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Knowledge Optimization and
Construction of New knowledge Creation Supporting

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Abstract

In this study, I constructed the tool that supported the process of tying to the arrangement new knowledge creation those knowledge was constructed after tacit knowledge was exhausted by applying the knowledge management, and applying 3C and a marketing mix and various enumeration methods, and I verified it by the quantity verification, the user study, and the evaluation through the comparison with the similar tool. In the past, though some theories are advocated to the user study for the knowledge creation. But the method of concretely applying the theory to the business was not presented. In this study, therefore, this tool was proven by an administrative project. As a result, it was proven to be more effective than an existing tool and the concept about the support of the new knowledge creation.

Key Word

Knowledge management, highangle,
Ontology, Database, Semantic Web

1. INTRODUCTION

There are a lot of researches have been done so far in the knowledge creation support field, but the research of knowledge creation support that lies organized or employee directly is not done enough in a scientific manner, Because the research of the knowledge creation support is a transition period now.

However, Nonaka [1] was modeled the new knowledge creation support in the organization by conversion cycle of tacit knowledge and explicit knowledge. In a word, Nonaka has developed the concept of dimension of the tacit knowledge of "Polanyi theory". Thereafter, this model gave the impact worldwide and the experimental study is advanced to this model. Therefore, the knowledge creation is important in the organization from this. The concept of knowledge management is knowledge conversion process of "SEKI Model". There are tacit knowledge and explicit knowledge in knowledge, and the new knowledge is created by converting it mutually for the individual and the organization in the systematic knowledge creation theory of Nonaka. This process is called "SECI" Model<Fig1>.
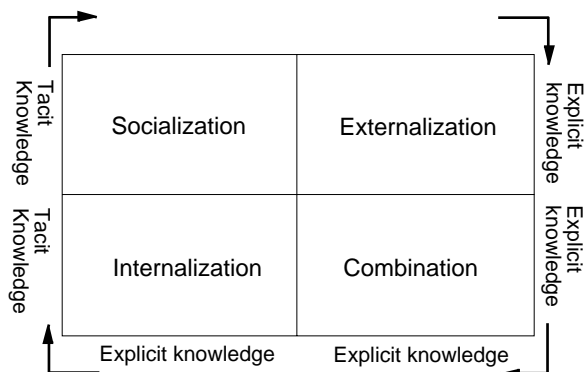
Tacit Knowledge | Tacit Knowledge

Socialization	Externalization
Internalization	Combination

Explicit knowledge | Explicit knowledge

Explicit knowledge | Explicit knowledge

Fig1 SECI Model Source   The Knowledge Creating Company

In this study, I propose the new knowledge creation support tool by applying knowledge management and using 3C' framework, marketing mix (4P's) and Enumeration method. In addition, this tool was proven by a real project of "Online administrative procedure", because the method of applying the knowledge creation theory to the business was not shown in the study of new knowledge creation support of the past. And the comparison verification with a similar tool was done. At the end, the composition of this thesis is as follows.

Chapter 1	Introduction
Chapter 2	The association study on the knowledge management and new knowledge creation is described
Chapter 3	The purpose of this study and outline of proposal is described
Chapter 4	Construction and functional overview of this tool is described
Chapter 5	Fixed quantity verification, Effectiveness verification and comparison verification with similar tool is described
Chapter 6	Conclusion and future work

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2.   Association study

The concept named "Memex" that connected the fragment of huge information associating it was advocated by Los Alamos National Laboratory as an origin of the tool concerning the creation support on the computer [22]. And the concept of artificial intelligence (AI) to make the machine execute man's intellectual processing performance as a proxy was advocated in the "Dartmouth seminar" in 1956. It derives from this concept and it has developed into the knowledge creation supporting tool.

A lot of related tools have been proposed so far, I explain it as follows.

he groupware that Takaya Yuizono [13-14] proposes is the system that support of conception in group by The KJ method is achieved on the computer. This system supports the support of the collection of the individual and the group of data and accumulation by using card type multimedia base

"wadaman" as a data base. On the other hand, the tool that I propose has aimed at a further improvement of fresh new ideas by constructing an original tool for "Relocation of the function" and "Combination of the pair of the solution" and achieving it.

"TRIZ" is a methodology that arranges the science and technology from the standpoint of the technology, and the "USIT" method that Nakagawa [12] proposes takes everything to pieces and is arranging a variety of methods of TRIZ again and systematically it integrates and it expands it, this result, "USIT" presented five solution generation methods "Made of the object two or more", "Dimension change in the attribute", "Relocation of the function", "Combination of the pair of the solution", and "Generalization of the solution". But Stages of the solution generation in the USIT method are four kinds of techniques of "Attribute dimension method (The focus is applied to the attribute of the object)", "Method of making to two or more objects (Many turn, and one object is divided into many)", and function arrangement method (Various functions are relocated between objects in the system) and "Function connection method (Two functions tie continuously)". It is difficult to say to respond to the fact of expressing the relation of Multi paragraph relation of information satisfactorily. In addition, it doesn't make it even to the definition in the relation and the expression. At the end, "IMindMap" is an illustration expression technique (And, tool it) that Tony Buzan advocated. This tool delays conceiving by the key word and image putting the key word and the image that becomes the center of the concept to be expressed on the center of figure, and tying there radially. A complex concept can be compactly expressed by this method and it is possible to understand quickly. However, this tool only ties radially the key word and the image that nothing but relates, and doesn't correspond to the definition between key words and detailed information on the key word. In addition, it is difficult to say to be able to correspond to the many-to-many relationship satisfactorily basically because of the illustration expression technique by the layered structure.

## 3.   The purpose of study and Proposal technique

3.1   The purpose of study and concept

I investigated researched structure of the research of past creativity and the systematic knowledge creation respectively. As a result, it is not expressible many-to-many relationship in a large amount of data. The expression in the knowledge management is to exhaust tacit knowledge in the individual of the organization, <Table1> is an example of 3C and the marketing mix used at a new planning. There is a possibility that a large amount of data is exhausted as shown in <Table1> at a new planning.

<Table1> an example of 3C and the marketing mix

	Extraction item	Extraction Example
	Proceedings theme	
	Meeting information	Location Date and Attendant
3C	Customer	Market size Growth of the market, Needs, Purchasing decision process, Purchasing decider
	Competitor	The number of competition, an entry wall, financial resources (employee, productive capacity), a performance (sales amount, a market share, profit, the number of the customers)
	Company	Sales amount, a market share, profitability, brand image, technology, an organization skill, human resources
4P	Product	Product, service, quality, a design
	Price	Price, discount, terms of payment, margin trading
	Place	Channel, the transportation, a circulation range, location, Keep quality, stock
	Promotion	Sales promotion, an advertisement, direct marketing

In addition, the multi paragraph relation exists between a large amount of data(Fig1   . And The relation forms a network(Fig2   .
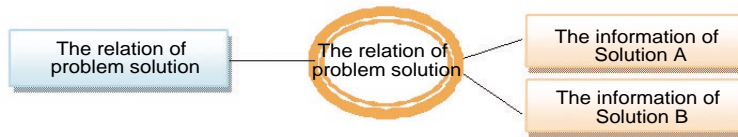
Fig1   The example of multi paragraph relation
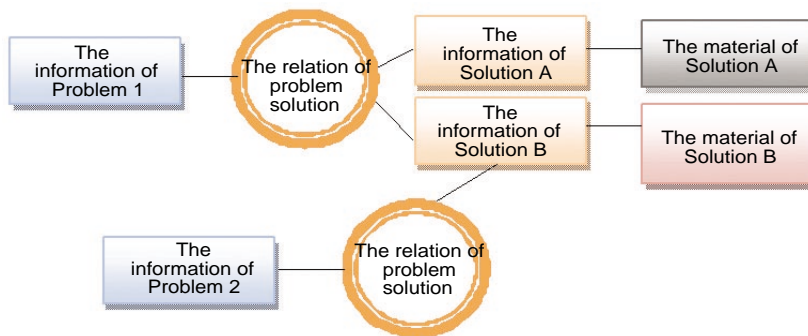
Fig2   The relation forms a network

It is insufficient only to arrange a large amount of data as the base material fee when new knowledge is created. Therefore, it is important to be able to mean the relation of the group. Then, as follows, it achieves it with the tool by which the author originally developed the concept of hanging in this study.

Expression of the multi paragraph relation with mean the relation of the group

Expression of the relation forms a network

Expression of group and network in which it paid attention to particular relationship

Tacit knowledge is extracted by applying the theory of the knowledge management is applied. I mean, 3C, the marketing mix, and the enumeration method are applied.

3.2   Proposal technique

3.2.1   Tacit knowledge is extracted by 3C, the marketing mix, and the enumeration method

Information that becomes the radical of the new knowledge creation chiefly prepares 3C analysis, the marketing mix, and the enumeration method by applying it. Concretely   The theme of a new knowledge creation is decided, and Tacit knowledge is exhausted by using 3C analysis and the marketing mix (Table1). In addition, The Imperfect knowledge is created by applying "Fault enumeration method" or "Characteristic enumeration method" following (1) and (2) based on information extracted by an item of 3C analysis and the marketing mix concerned. It uses it as material when new knowledge is created by these knowledge information's tying back and doing the list display. The flow when the problem of "Online administrative procedure" described later is assumed and each enumeration method is applied is shown in the following.

(1)   The characteristic of the problem is enumerated by Characteristic enumeration method

  Noun characteristic

EX   The one expressible by noun of Composition of Target

  Adjective characteristic

EX   Size, color, shape, and weight of Target

  Functional characteristic

EX   Working equipped or role in Target

(2)   The problem of the target is enumerated by the fault enumeration method.

EX   Enumeration of dissatisfaction

  Enumeration of problem factor

3.2.2   New Knowledge Creation

The knowledge arrangement and the new knowledge creation tool that arranged the knowledge information that and tied to the new knowledge creation was made. Concretely it made to the group in each matter to which the content was similar, and it was applied to the new knowledge creation. The example of the method is shown as follows.
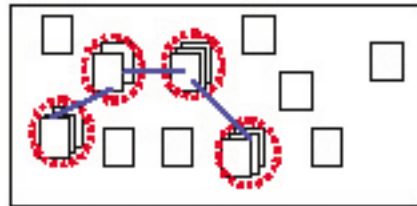
The knowledge information to which the content is similar is nested. (Fig3)

A related line is drawn at the group where the similarity exists and the relational concept is de scribed clearly(Fig4).

"KE" or "KO" developed the new knowledge based on the group that relation is clarified.
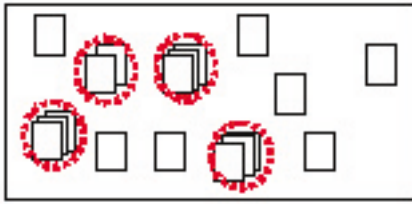

Fig3 Example of nest

<Fig4>Example of drawing related line

4. Outline of system

The outline of the knowledge exhausts system by the 3C, marketing mix and the enumeration method made by java6.0 and MySQL5.0. It explains the knowledge exhaust technique in this system as follows. To the start, the category of the exhausted knowledge information is input to the text (Fig5) or selection from palette (Fig8).
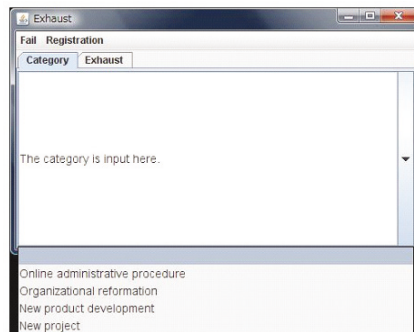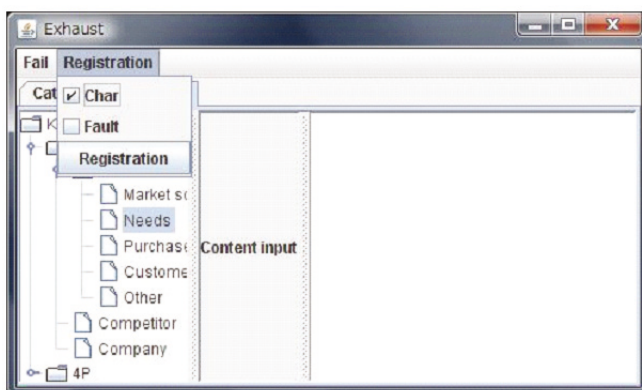

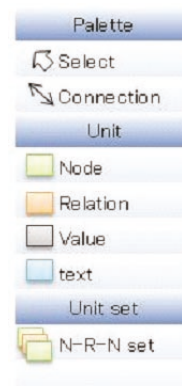<Fig5>Example 1 of knowledge exhaust system screen
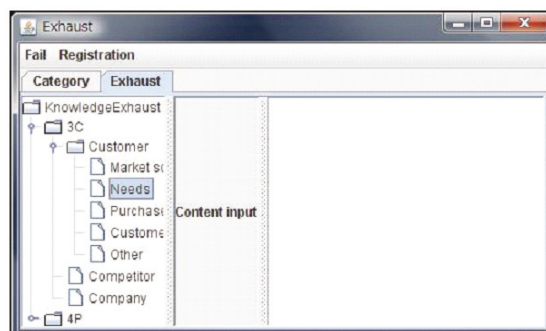
<Fig6>Example 2 of knowledge exhaust system screen

Next, the item exhausted from 3C and marketing mix tree is selected (Fig7). And it is selected whether to input the characteristic enumeration method or the fault enumeration method from Knowledge registration tab (Fig7). Finally, the knowledge information is input in the text.

<Fig7>Example 3 of knowledge exhaust system screen　　　　<Fig8>Palette

Next, new knowledge creation support tool constructed by enhancing Shapes of Eclipse GEF(Fig12-14　. It is composed of "Editor part", "Detailed operation parts of the property and the highlight, etc.", and "Palette" (Fig8). And Making to the group and the new knowledge creation of knowledge are supported by freely drawing to an editor using the unit from the palette. Table2 shows the outline of this tool. In addition, this tool has the highlight function to express the particular relationship. A concrete use image of this tool is described later. The use image of this tool is described later.

<Table2>Explanation of outline of each function of palette of this tool

Select	The node is selected
Connection	The line is drawn between nodes
Node	The concept information
Relation	Relation node that expresses the relations between units
Value	Node that expresses concrete value and information
Unit set	Set of "Node" , "Relation" , and "Node"

5. Proof and verification

This tool was proven by the content of following 5.1 and 5.2. And the comparison verification was done as a similar tool (Free Mind) Those verification results are described since 5.3.

5.1 Group and member who creates new ideas

In this study, the organization was composed that consisted of the composition of knowledge Practi-

tioner (KP), knowledge officer (KO) and knowledge engineer (KE). KP acquires knowledge from the experience. And KE promotes the knowledge conversion. And KO decides the directionality of the organization.

5.2　Setting of proof problem

The problem that proved this tool was set as follows, "Problem solution", "New project" and "New system". And the conference was held for several days by member of above-mentioned 5.1.

Problem solution　Examination of use promotion plan of online administrative procedure

An online administrative procedure is one policy of "E-Japan Priority Policy Program", and administrative application and the written report done by the document so far are done by using the Internet. According to "IT new reform strategy" that the IT strategy headquarters decided on January 19, 2006, Online availability in the procedure like application and the written report to the country and the local authority is assumed to be 50% is achieved until 2010 it provides. The solution of this problem was proven with this tool.

New project　Proposal of new project

The problem of new project proposal for the flexibility improvement of the market was set to the theme. And the solution of this problem was proven with this tool.

New system　Proposal of new system

It is assumed that a certain financial company introduces a new system as an original lending requirement counter measure. And the solution of this problem was proven with this tool.

5. 3　Quantity verification

Fig9-11 is graphing of the result of quantitatively comparing this tool and FreeMind of the new knowledge creation "Problem solution", "New project", and "Introduction of a new system", respectively. FreeMind is a free tool similar to "iMindMap" in "Association study" above-mentioned 3. First, The comparison of the numbers of exhausts of information. Number of "Problem solution", "New project", and "Introduction of new system" extractions in this tool was 58 , 47, and 66　respectively. On the other hand, FreeMind was 26, 18, and 32. Next, The number of new ideas created based on those knowledge. Number of "Problem solution", "New project", and "Introduction of new system" extractions in this tool was 35 , 50, and 60 respectively. On the other hand, FreeMind was 13, 20, and 26. As mentioned above, This tool was larger than Freemind the numbers.

Next, Table3 is result of the user (Eight people) questionnaire that this tool advantage and the fault were heard. It was able to be confirmed that clarifying the target (EX: 3C or Marketing mix) was able to exhaust a lot of knowledge than the knowledge exhaust in the state with nothing.
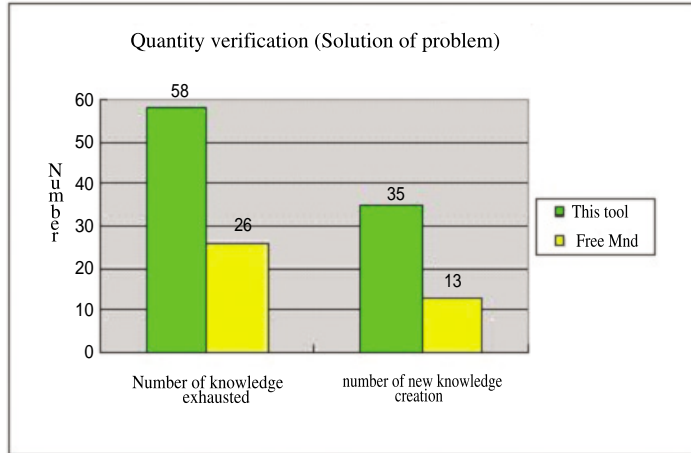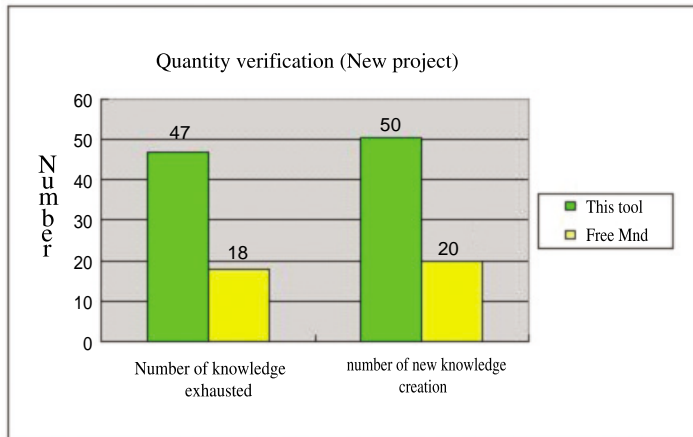
Fig9　Quantity graph (Solution of problem)

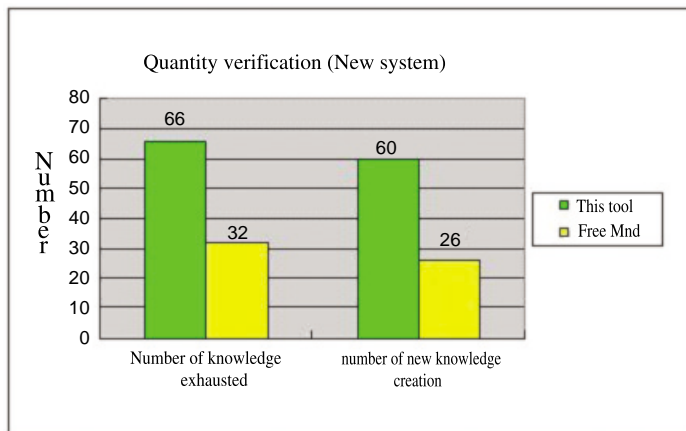Fig10　Quantity graph (New project)

Fig11　Quantity graph (New system)

<Table3> Result of the questionnaire

Number of answer	Answer
Advantage of this tool	
	It is easy to have exhausted knowledge because the target is clear (EX: 3C or Marketing mix).
	It is easy to have imagined new knowledge because details of information exhausted by the enumeration method are drawn out.
	There is no answer.
Fault of this tool	
	It was not bound by each item of 3C and P and 4 enumeration methods and it was possible to conceive it freely.
	3C and marketing mix did not correspond satisfactorily in this project because it was the one chiefly using it when planning.
	There is no answer.

5.4 Comparison verification with similar tool

The comparison verification was using the knowledge exhausted by 3C 4P and the enumeration method respectively with this tool and Free Mind. This comparative result is shown in following (1) - (4).

(1) comparison of highlight

The highlight function of this tool is to make the relating node a group, and to display the group emphatically (Fig12). The relation of the group is emphasized by the highlight more. Moreover, two or more highlights can be made in the editor. Fig12 is an image that highlights the group related to the law. The image to which a similar highlight is done with Free Mind is Fig15. When both are compared, this tool expresses the relation plainly than Free Mind.

(2) Comparison of expressions related to multi paragraph where meaning was given

Table4 is an extraction only of the relation (Group related to law) of fig12. It is relation of 3:1 to which the solution and the problem ties by the relation "Problem solving". Therefore, this tool is flexibly expressible of the multi paragraph relation. Free Mind can do similar (Fig15). But Free Mind is not expressible the relation that gives the meaning. As for this tool, it is expressible. By this, Searching out the relation that pays attention to a certain specific relation even when a lot of relations exist together becomes possible.

<Table4>   Relation of multi paragraph of Fig12

The left side(Problem)	Relation	The right side(Solution of problem)
An indispensable attached document of the administrative procedure is not made electronic.	Solution of problem	Simplification of administrative procedure
An electronic certificate is not widespread.		
No legal system corresponding to online application.		

(3)   The flow of each target is managed

Fig12 is the highlight that pays attention to the legal system relation in online application. The highlight group that similarly pays attention to "System relation" is Fig13, The highlight group that pays attention to "Cost relation" is Fig14. Thus, this tool expresses the flow of each target is managed by constructing the highlight group that pays attention to an individual relation. On the other hand, Fig16 is the one that "System relation", "Legal system relation", and "Cost relation" were expressed by using Free Mind. Free Mind is the connection of the node is not understood easily. In addition Free Mind cannot manage the flow that pays attention to the relation easily.
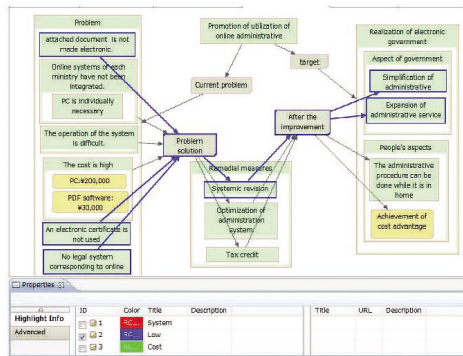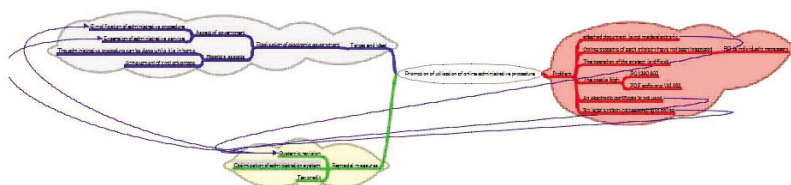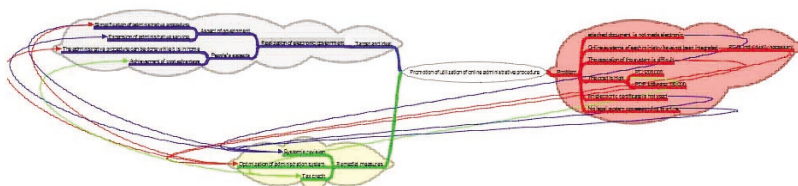

<Fig12>Highlight example (Law)
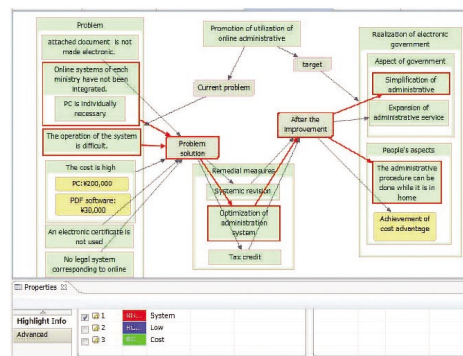
<Fig13>Highlight example (System)

<Fig14>Example of editor and highlight (Cost)

<Fig15>Free Mind Example (Law)

<Fig15>Free Mind Example (Law, System and Cost)

6. Conclusion

In this study, I constructed the tool that supported the process of tying to the arrangement new knowledge creation those knowledge was constructed after tacit knowledge was exhausted by applying the knowledge management, and applying 3C and a marketing mix and various enumeration methods, and I verified it by the quantity verification, the user study, and the evaluation through the comparison with the similar tool. In the past, though some theories are advocated to the user study for the knowledge creation. But the method of concretely applying the theory to the business was not presented. In this study, therefore, this tool was proven by an administrative project. As a result, it was proven to be more effective than an existing tool and the concept about the support of the new knowledge creation.

Action in the future on problem that process of verification made clear

In the future, I want to straighten out the problem by this tool is developed, and it wants to pile a further verification by the problem in an actual project.

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