Text Montage, a method for encouraging out-of-the-box thinking

The design of a brainstorming groupware KOTOBA JAM

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Abstract

This study proposes a new brainstorming method, Text Montage. The term "montage" refers to the famous experiment in film editing by Lev Kuleshov, who demonstrated the effect when people try to interpret the meaning from a pair of images subliminally. In the case of Text Montage, people can make leaps of imagination with neologisms (new phrases) generated in a pair of words. To verify the validity and usefulness of the method, we designed a novel brainstorming groupware KOTOBA JAM. In the usual brainstorming methods, participants find it difficult to come up ideas that are outside the box. KOTOBA JAM, originally a chat-bot system, generates completely unexpected neologisms by combining keywords of the discussed subject with randomly picked modifiers from various designed-modifier selections. The system keeps mumbling phrases as an additional participant in brainstorming sessions.

In this study, we focused on the effect of the neologisms, which created in the method of Text Montage, on the activity of idea creation. To increase the probability of inspiration, we designed the neologism-generation system with a linguistic approach. We created a designed-modifier database, which consists of several types of modifiers based on Onomatopoeia, cartoon expression and the theory of inventive problem solving in engineering, TRIZ. We performed a usability testing to observe users' reactions to each neologism generated by KOTOBA JAM. Then we attempted to discover which types of modifiers increase the possibility of new ideas for products or services. During the usability testing, we discovered tendencies to create new ideas. 1.The modifiers based on TRIZ functioned effectively as a trigger of new ideas for both designers and general users (non-designers). 2. Designers can be inspired even by a randomly selected modifier from a language dictionary. 3.Onomatopoeia was helpful for general users who had limited brainstorming experiences.

Keywords: Brainstorming, TRIZ, Creative thinking

1. Introduction

In a digital society, we often hear success stories about entrepreners who make a name for themselves with a simple prototype inspired by a single idea. Thanks to the growth of open-source culture, everyone has access to specialized information on the Internet, with which we can educate ourselves. Additionally, digital-fabrication allows us to shape our ideas into tangible prototypes quickly and at a low cost. Then, it is possible to show these products to countless people on the Internet to get investments. This new trend has led to the development of an entrepreneurial society [1], which is more open, voluntary, fast-paced, and collaborative.

This development has dynamically changed the processes of business and industry, however rate at which ideas are formulated has stayed unchanged for long time. The act of creating ideas, which is the very initial phase of innovation, still depends on inspirations by a talented person. (You might think of a certain coworker with a great idea in every brainstorming at your company.) In this study, we introduce new computational approaches to the concept of idea creation, in order to revitalize brainstorming.

In this paper, we propose new brainstorming groupware,

KOTOBA JAM, which provides a new method for creating inventive ideas with out-of-the-box thinking. The primary characteristic of the KOTOBA JAM is that it continuously generates neologisms (new phrases) as a chat-bot system, which sounds grammatically correct but completely unpredictable phrases that stimulate users' power of imagination and inspiration. We also focus on design of interface as a groupware, which encourages participants in brainstorming sessions to foster ideas collaboratively. We believe that the system increases the productivity of idea creation.

2. Background

We started the research and development in 2006 with the brainstorming application INFO SPIDER (Figure 1) [2], which generates neologisms by assembling a keyword with randomly selected modifiers. By natural language processing system, the neologisms are grammatically correct and sound natural even though phrases aren't used. Since application program mechanically combines two words in unusual combinations without evaluation based on text corpus, the concept of generated phrases sound totally new to users.

In the usability testing, we found surprising results. Although the phrases didn't sound realistic, subjects tried to understand

them.

- Losing meal
  (失うごはん)
- Detailed meal
  (詳しいごはん)
- Maintaining meal
  (保つごはん)
- Crazily living meal
  (狂おしいごはん)
- Meal to die
  (死ぬご飯)

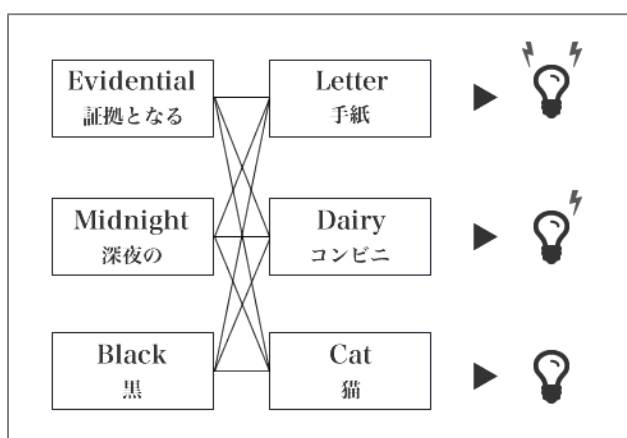**Figure 1** Neologisms created by INFO SPIDER

Figure 2 Text Montage

In almost every case, the subjects conceived a certain idea or explanation for them, just like the method for idea creation using Osborn's checklist [3]. We named this phenomenon Text Montage (Figure 2). The term montage refers to a technique in film editing in which a series of short shots are edited into a sequence to condense space, time, and information. Russian filmmaker Lev Kuleshov demonstrated the effect when people try to interpret the meaning from a sequence of images subliminally [4] (Figure 3).

Referring to the film montage demonstration, we replaced a pair of images with a pair of texts, which look like a neologism combined of two words. Then we examined the feedback from the experiment participants. Surprisingly, they mostly successfully associated two words and understood the meaning as a single word. After we analyzed the feedback for the neologisms, we found 4 approaches: analogical thinking (conceive a new idea with analogical thinking), detection (detect a new aspect of the facts), reminiscence (recall and reinterpret one's own memories), and storytelling (build a narrative line inspired by the neologism).

Similar to the demonstration of the Kuleshov effect, the participants interpreted the motif of text montage very easily. However, we discovered a difference between film montage and text montage. In most film montages, each user interprets the montage similarly. On the other hand, in text montage, each participant's interpretation was different. We found that each
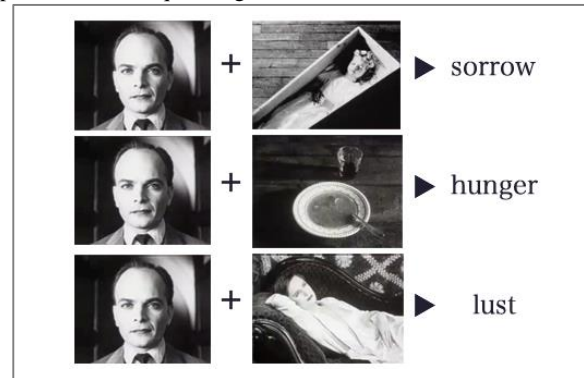
person had a unique imagination.

Figure 3 Demonstrations by Lev Kuleshov

3. Concept Design

3.1 Design Concept

In the previous section, we reported on the basic idea and effect of Text Montage. Based on the INFO SPIDER, we developed KOTOBA JAM as an improved version, which was more enforced as a tool for creating ideas by introduction of originally designed modifier databases and as a platform for crowdstorming, to foster innovative ideas with the others on the Internet. In this section, we discuss two features of the system design.

3.1.1. Analogical thinking

In order to specialize in a brainstorming tool for inventive ideas for new services and products, we categorized the effect of analogical thinking among 4 broad types.

To confine participants to analogical thinking, we focused on the design of the neologism, what types of modifier are the most effective for heightening users' imaginations. As a solution, we focused on the theory of inventive problem solving TRIZ [5], which was developed by the Soviet inventor and science fiction author Genrich Altshuller.

In KOTOBA JAM, we use 3 types of modifier sources. One is vocabulary from a language dictionary, one is spoken vocabulary from Twitter, and one is selected vocabulary from originally designed modifier collections, which include the vocabulary database extracted from the 40-principle of TRIZ [6]. The 40-principles are basic engineering parameters of common objects, such as weight, length, and manufacturing tolerances. The database is derived from the study of patterns of invention in 40,000 global patents. We anticipated that the TRIZ 40-principle database would help to inspire users, since each word had been logically selected as an innovation solution. Following are examples of neologisms combined with modifiers from TRIZ 40-principle database (Table 1, Figure 4).

Besides the modifier group based on TRIZ, we introduced the modifier collections made of expressions in cartoons and Onomatopoeias.

3.1.2 Interface for collaborative idea creation

The INFO SPIDER didn't have a collaborative function. In the usability testing for INFO SPIDER, we found that each trial subject expressed very unique ideas or interpretations to a same

neologism. It is very meaningful to exchange different ideas and to be inspired mutually. Therefore, we also focused on the collaboration function as a groupware in brainstorming sessions.

During a brainstorming session, The KOTOBA JAM keeps mumbling generated phrases as if it is an additional participant. If participants' like the idea, they can stock it as a favorite neologism on the bottom of interface, and others submit their own feedbacks in response to the ideas. That allows them to enjoy the process of expanding the idea and even to deepen the thinking by exchanging opinions in the interface.

3.2 User scenario

We planned two user scenarios. One was for divergent thinking, and the other was for convergent thinking. KOTOBA JAM is intended for a phase of divergent thinking.

Divergent thinking [7] is a thought process or method used to generate creative ideas by exploring many possible solutions. It typically occurs in a spontaneous, freewheeling manner. After the process of divergent thinking, ideas and information are organized and structured using convergent thinking, which is the opposite of divergent thinking and used to give the correct answer. These methods are often used concurrently as a set of logical steps. The steps take place iteratively until people get the final solution (Figure 5).
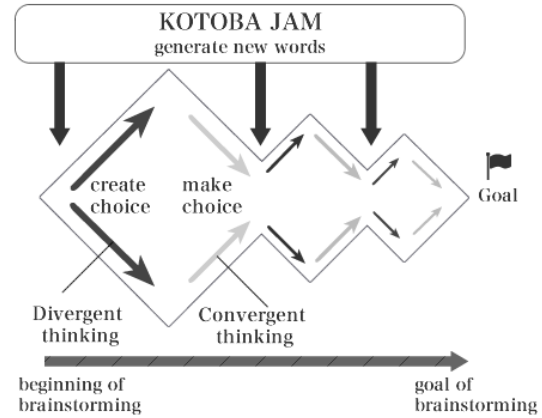
Table 1 TRIZ 40 principles (example of modifiers)

|	
1.Segmentation	21.Rushing through
2.Extraction	22.Convert harm to benefit
3.Local quality	23.Feedback
4.Asymmetry	24.Mediator
5.Combining	25.Self-service
6.Universality	26.Copying
7.Nesting	27.Substitute throwaway
8.Counterweight	28.Replace mechanical system
9.Prior counter-action	29.Use pneumatic / hydraulic system
10.Prior action	30.Flexible film or thin membranes
11.Cushion in advance	31.Use porous material
12.Equipotentiality	32.Change color
13.Inversion	33.Make homogeneous
14.Spheroidality	34.Rejecting or regenerating parts
15.Dynamicity	35.Transform physical-chemical states
16.Partial or overdone action	36.Phase transition
17.Move to new dimension	37.Thermal expansion
18.Mechanical vibration	38.Use oxidizers
19.Periodic action	39.Inert environment
20.Continue useful action	40.Composite material
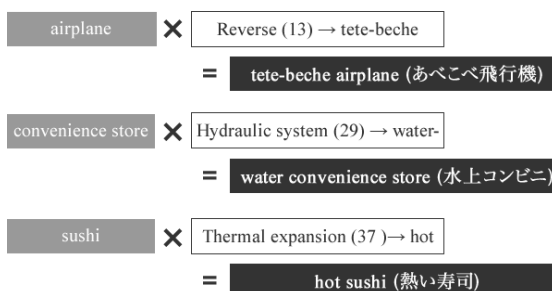
Figure 4 Example of neologisms generated with modifiers based on 40 principles of TRIZ

Figure 5 KOTOBA JAM Interaction Scenario

4. Related work

We refer to related works and researches, which proposed methods of creating ideas or brainstorming.

4.1 Idea Pop-up Cards (Chie Card)

Idea Pop-up Cards [8] are a good example of tools that utilized the method TRIZ, which was proposed by IDEAPLANT and the Miyagi TRIZ Study Group as a card tool for creating technological ideas, to introduce TRIZ.

They made casual translations of the 40 principles of invention and formulated a card tool with 40 simple instructions on each card. The TRIZ theory is academically too difficult for non-engineers to get instinctive inspiration with it. The Idea Pop-up Card lets general users enjoy the concept of TRIZ similar to playing a card game.

4.2 Cuusoo /cuusoo.com

CUUSOO.com [9] is a successful web service that uses crowdstorming. It helps aspiring and professional designers to get their products manufactured. Designers post their product ideas there, and then the designers receive feedback from the crowd and fans to enhance the product. If the product stands out, a brand owner will offer to produce it.

4.3 Mazer

Mazer [10] is an online platform on which anyone can participate to develop and realize new ideas including services, products, and systems to make Japan better. Mazer introduced a method and mechanism for people to jointly conceive and mix ideas.

A creative director develops missions to which people respond with inspiration. The creative director then mixes new elements. Users also generate idea creations and collectively decide which ideas are the best. In the end, companies buy these ideas in an auction.

4.4 Kirikuchi BOY[11]

Kirikuchi BOY is an iPhone application, which generates new words and expressions by combining a typed keyword with other random words. It has a similar concept with our previous application INFO SPIDER.
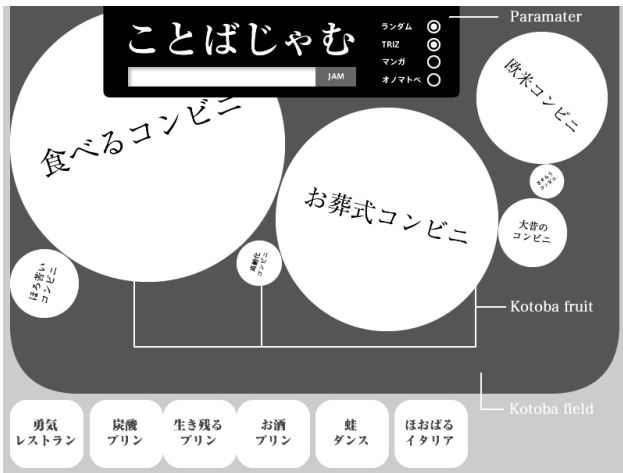
Figure 6 The text montage interface

Figure 7 The crowdstorming interface

KOTOBA JAM has two advantages compared with Kirikuchi BOY. KOTOBA JAM has the originally designed modifier database, which designed for increasing the probability of new ideas. Therefore, we focused on the verification of the effects of neologisms on users with using the database as a validation. Second advantage is that KOTOBA JAM was oriented toward groupware, while Kirikuchi BOY is a service for personal use.

5. System

In this section, we discuss the current state of our interface design. We designed two main interfaces for the neologism formation (Figure 6) and crowdstorming stages (Figure 7).

5.1 How to play

① Install the KOTOBA JAM system into his or her own browser.

② After the installation completes, open the KOTOBA JAM with the Google Chrome browser. Access to the same URL with the participants in a brainstorming.

③ Type a topic keyword in the discussion into the text box. Set some parameters. (Select the category of the vocabulary source.)
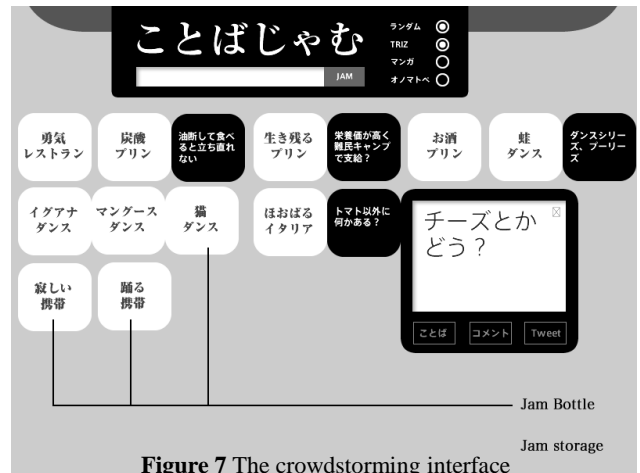
④ Start a group brainstorming session.

⑤ In the main screen of KOTOBA JAM (Kotoba field), neologisms keep springing up. Each generated neologism is pronounced in a voice of the Google text to speech and displayed in the shape of a big circle (Kotoba fruit). After that, it's size keep getting smaller. As minutes pass, the fruit disappears in the end.

⑥ If the user finds an interesting neologism, he or she saves it in the bottom of the interface (Jam storage). The shape changes to a square (Jam bottle).

⑦ The other participants allow adding black Jam bottle, in which they write new ideas and opinions toward the neologisms.

5.2 The processing flow of the system

Based on requirements for our design, the system is divided into two parts for Text Montage system and a groupware system.

Text Montage is the core function, which generates neologisms combined with the discussed keyword and a grammatically compatible modifier. By adjusting parameters, users control the incidence rate between two request methods, a request for a randomly extracted modifier (Random modifier) and one from original database (Designed modifier).
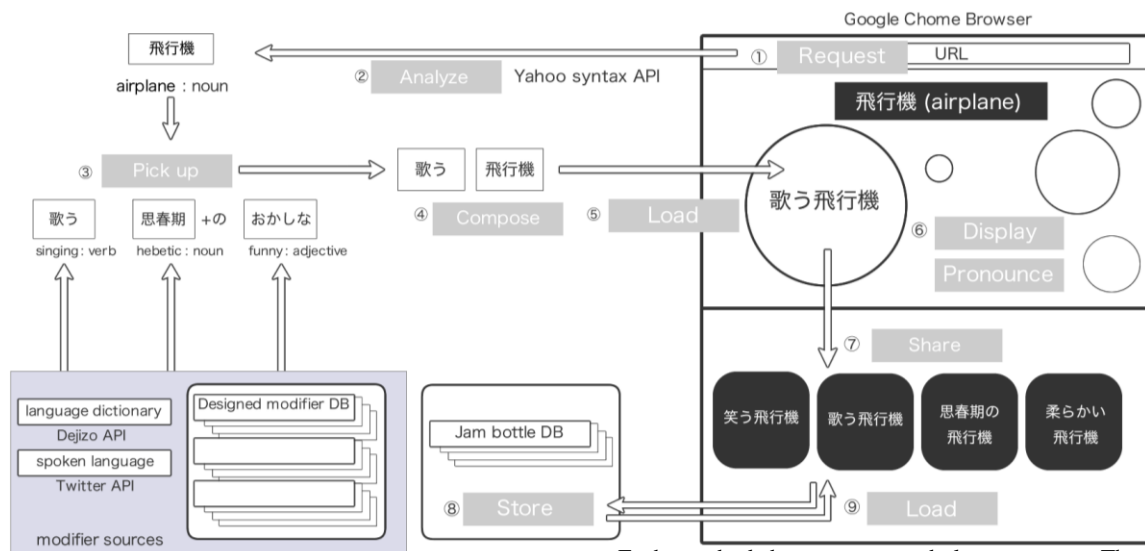

Each method has some vocabulary sources. The random

Figure 8 System design of KOTOBA JAM

modifiers are extracted from the language dictionary and the spoken language on Twitter. The designed modifiers are done form the original database including modifiers based on TRIZ, cartoon expression, and onomatopoeia. The groupware system is one enriched features of KOTOBA JAM. Each user can save, edit, delete, and comment to each neologism. The each process of them is stored in the Jam bottles and displayed in browsers. The processing flow is listed below and Figure 8.

① The browser sends a request for new neologism with an inputted keyword to a server. (Backbone.js, Cake PHP)

② The server analyzes syntax of the keyword. (Yahoo syntax API, Ajax, JSON)

③ Responding to the result of analytics, the server requests for a compatible modifier from the database. (MySQL) To get random words, we used Twitter API for spoken vocabulary and Dejizo API for the language vocabulary.

④ To create a neologism, the server combines the keyword and selected modifier from database. (Cake PHP)

⑤ Server sends back the created neologism to the client browser. (Cake PHP)

⑥ The browser loads the neologism, pronounces with the Google text to speech and displays it. (Backbone.js)

⑦ When a user double-clicks a favorite neologism, it transfers in the bottom of interface. (Backbone.js)

⑧ The database saves the neologism by the requests of the browser. (Cake PHP, MySQL)

⑨ The Jam storage loads all of the saved Jam bottles including neologisms, ideas, comments, etc. (Backbone.js)

6. Usability testing

In the usability testing, we aimed to find out which types of modifier become triggers for inspiration. We also paid attention to the attributes of each trial subject to find differences in responses related to the neologisms between designers and non-designers. Additionally, we asked them to assess the system. Fourteen users evaluated the system (8 designers, 6 non-designers).

Table 3 Modifier source word category

Vocabulary Source			Example	Type
Random modifier source	Language dictionary		Camellia word (椿…)	RD
	Spoken language (Twitter)		Mogi's word (茂木さんの…)	RS
Designed modifier source	Normal expression	TRIZ	Liquefaction word (液状化…)	DT
	Cartoon expression	TRIZ	Tete-beche ward (あべこべ…)	DC-1
		Other	Wild word (野生の…)	DC-2
	Onomatopoeia	TRIZ	twinkle-twinkle ward (きらきら…)	DO-1
		Other	smiley ward (にこにこ…)	DO-2

6.1 Investigation 1

The first usability test investigated which types of modifiers stimulate users' inspiration for inventive ideas. Having the examination in the same condition, we generated 40 neologisms with the keyword "airplane" by using KOTOBA JAM beforehand (Table 4).

To get a combined modifier, KOTOBA JAM uses two language sources. One is the random modifier source, and the other is the designed modifier source, which we composed to focus exclusively on the potential words for inspiration.

In the random modifier source, we extract modifiers from the language dictionary and the spoken language from Twitter. In the designed modifier database, we prepared three types of modifier selections based on TRIZ, cartoon expression and onomatopoeia (8 words each in 5 categories; type RD, type RS, type DT, type DC, and type DO) (Figure 9, Table 3).

Table 4 Types of 40 neologisms for the usability test

[Type-RD: Language dictionary]
camellia airplane (1.椿飛行機), medical-treatment airplane (2.治療できる飛行機), decennial airplane (3.十年毎の飛行機), cathode-ray tube airplane (4.ブラウン管飛行機), entreaty airplane (5.哀願飛行機), office airplane (6.事務飛行機), lowly airplane (7.卑しい飛行機), airplane containing chromium (8.クロムを含む飛行機)

[Type-RS: Conversation]
discreet airplane (9.分別のある飛行機), child airplane (10.こども飛行機), airplanes in unintended use (11.目的以外の飛行機), supported airplane (12.支えられている飛行機), acting airplane (13.行動した飛行機), deviant airplane (14.逸脱してしまう飛行機), airplane complete (15.すっかり飛行機), Mr. Mogi 's airplane (16.茂木さんの飛行機)

[Type-DT: TRIZ]
takedown airplane (17.分解する飛行機), remote airplane (18.遠隔型飛行機), predictive airplane (19.予知する飛行機), environment-adaptation airplane (20.環境適応型飛行機), improvable airplane (21.改善する飛行機), time shortening airplane (22.時短型飛行機), mimic airplane (23.まねる飛行機), liquefaction airplane (24.液状化飛行機)

[Type-DC-1: TRIZ Cartoon]
capsule airplane (25.カプセル飛行機), anywhere airplane (26.どこでも飛行機), tete-beche airplane (27.あべこべ飛行機), aqua airplane (28.アクア飛行機)

[Type-DC-2: Cartoon]
four-dimensional airplane (29.四次元飛行機), wild airplane (30.野生飛行機), ill-tempered airplane (31.意地悪飛行機), pretending airplane (32.なりきり飛行機)

[Type-DO-1: TRIZ Onomatopoeia]
fluffy airplane (33.もふもふ飛行機), slippery airplane (34.ぬるぬる飛行機), flip-flop airplane (35.ころころ飛行機), twinkle-twinkle airplane (36.きらきら飛行機)

[Type-DO-2: Onomatopoeia]
roaring airplane (37.ゲラゲラ飛行機), smiley airplane (38.にこにこ飛行機), ring-a-ding airplane (39.はらはら飛行機), surprise airplane (40.びっくり飛行機)
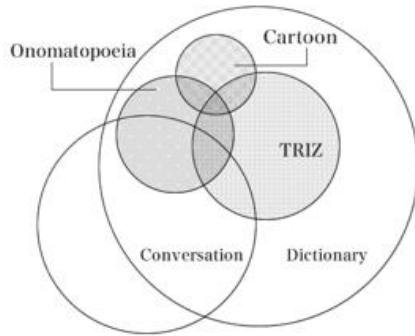
Figure 9 Word mapping by modifier source category

Table 5 Questions to investigate reactions toward neologisms

Q1. Favorability rating: positive (+3) to negative (-3).
 "Do you like the sound of the word or dislike it?"

Q2. Potential of the inventive idea: positive (+3) to negative (-3).
"Does the word have a potential to turn a good idea for good service or product? "

Q3. Probability of conception: positive (+3) to negative (-3).
"Does the word appear spontaneously in your mind without KOTOBA JAM? "

Table 6 Favorability Rating

Favorability Rating	Designer	Non-designer
Number of very positive evaluation (More than 1.5)	8 -RD (5), -DC (2), -DT (1),	10 -DO (5), -DC (3), -DT (2)
Number of negative evaluation (Less than 0)	0	13 -RD (4), -RS (5), -DT (4)

Favorability Rating	Designer	Non-designer
Average (avg.)	1.04	0.44
Avg. Score for the Type-RD	1.48	-0.5
Avg. Score for the Type-DO	0.64	1.71

We asked the subjects to evaluate each neologism in the selections in terms of 3 points of view. The subjects scored them from positive (+3) to negative (-3) (Table 5).

Several particularly interesting features were implied by the investigation. We found a clear divergence in views between designers and non-designers.

In the investigation of favorability rating, there was no negative evaluation for all neologisms by designers and average rate is 1.04. Designers showed high favorability rate in Type-RD the most (ex. 3 十年毎の飛行機, 5 哀願飛行機, 7 卑しい飛行機, 8 クロムを含む飛行機).   While designers were favorably disposed toward neologisms, non-designers gave 13 negative scores in the reaction to the neologisms. This implies that some types of neologisms significantly confounded non-designers. They gave negative score in Type -RD (4), -RS (5) and -DT (4) (ex.14 逸脱してしまう飛行機, 9 分別のある飛行機, 2 治療できる飛行機, 7 卑しい飛行機, 8 クロムを含む飛行機, etc.). Non-designers gave positive scores for the neologisms combined with modifiers in the designed modifiers database and preferred onomatopoeia the most (ex.36 きらきら飛行機, 33 もふもふ飛行機, 37 ゲラゲラ飛行機, 38 にこにこ飛行機, 39 はらはら飛行機). Most of the negative reactions occurred against types RD and RS from the random modifier source. It means the designed modifier database helps beginners in brainstorm effectively.

Table 7 Potential of Inventive idea

Potential of Inventive idea	Designer	Non-designer
Number of very positive evaluation (More than 1.5)	11 -RD (3), -RS (1), -DC (2), -DT (5)	12 -RD (1), -DO (5), -DT (3), -DC (3)
Number of negative evaluation (Less than 0)	0	12 -RD (5), -RS (3), -DT (4)

Potential of Inventive idea	Designer	Non-designer
Average (avg.)	1.03	0.73
Avg. Score for the Type-DT	1.5	1.13
Avg. Score for the Type-DO	0.65	1.67

Table 7 shows that both types of subjects are successfully inspired by the modifier form Type-DT. It implied that the application of TRIZ 40 principals has big potential for inventive ideas. Although we anticipated that combining with words from dictionary might confuse people, surprisingly the designers were still able to create ideas with neologisms using the random of Type-RD.
We found evidence from the result as well. The designers showed the good evaluation when they encountered the words.

At the end, we investigated relevance between effectiveness of Text Montage and probability of conception. According to the Table 6 and Table 8, designers showed high favorability rate toward modifiers of Type-RD. However they showed low probability rate of conception toward them. On the other hand, non-designers showed high favorability rate toward modifiers of Type-DO and they showed high probability rate of conception toward them. We inferred that designers prefer unexpected expression on the occasion for brainstorming. As opposed to it, non-designers probably can be imaginative by the expression, which consist in familiarity.

Table 8 Probability of conception

Probability of conception	Designer	Non-designer
Average (avg.)	-0.8	0.48
Avg. Score for the Type-RD	-1.18	0.25
Avg. Score for the Type-DT	-0.15	0.42
Avg. Score for the Type-DO	-0.93	1.04

7.2 Investigation 2

The 2nd investigation was performed to evaluate the experience with the KOTOBA JAM. Surprisingly, all subjects marked the highest score in respect of amusement. In addition, they showed very positive scores for introduction of KOTOBA JAM into their brainstorming. As a result, we found that KOTOBA JAM could provide subjects satisfying experiences in the Usability testing (Table 9).

Table 9 Evaluation of the KOTOBA JAM system

Question	Avg. score
Do you want to use the app for brainstorming again?	4.1
Do you want to use the app for group brainstorming again?	4.5
Did you have fun with the app?	5.0

Positive (+5) to negative (0)

7. Conclusion and future work

In this paper, we proposed the idea-creation method Text Montage with the case study of brainstorming groupware KOTOBA JAM. We investigated incorporating optimized modifiers, which can be a trigger for good inspiration. In the usability testing, we found the availability of especial types of modifiers for general users (non-designers), which inspired their creativity. In this research, we created modifier collections based on TRIZ 40 principals, cartoon expression, and onomatopoeia.

Throughout the usability testing, we found several consistent trends of idea creation. 1. Modifiers based on TRIZ functioned effectively as a trigger of inventive ideas for both designers and non-designers. 2. Designers were inspired even from randomly selected modifiers from the language dictionary. 3. Onomatopoeia is helpful for users who had limited brainstorming experience.

In the future work, we would like to develop more modifier categories for stimulating divergent thinking. In this study, we focused on investigating the effectiveness of Text Montage; thus, we did not investigate availability as a collaboration tool well. In future research, we will report on insight of collaboration on KOTOBA JAM as a tool for brainstorming groupware.

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