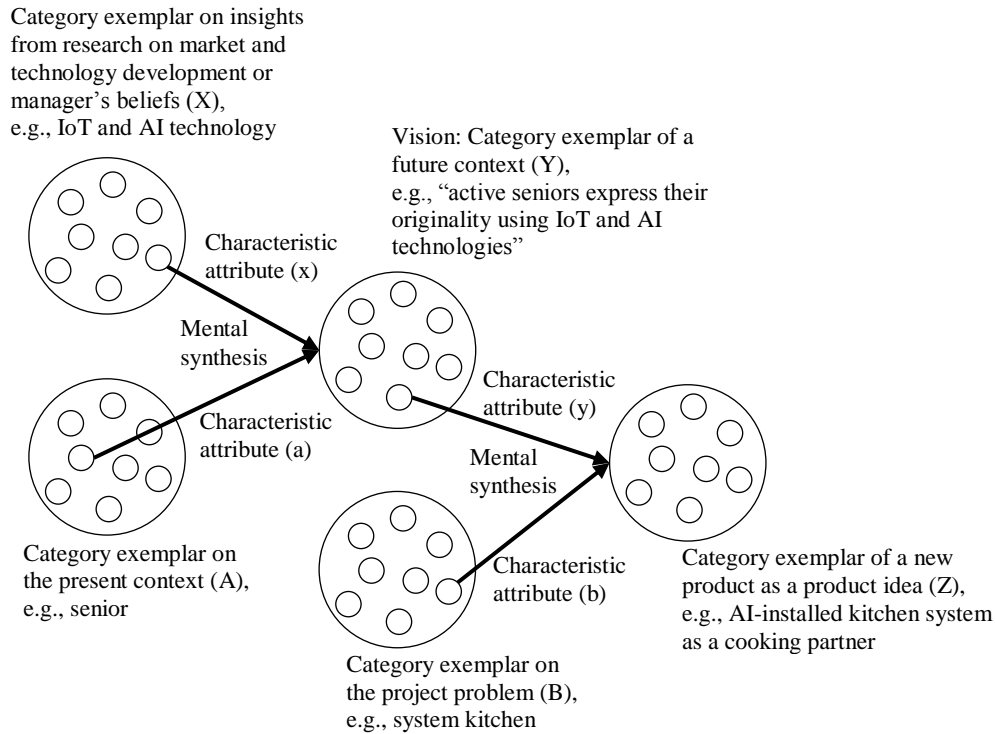
Mental synthesis in imagining products (Z) uses category knowledge of the vision or the future context (y) and category knowledge of the project problem (b). The choice of category knowledge on the project problem (b) is assumed not to make a major difference, depending on the managers, as it is something present and is familiar to them. Therefore, it is assumed that the innovativeness of product ideas (Z) generated mainly depends on category knowledge of the vision or the future context (y) used for mental synthesis in imagining the products.

The category knowledge (or knowledge of the characteristic attribute) (y) belongs to the knowledge of category exemplar of the vision (Y) therefore the (y) is supposed to be influenced by (Y). What are used for mental synthesis in imagination of the vision (Y) are category knowledge of insights from research on market and technology development and/or category knowledge regarding manager's beliefs (x) and category knowledge of the present context (a). The choice of category knowledge in the present context (a) is assumed not to make a major difference, depending on the managers, as it is something present and is familiar to them. Therefore, the innovativeness of the vision (Y) is assumed to mainly depend on category knowledge regarding insights from research on market and technology development or the manager's beliefs (x) used for the mental synthesis in imagination of the vision. In other words, the innovativeness of product ideas is assumed to depend on what category knowledge of the set vision was

chosen in imagining products, and what category knowledge of insights from research on market and technology development, or the manager's beliefs, were chosen in imagining visions. When the innovativeness of product ideas was not well confirmed, the category knowledge used should be revised. A mundane vision would lead to merely mundane category knowledge, resulting in the generation of mundane product ideas. In cases N° A1 and N° G1, the once-set visions were revisited in the process of the product-idea generation. In these cases what happened were that the category knowledge pertaining to insights from marketing and technology research used in imagining visions was revisited.

Imagining visions and products were both done by particular individuals in their project teams. This coincides with O'Connor & Veryzer (2001) and Reid & Brentani (2014) in terms that vision imagination relies on individuals. On top of that, the author found that, in many cases, others besides those who imagined visions imagined products, i.e., generated product ideas. That outcome was generated because product ideas are developed based on a set vision by each member of multiple teams on the project, which underlies the intention to explore the most diverse ideas possible, and the one who generated the idea that ended up being selected happened not to be identical to the one who imagined the vision.

Figure 2 An example of the cognitive process in visioning

Category exemplar on insights from research on market and technology development or manager's beliefs (X), e.g., IoT and AI technology

Characteristic attribute (x)

Mental synthesis

Characteristic attribute (a)

Category exemplar on the present context (A), e.g., senior

Vision: Category exemplar of a future context (Y), e.g., "active seniors express their originality using IoT and AI technologies"

Characteristic attribute (y)

Mental synthesis

Characteristic attribute (b)

Category exemplar on the project problem (B), e.g., system kitchen

Category exemplar of a new product as a product idea (Z), e.g., AI-installed kitchen system as a cooking partner

Vision typology

Visions may be classified by their content and style. The visions mentioned by O'Connor & Veryzer (2001) are about future markets. This research adds insights on how future markets may be imagined. In terms of vision content, the author found that visions were classified either as insight-driven, belief-driven type, or mixed, depending on the extent they are based more on insights from research on market and technology development, and the extent they are based more on manager's beliefs. On the one hand, the insight-driven type of visions could lead to generation of product ideas new to both the market and/or technologies, as well as the firms. That could be because the visions were a function of the manager's efforts to achieve what customers would believe as their ideal future state drawn from the insights of modern marketing and technology research. On the other hand, the belief-driven type of visions could lead to the generation of product ideas that are new to firms, but not to markets or technologies. When visions are imagined without taking insights from market and technology research into account, the effects on developing markets and/or technology newness

may greatly depend on whether the manager's beliefs are truly relevant to what future markets and/or technologies demand.

In terms of vision style, the author found that the vision examples were classified either into the scene type, which were more static and did not involve story development, or the story type, which were more dynamic and involved story development. Ward & Rebecca (2002) pointed out that one tends to rely on knowledge that is easy to retrieve in mental synthesis of category knowledge. When they just used it, the visions or product ideas generated were more likely to result in something less innovative, since such knowledge is accessible to others, too. To avoid that problem, Finke et al. (1992) suggested deliberately using mental models in retrieving category knowledge, since they enable one to use category knowledge that is harder to retrieve. From this point of view, the author expected that imagining visions as stories would involve dynamic aspects of things and would drive mental models of things imagined, resulting in generating more innovative ideas. Nevertheless, contrary to that expectation, no clear relationship between the story type of visions and the innovativeness of ideas generated was found in this study. Further research is needed to build a deeper understanding on the effects of using the story type vision and mental models.

IMPLICATIONS, LIMITATIONS, AND FUTURE RESEARCH

This research addressed the idea-generation approach using visioning, based on the insights on imagination discussed in the creative cognition theories and attempted to clarify the cognitive process used in visioning that contributes to innovative idea generation in a NPD project. The findings are summarized as follows. (1) The cognitive process of visioning consists of two steps of imagination, i.e., imagining visions and imagining products as vision constituents; (2) Mental syntheses of category knowledge

take place at each imagination step; (3) The innovativeness of any product ideas generated is assumed to depend on the category knowledge of the visions used for mental synthesis for imagining the products, and the category knowledge of insights from research on market and technology development or managers' beliefs used for mental synthesis for imagination of the visions; (4) Visions can be classified into the insight-driven type or the belief-driven type, depending on the vision content, and the scene type or the story type, depending the vision style; (5) The insight-driven type of visions might lead to generation of ideas new both to markets and/or technologies as well as the firms, while the belief-driven type of visions might lead to the generation of ideas that are new to firms.

The following three ideas may be drawn as implications for NPD practices. First, for managers who intend to generate innovative ideas, the effects of using divergent thinking in both imagining visions and imagining products, i.e., generation of product ideas, is emphasized, since it leads to trials of mental synthesis with more diverse category knowledge. Second, in addition to that, examining whether category knowledge of visions used for mental synthesis in imagining products is appropriate might be suggested, along with whether category knowledge of the insights from research on market and technology development or the managers' beliefs (used for mental synthesis in imagining visions) is appropriate. Third, when managers rely solely on their beliefs in imagining a vision, the vision could lead to generation of ideas that are more likely to be new to the firm but not to markets or technologies. The author suggests that they refer to market and technology research insights in imagining a vision in order to generate the ideas that are new to both markets and technologies, as well as the firm. The research findings are limited because they are drawn from case studies and are subject to validity evaluation by quantitative studies. Although this research

pointed out the scene type of visions and the story type of visions as typologies in terms of the imagined vision style, the relationship between the typology and the types of innovations on project performance was unclear. Thus, additional research is needed to fully examine the phenomena.

REFERENCES

Cooper, Robert G. & Kleinschmidt, Elko J. (1987) "New Products: What Separates Winners from Losers? *Journal of Product Innovation Management*," 4, 169-184.

Davis, Stanley M. (1987) *Future Perfect*, Addison-Wesley.

Ende, Jan van den, Frederiksen, Lars, Prencipe, Andrea (2014) "The Front End of Innovation: Organizing Search for Ideas," *Journal of Product Innovation Management*, 32(4), 482-487.

Finke, Ronald A., Ward, Thomas B. & Smith, Steven M. (1992) *Creative Cognition*, The MIT Press.

Garcia, Rosanna & Calantone, Roger (2002) "A Critical look at Technical Innovation Typology and Innovativeness Terminology: A Literature Review," *Journal of Product Innovation Management*, 19, 110-132.

Hamel, Gary & Prahalad, C. K. (1994) *Competing for the Future*, Harvard Business School Press.

Holland, John H., Holyoak, Keith J., Nisbett, Richard E. & Thagard, Paul R. (1986) *Induction: Process of Inference, Learning, & Discovery*, MIT Press.

Jolly, Vijay K. (1997) *Commercializing New Technologies*, Harvard Business School Press.

Khurana, Anil & Rosenthal, Stephen R. (1998) "Towards Holistic "Front Ends" In New Product Development, " *Journal of Product Innovation Management*, 15, 57-74.

Lindgren, Lisa M. & O'Connor, Gina Colarelli (2011) "The Role of Future-Market Focus in the Early Stages of NPD across Varying Levels of Innovativeness," *Journal of Product Innovation Management*, 28, 787-800.

Markham, Stephen K. (2013) "The Impact of Front-End Innovation Activities on Product Performance," *Journal of Product Innovation Management*, 30(S1), 77-92.

Murphy, Gregory L. & Medin, Doug L. (1985) "The Role of Theories in Conceptual Coherence, " *Psychological Review*, 92(3), 289-316.

Nishimura, Michinari (2010) *Senryaku Shikou no Framework (The Framework for The Strategic Thinking)*, Tokyo Keizai Inc.

O'Connor, Gina Colarelli & Veryzer, Robert W. (2001) "The nature of market visioning for technology-based radical innovation," *Journal of Product Innovation Management*, 18, 231-246.

Reid, Susan E. & Brentani, Ulrike de (2014) "Building a Measurement Model for Market Visioning Competence and Its Proposed Antecedents: Organizational Encouragement of Divergent Thinking, Divergent Thinking Attitudes, and Ideational Behavior," *Journal of Product Innovation Management*, 32(2), 243-262.

Reid, Susan E., Roberts, Deborah & Moore, Karl (2014) "Technology Vision for Radical Innovation and Its Impact on Early Success," *Journal of Product Innovation Management*, 32(4), 593-609.

Ward, Thomas B. (1995) "What's Old about New Ideas?" In: ed. Smith, Steven M., Ward, Thomas B., & Finke, Ronald A., *The Creative Cognition Approach*, The MIT Press, 157-178.

Ward, Thomas B. & Dodds, Rebecca A. (2002) "The Role of Graded Category Structure in Imaginative Thought," *Memory & Cognition*, 30(2), 199-216.

Yin, Robert K. (2009) *Case Study Research, Fourth Edition*, Sage.

Appendix Table 1 Vision and product imagination processes

	Inter-viewee	Belonging	Project area	Process	Mental synthesis for vision imagination	Vision	Mental synthesis for product imagination	Product Idea	Innov-ation
A	CD 15yr	Large firm	A1: House-hold care	Visioning (i)(sc)	Natural Freshness +Daily life	Everyday life with freshness felt like morning after the rain	Morning dew +detergent	New functional detergent	MN/-/FN
	↑	↑	A2:House-hold care			—		New deodorizer	MN/-/FN
B	CD 25yr	Large firm	B: AV equipment	Visioning (i)(sc)	Earth value +Daily life	Life with the earth's beat felt	Nature sound +AV business	Forest sound live delivery service	-/FN
C	MD 22yr	Large firm	C: Food	Visioning (i)(st)	Family meal when one was small +Solo meal	Meal with family members together	Family meal+ Seasoning	Seasoning for family sushi party	MN/-/FN
D	CD 23yr	Large firm	D1: Food	Visioning (i)(sc)	Treat +Senior in the mall	Senior relaxed in the mall	Relaxed senior +cafe	Coffee stall in the mall	MN/-/FN
	↑	↑	D2: Food			—		New functional tea drink	-/FN
E	CD 15yr	Free-lance	E: Beauty care	Visioning (b)(st)	Aristocratic beauty +Ordinary woman	Life like French princess in the 16th cent.	French princess +Hair care	Premium hair care brand line-up	-/FN
F	CD 25yr	Free-lance	F1: Banking	Visioning (ib)(st)	Cafe +Daily life	Daily life with my favorite cafes	Cafe +Banking	New local banking service	MN/-/FN
	↑	↑	F2: Apparel	Visioning (b)(st)	Kids playing in a park +Kids going to school	Kids running around after school	Playing + School backpack	New functional backpack for kids	-/FN
G	CD 25yr	Free-lance	G1: Interior	Visioning (i)(st)	AI +Senior today	Active senior mastering AI	Smart senior +system kitchen	AI embedded UD system kitchen	MN/TN /FN
	↑	↑	G2: Industrial			—		New industrial machine model	-/FN
H	MD 30yr	Univ-ersity	H: Local products	Visioning (ib)(sc)	Popular town +Town passed by	No. 1 favorite town to live	Global product +Local product	Globally popular local product	-/FN
I	ED 15yr	Con-sult-ing	I: IT	Visioning (i)(st)	Atami as the aged town model +Japan today	Japan in 30yrs as healthy aged society	Healthy senior +Sensing tech.	Mental and physical health forecast device	MN/TN /FN
J	MD 20yr	Mid-sized firm	J:F&B service	Visioning (b)(sc)	Old farming in hometown	Dietary & farming	Organic bakery	Locavore shopping	MN/-/FN

					+Consumption today	education in hometown	+Cooking class +Hometown	mall in hometown	
K	ED 25yr	Large firm	K:Food	Visioning (i)(sc)	Quality and healthy life +Life of today	A bit of luxury	Relaxing time +drink pkg	New pkg structure	-/TN /FN

CD: Creative director   ED: Engineering director   MD: Marketing director

(i): Insight-driven type   (b): Belief-driven type   (ib): Mix type

(sc): Scene type   (st): Story type

MN: Market newness   TN: Technology newness   FN: Newness to the Firm