

博士論文

**Identification of factors enhancing the novelty of ideas
in innovation Workshops and their utilization for
workshop design**

(イノベーションワークショップにおけるアイデアの新規性を
促進する要因の特定と
ワークショップデザインへの活用)

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Abstract

In response to the social needs for innovation, many academic institutions all over the world have established educational programs to promote innovation focusing on the creation of new ideas. Innovation in this study is not only confined to the conventional conception of technology-driven innovation but also applies to the creation of any kind of value to human life, through introducing novel ideas, methods, directions, opportunities, and solutions that meet new requirements, through more effective products, processes, services, and technologies that are readily available to users. Reflecting this increasing need for human-centered innovation, the University of Tokyo provides innovation workshop programs to generate new ideas.

To design an education program for encouraging innovative idea creation, it is crucial to formulate an evaluation method for the appropriateness of ideas generated, as well as to identify factors that encourage an appropriate idea generation. However, despite numerous previous studies on idea generation, existing definitions of the indicators for evaluation are too general to establish an evaluation method in a general context. The existing methods of evaluation on new ideas are based on subjective judgements of a certain number of raters and their evaluations vary widely, depending on the personal perception of raters. In addition, there is lack of consensus on the factors which enable us to generate appropriate ideas in spite of numerous studies in creativity education. In this study, there are three main objectives: 1) To propose an evaluation method for appropriateness of ideas by excluding subjective judgements as far as possible; 2) To identify factors which enhance appropriateness of ideas in innovation workshops; 3) To utilize this data to propose a workshop design for enhancing appropriateness in idea generation.

The focus of the innovation workshops in this study is placed on the generation of ideas using analogical thinking. Analogical thinking has been identified as one of the key mechanisms for creative thinking by many researchers in the fields of cognitive psychology, cognitive science, artificial intelligence, learning science, creative research, and so on. Analogical thinking is a basic mechanism inspiring creative tasks, in which people transfer information from well-known domains and utilize it in a new domain in order to develop new ideas. In this regard, using analogical thinking for innovation workshops is required to facilitate idea generation.

To evaluate the ideas generated using analogical thinking, it is important to compare structural similarity and superficial similarity. Based on analogical thinking, creativity is best realized with the representation of core structural features in source ideas, and importing them into unusual domains. For example, to explain the electric circuit for people who are not well aware of it, the analogy of the water flow in a pipe is often used to enable us to understand a new concept in invisible domain more clearly with a well-known visible domain. In this study, the appropriateness of ideas is defined as those which have low superficial similarity and high structural similarity with the source ideas. According to this definition, an evaluation method is proposed based on the measurement of superficial similarity and structural similarity. Superficial similarities are calculated by evaluating semantic similarity between the domains of source cases and the created idea using latent semantic analysis. Structural similarities are judged using cluster analysis, followed by comparative analysis between the structure of new ideas and source ideas.

To implement the proposed method and identify factors contributing to creating an appropriate idea, innovation workshops have been conducted seven times with the participation of 45 university students. The workshops consist of three tasks: 1) Pre-task: All subjects were asked to read the 25 business cases study; 2) Categorization task: Subjects were asked to categorize the cases based on the underlying mechanism of the business through group discussion; 3) Generation task: Subjects were asked to create a new service idea individually using analogical thinking. The workshops for this study are divided into two groups according to the instruction given for the generation task: the 1st to 4th workshop, 22 participants were asked to generate idea freely based on analogical table; on the other hand, in the 5th to 6th workshops, 23 participants were asked to generate five new ideas first, then select the one idea to complete the analogy table.

As a result of the 1st - 4th workshops, a total of 20 ideas were created, 10 of which were evaluated as appropriate according to the proposed method. For identifying factors which promote appropriateness in idea generation, this study focused on the factors which are controllable by workshop facilitation. Thus, all the data which are available from the workshop was analyzed: each participant's performance in the categorization task; pattern in thinking process during the generation task. In addition, personal interview surveys were conducted after the workshop.

Consequently, three factors were considered to have a significant relationship with the appropriateness of ideas generated using analogical thinking: 1) categorization skill; 2) deliberation before reaching the creative leap moment; and 3) having trial and error in setting a domain for a new idea. Specifically, the participants who showed higher skill in categorization tasks had a greater possibility of generating appropriate ideas. In addition, the participants who deliberated more before reaching the ‘creative leap’ stage, as well as engaging in more trial and error before deciding on the final domain of a new idea, generated an appropriate idea.

Consequently, this study proposed a workshop design to strengthen the factors for facilitating an appropriate idea generation. As for the factor of categorization skill, it presumably results from personal level of knowledge, and group dynamics during the categorization task, which is carried out through discussion among team members. Thus, it is difficult to be trained through the workshop facilitation. More importantly, any proposal for an improved workshop design method should focus on the ideation process, such as improving the instruction for forming analogy tables which allow participants to apply high structural similarity from the source ideas, presenting a numbers of examples for finding domains, which are different from the source ideas, or setting an additional task for encouraging deliberation, as well as trial and error before reaching the ‘creative leap’ moment.

As a consequence, for the 5th – 6th workshops (N=23), to foster deliberation before reaching the ‘creative leap’ moment, an additional task was given to the participants. The various examples of domains were presented to each participant as a cue, before the task of generating a idea using analogy table. In this session, participants were asked to generate five new ideas within 15 minutes; also, they were instructed to create new ideas as diverse as possible in terms of a business domain. As a result, 23 ideas were generated in total, and 15 of them were evaluated as appropriate ideas according to the same evaluation method. Comparing with the results from the previous workshops, the proposed workshop design promoted two factors for generating an appropriate idea, which are deliberation before reaching the ‘creative leap’ moment, as well as having trial and error in setting a domain for a new idea.

Throughout this study, we have found that, firstly, the proposed evaluation method can effectively evaluate the appropriateness of ideas generated using analogical thinking. This is important not only because it allows us to overcome weaknesses in current assessment methods

which depend on subjective judgements but it also enables further studies into how people generate appropriate ideas, by observing the entire ideation process. Secondly, important factors for generating appropriate ideas were identified as categorization skills and the ideation process, in other words, deliberation before reaching the creative leap stage and extensive trial and error before deciding the domain for a new idea. While almost all past research has focused on the outcomes of ideation workshops, which are the new ideas themselves, this study allows us to trace the source of idea as well as individual thought processes. Last, but not least, the workshop design method was proposed to enhance appropriateness in generating an idea using analogical thinking for innovation workshops.

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1. Introduction

1.1. Background

1.1.1. The increasing needs for innovation

The three most drastic transitions to have taken place in human history are the agricultural revolution, the industrial revolution and the information age (Dertouzos & Moses, 1979; Gates et al., 1995; Negroponte, 1996; Toffler, Longul, & Forbes, 1981). Each transition brought an immense improvement in productivity and the speed of development has accelerated. This radical change allows us to live in a world of abundance. In contrast to those who lived in the industrial age of high volume but low variety, people who live in current information-led society of high variety and low volume are seeking for the new ideas.

In this contemporary world of exuberance, innovation is a prerequisite for finding new opportunities for the both private and public sectors. In the private sector, the paradigm has shifted from manufacturing to value creation through innovation. Innovation in a business is not an option, but an imperative for survival. Innovation allows us to create a new business, which is differentiated from all of the others by a unique business idea. Consequently, business organizations, more than ever before, recognize that they need employees who think creatively in order to maintain their competitive edge. In response to this, large numbers of companies are providing creativity training programs as a means of enhancing innovative thinking in their employees.

Moreover, several prestigious periodicals, such as CNN¹, Forbes², Business week³ as well as consulting companies such as the Boston Consulting Group publish lists of the world's most innovative companies⁴. Crucially, companies ranked in these lists, such as Apple, Google,

¹ The World's Most Admired Companies: Innovation. CNN. from http://money.cnn.com/magazines/fortune/mostadmired/2011/best_worst/best1.html

² The World's Most Innovative Companies List. (2014/01/09/01:45:43). Forbes. from <http://www.forbes.com/innovative-companies/list/>

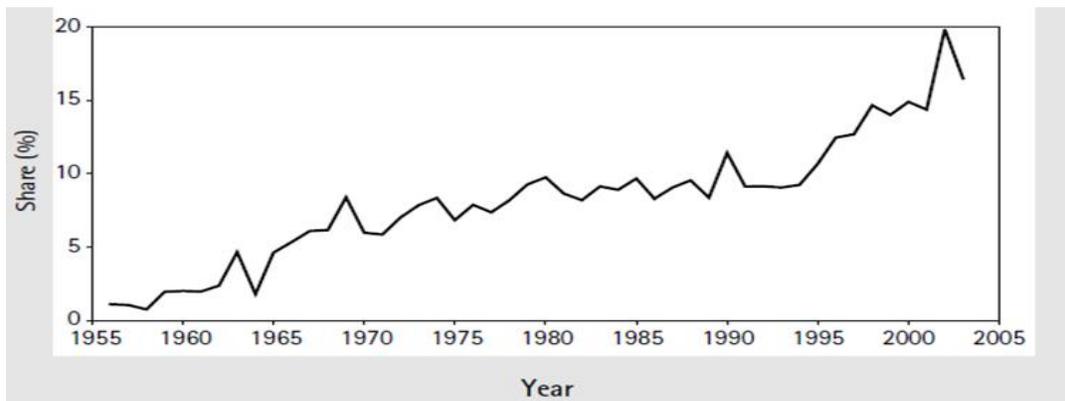
³ Most Innovative Companies - BusinessWeek. (2014/01/09/02:02:48). Businessweek.com. from http://www.businessweek.com/magazine/toc/10_17/B4175innovative_companies.htm
[files/632/B4175innovative_companies.html](http://www.businessweek.com/magazine/toc/10_17/B4175innovative_companies.html)

⁴ BCG. (2014). The 50 Most Innovative Companies. from https://www.bcgperspectives.com/content/articles/innovation_growth_digital_economy_innovation_in_2014/

Amazon.com, Facebook, etc., are highly correlated with those listed as top ranking companies in terms of market capitalization.

The academic field, without exception, has paid profound attention to innovation. Reflecting this new emphasis, the number of scholarly articles with innovation in their titles per 10,000 social science articles has increased from 10% shares in 1990s to 20% shares in early 2000s according to the social science citation index of the Thomson Reuters Web of Science. (see the figure 1.) Significantly, C. R. Carlson and Wilmot (2006) noted that improvements in knowledge-based products and services have no upper limits. While, according to Vicenzi (2000), the most successful organizations promote environments where creativity and innovation are occurring consistently at all levels and in all functions of the organization.

Figure 1. Scholarly articles with innovation in the title per 10,000 social science articles



Source: Fagerberg, Mowery, and Nelson (2006)

Original data sourced from the ISI Web of knowledge. Social science citation index (<http://apps.webofknowledge.com/>)

The significance of innovation is not restricted to business organizations. The US government has established several bureaus within the departments: the Office of Innovation and Entrepreneurship (OIE)⁵, housed within the U.S. Economic Development Administration; the

⁵ <http://www.eda.gov/oie/>

Office of Innovation and Improvement (OII)⁶ and the Office of Investing in Innovation (Oi3)⁷, Innovation (M/PRI)⁸, the Under Secretary for Management's central management analysis organization which housed within the U.S. Department of state. The UK government created The Department for Business, Innovation & Skills (BIS) as a ministerial department of the United Kingdom Government on June 2009⁹. The UK's Department for Innovation, Universities, and Skills (2008) commented on the wider implications of innovation in the face of globalisation and environmental challenges by highlighting the importance of all types of innovation in creating and maintaining competencies and responding to environmental and demographic restrictions. Australian government formed The Department of Innovation, Industry, Science and Research (DIISR) in 2007, changed its name as The Department of Industry, Innovation, Science, Research and Tertiary Education in 2011, and currently succeeded as The Department of Industry and Science¹⁰. New Zealand government established The Ministry of Business, Innovation and Employment (MBIE) on 1 July 2012¹¹. Besides, Ireland government¹², and several provinces of Canadian governments have founded the Ministry or working groups relating the innovation: Ministry of Research and Innovation in the government of Ontario¹³; Ministry of Social Development and Social Innovation the government of British Columbia¹⁴.

International organizations are not exception. Many international organizations launched the institutes, laboratories or working groups regarding to the innovation. For instance, the World Bank and the OECD developed the Innovation Policy Platform (IPP)¹⁵ as a joint initiative to provide policy practitioners around the world with a simple and easy-to-use tool, supporting them in the innovation policy-making process. The World Bank Innovation labs¹⁶ support research and cross-sector collaboration to create ecosystem to foster social innovation and local

⁶ <http://www.ed.gov/edblogs/oii/>

⁷ <http://www2.ed.gov/about/offices/list/oii/oi3/index.html>

⁸ <http://www.state.gov/m/pri/>

⁹ <https://www.gov.uk/government/organisations/department-for-business-innovation-skills>

¹⁰ <http://www.industry.gov.au/Pages/default.aspx>

¹¹ <http://www.mbie.govt.nz/>

¹² <http://www.enterprise.gov.ie/en/>

¹³ <http://www.ontario.ca/ministry-research-and-innovation>

¹⁴ <http://www.sdsi.gov.bc.ca/ministry/index.htm>

¹⁵ <https://www.innovationpolicyplatform.org/>

¹⁶ <https://wbi.worldbank.org/wbi/stories/striking-poverty-ecosystems-innovation-and-role-innovation-labs>

co-production of solutions. UNICEF established Innovation Labs¹⁷ which is open, collaborative incubation accelerators that bring business, universities, governments and civil society together to create sustainable solutions to the most pressing challenges facing children and youth.

There is agreement that to sustain their competitive position and strengthen it, organizations and economies must innovate and promote innovation. Innovation is a key policy and strategic issue. Definitely, innovation allows us to solve complex problems that cannot be solved by traditional, routine or common methods. Creating novel solutions to problems has fascinated many researchers in diverse disciplines. There is wide range of approaches in perspective of cognitive, biological, clinical, social, organizational, educational, historical, cultural, managerial and personal area. In spite of tremendous amount of information on the innovation, we still lack of how to evaluate innovative ideas and which thinking process encourages innovativeness.

1.1.2. Educational programs for promoting innovative idea creation

Despite of its tremendous contribution to technological or theoretical innovation, academy has been dishonored for a long time by a lot of people who claim that it neglects the reality and insensitiveness of the rapid changes in real world. Furthermore, especially in the engineering school, Felder et al. (2000) noted that traditional instructional methods are not adequate to equip engineering graduates with the knowledge, skills, and attitudes required of them in the coming decades. In response to those criticisms and social needs, during the last decades, a number of research centers and departments have been founded focusing on the innovation for economic and social change. Many of these have multidisciplinary perspectives, much attention focusing on the need for innovation to be studied from different viewpoints. Accordingly, several journals and professional associations have also been founded to research on innovation. Reflecting the increasing needs for facilitating innovation, many academic institutions provide educational programs for promoting innovative ideas, for example, The Harvard Innovation lab¹⁸, Design

¹⁷ http://www.unicef.org/innovation/innovation_73201.html

¹⁸ <https://i-lab.harvard.edu/>

Social Innovation and Sustainability Lab¹⁹, The Global Innovation Design program²⁰, The Entrepreneurship and Innovation Program²¹, and Kaospilot²².

Amongst them, the Hasso Plattner Institute of Design, better known as the d.school, at Stanford University is the most representative program. It cooperates with professionals in design thinking as a new mechanism for developing innovative ideas in all areas of life. It is based on the principle developed by D. Kelley, the founder of the design consulting firm IDEO, that innovation takes place when multi-disciplinary groups decide to create a common culture and develop the interface of differing opinions and perspectives. To promote design thinking, d.school proposed 44 methods such as brainstorming, two-by-two matrix, and point-of-view analogy²³.

The d.school has disseminated its methods through partnership with several research institutes all over the world including the University of Tokyo. The i.school at the University of Tokyo was established in 2009 with the aim of fostering innovative leaders, and is tasked with the development and provision of educational programs for human-centered innovation²⁴. 'Innovation' here means not only conventional conceptions of technology-driven innovation but also the creation of any kind of new values: adding values through introducing new ideas, methods, directions, opportunities, and solutions that meet new requirements, through more effective products, processes, services, and technologies that are readily available to users. Its main activities are to provide workshop programs with various social themes: e.g. corporate social responsibility (CSR) of Japanese companies in disaster-stricken areas, the improvement of housework technology for aging society and quality of life, creating new service business ideas in Indian market. The innovation workshop program at i.school encourages participants to generate new ideas based on analogical thinking as leverage into creating new ideas.

¹⁹ <http://www.desis-network.org/>

²⁰ <http://globalinnovationdesign.org/>

²¹ <http://www.eip.umd.edu/>

²² <http://www.kaospilot.dk/#>

²³ <http://dschool.stanford.edu/use-our-methods/>

²⁴ i.school website <http://ischool.t.u-tokyo.ac.jp/english/>

1.2. Objectives and the structure of research

This study focuses on how people generate new ideas using analogical thinking in ideation phase and how to facilitate generating appropriate ideas through the innovation workshop. To design a workshop process that enhances innovation and creativity skills, an objective evaluation method for new ideas needs to be developed.

In response to this, this study aims to:

Firstly, it suggests an evaluation method for the new ideas created using analogical thinking. For developing an evaluation method, it is important to exclude subjective judgements as far as possible.

Secondly, based on the results from the proposed evaluation method, this study identifies factors which enhance appropriateness of ideas in innovation workshops. The factors should be controllable by the workshop facilitation. Thus, the scopes for analysis are including participants' performances in the categorization task as well as their thinking processes in idea generation task.

Lastly, this study will propose a workshop design method that facilitates an appropriate idea creation.

For the first objective, developing an evaluation method for new ideas created through analogical thinking, this research focuses on using analogical thinking for idea generation. To build logic for the development of an evaluation method, a large amount of literature survey has been conducted. And we tested the proposed method with empirical data collected from the outcomes of participants. The literature review includes studies from cognitive science, psychology, computer science, business management, behavioural studies, learning science, creative design research, and educational psychology. Although many of these studies do not directly support a format of workshop in generating ideas using analogical thinking, they provide theoretical and empirical backgrounds by reviewing on the creativity research in line with contexts. For developing an evaluation method in this study, the reviews on the creativity research covers: 1) how analogical thinking enables new idea generation; 2) how they define the key concepts of this studies, such as innovation, creativity, novelty, and appropriateness in each discipline; and 3) what kind of methods were applied to measure those key concepts. Throughout the literature survey on analogical thinking in idea generation, the major two axes for evaluating new ideas

were derived, which are superficial and structural similarity. Based on this, specific methods for analysis were developed on each axis. The proposed evaluation method in this study could be theoretically supported since its logic derived from the extensive review of previous studies. Moreover, it has pragmatic value as for the current phase of this study. The development of a new evaluation method requires a validation. However, the question of how to validate an evaluation method for the new ideas is a problematic issue.

For the second objective of this study, identification of factors which enhance appropriateness of new ideas in innovation workshop, this research firstly conducts the assessment on the new ideas based on the proposed method from the first objective of this study. Then it is followed with two main analyses: the assessment of each participant's performances in the group task, categorizing the given cases of 25 existing services based on the structures of its business mechanisms; and the analysis of each participant's thinking process based on the all notes they created during the innovation workshop. To assess the performance in categorization task, it is required to present an exemplary categorization. Four researchers, who have a high level of knowledge on the given cases, were selected as raters and asked to complete the same categorization task, which was given to the participants in innovation workshop. The exemplary categories were presented by cluster analysis of the results from the four raters and additional literature survey was conducted to validate the result from the four raters.

Also, to analyse each participant's thinking process, their idea generation process were coded in chronological order based on the notes they created for generating an idea. In addition, face to face interviews were conducted after the workshop to find out the creative moment leap, which is a participant produces the most insightful note of idea, by recalling their ideation process with viewing the flow of notes they created. During the interview session, participants indicated the most important notes to generate a new idea as an output of the task. Finally, the relationships between the appropriateness of ideas created and 1) the performance in the categorization task; as well as 2) the thinking process pattern of each participant were studied to identify factors which might enhance appropriateness of idea generation using analogical thinking.

The third objective could be fulfilled by the results from the identification of factors, mentioned in the second objective of this study. To propose a workshop design method for enhancing

appropriateness in idea creation, this research will suggest a couple of measures which enable us to promote thinking skills, and implement those measures in the innovation workshop to test its effectiveness. As a result, this proposed workshop design method would assist researchers and educators who are willing to promote innovation workshops.

1.3. Thesis structure

Chapter 1 describes an introduction for the whole dissertation. It briefly explains the importance of research topic which meets the demands of the times and current academic trend responding to them. Then, it presents an outline of research objectives along with its methodology and the thesis structure.

Chapter 2 firstly introduces theoretical backgrounds and empirical investigations of analogical thinking, which is basic mechanism to be used for generating an idea in this research. After, it reviews the definitions of the key concepts and current evaluation methods regarding to the new ideas. Finally, this chapter examines which factors enable us to create appropriate ideas.

Chapter 3 explains how we sourced data including recruitment of the participants for innovation workshop, the APISNOTE software that records data, and the data coding scheme. In addition, most importantly, this chapter provides a detailed description of each process in the innovation workshop.

Chapter 4 proposes an idea evaluation method based on the logic from the literature survey, and it explains how to measure structural similarity and superficial similarity: cluster analysis of the results from the four professional raters and its validation by literature survey to judge structural similarity; and applying the latent semantic analysis for measuring superficial similarity.

Consequently, based on the results of analysis from the chapter 4, chapter 5 identifies possible factors which have contributed to generate an appropriate idea. In order to find out factors, this study analyzed the relationship between the appropriateness of ideas generated and participants' performances in the categorization task; as well as their thinking pattern in ideation process. It

conducts protocol analysis to assess the performance in the categorization task, and interview survey to analyze thinking process in the idea generation task.

Chapter 6 suggests a workshop design method to be applied for enhancing the appropriateness in generating a idea using analogical thinking. Then, the results from the new workshop design are compared with the results from previous workshops to examine the effectiveness of new workshop design.

Chapter 7 summarizes the outcomes of this research as well as its limitations. In addition, it also discusses future works needed for improving this research and suggesting its further developments.

2. Literature review

This research focuses attention on the use of analogical thinking for idea generation, thus, literature review begins by briefly discussing the role of analogical thinking in idea generation including major scientific discoveries and problem solving. Then this chapter outlines the basic mechanism of analogical thinking: superficial similarity; and structural similarity. Key concepts for evaluating the generated ideas, such as innovativeness, creativity or novelty will then be defined and the existing methods of assessment will be introduced. Finally, this chapter examines factors which influence on generating new ideas focusing on the person; the process; and the pressure, in other words, the environmental factor.

2.1 Analogical thinking for generating ideas

Numerous previous studies have supported analogical thinking as a key mechanism for creative idea generation because it can foster insight into new domain by analogizing to prior knowledge (Finke, Ward, & Smith, 1992; Gentner et al., 1997; Hesse, 1966; K. J. Holyoak & Thagard, 1989; Koestler, 1964; Perkins, 1997) Welling (2007) defined analogical thinking that “it implies the transposition of a conceptual structure from one habitual context to another innovative context. The abstract relationship between the elements of one situation is similar to those found in the innovative context.” An analogy “serves an explanatory function when it puts new concepts and principles into familiar terms. It serves a creative function when it stimulates the solution of existing problems, the identification of new problems and the generation of hypotheses” (Glynn et al., 1989)

Analogy is a cognitive process of transferring information or meaning from a particular subject (the source) to another particular subject (the target). Gentner and Jeziorski (1993) explained six principles of analogical reasoning as shown in the table 1.

Table 1. Modern principles of analogical reasoning

| | |
|----------------------------|--|
| Structural consistency | Objects are placed in one-to-one correspondence and parallel connectivity in predicates is maintained. |
| Relational focus | Relational systems are preserved and object descriptions disregarded. |
| Systematicity | Among various relational interpretations, the one with the greatest depth - that is, the greatest degree of common higher-order relational structure - is preferred. |
| No extraneous associations | Only commonalities strengthen an analogy. Further relations and associations between the base and target - for example, thematic connections - do not contribute to the analogy. |
| No mixed analogies | The relational network to be mapped should be entirely contained within one base domain. When two bases are used, they should each convey a coherent system. |
| Analogy is not causation | That two phenomena are analogous does not imply that one causes the other. |

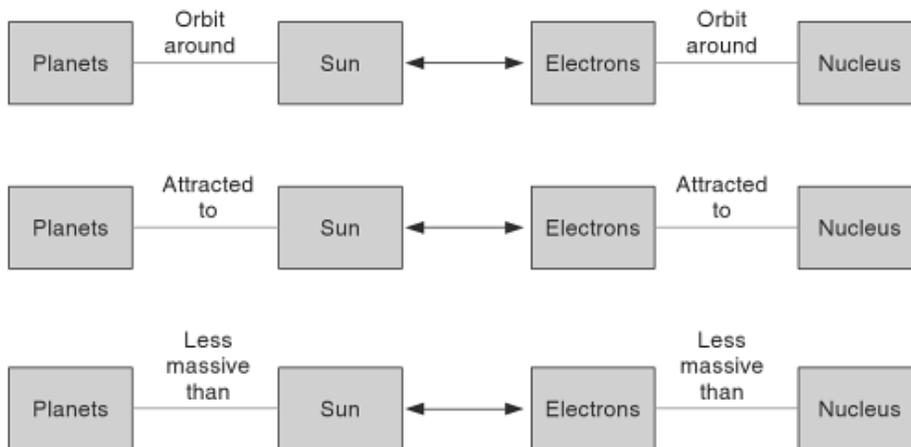
Metaphor is also often referred for explaining the analogical thinking. Both analogies and metaphors express comparisons and highlight similarities, but they do this in different ways (Duit, 1991). An analogy explicitly compares the structures of two domains; it indicates identity of parts of structures. A metaphor compares implicitly, highlighting features or relational qualities that do not coincide in two domains.

Empirical studies which examined how and to what extent analogical thinking influences creative thought are still not enough. However, according to several existing studies on the methods for generating new ideas, analogical thinking has the greatest theoretical supports as the driver of innovative thought beyond doubt. As a consequence, researchers in major disciplines accept the premise of previous studies (Clement, 2008; Goel, 1997; Hofstadter, 2008; K. J. Holyoak & Thagard, 1996) that analogical thinking plays a central role in innovation and creativity.

Analogical thinking in major scientific discoveries

Historically, major scientific findings derived from everyday prosaic things. For example, Newton discovered the law of gravity by observing a falling apple, and Archimedes exclaimed eureka after discovering the principle of displacement from the water overflowing from his bathtub. In psychology, major evidences are historical and they analyze the role analogy in the scientific discoveries. For instance, Bell conceived of the early telephone by analogy with the inner workings of the ear. (W. B. Carlson & Gorman, 1992). Johannes Kepler (1571-1630), today best known for his three laws of planetary motion, was a prolific analogical thinker. Not only in his books but also in his journals and letters, he used analogies constantly (Gentner et al., 1997). In addition, Rutherford was recognizing that the structure of the atom entailed the principles of orbital motion, as exemplified in the solar system (Gentner, 1983). His analogy entails transferring the system of relations between solar and planetary bodies to the nucleus and electron. This example also illustrates the role of analogy in scientific discoveries (see the figure 2.)

Figure 2. Relational mappings between the solar system and hydrogen atom



Source: Nakatsu (2009) Reasoning with Diagrams: Decision-Making and Problem

Clement (2008) examined sources of creative scientific theory formation in the domain of non-formal reasoning. He provided scientific problems to professors and PhD candidates (ten

participants in total) in technical fields and videotaped their problem solving process with think-aloud. For the first task, all participants favored correct answer and eight people generated at least one analogy. As a result of the protocol analysis, the four major processes in a direct analogical inference for solving 'the problem A' were identified: 1) generating tentative analogous case B, 2) establishing confidence in the analogy relation between the A and the B, 3) understanding the case B, 4) inference projection from B to A. Furthermore, with analysis of the think aloud protocol transcript, he concluded that there were at least three types of analogy generation methods: 1) generation via a principle, 2) generation via a transformation, and 3) generation via an association. Among these three methods, the generation via transformation was observed as the most frequently used with 18 out of 31 analogies. Moreover, there were five analogous cases observed clearly novel, generated via transformation.

In addition, Ueda (2000) conducted interview survey to investigate how scientists actually use analogies in their remarkable scientific discoveries. He classified the observed cases of analogy according to the two criteria of similarity and transfer, and he found that four among those six types were actually used in the observed cases.

Many existing research have emphasized the main uses of analogy in the development of scientific theories and indicated why it has played an important role; analogies let people think about complex and vague subjects in simple or familiar terms. For example, to explain the electric circuit for people who are not well aware of it, the analogy of the water flow in a pipe is often used to enable us to understand a new concept in invisible domain more clearly with a well-known visible domain.

Analogical thinking for problem solving

There are considerable numbers of studies have been made on problem solving or hypotheses formation by analogical thinking. People solve problems better if they have experienced associated or similar problems (K. J. Holyoak & Koh, 1987; Novick, 1988; Ross, 1987). In this context, Analogical thinking has been suggested as a basic mechanism inspiring creative tasks, in which people transfer information from well-known, existing categories, i.e., base or source domains to utilize it in constructing their new idea, i.e., the target domain (Finke et al., 1992;

Gentner et al., 1997; Perkins, 1997). Weisberg (1995) identified numerous creative ideas and solutions that information from a previous situation is transferred to the new situation that is analogous to the old. Gentner et al. (1997) claimed that creativity is best realized with deeply structured representations that are relatively firm, structurally guided alterations. The use of analogical thinking is an important for theory formation, design and construction (Sarlemijn & Kroes, 1988). Moreover, Bingham and Kahl (2013) noted that analogical thinking is a highly effective tool for companies and organizations to cope with significant change and innovation.

Gick and Holyoak (1980) conducted an experiment with university students regarding the problem solving using Duncker's radiation problem (Duncker & Lees, 1945)²⁵. Participants were provided with a story about a general who is trying to capture a fortress controlled by a dictator and needs to get his army to the fortress at full strength. Because the entire army could not pass safely along any single road, the general sends his men in small groups down several roads simultaneously. Arriving at the same time, the groups join together and capture the fortress. A few minutes after reading this story under instructions to read and remember it along with two other irrelevant stories, participants were asked to solve a Duncker's radiation problem. Without a source analog, only about 10% of them produced the solution. When the general story had been studied, but no hint to use it was given, only about 20% of participants produced the solution. Conversely, when the same participants were then given a simple hint that "you may find one of the stories you read earlier to be helpful in solving the problem," about 75 % succeeded in generating the analogous solution. In other words, people often fail to notice superficially dissimilar source analogs that they could readily use.

²⁵ Suppose you are a doctor faced with a patient who has a malignant tumor in his stomach. It is impossible to operate on the patient; but unless the tumor is destroyed the patient will die. There is a kind of ray that can be used to destroy the tumor. If the rays are directed at the tumor at a sufficiently high intensity the tumor will be destroyed. Unfortunately, at this intensity the healthy tissue that the rays pass through on the way to the tumor will also be destroyed. At lower intensities the rays are harmless to the healthy tissue but they will not affect the tumor either. What type of procedure might be used to destroy the tumor with the rays, and at the same time avoid destroying the healthy tissue?

Dunbar (2001) found out that structural analogies are not a rare event in both science and politics. His research team recorded video and audio from three months to a year in leading molecular biologists and immunologists in the United States, Canada, and Italy, as they think and reason at their laboratory meetings. Afterward, they analyze the types of thinking and reasoning that they use for formulating theories, analyzing data, and designing experiments, sentence by sentence. Furthermore, they supplement the meetings with interviews and other documents such as grant proposals, drafts of papers, and one-on-one meetings. They called this approach *the in vivo* cognitive approach, whereas the *in vitro* cognitive approach is bound with experimental conditions. On top of that, they investigated the use of analogy in a naturalistic context of politics with analyzing politicians' and journalists' use of analogy in newspaper articles during the final week of the referendum campaign. Comparing between *in vivo* and *in vitro* approaches, he concluded that analogy seems easy in naturalistic contexts, while it is difficult in the psychological laboratory. People frequently make analogies that are based on deep structural features and have little superficial overlap between the source and the target.

Analogical thinking in creative design

Analogical thinking also appears to play a key role in creative design: analogical design involves reminding and transfer of elements of a solution for one design problem to the solution for another design problem (Goel, 1997). Cross (2011) conducted research to understand how designers think and work, allowing people to identify what is design thinking. After several interviews with professional designers and observation of their working process, he discovered that their inspirations are arisen prosaically by applying an analogy and this analogy-making encourages creative thinking.

Casakin and Goldschmidt (H. Casakin, 1997; H. P. Casakin & Goldschmidt, 2000) investigated empirically if the use of analogy enables subjects perform better in solving problems. In their research, three groups of subjects with varying design experience participated in the experiments: experienced architects, advanced architecture students and novice architecture students. Each subject solved a number of well-defined, which have one correct solution, and ill-defined, which have any number of acceptable solutions, design problems that were presented

under three conditions: a) The design problem was administered with no additional material or commentary; b) The design problem was administered while the subject was also shown a panel with visual displays (approximately two dozen images), some of which could be used as source analogues for the problem, and some that could not be related to it in any way; c) Same as b), but subjects were also explicitly encouraged to identify relevant images among the displays and use them as source analogues in their designing. All subjects were asked to present the solutions to the design problems were expressed in sketch form, on one or more sheets of paper. These sketch-designs were assessed by three judges of experienced architects: quality and creativity of the solutions for the ill-defined problems were evaluated on a scale of five points. The assessment results were reliable because the degree of agreement among the judges was very high and the scores are analysed as show in the table 3. For ill-defined problems solving, all the subjects, regardless of their level of experience, obtained significantly higher scores when using cues, and giving them instructions to use analogy.

Table 2. Design quality scores, novice and experienced designers under different problem solving conditions

| | | Novice designers (students) | | | | Expert designers (architects) | |
|---------------------------------------|--|-----------------------------|--------|-----------------|-----------------|-------------------------------|-----------------|
| | | Well-defined | | Ill-defined | | Well-defined | Ill-defined |
| | | Begin. | Advan. | Begin. | Advan. | | |
| Baseline (control) | No display provided No instructions to use analogy | -- | -- | 2.227 | 2.58 | -- | 2.809 |
| Design quality improvement | Displays provided No instructions to use analogy | p<.469 | p<.541 | 2.621 p<.039 | 2.939 p<.092 | p<.091 | 3.236 p<.046 |
| Additional design quality improvement | Displays provided Instructions to use analogy given | p<.063 | p<.042 | 3.463 p<.001 | 3.731 p<.002 | p<.148 | 3.984 p<.001 |

Source: Goldschmidt (2001), p213

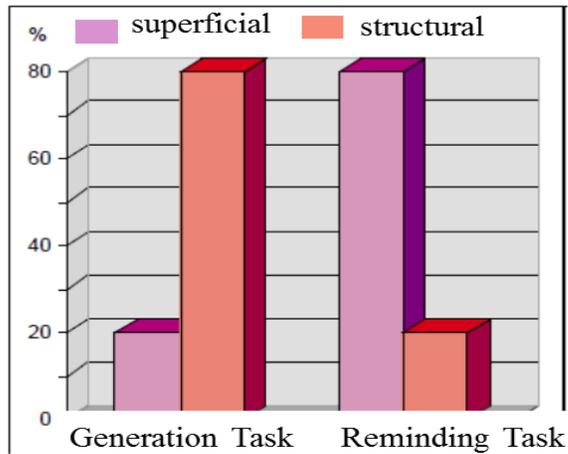
2.2 Superficial similarity and structural similarity in analogical thinking

Dunbar (1995) focused on scientific analogies and he identified three different kinds of analogy as follows: 1) local analogies, one part of one experiment is related to a second experiment ; 2) regional analogies, involving systems of relationships applied in one domain but used in a similar domain ; 3) long distance analogies, a system is found in applied in a different domain. In addition, Nathalie Bonnardel and Marmèche (2004) described that analogy-making allows two kinds of analogies: intra-domain analogies, when the target (e.g. the situation or problem at hand) and the source (a previous similar situation) belong to the same conceptual domain; inter-domain analogies, when the target and the source belong to different conceptual domains.

Blanchette and Dunbar (2000) claimed that analogies are generated by superficial or structural similarities from the memory. They asked 49 participants to produce as many analogies as possible on the topic of pro-zero deficit and anti-zero deficit and they identified structural similarity as the resemblance in the underlying systems of relations between the elements of the sources and the target: Ten different categories of underlying structures were identified through the grouping process, five for each viewpoint (Anti and Pro-zero deficit). For instance, in the anti-zero deficit condition, the most frequently used statement structure was "If cut X, then negative consequence". In this case, the specific objects representing both "X" and "negative consequence" varied in the sources. Likewise, in the pro-zero deficit condition, the most frequently used statement structure was "If Y is not solved, and then negative consequences", and the objects matching to "Y" and "negative consequence" varied in the sources.

In their later study, Dunbar and Blanchette (2001) found out that the generation task motivated people to use more structural similarity. In generation task, subjects were asked to generate sources for a given target, while in reminding task, subjects were given various sources to read and then, given new stories and asked which old stories they were reminded of by the new stories. This study revealed that in the generation task, people can and do use analogical sources that do not have superficial features in common with the target. Most of the analogies were generated (80%) dependent from superficial features of a given target. However, when the task was changed to a reminding task our results mirrored those of research on analogical reminding – people used predominantly superficial features (see the figure 3).

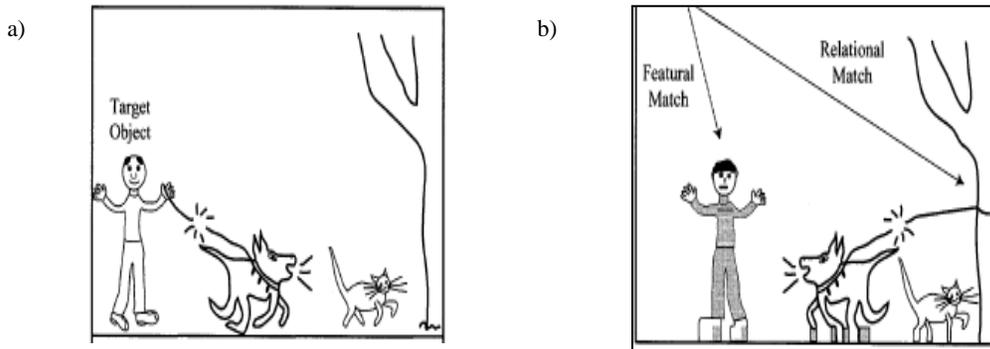
Figure 3. Types of sources used by subjects in experimental situations, as a function of generating analogies or being asked which source they are reminded of



Source: Dunbar and Blanchette (2001)

Superficial similarity refers to the resemblance of their properties between the objects in the source and target (Keane, Ledgeway, & Duff, 1994). For example, when people examined two pictures in the figure 4, and were asked to indicate which object in the picture b) could be match to the boy in the picture a), they are more likely to map it to the man in the picture b) based on superficial similarity while people who consider the relation among the objects and of higher-order relations between relations, i.e. structural similarities, map it to the tree in the picture b).

Figure 4. A picture-mapping paradigm introduced by Markman and Gentner (1993)



Many studies suggest that the structural similarity could be presented by matching the relation of each element in one idea to the other idea by introducing the structure-mapping framework (Falkenhainer, Forbus, & Gentner, 1989; Forbus, Ferguson, & Gentner, 1994; Forbus & Oblinger, 1990; Gentner, 1983) Intra-domain analogies would be based on both superficial similarities and structural similarities between the target and the sources, whereas inter-domain analogies would be based only on structural similarities (or underlying principles) between the target and the sources.

For creative idea generation, it needs to adopt not superficial similarity but structural similarity in using analogical thinking. In other words, long distance analogy, i.e. cross-domain analogy enables us to generate more novel ideas than local analogy, i.e. within-domain analogy, or regional analogy, i.e. similar-domain analogy. The process of structural comparison acts as a bridge by which similarity-based processes can give rise to abstract rules (Dedre Gentner & José Medina, 1998). Carrying out an analogy can lead to a schematic structure in which the domain objects are replaced by variables, while retaining the common relations (Winston, 1982)

Especially for creative designers, cross-domain analogy play important role in creative idea generation. For instance, Le Corbusier, who made frequent use of analogical reasoning, transferred the structural principle of the double-membrane shell to the roof for designing the Ronchamp chapel. Afterwards, adjustments were made to guarantee the proper functioning of this concrete shell to its role as a roof, including insulation, drainage, as well as aesthetic and

structural properties concerning the large overhangs that shape the building with its special silhouette (Goldschmidt, 2001).

Many authors have argued that structural similarity is the crucial defining feature of analogical thinking. The power of analogical thinking is to reveal common structure and to import structure from a well-articulated domain into a less coherent domain makes it the foremost instrument of major theory change (Gentner et al., 1997). Holyoak, Lee, and Lu (2010) defined analogical thinking as focusing on abstract relational categories. Goldschmidt (1995) affirmed that the carrying over of surface features only, without a structural similarity to underpin them, may lead to a false analogy and consequently to a wrong solution to a problem.

2.3 Current evaluation methods for new ideas

It has long been acknowledged that creativity is one of the most complex of human functions and that it is also one of the most difficult psychological constructs to define and measure (Hocevar, 1981). Researchers have been dissatisfied with definitions related to the creativity or innovativeness of new ideas, as well as evaluation methods of assessing new ideas.

To develop an evaluation method, it is important to define the related concepts. Thus, this section reviews definitions on innovation, creativity, novelty, and appropriateness, subsequently, it describes how existing evaluation methods are measuring those concepts.

2.3.1 Definitions: Innovation; Creativity; Novelty; Appropriateness

In early studies, Schumpeter (1934) defined innovation as new combinations of existing resources, which are economically more viable than the old way of doing things. As an economist, he put more emphasis on commercialization role of innovation which differentiating itself from invention. However, innovation is not limited to only in market. For instance, in a domain of technology, innovation can be recognized by the job that the technology in question lets you do (Johnson, 2010). In terms of job, *ceteris paribus*, a discovery that lets user carry out

two new jobs which were impossible before its development is twice as innovative as a discovery that allows user to execute one new job despite the complexity of technology.

There exist various definitions on innovation. Baregheh, Rowley, and Sambrook (2009) collected 60 definitions of innovation from the various disciplinary literatures.²⁶ They analyzed the frequency of words which appeared in each set of definitions and found that the “new” has been repeated 76 times where there are only 60 definitions of innovation. Davenport (2013) defined simply, “innovation is, of course, the introduction of something new.”

Table 3. A sample list of various definitions on innovation

| | |
|--------------------------|---|
| Barnett (1953) | “An innovation is ... any thought, behavior or thing that is <i>new</i> because it is qualitatively <i>different from existing</i> forms” |
| Thompson (1965) | “Innovation is the generation, acceptance and implementation of <i>new ideas</i> , processes products or services” |
| West and Anderson (1996) | “Innovation can be defined as the effective application of processes and products <i>new to the organization</i> and designed to benefit it and its stakeholders” |
| Kimberly (1981) | “There are three stages of innovation: innovation as a process, innovation as a discrete item including, products, programs or services; and innovation as an attribute of organizations.” |
| Van de Ven (1986) | “As long as the idea is <i>perceived as new to the people</i> involved, it is an ‘innovation’ even though it may appear to others to be an ‘imitation’ of something that exists elsewhere”. |
| Damanpour (1996) | “innovation is broadly defined to encompass a range of types, <i>including new product or service, new process technology, new organization structure or administrative systems, or new plans or program</i> pertaining to organization members.” |

²⁶ 18 definitions from business and management (1966 to 2007); nine definitions from economics (1934 to 2004); six definitions from organization studies (1953 to 2008); nine definitions innovation and entrepreneurship (from 1953 to 2007); 13 definitions from technology, science and engineering (1969 to 2005); three definitions from knowledge management (1999 to 2007); and two definitions from marketing (1994 to 2004).

| | |
|---------------------------|---|
| Du Plessis (2007) | Innovation as the <i>creation of new knowledge and ideas to facilitate new business outcomes</i> , aimed at improving internal business processes and structures and to create market driven products and services. Innovation encompasses both radical and incremental innovation. |
| Becker and Whisler (1967) | Innovation is a process that follows invention, being separated from invention in time. Invention is the creative act, while innovation is the first or early employment of an idea by one organization or a set of organizations with similar goals. |

Source: Baregheh et al. (2009), Seidler-de Alwis and Hartmann (2008)

Generally, innovation is referred with creativity. Amabile (1988) claimed that innovation is built on creative ideas as the basic of elements. Subsequently, Amabile et al. (1996) initiated their research based on the thought that “All innovation begins with creative ideas.” Successful implementation of new programs, new product introductions, or new services depends on a person or a team having a good idea, and developing that idea beyond its initial state. They defined creativity as the production of novel and useful ideas in any domain and innovation as the successful implementation of creative ideas within an organization. Likewise, Nyström (1993) viewed innovation as “the result and implementation of creativity. It is process of bringing new ideas into use.”

However, innovation is different from creativity. Innovation certainly requires some level of originality, but not maximum level of novelty, while creative thinking can benefit from maximum level of originality (Runco, 2014), as shown in the figure 5.

Figure 5. Proposed continuum allowing a balance of originality and effectiveness in creative effort



There are myriad definitions on creativity. Remarkably, one common thread in these definitions is the notion of novelty. This is a mandatory characteristic in any creative artifact. Csikszentmihályi (1990) described creativity as something that begins with the individual, who has an idea or product that influences the field, which is a group of appropriate judges, and eventually changes a domain, for example, art, music, science. The creative product must be something different from what the evaluator knows or is expecting (Gomes et al., 2006). Ford (1995) described creativity as having a "subjective judgment of the novelty and value of an outcome of an individual's or a collective's behavior". Stein (1974) defined creativity as “novelty that is useful.” a creative idea as a quality idea that is also novel. In other words, creativity results in generating some novel result, which is useful and different from that which already exists.

Figure 6. Relationships between creative and novel



Source: Dean, D. L., et al. (2006). "Identifying quality, novel, and creative Ideas: Constructs and scales for idea evaluation." *Journal of the Association for Information Systems* 7(10): 646-698.

Novelty is a key construct for measuring the creativity of ideas. Morgan (1953) reviewed a large number of definitions of creativity and showed that the single common element was novelty. The cognitive approach to creativity emphasizes the processes involved in producing effective novelty (Cropley, 1999). Simon (1995) regarded novelty as the core of creativity. He defined creativity operationally, in full accordance with general usage, as novelty that is regarded as having interest or value: economic, esthetic, moral, scientific or other value.

According to the Encyclopedia of creativity (Runco & Pritzker, 1999), novelty is defined as original, innovative, or creative, in other words, it is also described as unusual, new and useful or

domain-changing (Stokes, 1999). MacCrimmon and Wagner (1994) defined a novel idea as one that had not been previously expressed. Dean et al. (2006) defined novelty as the degree to which an idea is rare, original and modifies a paradigm: The rarity of an idea can be determined by counting the number of times an idea occurs in a set of ideas; Originality is defined as the degree to which the idea is not only rare but is also ingenious, imaginative, or surprising; Paradigm relatedness is defined as the degree to which an idea is paradigm preserving (PP) or paradigm modifying (PM). PM ideas are sometimes radical or transformational.

Bruner (1979) implied appropriateness in his definition of creativity as “effective surprise”. Similarly, Mednick (1962) defined creativity as the forming of associative elements into new combinations that meet new requirements or are in some way useful. Sternberg (2001) defined creativity as the potential to produce novel ideas that are task appropriate and high in quality. In the empirical research, usefulness or some other quality of ideas assessed indicative of appropriateness (Harrington, Block, & Block, 1983; Milgram et al., 1978; Mobley, Doares, & Mumford, 1992; O'Quin & Besemer, 1989; Yamamoto, 1965).

2.3.2 Evaluation methods on new ideas

Despite all of this attention to the innovativeness, the assessment method on new ideas is still problematic. The measurement methods for creativity or appropriateness of new ideas used at present are controversial because they involve subjective judgments, are time consuming, lack comprehensiveness, and adopt instruments that have no theoretical grounding (Salcedo, 2006).

In practice, companies or designers usually evaluate innovation ideas with a small group of experts based on the criteria which are defined with their attributes by the purpose of the idea development. However, there is no guarantee that judges will understand and be guided by the sometimes complex definitions, and there is little research that shows the instructions even make a difference (Hocevar, 1981). Probably, each judge considers different criteria according to his or her level of personal creativity and other cognitive characteristics, personality traits, self-expression, enthusiasm, productivity, and expertise.

Blair and Mumford (2007) reviewed the literature on idea evaluation and identified 12 attributes that people use when evaluating ideas: 1) Risky (high probability of incurring a loss); 2) Easy to

understand; 3) Original; 4) Complete description (provides detailed steps needed to make the idea work); 5) Complicated; 6) Consistent with existing social norms; 7) High probability of success; 8) Easy to implement; 9) Benefits many people; 10) Produces desired societal rewards; 11) Time and effort required to implement; 12) Complexity of implementation

For evaluating ideas, it is possible that certain characteristics of the judges may moderate the result of assessment. For example, highly creative people (Basadur, Runco, & Vega, 2000) and people who have substantial expertise working in a domain (Weisberg, 1999) may apply different standards in evaluating ideas. Many researchers have discussed the relevance of idea evaluation, only a few studies have expressly examined how idea evaluation operates (Lonergan, Scott, & Mumford, 2004).

In past studies, numerous kinds of measures have been used to evaluate ideas, and each measure had its own set of limitations. Specifically, in single-dimension measure of idea evaluation, raters may consciously or unconsciously include multiple constructs in a single rating (Dean et al., 2006). Similarly, in multidimensional measures, raters also may consciously or unconsciously be influenced by other dimensions or sub-dimensions. Furthermore, even though the guideline on evaluation is given to raters, different raters may have different biases, point of views, and standards.

Furthermore, risk avoiding behaviors in assessing the new ideas are also problematic. Since Schumpeter (1934) has introduced theoretical definition of innovation as new combinations of existing resources, which are economically more viable than the old way of doing things, people have put more emphasis on commercialization role of innovation which differentiating itself from invention. Rogers and Adhikarya (1979) observed what kind of standards people routinely apply in evaluating new ideas and found that low implementation cost, consistency of the idea with extant systems, and rate of return influenced the adoption of new ideas. Prior studies indicate that people actively seek to eliminate original high risk ideas (De Dreu, 2003; Suri & Monro, 2003). Blair and Mumford (2007) found that people preferred ideas that fit social norms, were likely to produce the desired outcomes quickly, were complex to implement, were easy to understand, and benefited many people. They were likely to reject risky and original ideas. But when they were placed under time pressure, people selected riskier and more original ideas-

suggesting that what people are doing with their extra time is screening out risky and original ideas. However, it is important to recognize these pragmatic, economic standards are not the only attributes people might consider in appraising new ideas.

Distinctly, there are some studies which tried to evaluate the novelty of ideas with less subjectivity. Connolly, Routhieaux, and Schneider (1993) focused on the rarity: the rarer the idea, the lower its rarity score. Connolly, Jessup, and Valacich (1990) conducted computer-based group brainstorming with 72 students to generate ideas for solving problems regarding the parking problems inside the campus. The rarity was determined by counting the number of subjects who proposed the same idea. This research calculated rarity by computing the reciprocal of the number of idea occurrences, in other words, the rarer the idea, the higher its rarity score. However, this approach has limitations because the result will be changed by the number of ideas in an idea pool, and it is not easy to differentiate each idea as repetitive with another idea or slightly different from another idea.

To evaluate the generated ideas using analogical thinking, it is necessary to examine the similarities and differences between elements (Berlyne, 1960). Blanchette and Dunbar (2000) assessed superficial similarity according to the semantic similarity between the source and target in terms of their domain of origin: in their experiment, target was fixed to the deficit problem, analogies coded as within-domain were analogies for which the source was taken from the domains of either politics, economics, or personal finances. Sources from these three domains have a high degree of superficial similarity with the target problem. Analogies with sources from any other domain, such as animal, farming, or eating, were coded as other-domain analogies.

2.4 Factors for creative idea generation

The two most important points to be addressed in this chapter are: 1) what is an appropriate idea generated using analogical thinking; 2) how it is generated. While the chapter 2.2 explains the first point, this chapter covers existing studies regarding to “how the appropriateness of new idea can be enhanced”.

There are many kinds of possible factors which may enhance the quality of idea in terms of the creativity: physical exercise (Steinberg et al., 1997); relaxation for stress reduction (Khasky & Smith, 1999); self-disclosure, sharing private thoughts (Pennebaker, Kiecolt-Glaser, & Glaser, 1997); manipulations of the human brain, such as stimulating using pulses to frontal lobes (Snyder et al., 2003); emotional process such as motivation, attitude, interest (Albert & Runco, 1988); adversity, such as severe frustrations, deprivations and traumatic experiences (MacKinnon, 1992) ; the family such as parents (Runco & Albert, 2005); peer status such as popularity among peer group (Lau & Li, 1996); social influences (R. Collins, 2000).

In creativity studies, the 4Ps (Person; Process; Product; and Press) are widely accepted framework (Rhodes, 1961). This framework have been approached structurally (Guilford, 1959a;1959b), and experimentally (Maltzman, 1960). Amongst the 4Ps, this study, in a perspective of an educational program designer, is focusing on thinking processes, which are able to be instructed through the workshop facilitation. To understand the theoretical background of thinking processes in generating an idea, it is important to grasp the context in early study of creativity.

Personality

In early studies, creativity was not believed to be a normally distributed trait (Nicholls, 1972). Also, creativity tended to be regarded as a fixed inborn trait. Numerous researchers have attempted to delineate a core set of personality characteristics inherent in the creative individual.

In 1949, the IPAR(Institute of Personality Assessment and Research) was founded to conduct research focusing on the relations between personality and performance, with forays into higher levels of human performance such as creativity, aesthetics, leadership, and profession-specific accomplishments. IPAR pioneered the notion that a full understanding of personality requires viewing the individual in a number of different situations. This was accomplished through intensive multi-day assessments, which included administration of self-report inventories, careful observation of behavior in structured and unstructured situations, and detailed in-depth interviews. Along with this trend, Guilford (1950) defined creativity as abilities that can be found in creative people, emphasizing a “person” approach to creativity. Osborn (1953) studied

creative people to see how they came up with ideas and creative solutions and developed Creative Problem Solving (CPS) process. Parnes (1967) confirmed that CPS can be taught, so that people can learn to improve the way they think and solve problems. Afterward, several research projects were conducted on personal characteristics, interrelationships between participants, and their implications for instruction.

Consequently, several instruments were developed to measure the individual difference regarding to creativity. Torrance (1974) found 103 studies designed to enhance creativity, and developed the Torrance Tests of Creative Thinking(TTCT). TTCT is a set of divergent thinking tests that provides scores in fluency (the number of ideas produced), flexibility (the number of different types of ideas produced) and originality (the uniqueness of the ideas) in both verbal and figural form. Kirton (1976) described two cognitive styles, adaptive and innovative and developed the KAI(Kirton Adaptation-Innovation Inventory). Also, there are the Gregorc Style Delineator (Gregorc, 1982), the PEPS; Productivity Environmental Preference Survey (Dunn, Dunn, & Price, 1982), and the MBTI; Myers-Briggs Type Indicator (Myers, McCaulley, & Most, 1985). These approaches are based on a premise that creativity associate with certain types of characteristics as well as certain level of the creative abilities: e.g. openness to experience, tolerance toward ambiguity, resistance to premature closure, curiosity and risk-taking, etc.

Many studies have examined the relationship between 16PF scores and creativity (See the table 4). Consistent predictors of creativity include high scores on Dominance (E+), Social Boldness (H+), and Openness-to-Change (Q1+); low scores on Tough-Mindedness (in the Receptive or open direction) and its traits of Openness-to-Change (Q1+), Sensitivity (I+), and Abstractedness (M+); and somewhat below average scores on Self-Control (unrestrained). (Cattell & Mead, 2008)

Table 4. Primary factors and descriptors in Cattell's 16 personality factor model

| Descriptors of low range | Primary factor | Descriptors of high range |
|--|------------------|--|
| Impersonal, distant, cool, reserved, detached, formal, aloof | Warmth | Warm, outgoing, attentive to others, kindly, easy-going, participating, likes people |
| Concrete thinking, lower general mental capacity, less intelligent, unable to handle | Reasoning | Abstract-thinking, more intelligent, bright, |

| | | |
|--|----------------------------|--|
| abstract problems | | higher general mental capacity, fast learner |
| Reactive emotionally, changeable, affected by feelings, emotionally less stable, easily upset | Emotional Stability | Emotionally stable, adaptive, mature, faces reality calmly |
| Deferential, cooperative, avoids conflict, submissive, humble, obedient, easily led, docile, accommodating | Dominance | Dominant, forceful, assertive, aggressive, competitive, stubborn, bossy |
| Serious, restrained, prudent, taciturn, introspective, silent | Liveliness | Lively, animated, spontaneous, enthusiastic, happy-go-lucky, cheerful, expressive, impulsive |
| Expedient, nonconforming, disregards rules, self-indulgent | Rule-Consciousness | Rule-conscious, dutiful, conscientious, conforming, moralistic, staid, rule bound |
| Shy, threat-sensitive, timid, hesitant, intimidated | Social Boldness | Socially bold, venturesome, thick-skinned, uninhibited |
| Utilitarian, objective, unsentimental, tough minded, self-reliant, no-nonsense, rough | Sensitivity | Sensitive, aesthetic, sentimental, tender-minded, intuitive, refined |
| Trusting, unsuspecting, accepting, unconditional, easy | Vigilance | Vigilant, suspicious, skeptical, distrustful, oppositional |
| Grounded, practical, prosaic, solution oriented, steady, conventional | Abstractedness | Abstract, imaginative, absent minded, impractical, absorbed in ideas |
| Forthright, genuine, artless, open, guileless, naive, unpretentious, involved | Privateness | Private, discreet, nondisclosing, shrewd, polished, worldly, astute, diplomatic |
| Self-assured, unworried, complacent, secure, free of guilt, confident, self-satisfied | Apprehension | Apprehensive, self-doubting, worried, guilt prone, insecure, worrying, self blaming |
| Traditional, attached to familiar, conservative, respecting traditional ideas | Openness to Change | Open to change, experimental, liberal, analytical, critical, free-thinking, flexibility |
| Group-oriented, affiliative, a joiner and follower dependent | Self-Reliance | Self-reliant, solitary, resourceful, individualistic, self-sufficient |
| Tolerates disorder, unexacting, flexible, undisciplined, lax, self-conflict, impulsive, careless of social rules, uncontrolled | Perfectionism | Perfectionistic, organized, compulsive, self-disciplined, socially precise, exacting will power, control, self-sentimental |
| Relaxed, placid, tranquil, torpid, patient, composed low drive | Tension | Tense, high energy, impatient, driven, frustrated, over wrought, time driven. |

Source: adapted from Conn and Rieke (1994)

However, many researchers indicate that everyone, to some degree, may hold these characteristics. Nicholls (1972) suggested the concept of creativity as a normally distributed trait. In addition many studies have found a few consistent correlations between personality

characteristics and various measures of creativity (Wolfradt & Pretz, 2001). Dyer, Gregersen, and Christensen (2009), after spending 8 years interviewing senior executives of large companies, found that top executives rarely mentioned an innovative business idea that they had personally generated. Even if two individuals have the same genetic creative ability, one who more frequently engaged in discovery skill will be more successful at creative problem solving.

Thinking process

Since 1970s, focus of the creativity research had moved from the personality to the process. In the 1970s, shortly after funding for IPAR and other personality studies had declined dramatically, a second wave of psychologists began to study creativity in a new way (Feldman, Csikszentmihalyi, & Gardner, 1994).²⁷ Research psychology was changing dramatically during the 1960s and 1970s. In other words, it is not any more a matter of who is capable to generate creative ideas, but how it is possible to generate creative idea and what is a creative idea as an outcome of the thinking process. Instead of studying traits and personality differences, cognitive psychologists analyze mental processes that are shared by all individuals.

People used to believe that creative idea comes from the sudden moment of insight which involves in unconscious mind. Many of the creativity beliefs argue that we tend to think that ideas emerge spontaneously, from the unconscious mind of the creator. Creativity may sometimes be significantly influenced by serendipity, chance, and accidents (Runco, 2014). Creative inventions and ideas often are found by accident, or at least with some unintentionality. Jones (2011) listed the examples of fifty accidental discoveries in history, for example, coffee, raisins, vinegar, microwave oven, matches, artificial sweeteners, and so on.

However, many cognitive psychologists theorized creative thinking process which contradicts to the belief on the sudden moment of insight. Cognitive psychologists claim that the reason of more creative people existence can be explained by variations in the use of specific, identifiable processes. They examined the representational structures of the mind, their interconnections, and

²⁷ In 1992, reflecting this change, the IPAR(Institute of Personality Assessment and Research) changed its name to the Institute of Personality and Social Research. (source: <http://ipsr.berkeley.edu/about.html>)

the mental processes that transform them to explain creativity by showing how it emerges from the cognitive abilities that everyone shares. Recent studies in the fields of cognitive psychology support that creativity takes place over time, and most of the creativity occurs while doing the work.

Psychologists have been studying the creative process for decades, and they've observed that creativity tends to occur in a sequence of stages. Sawyer (2012) proposed eight stages of the creative process as follows:

1. **Find and formulate the problem.** The first step is to identify a good problem and to formulate the problem in such a way that it will be more likely to lead to a creative solution.

2. **Acquire knowledge relevant to the problem.** Creativity is always based on mastery, practice, and expertise.

3. **Gather a broad range of potentially related information.** Creativity often results from alert awareness to unexpected and apparently unrelated information in the environment.

4. **Take time off for incubation.** Once you've acquired the relevant knowledge, and some amount of apparently unrelated information, the unconscious mind will process and associate that information in unpredictable and surprising ways.

5. **Generate a large variety of ideas.** Unconscious incubation supports the generation of potential solutions to the problem, but conscious attention to the problem can also result in potential solutions.

6. **Combine ideas in unexpected ways.** Many creative ideas result from a combination of existing mental concepts or ideas.

7. **Select the best ideas, applying relevant criteria.** The creative process typically results in a large number of potential solutions. Most of them will turn out not to be effective solutions; successful creators must be good at selecting which ideas to pursue further.

8. **Externalize the idea using materials and representations.** Creativity isn't just having an idea; creative ideas emerge, develop, and transform as they are expressed in the world.

Regarding the 2nd and 3rd stage mentioned above, creativity requires a substantial amount of domain knowledge. Weisberg (1995) examined the role of knowledge in creativity and identified a number of creative ideas and solutions where “information from a previous situation is transferred to the new situation that is analogous to the old”(p.62). However, creativity goes beyond knowledge. Knowledge may provide the basic elements, to generate new ideas, it is important that keeping a certain distance from the old ideas. Thus, while it is universally acknowledged that one must have knowledge of a field if one hopes to produce something new within it, it is also widely assumed that too much experience can leave one in conventional thinking, so that one cannot go beyond stereotyped responding. The relationship between knowledge and creativity is assumed to be shaped like an inverted U, with maximal creativity occurring with some middle range of knowledge.

Taking time and generating a large variety of ideas, mentioned in the 4th and 5th stage above, are also crucial. Wallas (1926) identified a stage of incubation, during which ideas seem to churn and work in the creative person's head until the required answer pops up. However, in later studies, Mumford and Whetzel (1996) concluded that sudden insights do occur, but explained them in terms of cognitive mechanisms in four areas: representation, constraints, structure, and selective processing

Czikszenmihalyi and Getzels (1988) led a research team for study of the creative process of fine art painters, with his question: “How do creative works come into being?” Aspiring artists were instructed to choose and rearrange the objects in the studio and draw them. They found there are two types of artists. The type 1 artists took only a few minutes to choose a few objects from among the 27 presented and they sketched an overall composition in a couple of minutes. On the other hand, the type 2 artists spent 5 or 10 minutes looking at the 27 objects, turning them around to see them from all angles. Even after sketching, they changed their mind again and put back and choose different one then, 20 or 30 minutes later they came up with a new idea. After an hour they settled on an idea and finally finished sketching in five or ten minutes. As a result, the type 2 paintings were judged to be far more creative, by a team of 5 professors in the Art

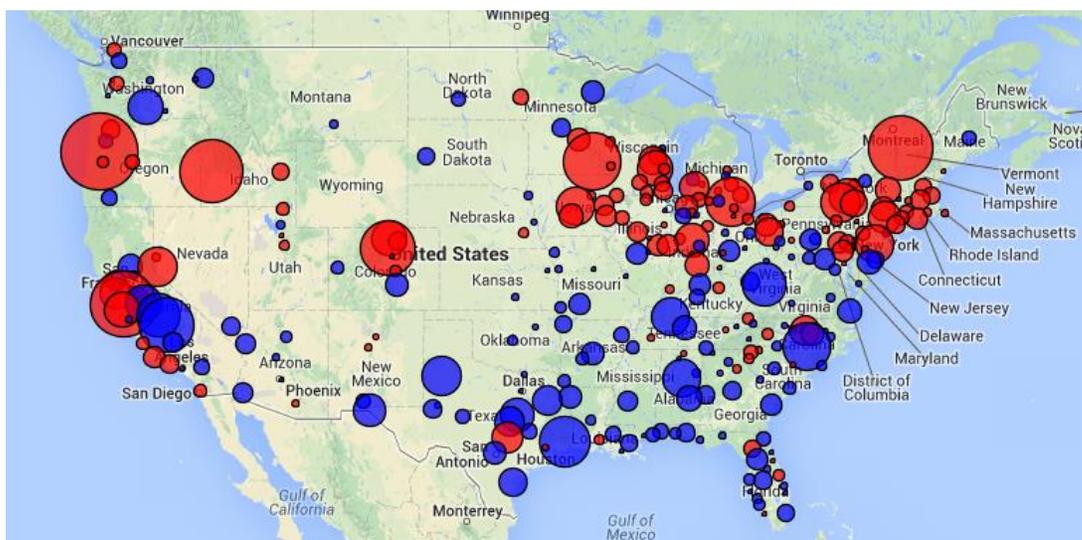
Institute. 5 years after the graduation of participants, Csikszentmihalyi tracked down all 31 of these students and found all successful artists were from Type 2.

For the 6th stage, Simon (1995) claimed that new ideas can be created, and is created, by combinations and recombinations of existing primitive components. For example, Langley et al. (1987) used the BACON program as a combinatorial process, which is a generate-and-test system that can create new ideas valuable for science. BACON takes as inputs uninterpreted numerical data and, when successful, it produces as outputs scientific laws that fit the data.

Issues in factors for creative idea generation: environmental or individual?

Amongst various factors, many of recent studies pay attention to person-environment interactions. These researches investigate how a person interacts to a particular environment to be more creative. We have seen that larger numbers of linkages, such as big city, industrial cluster, competition, etc., endorse more innovation. Bettencourt et al. (2010) found out that the bigger cities USA create more innovation in terms of the number of patents, budget for the research and development, the number of creative professionals (See the figure 7).

Figure 7. Ranking of United States Metropolitan Statistical Areas: Patents (2006)



Note 1) Blue bubble indicates negative and red bubble indicates positive value percent deviation from scaling

Note 2) 300 Metropolitan Statistical Areas (MSAs) of the United States filtered from 11,161 originally

Source: http://tuvalu.santafe.edu/~bettencourt/urban_observatory/patents.htm

Johnson (2010) listed up 200 historically important innovation and scientific discoveries since the invention of Gutenberg's printing: finding out the theory of relativity, invention of air conditioner, introduction of World Wide Web, etc.. He adopted the 2x2 matrix framework of Benkler (2006) which demonstrates that we experienced the market-based activities under centralized system or decentralized system, and the centralized economy which are not market-based, however, historically we have less experienced non-market based under decentralized system (see the figure8). For example, most of innovative inventions in the Renaissance era (the 15~17 centuries) such as concave lens, heliocentric theory, modern toilet, parachute, etc. are belongs to the quadrant 3 in the figure 7, which is non-market based and individual. In the consecutive bicentennial (the 17~19 centuries), the major innovative inventions: chronometer, steam engine, spinning machine, calculator, discovery of light spectrum, oxygen, photosynthesis, etc. shifted to more network-based (the quadrant 2 and the quadrant 4) since the development of sharing knowledge through printing. Even though the legislation of the patent law in early 18 century, afterwards, most of innovations such as invention of airplane, computer, contact lenses, sewing machine, vacuum cleaner, washing machine, tape recorder, television, bicycle, etc. were created under collaborative activities. The quadrant 4 is not a standard system in both capitalism and socialism, however, it allows great numbers of innovation contemporarily. Interestingly, despite the introduction of several protection measures such as license, patent, etc., which are against free transfer of ideas and for the profits seeking, financial incentive has not motivated innovators in collaborative system, especially for those who are in the academy.

Figure 8. Four quadrants of innovation

| | |
|--|---|
| <p>Quadrant 1</p> <p>Market-based / Individual</p> | <p>Quadrant 2</p> <p>the 20 century ~ current</p> <p>Market-based / Network</p> |
| <p>Quadrant 3</p> <p>the Renaissance era (15~17 centuries)</p> <p>the 17~19 centuries</p> <p>the 20 century ~ current</p> <p>Non market-based / Individual</p> | <p>Quadrant 4</p> <p>the 17~19 centuries</p> <p>the 20 century ~ current</p> <p>Non market-based / Network</p> |

Source: Johnson, Steven. (2010). *Where good ideas come from: The natural history of innovation*, Penguin, UK.

A great number of recent studies focus on collaboration in creativity and many of these research scientifically support that groups are more creative than individuals (Larey & Paulus, 1999; Taylor, Berry, & Block, 1958). In addition, Evans and Sims Jr (1997) support that most business innovations originate in groups. However, many people claims that they had the opposite experiences of finding themselves in a dysfunctional group, one that made everyone less creative and less productive than they might have been otherwise (Lencioni, 2002). Historically, major scientific discoveries or great artworks were performed by individual researcher for example, Archimedes, Charles Darwin, Einstein, and so on. Charness et al. (2005) emphasized the role of deliberation in individual level for learning.

2.5 Summary

In this study, we agree to the premises of previous studies that analogical thinking is a powerful mechanism for generating new ideas. Especially, use of long-distance analogy, rather than local analogy or regional analogy is more important to enhance the appropriateness in idea generation.

Thus, using analogical thinking for innovation workshop is required for creative idea generation. However, while there are substantial agreement on using analogy plays important role on generating new ideas, there are insufficient studies on how to instruct people to use analogical thinking to create a new idea.

Many of current definitions on quality of ideas are too general to establish an evaluation method of based on an abstract definition in general context, as a consequence, current major evaluation methods involve subjective assessments. Because there is no consensus in theory and definition of creativity or novelty to direct assessment endeavors, it is difficult to establish useful operational definitions, understanding the implications of differences among evaluation methods. Consequently, we should specifically focus on the idea generation mechanism, which is analogical thinking. Therefore, it is important to define which elements constitute the quality of ideas generated throughout analogical thinking, how to assess it, as well as, how to utilize the results from the analysis.

Finally, to propose a workshop design method for enhancing the appropriateness of ideas generated throughout analogical thinking, this study regards factors for appropriate idea generation in the perspective of thinking process, which is controllable by the workshop facilitation, rather than the personalities in including the level of knowledge, which are hard to be controlled by the workshop design. Also, prior to discuss the group creativity, this research focuses on facilitating an appropriate idea generation at an individual level, taking into account that creativity by individuals is a starting point for innovation. Thus, the level of analysis in this study is based on individual data.

3. Data collection: The innovation workshop for this study

The workshops for this study were conducted six times on 46 university students with 20 different nationalities in the University of Tokyo, between the years of 2014-2015. Participants were volunteers from those who took the related courses of the department of engineering, who are registered in the mailing list of the i.school. The subjects were recruited via email communication to be informed about the innovation workshop. Because the innovation workshop program needs a certain level of commitment such as spending at least 4.5 hours as an active participant, and reading 25 business cases as a pre-task, it was difficult to unify the number of participants at each time of the workshop.

3.1 Recruiting participants for the innovation workshop

The first workshop, which was held in February 2014, was a pilot workshop for developing an evaluation method, as well as finding out possible factors for enhancing appropriateness of generated ideas. Five participants, 4 males and 1 female were recruited from the civil engineering department and the workshop was held in a laboratory meeting room equipped with two shared screens: one for the workshop facilitator; another for the participants.

Since the second workshop, which was held in December 2014, almost all workshops were held in the i.school studio, which equipped with five shared screens for small group, as well as a lecture hall size projector screen for the workshop facilitator. The second workshop was conducted with three participants and all of them were male.

Unlike the previous workshops, the third workshop, held in February 2015, had three groups of a pair: each group has different combination of member: 2 males; 2 females; and 1 male with 1 female. The intention for make a pair as a group to have a discussion and generate idea was to have extensive verbal record than more than three people in a group. According to Miyake (1986), the pair naturally explains not only what they have been thinking about, but why they think it, so that the situation makes a usually invisible process visible. However, against our expectation, the verbal records from a pair were far less than the previous groups in the first and

second workshop in terms of both quantity and quality. Moreover, when the participants were asked to generate idea in a pair for the idea generation task, one pair decided to generate idea individually, and other two groups of pair generated idea mainly by one participant and another participant merely showed agreement to the other.

Therefore, since the fourth workshop, held in April 2015, we allocated three members in each group if possible. Also, diversity within a group such as sex and nationality was considered for the workshop with a large number of participants.

Based on the implications from the results of the first to fourth workshop, we developed new workshop design for the idea generation task (See the chapter 6). Thus, since the fifth workshop, new instruction was given to the participants. For the fifth workshop which was held in June 2015, three male students were recruited, but one of them was not following the instruction at all and failed to generate an idea.

The sixth workshop in July 2015, 21 students were recruited: nine females and twelve males; ten students were from the Global Innovation Design program²⁸, a joint Master's program between the Royal College of Art and Imperial College London, and 11 students were recruited from the i.school at the University of Tokyo.

Table 5. The participants for each workshop

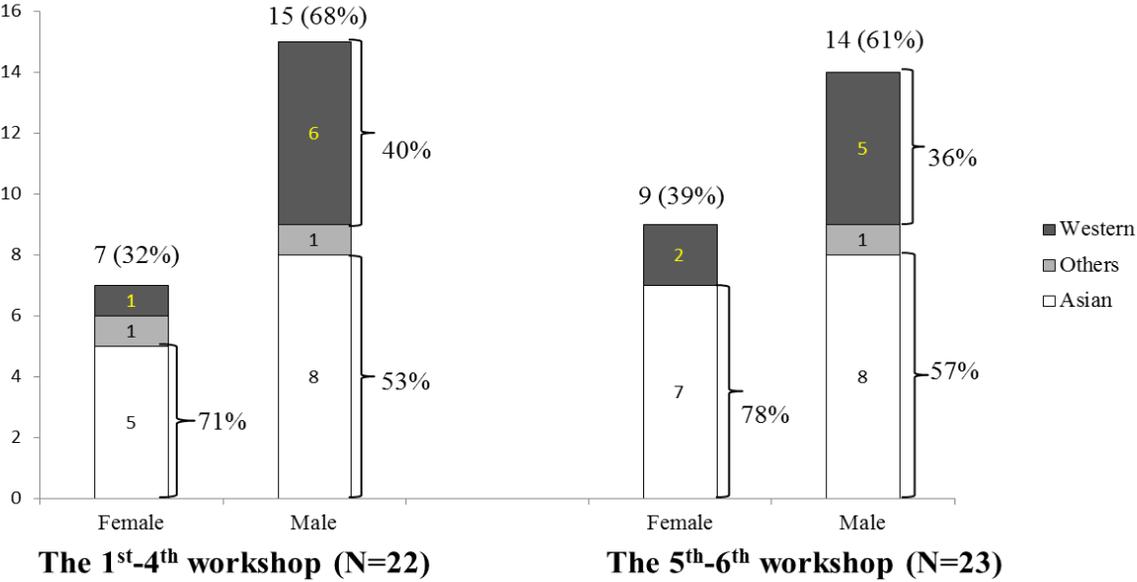
| | No. of participants | No. of group | Nationalities |
|---|---------------------|--------------|--|
| 1 | 5 | 1 | China, France, Guatemala, India, Nepal |
| 2 | 3 | 1 | Colombia, Pakistan, Thai |
| 3 | 6 | 3 | Guatemala, Indonesia(2), Kenya, Pakistan, Turkey |
| 4 | 8 | 3 | Japan(4), Brazil-Japan, India, France, Norway |
| 5 | 2 | 1 | Japan, India |
| 6 | 21 | 5 | Japan(11), China(2), China-US, Austria, Belgium, Brazil, France, Germany, UK, US |

²⁸ <http://www.rca.ac.uk/schools/school-of-design/global-innovation-design/>

| | | | |
|-------|----|----|----------------------------|
| Total | 45 | 14 | 20 different nationalities |
|-------|----|----|----------------------------|

It is unfair to compare the results of participants between before and after applying the new workshop design if the participants were recruited under different condition. For the generalizability of samples in this study, we recruited participants and group them as a team under equal condition as much as possible. As show in the figure 9, 22 participants were recruited for the 1st – 4th workshops: 32% of them were females; others were males, and 23 participants were recruited after applying the new workshop design: 39% of them were females. In addition, diversity in the cultural background of participants, in terms of their origin countries, was similar between the previous workshops and the workshops after applying the new workshop design. Participants from Europe or America were coded as ‘Western’, participants from Asian countries were coded as ‘Asian’, participants from African countries or dual nationalities between two different background such as Chinese-American, or Brazilian-Japanese were coded as ‘others’.

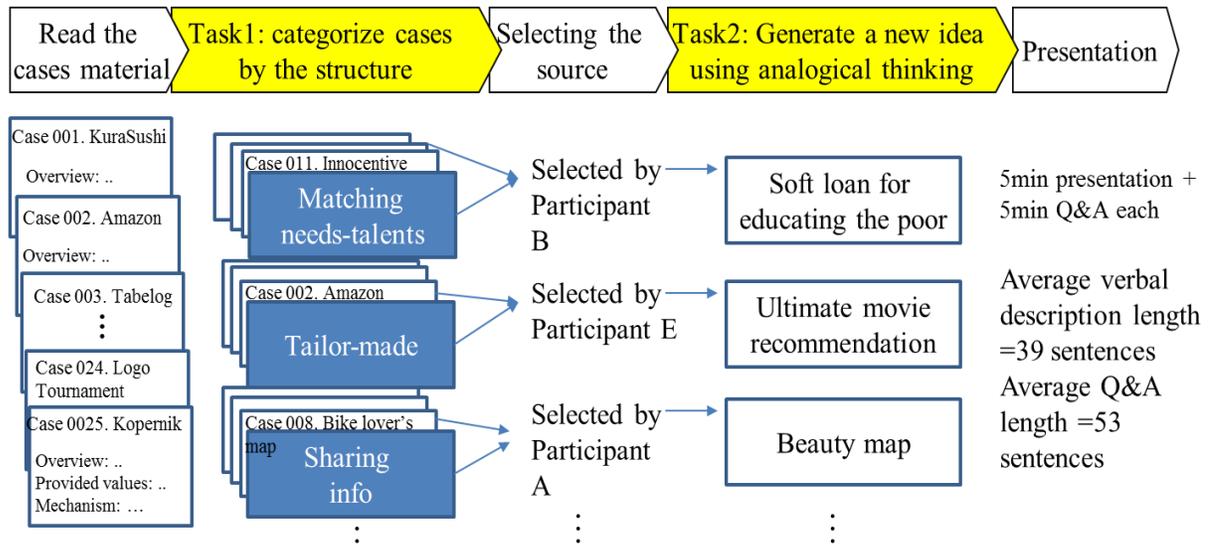
Figure 9. Demographic of participants



3.2 The innovation workshops process

The innovation workshop consists of a pre-task and two main tasks (see the figure 10): 1) a pre-task for acquiring knowledge on the existing business cases; 2) a categorization task for learning underlying mechanism by abstracting the previously acquired knowledge; 3) an idea generation task for creating new service idea using analogical thinking based on the categorization they created in previous task. The categorization task was carried out through group discussion, however, the generation task was performed individually. Each process is described in the following sub-sections.

Figure 10. The workshop process and sample results of each process from the first workshop



3.2.1 Pre-task: Acquiring knowledge on the collective intelligence services

The collective intelligence service has received much attention in the field of innovation. The MIT has established the MIT Center for Collective Intelligence (<http://cci.mit.edu/>), to research on how people and computers can be connected so that, collectively, they act more intelligently than any person, group, or computer has ever done before.

There exist many types of collective intelligence. The term appears in sociobiology (Passino, Seeley, & Visscher, 2008), systems design (Vanderhaeghen, Fettke, & Loos, 2010), psychology (Woodley & Bell, 2011), complexity sciences (Schut, 2010), cognitive studies (Trianni et al., 2011), computer sciences and semantics (Lévy, 2010), social media (Shimazu & Koike, 2007) and crowdsourcing in business (Howe, 2008). Traditional study of collective intelligence focused on the inherent decision making abilities of large groups (Lévy, 1997). Today, the field of collective intelligence is being advanced by researchers from areas as diverse as artificial intelligence (Lieberman, Smith, & Teeters, 2007; Singh et al., 2002), business (Ipeirotis, Provost, & Wang, 2010; Wolfers & Zitzewitz, 2004), art (Edmunds, 2006; Koblin, 2009). However, in the innovation workshop, we focus on the collective intelligence service as a business model.

According to Malone, Laubacher, and Dellarocas (2009), collective intelligence service is a business model creating value from large and loosely organized groups of people working together electronically. Malone et al. (2009) defined the term, collective intelligence very broadly as: "groups of individuals doing things collectively that seem intelligent." According to an often-cited definition, collective intelligence is a form of universal, distributed intelligence, which arises from the collaboration and competition of many individuals (Lévy, 1997). Glenn (2009) defined collective intelligence as an emergent property from synergies among three elements: 1) data/info/knowledge; 2) software/hardware; and 3) experts and others with insight that continually learns from feedback to produce just-in-time knowledge for better decisions than any of these elements acting alone.

In the innovation workshops, a pre-task was given to all participants to read the 25 collective intelligence business cases study (see the table 6). The cases used in the innovation workshops consist of well-known services such as Amazon.com, or Google Japanese input, as well as unfamiliar services to the participants but popular in Japan, such as Tabelog, @Cosme. These cases were collected by students who were registered as regular members in the i.school. Originally, there were 71 examples (see the table 11), however, 25 cases were selected by an instructor for the categorization task.

Table 6. The 25 collective intelligence service cases presented to the participants of innovation workshop in this study (alphabetical order)

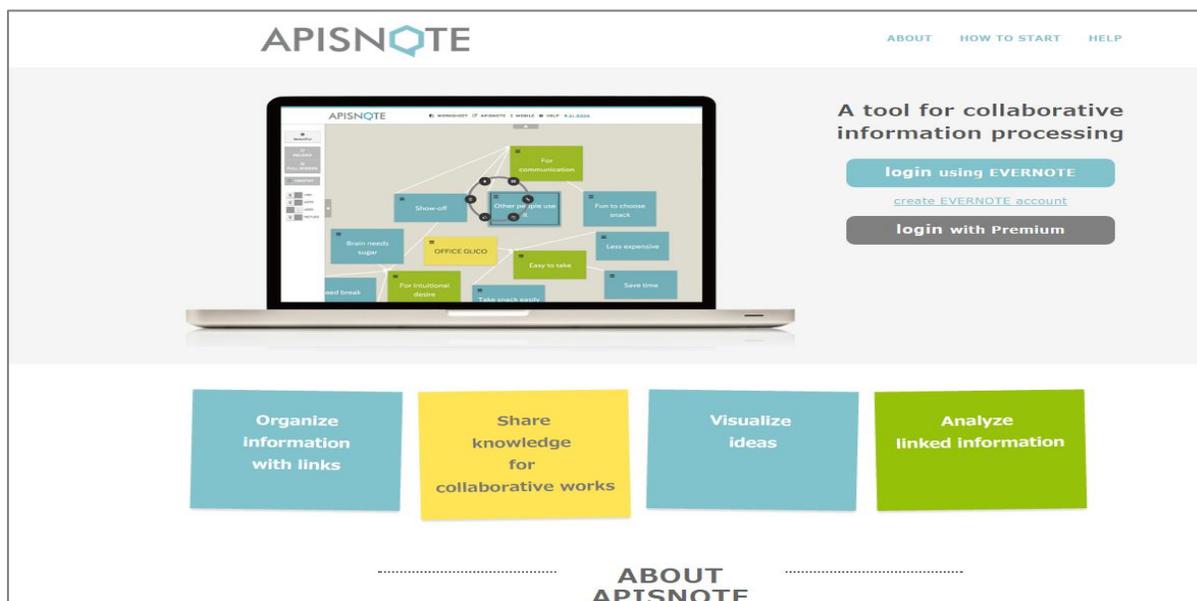
| No | Case | Case description regarding the mechanism |
|----|---|---|
| 1 | 4travel.jp | Sharing their own travel experience with possibility of helping others to make decision on their travel. |
| 2 | Amazon.com | Recommending books to customers for their interests |
| 3 | @ cosme www.cosme.net | Products are ranked and rated by the users comments, and this is more reliable rather than advertisement or commercial. |
| 4 | Bike lover's MAP www.bicyclemap.net | A lot of people post useful information (e.g. preferred routes, parking, slopes, toilets) for the user with the bike maps, You can find the optimal route with GPS search |
| 5 | Conyac https://conyac.cc/ja | It matches people need translation with people who speak that language around the world. Users can make small income by translating a few sentences. |
| 6 | Cook pad cookpad.com | Share your own recipes posted on the community and attract participants. |
| 7 | Creative agency for everyone http://www.recruit.jp/service/it_trends/c-team.html | A service featuring the new practice of crowdsourcing, allowing anyone to become a creator and create ads for clients. Banner ad proposals can be solicited from the online community by any users then posted on the website. Providing more exposure to the best-performance based on click rate facilitates a higher click rate for the overall banner campaign. |
| 8 | Dating expert http://www.date2.jp | Build a database of the actual information from experiences concerning lovers and dating to assist users dating skills or planning for the date out activities. |
| 9 | Google Japanese Input https://www.google.co.jp/ime/ | Since its dictionaries are generated automatically from the Internet, it is much easier to type personal names, Internet slang and Anime, Comics and Games terms. |
| 10 | InnoCentive www.innocentive.com | The seekers (the people who have a problem) disclose the issues with bounty on the website it supports them to find the solver(those who have the technology to solve the problem) till the solver propose a draft resolution for the seeker get satisfied by the prize money. |
| 11 | Katariba café cafe.katariba.ne | Providing a place to speak about the future career and build the relationship with university students. |
| 12 | Kopernik www.kopernik.ngo | It provides the efficient matching system between supply and demand for inexpensive low tech products in developed and developing countries. |

| | | |
|----|--|---|
| | | It efficiently operates as a platform for collecting funds online and collecting the practical idea from all over the world at the same time, to avoid waste of costs. |
| 13 | KuraSushi | Demand forecasting system and a analysis of customers database, Waste management system by the IC chip that is affixed to the back of the plate |
| 14 | Lancers www.lancers.jp | The online Marketplace providing matching service with freelance designer with clients for designing logos or webpages. |
| 15 | Lang-8 lang-8.com | Building the database and matching users. And Users can check the list of members who need proofread of their own language. |
| 16 | Logo Tournament logotournament.com | Client can easily request to the designers all over the world. For designers, it would be a chance to raise their name value in the world |
| 17 | Open ideo https://openideo.com | Sponsor company presents the social issues of the world, and various people can post how to solve it. |
| 18 | POS system | For management, it gives suggestion on selling goods, understanding consumer trends, future projection. |
| 19 | Price.Com | It collects the dealer price info, and show it in the order of lowest prices, and also collects the reviews from users. |
| 20 | Rakuten Travel travel.rakuten.co.jp | on-line hotel reservation service with information such as the available hotels of your destination, schedule, budget, reviews from customers. |
| 21 | Tabelog tabelog.com | We can see the rank of restaurant and its information posted by the user. |
| 22 | User creating weather news | You can report the weather information from mobile phone conveniently. |
| 23 | Wedding Park www.weddingpark.net | Users can search their wedding venue candidate upon the lists of 4,000 nationwide wedding venues info about area, condition, advantage, reviews, photos, videos, rankings. |
| 24 | Yahoo Weather weather.yahoo.co.jp | Users can easily click on the weather of their location and this data is integrated to DB. |
| 25 | YOMIURI ONLINE Comments | Every user can read all the helpful posts for free of charge at any time. To avoid insulting, it check the wording before posting. So, compared with other sites, users feel safe to use. |

3.2.2 Warm-up: Introduction for using the APISNOTE

All participants were asked to bring their own laptop for the workshop to connect the shared screen, and to carry out the tasks using the software, APISNOTE²⁹. The APISNOTE is a powerful tool not only for collaborative information processing, but also for recording thinking process in an individual level. During the categorization task, which requires group conversations, the APISNOTE is displayed on a large shared-screen. The entire workshop process was recorded in video files as well as the text format by the APISNOTE, which is software that allows all participants to record their idea notes and share them to others who is connected on the system. The APISNOTE records the time when each note was created, so that it can trace the process of generating a new idea.

Figure 11. The APISNOTE main page

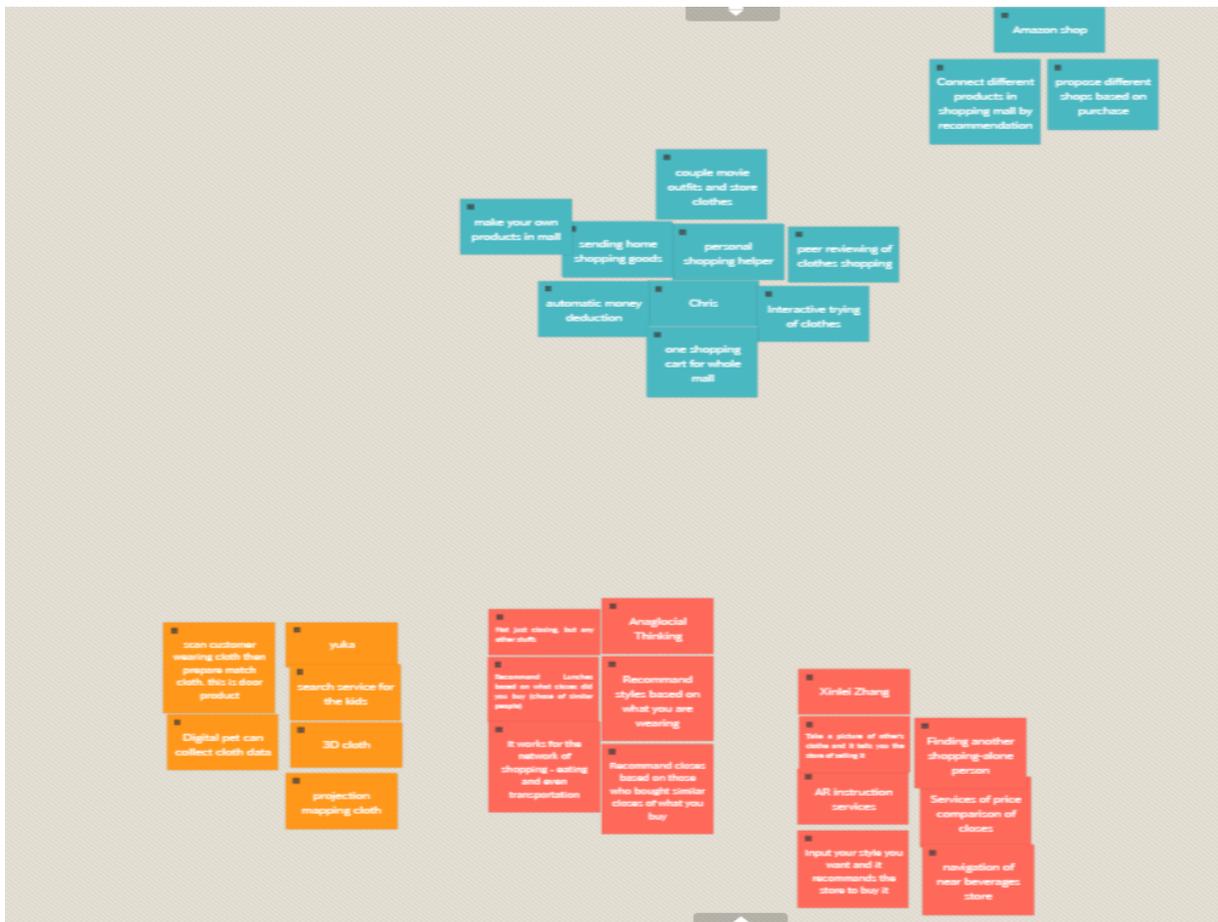


A warm-up task was given to each participant to allow them to be familiar with using the APISNOTE, as well as generating ideas. Same as the sticky note, users can freely choose the color of a note for their preference. In the warm-up session, each participant chooses their

²⁹ <http://apisnote.com>

preferred color of notes for generating ideas (see the figure 12). The warm-up task is consist of two parts: 1) creating new service ideas in a shopping mall within five minutes, as many ideas as possible; 2) creating a new service idea in a shopping mall by analogical thinking within three minutes, one idea only, as best as possible in terms of quality of an idea. Before asking subjects to fulfill the second warm-up task, and the instruction was given to make them understand what analogical thinking is, and how they can generate ideas using analogical thinking.

Figure 12. Sample results from the warm up task



After completing the warm-up tasks, a workshop facilitator asked participants which task was easier to generate an idea, in almost all cases, subjects responded that they felt easier to generate

new ideas in the second condition, which is, using analogical thinking, rather than the first condition, which is, no limitation in thinking mechanisms.

3.2.3 Categorization Task: The basis of cues for the idea generation task

There have been lots of studies that suggest categorization is importantly related to analogical reasoning (Bowdle & Gentner, 2005; Gentner & Markman, 1997; Hesse, 1966; K. J. Holyoak & Thagard, 1997; Sternberg, 1977). Categories are defined by a set of exemplary cases, and their structures. Categorization is believed to arise from exposure to relevant exemplars and deep, elaborative processing intended to reveal the central features or common properties of members in the category (Chi et al., 1989; Schmeck & Grove, 1979; Ward, Byrnes, & Overton, 1990). These categories and the associated examples are used in problem solving through analogical thinking based on specific cases drawn from the activated categories (Gick & Holyoak, 1983; Medin, 1989). D Gentner and J Medina (1998) have shown that the use of analogy, especially by novices, contributes to the learning of new abstract concepts and to the extension and application of previously acquired knowledge.

According to Bruner (1979), in the course of cognitive development, people come to understand events, experiences or knowledge by generalized abstract properties, and that these are the basis of belonging together. The abstract properties that are common to a number of individual exemplars define a category or concept. The process of assigning events, experiences or knowledge to categories is referred to as coding. Coding is a special form of production of novelty involving "going beyond the information given". Categories based on abstract, complex properties, offer permeable category boundaries, allow association in multi layers, and encourage the building of complex networks, and those enable to generate an appropriate idea. Coding based on higher levels of generalization and abstraction offers increased chances of effective novelty (Cropley, 1999).

During the workshop, participants were asked to categorize each case based on the underlying mechanism of the business through group discussion and confer the title of each category (see the figure 14) within about 40 minutes. Since the second workshop, the concept of superficial

similarity and structural similarity was introduced as an instruction, using the examples of Amazon.com and Kura Sushi.

The subjects were instructed as follows (transcribed from the workshop):

“Before you start, I’ll give you information. If you compare the Amazon, and the Sushi bar , they have no superficial similarity. When I say superficial similarity, Amazon is web service and Sushi is real service. And, food - bookstore, so they are different. That means superficial similarity is low. But, structural similarity, which means a service mechanism, is same. They have the history of purchase and recommendation, in a sense, they have structural similarity. We believe that we can create innovative service or ideas with high structural similarity and low superficial similarity. So you are going to create the group of services based on structural similarity. Not superficial similarity, do you understand?”

Then, I think when you read the case study material, you must have found that some of the services are similar. Based on your sense, you create services, a group of services, and then you create title note to each group like amazon and sushi bar to tailor-made proposal (showing the figure 13). You’re going to give a title with a gray note. This is what you’re going to do. It’s a group work, so you discuss each other.”

Figure 13. Instruction given for the categorization task

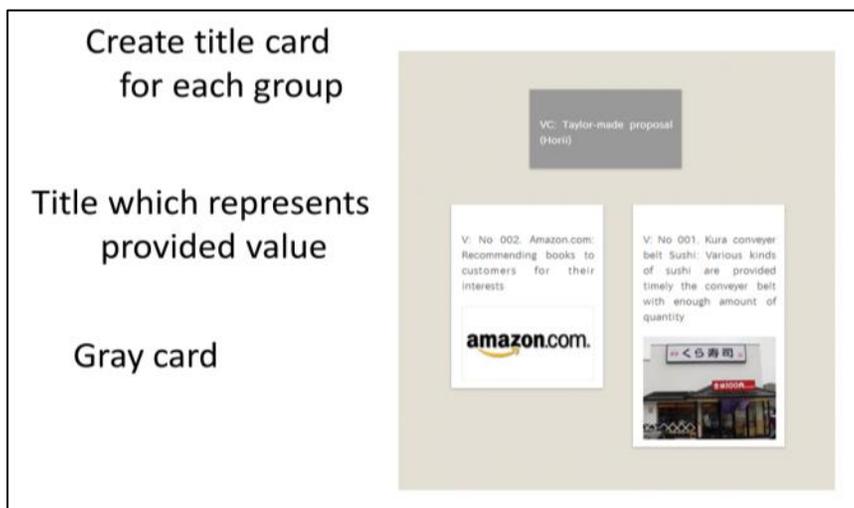
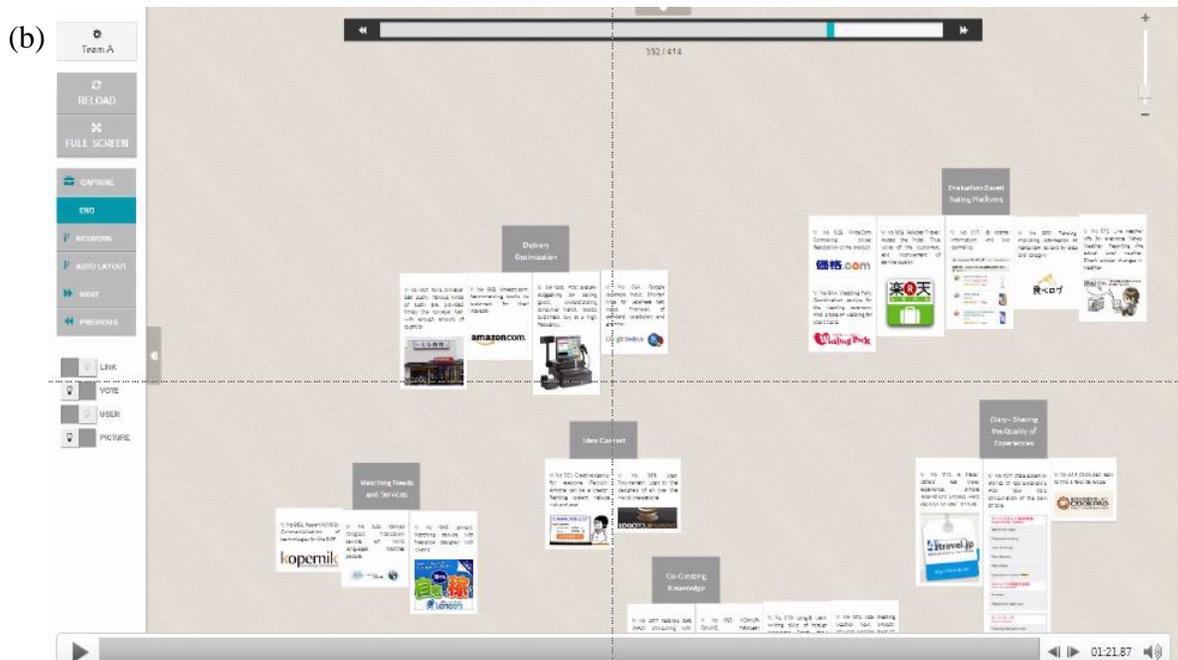
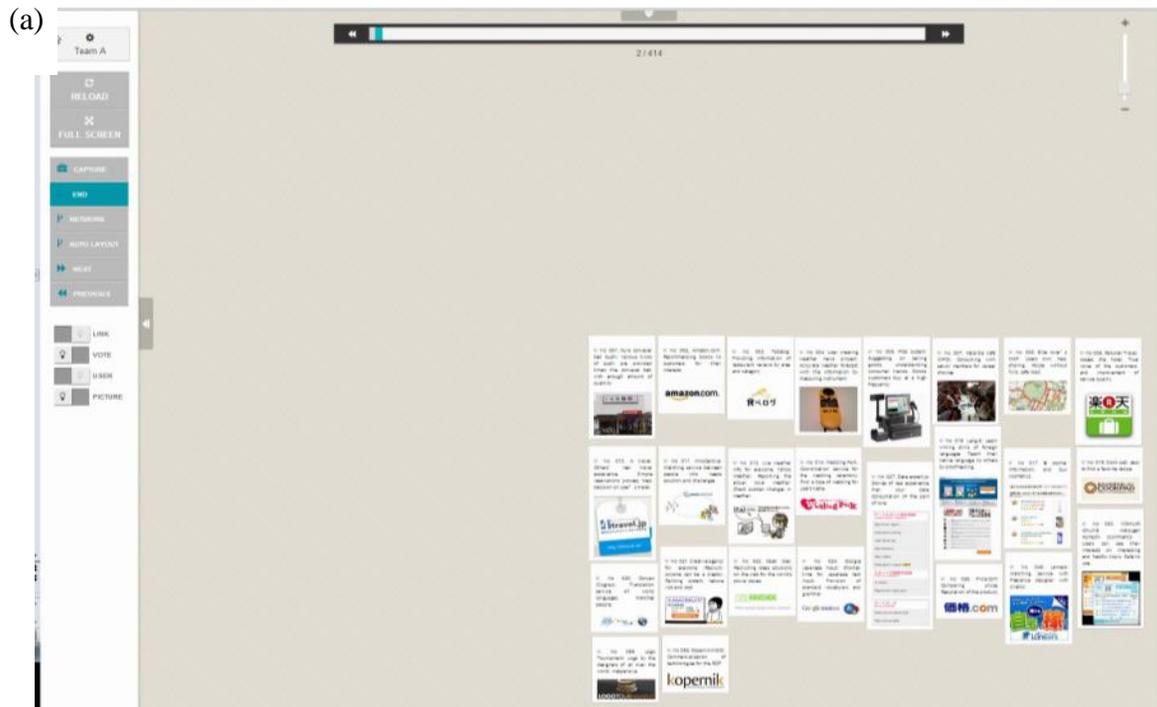


Figure 14. (a) The categorization task given; (b) sample results of the task from the APISNOTE record

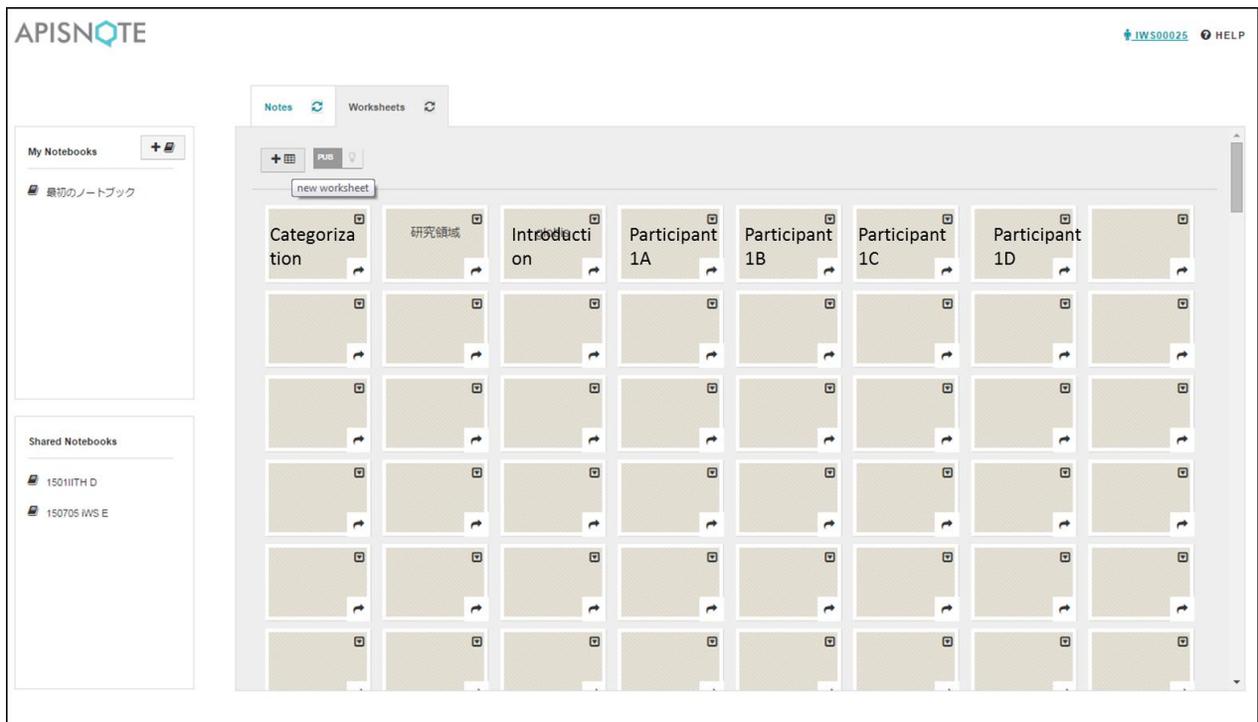


After each workshop, all the verbal contents from the categorization task were transcribed as the appendix A. Categorical knowledge is accessed and used when the participants generated new ideas. The labels of category and their subordinating cases were retrieved as cues during the idea generation task.

3.2.4 Generation Task: creating new service ideas using analogical thinking

The generation task was carried out individually. Each participant had to bring his or her own laptop for using the APISNOTE, and they were asked to create their own worksheet to perform the generation task individually (see the figure 15).

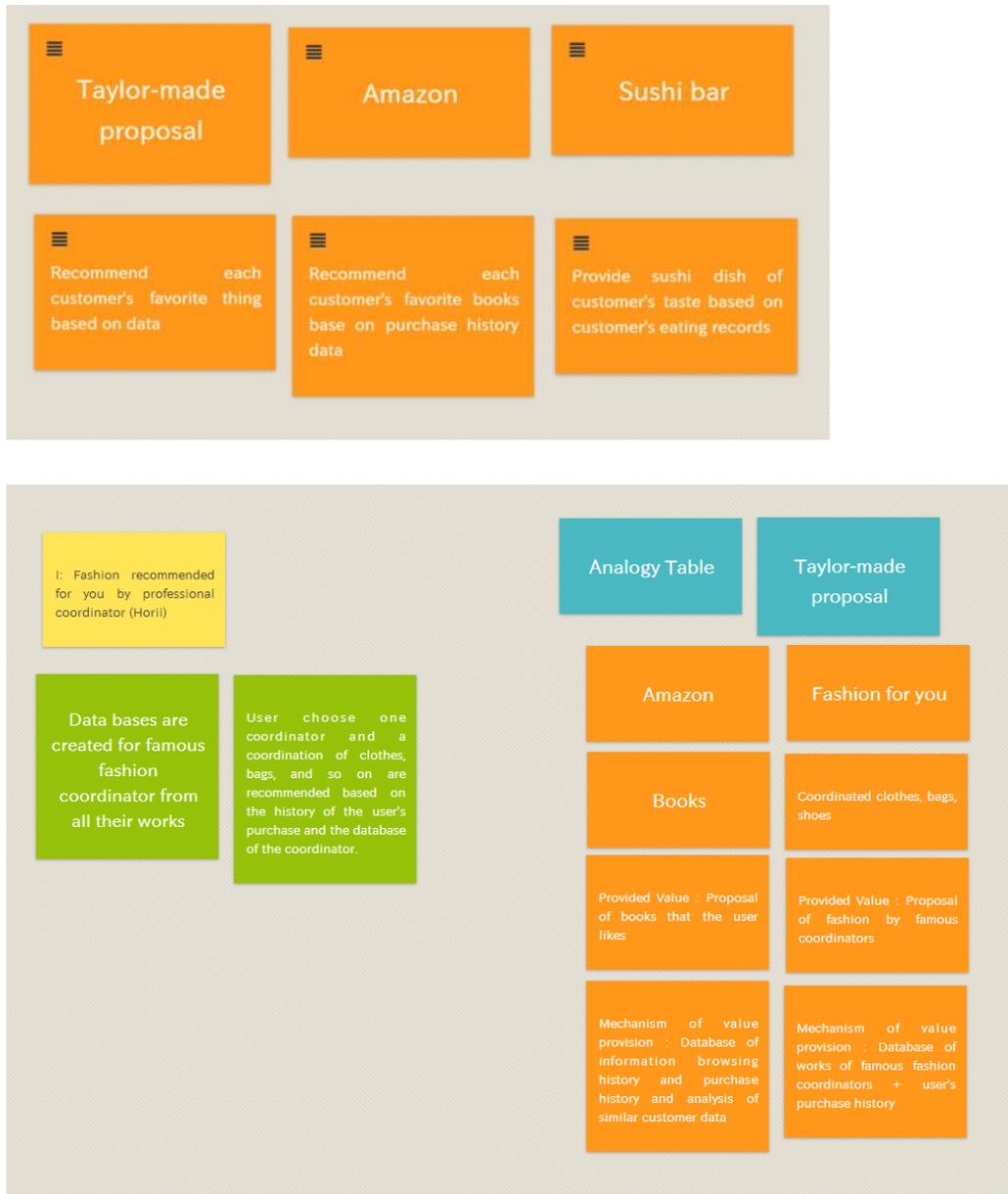
Figure 15. Creating an individual worksheet in the APISNOTE



After creating an individual worksheet, participants were instructed to use the analogy table for the idea generation task (see the figure 16). Each participant was asked to create new service

ideas using analogical thinking sourcing from the title of the category as well as selected cases upon his or her preference.

Figure 16. The analogy table sample for instruction



Participants created 27.33 notes in average for generation task; min=10, max=60, stdev=12.2. 43 ideas were created in total, from the 6 workshops: 41 ideas from individual ideation; but 2 ideas from collaborative ideation by a pair. In this study, the unit of analysis is the individual. Thus, for data analysis, each participant was coded as “# of the workshop - # of the group + the letter in an alphabetical order”. (see the table 7).

Table 7. A list of the generated ideas from the innovation workshops

| Subject | Title of idea | Description | Selected source ideas |
|---------|----------------------------------|---|------------------------------|
| 1A | Ultimate movie recommendation | All users has to rate the samples of movies they watched. Then, it customized the personal data and recommends movies which you haven't watched using taste matching algorithm. | Amazon.com, online dating |
| 1B | Beauty map | It's a website, we can find people look similar to us, by input of personal data like the eye-shapes. We can follow their way to do make-up; And it provides information of where we can buy what kinds of cosmetics; also, which make-up is good for special situation like for a party or for a work. | Bike lover's MAP, @cosme |
| 1C | Soft loan for educating the poor | An online platform which motivates the rich people for investment for the fund to educate the needed people all over the world. It's long-term investment, like 15-25 years old. It has a monitor system to get constant feedback whether the loan only utilize for education or not. | Kopernik |
| 1D | Quick geek fix | A mobile app that users who have some trouble with computer software, explain the problem with the location info, then they find nearby people who can fix it for a small money. They meet each other in public place(e.g. McDonalds) with device, then after the service, users post review on the person who fix for his credibility. | InnoCentive, Tabelog, Ekiten |
| 1E | City microscope | A mobile app to tell user valuable information of the current status of the cities' road, not only for congestion, congested area, but also share information about accidents, the location of the | Conyac |

| | | | |
|------|------------------------------|--|-----------------------------|
| | | thieves, natural disasters. | |
| 2A | Fill out my forms | A website that foreigners in Japan who has to fill out the public documents in Japanese, upload a scanned form and send it to Japanese buddy. Buddy will explain how to fill in each blank. | Lang-8 |
| 2B | Wifi finder | A map based online application that shows nearby free wifi. Users share free wifi spot and strength on the map. | Bike lover's MAP |
| 2C | PET finder | An online platform that provides a database of dumpsites of plastic bottles. Users take picture of PET bottle with GPS info, and people who need PET bottle can find a suitable demand for PET bottles and recommend them the location PET bottles based on the price they are willing to pay. | Wedding Park |
| 3-1A | Blood donation | A database of hospitals that recommends the most suitable family members to donate blood based on ages and medical history. | KuraSushi , Amazon |
| 3-1B | Cut & fill | It provides a list of construction sites based on location info. And it also shows the soil information of near-by location, then, it matches supply and demand for land fill based on location. | Wedding Park |
| 3-2A | job finder for graduate | A web service that links people who newly graduated or job seekers with small scale companies, databased is sourced from the Linked in. | Lancers |
| 3-3A | e-database for shopping mall | A web service that recommends each customer mostly purchased items as a good combination based on their purchase behaviors. | Amazon.com |
| 4-1A | Moral and sex education | A global website for moral education and sex education to broaden the perspective by various people's posting about how to solve the world's issue. | Open ideo, Yomiuri comments |
| 4-1B | Childcare | A web service that matches people who need childcare service with people who can response to their needs. | Conayc, Logo tournament |
| 4-1C | Immersive education in | A psychological and physically customized knowledge service for a school where students are | Kopernik, Katariba café |

| | | | |
|------|---|---|--|
| | micro worlds | immersed in certain special domains, such as a multidisciplinary mentoring knowledge service to the students' education. | |
| 4-2A | Education coaching | It helps children to decide his future career based on his performance in school and preferences, it recommends which courses to focus on and propose new tests customized for each student. | KuraSushi, Google Japanese Input |
| 4-2B | Services for education | Small group education service about studying very bizarre and minor topics which are generally liked by a very few people, less demands at a particular place are tracked, then, it forms a small study group by connecting people from other different places to give an online education service on that topic. | Logo Tournament, InnoCentive |
| 4-2C | Elite education | Gather idea of how to educate the child, e.g. how to study TOEIC, TOEFL, etc. Users can see previous consultation of other users and choose their favourite ideas, and contact the person directly for an education consulting service. | Creative agency for everyone, Open ideo |
| 4-3A | Head hunting | A portal, offered by head hunters, that recommends new employees based on contacts, information on continuous assessments, filtered by customer specifications | KuraSushi , Amazon.com, POS system |
| 4-3B | Job searching | Matching a person in need for a job with a specific advisor who can help them in finding a job. | Katariba café, Lancers, Lang-8 |
| 5A | Job training by expertise | It builds a database of specialists who can teach business skills for a job, it matches them with students who enter company next year and want to learn necessary skill regarding their jobs. | Lang-8 |
| 5B | House finder for professionals/students | It builds a database of available houses, based on workplace location and budget, it also has database of people who looks for apartment as a flatmate, user can search house with flatmate with common interests. It matches roommates as well as houses/rooms | Uber, Creative agency, Bike lover's map, Date2, Amazon |
| 6-1A | What is he/she like? | It is a genuine dating platform that friends on the Facebook write the self-introduction of the friend who searches for a lover so that it gives the real | Bike lover's MAP, Linked in |

| | | | |
|------|--|---|------------------|
| | | voices in finding lovers. | |
| 6-1B | No garbage life | It is a sharing groceries system for cooking, mainly for those who live alone. It is difficult for them to use all of what they bought. If there is something unused after several days, it will be used as compost in farms. | Open ideo |
| 6-1C | Remote Chef | A platform to allow crowd-sourced creation amongst professionals to pick one as your chef, based on his/her specialty, we can discuss recipes, and decide a menu (or ask for inspiration) make an appointment (guests coming to visit), buy ingredients, prepare necessary equipment. | Tabelog |
| 6-1D | Cross-collaboration in specific fields | A platform to allow crowd-sourced creations amongst professionals, specialized freelance work, e.g. advanced materials companies with manufacturers. It enables companies to find collaborators in specific fields to develop innovative solutions based on their experiences. | OpenIDEO |
| 6-2A | Group travel planning | Users plan a trip together, on the shared map, schedule with money are calculated. Then, based on this, a number of travel agencies bids on that travel package. So users can select optimized package based on their needs. | Bike lover's map |
| 6-2B | artSpace | It is a virtual exhibition space, curated by online participation, can walk through virtually. But the artists are not mentioned, until after you look at the art pieces to judge them transparently. Popular work is pushed up through voting (like a Reddit). | Reddit |
| 6-2C | Everyone's PARTY | Parties are run & created by volunteers every weekend: theme, concepts all decided depending on volunteers at that time. Volunteer leaders may choose theme and other staffs do what they can contribute: food, music, movie, etc. Meeting space can be provided by sponsors. | Bike lover's map |
| 6-2D | Dog sharing | It matches the dog owners unwilling to go outside and the dog lovers eager to take dogs for a walk. It solve troubles for dog owners, and satisfies dog lovers, and dogs themselves will be happy too! | Conyac |

| | | | |
|------|---|--|--|
| 6-3A | Machine Learning Charity Impact Analysis | Machine learning researches each charity funding and their impact. It measures objectively how well the charity fund is achieving their stated goals, and recommends complementary causes that help facilitate each other. | Amazon |
| 6-3B | Service platform for new mothers | Users can search information about raising child, doctors and people who care children and mothers can register their knowledge and new mothers can read and communicate with them. | wedding park |
| 6-3C | Japanese Hospital Rating System | We can see the rank of hospitals and their information posted by the user, reviewers can interact with each other through the exchange of hospitals' information such as service quality, waiting time... | Tabelog |
| 6-3D | Crowdsourced Refugee Housing | It matched the average people who want to help and refugees or homeless people by providing their extra flats or extra rooms, and help them adjusting to new country and culture. | Spareroom.co.uk |
| 6-3E | Custom, handmade tailor goods by craftsmen | This system is to inform craftsmen for custom, handmade tailor goods backed with machine learning algorithms. So that we could buy each shopping mall original products, order hand-made items designed at the studio in the mall, tailors register the specialized items. | Google Japanese input |
| 6-4A | Matching old people's house to international students | Matching the old people always suffer from loneliness to the young students who are around 20s always struggling to find spare houses (especially for international who wants to practice language also). | Wedding Park, Conyac, Innocentive, Lancens, AirBnB |
| 6-4B | Starting business | Customers post future problems and make a team to think about how to resolve them. This service also supports its commercialization. Customers continue to brush up the ideas in a team to create a prototype gathered in a team. Investors choose interesting ideas. | bike Lovers Map, Open IDEO |
| 6-4C | Collaborative diagnosis | When people feel sick, they input data such as photos, blood pressure, electro cardiogram, body temperature, etc, measured with their home-diagnosis devices. Then, professionals or | OpenIDEO |

| | | | |
|------|----------------------------------|---|-----------------|
| | | experienced patients collectively diagnose and find a solution for their health issues. | |
| 6-4D | Studying abroad | Providing the information of the family willing to take care of the kids who are studying abroad alone. Match up the two families who have kids studying in each other's country. | Wedding park |
| 6-5A | Renting room for artists | It is a room rental network for artists who have difficulty in living but who can work in any places, and room providers who support them for fostering creativities. | |
| 6-5B | Psychologist Tournament | Users post their problem and how much they are willing to pay for good advice, psychologists submit their solution or diagnosis of the problem for free. The user gets responses and selects their favorite advice. | Logo tournament |
| 6-5C | Crowdsourcing divorce settlement | A Couple decided to get a divorce ask their issues to worldwide juries. Each side makes their case and the collective juries vote on which person they choose to side with. The percentage split of the jury then becomes the percentage split of the assets for the divorce. | Quora, Reddit |
| 6-5D | Blood matching | Blood matching service between a patient and a donator using a pre-registration system, it also shows the life story of a donator. | Katariba café |

In the third workshop, participants were able to generate an idea in collaborate with the other group member in a pair or alone. Among the three groups of a pair, two pairs generated an idea as a pair, and one pair generated an idea individually. For those two groups of pair, the process of generating an idea was not found to be collaborative creation, but close to one active initiator and a follower. For example, the participant 3-2B suggested many different ideas in the early stage, however, none of those suggested ideas were refined or developed by discussion. In this group, the domain for the new idea was set by the participant 3-2A, when he suggested his idea of 'job hunting' first time and the participant 3-2B agreed with him (see the table 8). Thus, in those cases, the level of analysis was focused on the individual who actually generated the idea.

Table 8. Example of the early stage of generating an idea by a pair discussion

| Time | Subject | Discourse |
|----------|---------|--|
| 01:44:02 | 3-2A | we can first think about the problems and ... I don't know.. |
| 01:44:20 | 3-2B | divorce, haha.. Hmm.. |
| 01:44:31 | 3-2A | we want to be similar to that.. Properly, we can collect some data, give some services.. What do you think? |
| 01:44:43 | 3-2B | yeah |
| 01:44:47 | 3-2A | something like that.. Can you think of something else? |
| 01:45:01 | 3-2A | ok. |
| 01:45:12 | 3-2B | what's this...? |
| 01:45:14 | 3-2A | this match... |
| 01:45:20 | 3-2B | dispatch police.. |
| 01:45:36 | 3-2A | or, procedure for assigning employees... I didn't know that . Can you... |
| 01:48:37 | 3-2B | Who are looking for the apartment, it's not history because, they cannot came to japan by themselves |
| 01:52:51 | 3-2B | Service based on the ... |
| 01:53:38 | 3-2B | Apartment based on data collection.. |
| 01:53:44 | 3-2A | Yeah, community.. |
| 01:53:55 | 3-2B | e.g. by (inaudible) |
| 01:54:05 | 3-2A | pattern. Park.?? |
| 01:54:08 | 3-2B | So, they can promote place, They can promote, share movie. Friend want to join, like subscribing, like youtube |
| 01:54:33 | 3-2B | and if it reaches a certain number, you can make a community, with different.. Create event... |
| 01:55:06 | 3-2B | What do you? Tell me.. |
| 01:55:32 | 3-2A | I'm thinking about job hunting. |

3.2.5 Follow-up

To analyze factors for enhancing appropriateness of ideas generated using analogical thinking, face to face interview session was followed after the workshop.

After the first workshop, as a trial, interviews were conducted 5 days after the workshop for 1.5 hours per each subject, including the two type personality tests as well as personal intelligence test on visual analogical thinking. All the participants were asked to complete three online tests: Eysenck personality test³⁰; Cattell's 16 Personality Factors test³¹ (see the table 4); Odd one out test of the Cambridge Brain Science.³²

In addition, participants were asked to ruminate on their ideation process during the idea generation task, provided cue from the APISNOTE which shows all the history of ideation process with the actual time record on each note they created during the workshop. They were asked to explain their flow of thinking how they came up with idea by each note they created using the APISNOTE, then each participant was asked to indicate the creative leap moment for idea creation (see the figure 19). The sixth workshop was conducted with 21 participants from different locations. Thus, it was difficult to conduct personal interviews after the workshop. Instead, we ask them to indicate the creative leap moment after the idea generation task by marking on the APISNOTE, and adding extra notes that describe how they reach the creative leap moment.

In the fields of creative design studies, 'creative leap' is a significant concept, often reported as arising as sudden illuminations (Cross, 1997). In design process, the creative leap is characterized as a sudden perception of a completely new perspective on the situation different

³⁰ Eysenck (1967; 1990) proposes that there is a biological basis for introversion-extraversion: introverts have higher levels of activity in the cortico-reticular loop, and thus are chronically more cortically aroused, than extraverts. Neuroticism is based on a separate biological system related to the visceral brain that produces autonomic arousal. Eysenck distinguishes arousal produced by reticular activity, the basis for extraversion, which he calls "arousal," from autonomic arousal, the basis for neuroticism, which he calls "activation." Other work shows that psychoticism (i.e., tough mindedness) is not a dimension of temperament at all, but rather of character (Strelau & Zawadzki, 1997). The test is available on <http://similar minds.com/eysenck.html>

³¹ The test is available on <http://personality-testing.info/tests/16PF.php>

³² The test is available on <http://www.cambridgebrainsciences.com/browse/reasoning/test/oddoneout>

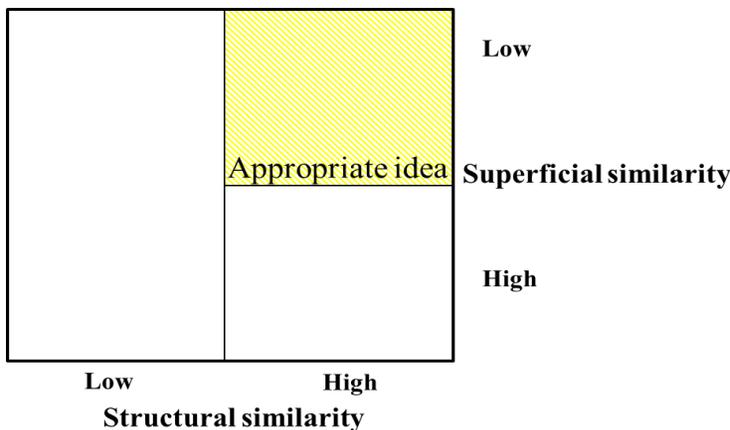
from what we previously understood (Dorst & Cross, 2001). The creative leap is able to identify a point during the ideation process at which the key concept or key element began to emerge. Retrospective accounts of creative moments in ideation decided by the participants themselves may not be perfectly reliable. However, some empirical studies of creative design focus on this creative leap moment. For example, Akin and Akin (1996) focus on the analysis of the 'aha!' moment, which is a well-known phenomenon associated with creativity, in other words the sudden mental insight.

After the analysis of the first workshop, it was found that the deliberation before reaching the creative leap moment is more significant than the results from three personality tests, in explaining factors for enhancing the appropriateness of new idea. Therefore, since the second workshop, the follow up session focused on identifying the creative leap moment after the retrospective recall procedure using the history function of the APISNOTE, which shows the creation of each note step by step based on the time series.

4. Proposal of an evaluation method for the generated ideas

Developing an evaluation method is a multi-phase process. As an initial step, the evaluator must determine the scope of construct. In this study, a focus is placed on generation of ideas using analogical thinking. In this regard, to construct an evaluation method, most importantly, it needs to be determined that what constitute the quality of ideas generated by analogical thinking. In the context of a new idea generation by analogical thinking, idea quality consists of two distinct dimensions: superficial; and structural analogies (Blanchette & Dunbar, 2000; Dunbar & Blanchette, 2001). If the ideas are created based on a structural similarity from the source ideas, it increases the chances to take advantage of the effective mechanisms already demonstrated by systems such as, for example, Amazon.com, or Google. However, this approach does not guarantee the development of an appropriate idea generation. In an appropriate idea generation, it is expected to keep the structural similarity but to be superficially different with already existing cases. In other words, it should be far from the existing domains, but it is a possible member of existing category of the mechanism. In this study, a new idea that has high structural similarity and low superficial similarity with existing cases is defined as an appropriate idea. Consequently, the appropriateness of a new idea is evaluated form superficial similarity and structural similarity as shown in the figure 17 (Kim & Horii, 2015).

Figure 17. The proposed evaluation method



As presented in the figure 17, the highlighted quadrant is for the ideas generated with representing the structure of source cases deeply in a semantically different domain, in other words, it has low superficial similarity and high structural similarity from the source cases. This area is for the new ideas of participants who could generate an appropriate idea by importing structural features from the example cases and applying it in different domain. On the other hand, if an idea is generated with implying the structural features of source cases but applying it in a similar domain or not having a structural similarity from existing cases, this method does not evaluate it as an appropriate idea.

After defining the dimensions of evaluation, an evaluator must design the scale of the assessment. Superficial similarities are measured by semantic similarity between the domains of source cases referred and the created idea using the latent semantic analysis. Landauer, Foltz, and Laham (1998) used the latent semantic analysis (LSA) to measure superficial similarity. LSA is a method for quantifying the similarity between words (or even whole passages) on the basis of statistical analyses of a large corpus of text (Prabhakaran, Green, & Gray, 2014). It is based on the vector space model from information retrieval (Salton & McGill, 1983). Technically, this measure of semantic similarity corresponds to the cosine of the angle between vectors corresponding to the terms within a given semantic space, which is derived through analyses of all of the contexts in which the word tends to be present or absent in that topic space (Laham, 1997; Landauer & Dumais, 1997). Here, a given corpus of text is first transformed into a term \times context matrix, displaying the occurrences of each word in each context (Wandmacher, Ovchinnikova, & Alexandrov, 2008).

4.1 The judgement of structural similarity

Suzuki, Ohnishi, and Shigemasu (1992) have shown that similarity judgments depend on level of expertise and goals. Expert and novice subjects were asked to solve the Tower of Hanoi puzzle, and judge the similarity between the goal and various states. The Tower of Hanoi is widely used as an experimental and diagnostic tool in the neuropsychology literature to gauge problem solving abilities. The puzzle consists of three pegs and several disks of varying size. Given a start state, in which the disks are stacked on one or more pegs, the task is to reach a goal state in

which the disks are stacked in descending order on a specified peg. There are three constraints on the transformation of the start state into the goal state. (1) Only one disk may be moved at a time. (2) Any disk not being currently moved must remain on a peg. (3) A larger disk may not be placed on a smaller disk. Experts' similarity ratings were based on the number of moves required to transform one position to the other. Less expert subjects tended to base their judgments on the number of shared superficial features. Similarly, Hardiman, Dufresne, and Mestre (1989) found that expert and novice physicists evaluate the similarity of physics problems differently, with experts basing similarity judgments more on general principles of physics than on superficial features (Sjoberg, 1974).

Structural similarities are judged by investigating if the new ideas were generated using the structure of source ideas or not. It requires to present exemplary structures of the existing cases to judge structural similarities. In this study, to present exemplary categories for judging structural similarity, four researchers, 1 assistant professor and 3 PhD candidates of the innovation science research group in our laboratory, categorized the source cases individually. As a result, 26 category labels were created, each rater created 6.5 labels in average (stdev=2.21, Min=5, Max=9) for 25 cases (see the table 9). Subsequently, cluster analysis was conducted (method = median, distance = squared-Euclidian) and 26 labels were clustered into four groups of category as shown in the figure 18.

The category I including matching demand and supply (rater A), matching parties (rater B), working like intermedium (rater C), advice from experienced people (rater C), matching need and seed (rater D), supporter (rater D). The category II including review and ranking (rater A), market big data (rater B), integrating service information from different firms and rank them (rater C), objective evaluation, professional raters and read only users (rater D), showing off experiences (rater D). The category III including users' information sharing (rater A), community of interests(rater B), information sharing between users (rater C), ask users to provide solution (rater C), a platform where people share their thoughts (rater C), give and take (rater D), collaborative knowledge creation (rater D). The category IV including customized recommendation by the analysis of database(rater A), date collection (rater A), find tendencies (rater B), individual big data (rater B), using artificial intelligence to forecast and enhancing

efficiency (rater C), tailor-made based on big data (rater D). Two category labels of the rater D: competition of creators; and utilizing busy bodies were not included in any of those categories.

Figure 18. The result of cluster analysis from 26 category labels on 25 cases by the four raters

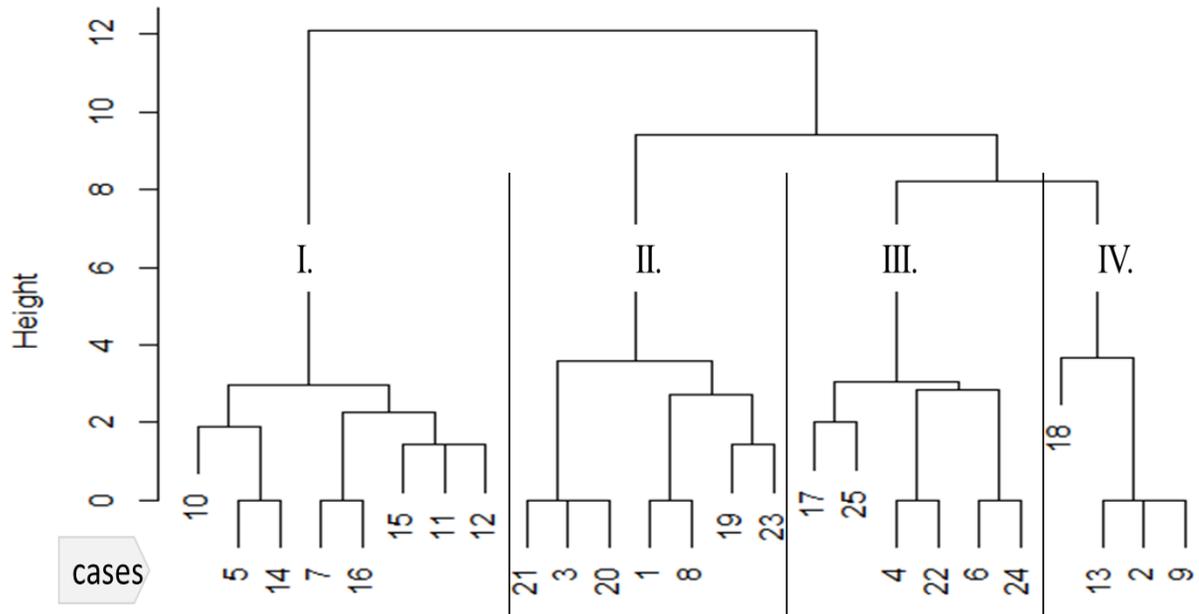


Table 9. The result of categorization on the 25 cases by four raters

| Rater | Row Labels | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 |
|-------|---|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 |
| A | 1 Customized recommendation by the analysis of databases | 1 | | | | | | | | 1 | | | 1 | | | | | | | | | | | | | |
| A | 2 Date collection | | | | | | | | | | | | | | | | | 1 | | | | | | | | |
| A | 3 Matching demand and supply | | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| A | 4 Review and Ranking | 1 | | 1 | | | | 1 | | | | | | | | | | | 1 | | | | | | | |
| A | 5 Users' information sharing | | | 1 | 1 | 1 | 1 | 1 | | | | | | | | | | 1 | | | | | 1 | 1 | 1 | 1 |
| B | 6 Community of interests | | | 1 | 1 | 1 | 1 | 1 | | | | | | | | | | 1 | | | | | 1 | 1 | 1 | 1 |
| B | 7 Find tendencies | | 1 | | | | | | | 1 | | | 1 | | | | | | | | | | | | | |
| B | 8 Individual big data | | | | | | | | | | | | | | | | | | 1 | | | | | | | |
| B | 9 Market big data | 1 | | 1 | | | | | 1 | | | | | | | | | | | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| B | 10 Matching parties | | | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | | | | | | | |
| C | 11 A platform where people share their thoughts | | | | | | | | | | | | | | | | | | | | | | | | | 1 |
| C | 12 Advice from experienced people | | | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | | | | | | | |
| C | 13 Ask users to provide solution/ working like intermedium | | | | | | | | | | 1 | | | | | | | 1 | | | | | | | | |
| C | 14 Collecting data from market | | | | | | | | | | | | | | | | | | 1 | | | | | | | |
| C | 15 Information sharing between users | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | | | 1 | 1 | 1 | 1 | 1 |
| C | 16 Integrating service information from different firms and rank them | | | | | | | | | | | | | | | | | | | 1 | | | | | | |
| C | 17 Using AI to forecast and enhancing efficiency | | 1 | | | | | | | 1 | | | | 1 | | | | | | | | | | | | |
| D | 18 Collaborative knowledge creation | | | | | | | | | | | | | | | | | 1 | | | | | | | | |
| D | 19 Competition of creators | | | | | | | 1 | | | | | | | | | 1 | | | | | | | | | |
| D | 20 Give and take | | | | 1 | | | | | | | | | | | 1 | | | | | | | | | | 1 |
| D | 21 Matching needs and seeds | | | | | 1 | | | | | 1 | | | | 1 | | | | | | | | | | | |
| D | 22 Objective evaluation, professional raters and read only users | | | | | | | | | | | | | | | | | | | | | | | | | |
| D | 23 Showing off experiences | | 1 | | | | 1 | | 1 | | | | | | | | | | | | | | | | | 1 |
| D | 24 Supporter | | | | | | | | | | | 1 | | | | | | | | | | | | | | |
| D | 25 Tailor-made based on big data | | | | | | | | | 1 | | | | 1 | | | | | | | | | | | | 1 |
| D | 26 Utilizing busy bodies | | | | | | | | | | | 1 | | | | | | | | | | | | | | 1 |

The results of categorization in the figure 18 are supported by the previous studies on collective intelligence or collaborative intelligence(CI). CI can encompass several types of mechanism based on the state of the system (Devadasan, 2011; Quinn & Bederson, 2011). According (Devadasan, 2011), the CI can be classified into four types based on the interaction between individuals in the system and they are aligned with the results of categorization in the figure 18: 1) coordination for matching customers to suppliers, which is compatible with the category I in the figure 15; 2) collect and combine knowledge to improve users' decision, which is compatible with the category II; 3) cooperation of multiple users for carrying out the task, which is compatible with the category III; 4) accumulation of data to find the patterns for predicting of decision, in other words, data mining, which is compatible with the category IV.

Since information and communication technologies developed drastically and majority of population can have access to the internet which allows us to be connected each other easily, it enables online human participation in the computational process, and it is called "human computation". Quinn and Bederson (2011) reviewed numerous existing definitions and examples related to human computation. For instance, Crowdsourcing defined as "the act of taking a job traditionally performed by a designated agent (usually an employee) and outsourcing it to an undefined, generally large group of people in the form of an open call" (Howe, 2008). Social computing is defined as "... applications and services that facilitate collective action and social interaction online with rich exchange of multimedia information and evolution of aggregate knowledge..." (Parameswaran & Whinston, 2007). Data mining is defined as "the application of specific algorithms for extracting patterns from data." (Fayyad, Piatetsky-Shapiro, & Smyth, 1996). And he found that collective intelligence applies only when the process depends on a group of participants while human computation is not. Also, it is a super ordinate concept of social computing and crowdsourcing, because both are defined in terms of social behaviour. Data mining encompasses with the concept of collective intelligence, because some applications benefit from groups while others do not. What most distinctive point between collective intelligence and human computation, human computation does not enclose online discussions or creative projects where the initiative and flow of activity are directed primarily by the participants' inspiration: for example, the goal of Wikipedia project is not to create novel

contents, but to gather existing knowledge from a neutral point of view as an encyclopedia³³. In contrast, collective intelligence allows the creative ability of humans.

After reviewing the related research on the classification of collective intelligence, and applying their categorization reference into the results from the four raters (see the table 10), this study suggests the four categories as shown in the figure 19.

Table 10. Cases belonging to the categorization of four raters

| | case | Category I | Category II | Category III | Category IV | Competition of creator | Utilizing the busy bodies | total |
|----|------------------------------|------------|-------------|--------------|-------------|------------------------|---------------------------|-------|
| 1 | InnoCentive | 4 | | | | | | 4 |
| 2 | Conyac | 4 | | | | | | 4 |
| 3 | Lancers | 4 | | | | | | 4 |
| 4 | Creative agency for everyone | 3 | | | | 1 | | 4 |
| 5 | Logo Tournament | 3 | | | | 1 | | 4 |
| 6 | Katariba café | 3 | | | | | 1 | 4 |
| 7 | Kopernik | 4 | | | | | | 4 |
| 8 | Lang-8 | 3 | | 1 | | | | 4 |
| 9 | at cosme | | 3 | 1 | | | | 4 |
| 10 | Rakuten Travel | | 3 | 1 | | | | 4 |
| 11 | Tabelog | | 3 | 1 | | | | 4 |
| 12 | Price.Com | | 3 | 1 | | | | 4 |
| 13 | Wedding Park | | 4 | | | | | 4 |
| 14 | 4 travel | | 3 | 1 | | | | 4 |
| 15 | Dating expert | | 3 | 1 | | | | 4 |
| 16 | Cook pad | | 1 | 3 | | | | 4 |
| 17 | Yahoo Weather | | | 4 | | | | 4 |
| 18 | Bike lover's MAP | | | 4 | | | | 4 |
| 19 | User creating weather news | | | 4 | | | | 4 |
| 20 | Open ideo | | | 4 | | | | 4 |
| 21 | YOMIURI ONLINE Comments | | | 3 | | | 1 | 4 |
| 22 | Amazon.com | | | | 4 | | | 4 |

³³ https://en.wikipedia.org/wiki/Wikipedia:Five_pillars

| | | | | | | | | |
|----|-----------------------|----|----|----|----|---|---|-----|
| 23 | Google Japanese Input | | | | 4 | | | 4 |
| 24 | KuraSushi | | | | 4 | | | 4 |
| 25 | POS system | | | | 4 | | | 4 |
| | total | 28 | 23 | 29 | 16 | 2 | 2 | 100 |

Figure 19. Four structural categories of collective intelligence services

| Classification of Collective intelligence in Quinn & Bederson(2011) | Cases belonging to the four raters' categorization |
|--|---|
| <p>I. Crowd sourcing "the act of taking a job and outsourcing it to an undefined, generally large group of people in the form of an open call."</p> | <p>I. Matching, Intermediate people •100% agreed: Innocentive, Conayc, Lancers, Kopernik •75% agreed: Creative agency, Logo tournament, Katariba, Lang-8</p> |
| <p>II. Human computation "...using human effort to perform tasks that computers cannot yet perform."</p> | <p>II. Reviews or rating on the integrate info •100% agreed: Wedding park •75% agreed: @cosme, Rakutel travel, Tabelog, 4 travel, Price.com, Date expert</p> |
| <p>III. Social computing "... services that facilitate collective action and social interaction online with evolution of aggregate knowledge..."</p> | <p>III. Share knowledge, collaboration •100% agreed: Bike map, live weather news, Open ideo •75% agreed: Cook pad, Yahoo weather, Yomiuri comments</p> |
| <p>IV. Data mining "the application of specific algorithms for extracting patterns from data."</p> | <p>IV. Analyze big data •100% agreed: Amazon, Google Japanes, Kura sushi, POS</p> |

Services in the category I intermediate an individual user to another individual user depending on their specific needs or skills. For example, Conyac provides a service that intermediates a client who need translators with those who want to translate for them with payment. Similarly, Katariba café also provides a service that intermediates high school students who need advice for future career with university students who would like to give advice.

The services in the category III have distinctive characteristic from the category II in the sense that the users create novel contents in cooperative manner. On the other hand, the services in the

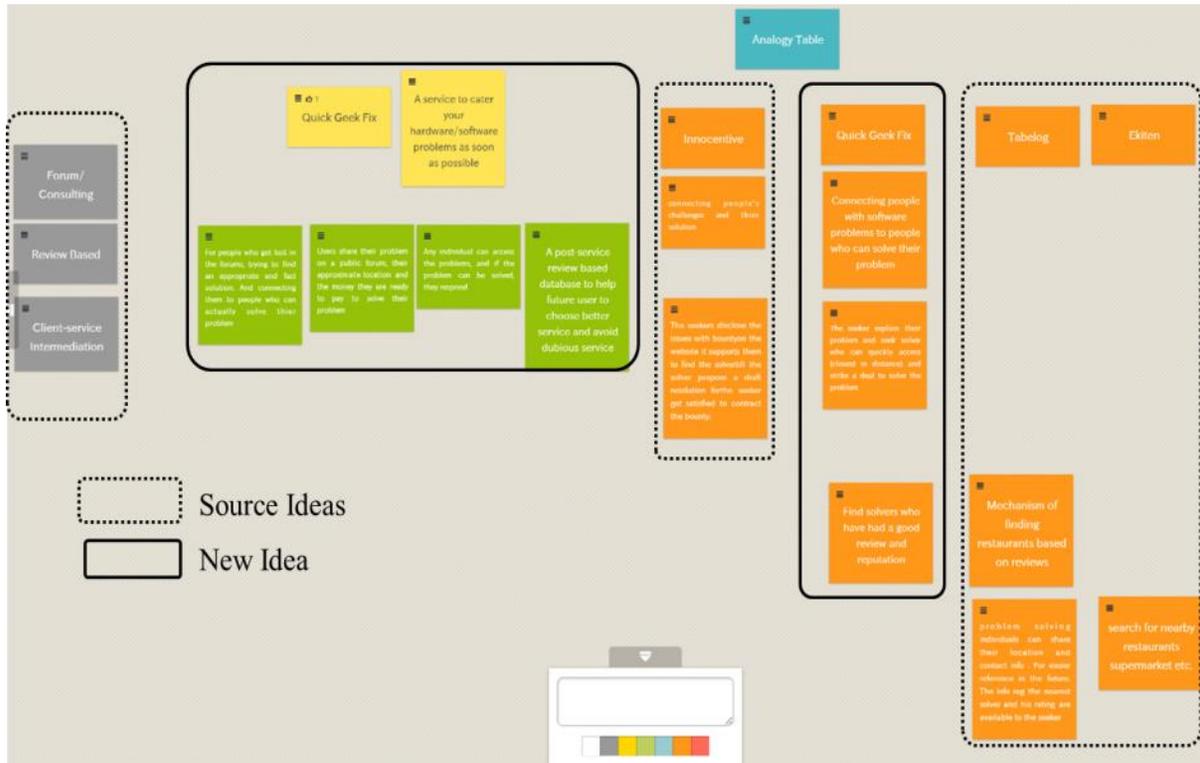
category II provide the integrated list of information and users merely add reviews on the prepared list. For example, both ‘User creating weather news’ and ‘Yahoo live weather’ provide weather information based on user’s participation, however, the former service is entirely depending on user’s input while the latter service provides weather information from the news agency and users can give a vote based on what kind of weather they currently situated. Also, other services in the category II, such as ‘@cosme’, ‘Tablelog’, ‘Price.com’, ‘Rakuten travel’, ‘Wedding park’, they all provide integrated list of items such as cosmetics, restaurants, devices, hotels, wedding venues, and each user can add the reviews from their experiences or check possible options for deciding their purchases. On the contrary, services in the category III, such as ‘Bike lover’s map’, ‘Cook pad’, ‘Yomiuri online comments’ provides information created by users who contributed to the community with their original knowledge or information.

Services in the category IV analyse the large amount of data collected from all the other users and recommend the optimized options to an individual user. For instance, Amazon.com analyses the database of purchase records from all the users and recommends specific items for each user which best fit with his or her taste. Similarly, Kura sushi also analyses purchase records of all the consumers and recommends specific dishes for current consumers which best fit with their taste. In addition, Google Japanese Input analyses the database of vocabularies used by all the users and recommends specific words to be typed for each user which best fit with his or her context in writing.

Consequently, structural similarity between the new idea and the source ideas needs to be judged. Participants were asked to select the category and cases from the categorization task, then generate new idea using analogical thinking. During the idea generation task, participants were asked to complete the analogy table with selected source idea(s) parallel with their new idea. To judge the structural similarity, the source ideas are based on the cases written in the analogy table. As shown in the figure 20, this participant selected three categories which are in gray notes, and three cases which are in orange notes in the dotted line boxes. The sample idea is a matching system that connects people who needs help for their electronic devices to people who can solve their problem. The source ideas he selected for idea generation include ‘intermedium’ as for a business structure; also ‘innocentive’ case which belongs to the category I: coordination. Thus, structural similarity between this new idea and the source ideas was assessed

as ‘High’, because the idea was generated using the same business structure with the source ideas.

Figure 20. A sample result of the idea generation task shown in the APISNOTE



Not all the participants generated new idea which has high structural similarity with any of those four categories. For example, as described in the table 7, participant 2B generated a new idea, titled ‘Beauty map’, the participant explained her idea as follow:

“It’s a website, we can find people look similar to us, by input of personal data like the eye-shapes or a distance between two eyes. Then, we can find other users who have similar shape of face, and follow their way to do make-up. And it provides information of where we can buy what kinds of cosmetics, also, which make-up is good for special situation like party. My idea is like the bike lover’s map. somehow my idea still comes from the @cosme.”

This new idea is difficult to be categorized as any of four exemplary categories, because the mechanism of this new idea is complex, as it seems to analyse the big data of users for a

customized suggestion similar to the category IV, however, according to the description from the participant, it also provides integrated information of products and stores, and this structure is similar to the category II,. In addition, this new service provides advices for special situations, which is similar to the category III.

Table 11. The examples of structural similarity between the ideas generated by participants and the referenced source ideas

| Subject | New idea | source ideas | Structural Category | | Analogical thinking ³⁴ | structural similarity |
|---------|-----------------------------------|------------------------------|---------------------|----------|-----------------------------------|-----------------------|
| | | | sources | new idea | | |
| 1A | Ultimate movie recommendation | Amazon.com, online dating | IV | IV | High | High |
| 1B | beauty map | Bike lover's MAP, at cosme | III, II | None | Low | Low |
| 1C | soft loan for educating the poor | Kopernik | I | I | High | High |
| 1D | quick geek fix | InnoCentive, tabelog, ekiten | I | I | High | High |
| 1E | city microscope | Conyac | I | III | Low | High |
| 2A | fill out my forms | Lang-8 | I | I | High | High |
| 2B | wifi finder | Bike lover's MAP | III | III | High | High |
| 2C | PET finder | Wedding Park | II | None | Low | Low |
| 3-2AB | job finer for graduate | Lancers, amazon | I | I | High | High |
| 3-1A | blood donation | KuraSushi, amazon | IV | IV | High | High |
| 3-1B | cut&fill | Wedding Park | II | None | Low | Low |
| 3-3AB | e-database for shopping mall | Amazon.com | IV | IV | High | High |
| 4-1A | moral education and sex education | Open ideo, Yomiuri comments | III | III | High | High |

³⁴ Analogical thinking skill is regarded differently from importing the structural similarity from source ideas.

| | | | | | | |
|------|------------------------------------|---|----|------|------|------|
| 4-1B | childcare | Conayc, Logo tournament | I | I | High | High |
| 4-1C | Immersive education in microworlds | Kopernik, Katariba café | I | None | Low | Low |
| 4-2A | personal education | KuraSushi, Google Japanese Input | IV | IV | High | High |
| 4-2B | Services for education | Logo Tournament, InnoCentive | I | I | High | High |
| 4-2C | elite education | Creative agency for everyone, Open ideo | I | None | High | Low |
| 4-3A | career change | KuraSushi , Amazon.com, Google Japanese Input, POS system | IV | IV | High | High |
| 4-3B | a job advisor | Katariba café, Lancers, Lang-8 | I | I | High | High |

4.2 The measurement of superficial similarity: the latent semantic analysis (LSA)

As mentioned in the introduction of chapter 4, superficial similarity is measured by the semantic similarity between the domains of source cases referred and the created idea. Measurement of text similarity has been used for a long time in application of the natural language processing and related areas (Corley & Mihalcea, 2005).

Amongst them, LSA is a mathematical, as well as a statistical technique for extracting and representing the similarity of meaning of words and passages by analysis of large bodies of text. It allows us to define the meaning of words as a vector in a high-dimensional semantic space. The raw data for LSA are meaningful passages and the set of words each contains. A matrix is constructed whose columns are words and whose rows are documents. The cells of the matrix are the frequencies with which each word occurred in each document. The data upon which the analyses reported below are based consist of a training corpus of about 11 million words, yielding a co-occurrence matrix of more than 92,000 word types and more than 37,000 documents (Kintsch, 2001).

Key words for targeting users or providing services of each business case should be considered to decide the specific semantic words of domain. To compute similarities by the latent semantic analysis, less ambiguous terms of domain need to be selected. Thus, the terms of the most obviously providing services, products, or targeting users which constitute the domain in each business case selected with specific, less ambiguous terms. As a consequence, we extracted words for domain in specific concept that can avoid ambiguity: for example, ‘dating’ is selected rather than ‘date’ which has several homonyms, in this regard, ‘typing’ is selected rather than ‘type’, also, abstract terms, such as beauty, love, were avoided as much as possible.

In addition, to measure how new ideas are generated in the domain of superficially far from existing ideas, it is important to generate a large pool of existing cases. For building a pool of existing cases of collective intelligence service, we asked the regular students of the i.school to search and gather together all cases they know regarding to the collective intelligence services. As a result, 71 cases were collected as shown in the table 12.

Table 12 . The words selection for the domain of 71 cases

| No. | Category | case | In Japanese | Domain1 | Domain2 |
|-----|----------|------------------------------|---------------------------|---------------|------------|
| 1 | I | Katariba café | カタリバカフェ | High school | university |
| 2 | I | Lang-8 | Lang-8 | language | proofread |
| 3 | I | Conyac | コニヤック | translation | |
| 4 | I | Creative agency for everyone | みんなのクリエイティブエージェンシー（リクルート） | advertisement | |
| 5 | I | Happy Campus | ハッピーキャンパス | homework | university |
| 6 | I | Couch Surfing | カウチサーフィン | travel | lodging |
| 7 | I | Lancers | ランサーズ | job | |
| 8 | I | BOOK OFF | BOOK OFF | book | |
| 9 | I | Kopernik | Kopernik | technology | poverty |

| | | | | | |
|----------|----|--------------------------------|-----------------------------|--------------|------------|
| 10 | I | Social funding Maneo | ソーシャルレンディングサービス「maneo(マネオ)」 | fund raising | investment |
| 11 | I | Trippiece | Trippiece | trip | |
| 12 | I | Donor Voice | Donor Voice | fund raising | donation |
| 13 | I | Coconala | Coconala | skills | |
| 14 | I | KAYAC, healty coin service | 面白法人カヤック「元気玉」サービス | idea | |
| 15 | I | InnoCentive | InnoCentive | innovation | |
| 16 | I | Logo Tournament | Logo Tournament | logo | |
| I | | Total cases | 16 | | |
| 17 | II | WikiLeaks | ウィキリークス (WikiLeaks) | confidential | |
| 18 | II | Price.Com | 価格.com | price | shopping |
| 19 | II | Rakuten Travel, voice of users | 楽天トラベル 口コミ・お客様の声 | travel | hotel |
| 20 | II | at cosme | @cosme | cosmetic | |
| 21 | II | Jalan .net | じゃらん | travel | hotel |
| 22 | II | Foursquare | Foursquare | location | |
| 23 | II | AKB Election | AKB 総選挙 | celebrity | |
| 24 | II | Miss Contest | ミス・コンテスト | beauty | pageant |
| 25 | II | Tabelog | 食べログ | restaurant | |
| 26 | II | Wedding Park | ウェディングパーク | wedding | |
| 27 | II | TripAdvisor | TripAdvisor | trip | |
| 28 | II | Mom's voice | ママこえ | childcare | |
| 29 | II | 4 travel | 4 travel | travel | |
| 30 | II | Campus for Everyone | みんなのキャンパス | university | class |

| | | | | | |
|----|-----|--|---------------------------------|--------------|------------|
| 31 | II | Nico Nico Douga | ニコニコ動画 | cartoon | video |
| 32 | II | Ekiten | エキテン！ | metro | shops |
| 33 | II | Yahoo Weather | Yahoo 天気情報「みんなで実況今の天気」 | weather | |
| 34 | II | Hatena Bookmark | はてなブックマーク | bookmark | |
| 35 | II | Dating expert | デート通.jp | dating | |
| II | | Total cases | 19 | | |
| 36 | III | walking around the world | 地球の歩き方 | travel | |
| 37 | III | Job hunting diary for Everyone | みんなの就職活動日記（通称：みん就） | job | university |
| 38 | III | 4010 Towa Service Station | 道の駅四万十とおわ | farmer | |
| 39 | III | Agricultural Co-op | 農業協同組合 | agriculture | |
| 40 | III | fishery co-op | 漁業協同組合（漁協） | fishery | |
| 41 | III | Academic Society | 学会 | academic | |
| 42 | III | Collective Housing | コレクティブハウジング | housing | |
| 43 | III | Statistics for Industrial Association | 工業会統計 | statistics | |
| 44 | III | Google Person Finder | Google Person Finder | person | disaster |
| 45 | III | Muji, crafts community | 無印良品ものづくりコミュニティー | consumer | |
| 46 | III | Open ideo | Open ideo | social issue | idea |
| 47 | III | Innovation Jam | Innovation Jam | innovation | idea |
| 48 | III | Check A Toilet : Universal Design Toilet Map | Check A Toilet ユニバーサルデザイントイレマップ | toilet | |
| 49 | III | GREE | GREE | game | |

| | | | | | |
|------------|-----|---|---------------------|--------------|----------------|
| 50 | III | User creating weather news | ウェザーニューズのサポーター参加型企画 | weather | |
| 51 | III | Bike lover's MAP | 自転車大好き MAP | bicycle | route |
| 52 | III | Google docs | Google docs | document | |
| 53 | III | Cook pad | クックパッド | recipe | |
| 54 | III | NRI Social planet | Social Planet | social issue | |
| 55 | III | uncyclopedia | uncyclopedia | joke | humor |
| 56 | III | 2 channels | 2ch (2チャンネル) | opinion | gossip |
| 57 | III | Interests share | 関心空間 | hobby | |
| 58 | III | e-woman roundtable | イーウーマン 円卓会議 | social issue | opinion |
| 59 | III | YOMIURI ONLINE Comments | YOMIURI ONLINE 発言小町 | advice | personal issue |
| 60 | III | Flickr | Flickr | photos | |
| 61 | III | quora.com | quora.com | questions | idea |
| 62 | III | NHK Gag show | 着信御礼! ケータイ大喜利 | comedy | TV show |
| III | | Total cases | 27 | | |
| 63 | IV | KuraSushi | 無添くら寿司 | sushi | |
| 64 | IV | Amazon.com | Amazon.com | shopping | book |
| 65 | IV | Google Japanese Input | Google 日本語入力 | typing | vocabulary |
| 66 | IV | SPYSEE | あの人検索 SPYSEE | person | |
| 67 | IV | Business Microscope | ビジネス顕微鏡 | monitoring | employee |
| 68 | IV | The Global Public Health Intelligence Network | | epidemic | |
| 69 | IV | POS system | POS system | shopping | |
| 70 | IV | T Card | Tカード | consumer | shopping |
| 71 | IV | Google Search | google 検索 | information | |

| | | | | |
|----|-------------|---|--|--|
| IV | Total cases | 9 | | |
|----|-------------|---|--|--|

In this study, appropriateness of new idea generated by analogical thinking is defined as domain-changing by applying similar structural feature from the source ideas. Therefore, we compute semantic similarity between the domains of idea created by participant and all the other domains using similar structures. For computation option, we selected the topic space of “general reading up to first-year college (300 factors)” and term-to-term matrix comparison type. The latent semantic analysis application (<http://lsa.colorado.edu>) computes the similarity between the contextual-usage meanings of words as calculated by the cosine of the included angle between vectors assigned to those words within a semantic space. Kintsch (2001) mentioned that “Intuitively, the vector length tells us how much information LSA has about this vector. Words that LSA knows a lot about, because they appear frequently in the training corpus, in many different contexts, have greater vector lengths than words LSA does not know well. Function words that are used frequently in many different contexts have low vector lengths. LSA knows nothing about them and cannot tell them apart since they appear in all contexts.” Semantic similarity values were used in the main parametric analysis. Specifically, these values allowed us to identify the superficial similarity between the domains of a new idea and those of existing business cases as shown in the table 13.

Table 13 . Superficial similarity between the new ideas and the source ideas calculated by LSA

| Category IV | | New idea Domain | Existing domains | | sushi | restaurant | shopping | typing | celebrity | monit oring | epidemic | consu mer | search | inform ation | book mark | book | vocabulary | employee |
|-------------|---------------------------|-----------------|---------------------|------------------|-------|------------|----------|--------|-----------|----------------|----------|--------------|--------|-----------------|--------------|------|------------|----------|
| Subject | Superficial similarity | | Similarity (Max) | Vector Length | 0.06 | 0.51 | 0.6 | 0.73 | 2.07 | 1.57 | 0.33 | 2.02 | 0.6 | 2.5 | 0.06 | 2.3 | 0.85 | 1.97 |
| 1A | 0.26 | movie | 0.26 | 0.65 | 0.04 | 0.26 | 0.15 | -0.04 | 0.15 | 0.06 | 0.03 | 0.07 | 0.07 | 0.07 | 0.04 | 0.14 | 0.02 | 0.02 |
| 3-1A | 0.21 | blood | 0.21 | 3.53 | -0.02 | 0.04 | 0.02 | 0.02 | 0.11 | 0.21 | 0.13 | 0 | 0.05 | 0.02 | 0.04 | 0.03 | 0.01 | -0.01 |
| 3-3AB | 1 | shopping | 1 | 0.6 | 0.01 | 0.37 | 1 | 0.03 | 0.06 | 0.07 | 0.02 | 0.31 | 0.09 | 0.11 | 0.08 | 0.04 | 0.02 | 0.04 |
| 4-2A | 0.18 | performance | 0.22 | 2.83 | 0 | 0.07 | 0.07 | 0.22 | 0.12 | 0.03 | 0.08 | 0.05 | 0.17 | 0.1 | 0.08 | 0.22 | 0.14 | 0.19 |
| | | coaching | 0.13 | 0.25 | 0 | 0.13 | 0.03 | 0.09 | 0.05 | 0.07 | 0.02 | 0 | 0.07 | 0.09 | 0.02 | 0.03 | 0.09 | 0.08 |
| 4-3A | 0.28 | job | 0.35 | 2.07 | -0.01 | 0.29 | 0.12 | 0.21 | 0.15 | 0.01 | 0.02 | 0.05 | 0.14 | 0.16 | -0 | 0.05 | 0.06 | 0.35 |
| | | career | 0.21 | 1.22 | 0.02 | 0.17 | 0.08 | 0.21 | 0.15 | 0.06 | 0.07 | 0.07 | 0.16 | 0.16 | -0 | 0.1 | 0.07 | 0.11 |

| Category I | Subject | Superficial similarity | New idea Domain | Existing domain | | university | poverty | high school | job | language | translation | advertisement | home work | lodging | book | technology | innovation | fund raising | trip | skills | idea | logo | travel | investment | donation |
|------------|---------|------------------------|-----------------|------------------|---------------|------------|---------|-------------|------|----------|-------------|---------------|-----------|---------|-------|------------|------------|--------------|-------|--------|------|------|--------|------------|----------|
| | | | | Similarity (Max) | Vector Length | | | | | | | | | | | | | | | | | | | | |
| ID | 0.23 | repair | 0.2 | 0.63 | 0.05 | 0.02 | 0.14 | 0.2 | 0.03 | 0.08 | 0.08 | 0.06 | 0.06 | 0.17 | 0.06 | 0.15 | 0.06 | 0.05 | 0.14 | 0.1 | 0.03 | 0.08 | 0.14 | 0.02 | 0.1 |
| | | | 0.31 | 3.57 | 0.06 | 0 | 0.07 | 0.08 | 0.08 | -0.01 | 0.04 | 0.15 | 0.04 | 0.15 | -0.04 | 0.05 | 0.31 | 0.11 | 0.06 | 0 | 0.03 | 0.05 | 0.03 | 0.03 | 0 |
| 1C | 0.44 | the poor | 0.71 | 1.08 | 0.12 | 0.71 | 0.2 | 0.16 | 0.08 | 0.06 | 0.12 | 0.12 | 0.12 | 0.28 | 0.09 | 0.05 | 0.03 | 0.17 | 0.11 | 0.12 | 0.11 | -0 | 0.14 | 0.04 | 0.1 |
| | | | 0.65 | 0.21 | 0.65 | 0.16 | 0.41 | 0.16 | 0.41 | 0.12 | 0.07 | 0.13 | 0.01 | 0.12 | 0.15 | 0.09 | 0.18 | 0.12 | 0.1 | 0.14 | 0.05 | 0.09 | 0.07 | 0.02 | 0.06 |
| 2A | 0.18 | official | 0.22 | 2.51 | 0.1 | 0.06 | 0.15 | 0.12 | 0.11 | 0.13 | 0.21 | 0.22 | 0.22 | 0.06 | 0.12 | 0.1 | 0.08 | 0.07 | 0.12 | 0.03 | 0.15 | 0.11 | 0.09 | 0.02 | 0.08 |
| | | | 0.25 | 0.09 | 0.14 | 0.09 | 0.07 | 0.06 | 0.25 | 0.06 | 0.25 | 0.15 | 0.02 | 0.05 | 0.1 | 0.02 | -0 | 0.09 | -0.02 | 0.12 | 0 | 0.09 | 0.1 | 0.12 | 0.03 |
| 3-2AB | 0.64 | job | 1 | 2.07 | 0.13 | 0.08 | 0.25 | 1 | 0.05 | -0.03 | 0.14 | 0.09 | -0.01 | 0.05 | 0.07 | 0.09 | 0.09 | 0.16 | 0.12 | 0.41 | 0.12 | 0.05 | 0.09 | 0.07 | 0.01 |
| | | | 0.93 | 2.51 | 0.41 | 0.1 | 0.93 | 0.17 | 0.22 | 0.12 | 0.14 | 0.05 | 0.04 | 0.08 | 0.14 | 0.07 | 0.07 | 0.08 | 0.1 | 0.14 | 0.21 | 0.17 | 0.02 | 0.07 | 0.03 |
| 4-1B | 0.22 | child care | 0.22 | 3.32 | 0.05 | 0.17 | 0.22 | 0.12 | 0.14 | 0.05 | 0.04 | 0.08 | 0.08 | 0.14 | 0.07 | 0.07 | 0.08 | 0.1 | 0.14 | 0.21 | 0.17 | 0.02 | 0.07 | 0.03 | 0.05 |
| | | | 0.32 | 2.95 | 0.32 | 0.08 | 0.21 | 0.11 | 0.13 | 0.11 | 0.03 | 0.23 | 0.03 | 0.23 | 0.03 | 0.15 | 0.2 | 0.1 | 0.09 | 0.13 | 0.17 | 0.2 | -0 | 0.12 | 0.02 |
| 4-2B | 0.22 | study group | 0.3 | 0.71 | 0.11 | 0.3 | 0.15 | 0.1 | 0.18 | 0.06 | 0.01 | 0.05 | 0.05 | 0.03 | 0.03 | 0.04 | 0.07 | 0.07 | 0 | 0.1 | 0.08 | 0.07 | 0.03 | 0.04 | 0.04 |
| | | | 0.3 | 0.71 | 0.11 | 0.3 | 0.15 | 0.1 | 0.18 | 0.06 | 0.01 | 0.05 | 0.05 | 0.05 | 0.03 | 0.03 | 0.04 | 0.07 | 0.07 | 0 | 0.1 | 0.08 | 0.07 | 0.03 | 0.04 |
| 4-3B | 0.60 | job | 1 | 2.07 | 0.13 | 0.08 | 0.25 | 1 | 0.05 | -0.03 | 0.14 | 0.09 | -0.01 | 0.05 | 0.07 | 0.09 | 0.09 | 0.16 | 0.12 | 0.41 | 0.12 | 0.05 | 0.09 | 0.07 | 0.01 |
| | | | 0.25 | 0.4 | 0.22 | 0.16 | 0.19 | 0.2 | 0.03 | 0.17 | 0.25 | 0.17 | 0.25 | 0.21 | 0.16 | 0.13 | 0.06 | 0.12 | 0.13 | 0.17 | 0.18 | 0.15 | 0.06 | 0.08 | 0.11 |

| Category III | Subject | Superficial similarity | New idea Domain | Existing domain | | agricultural | fishery | research | housing | statistics | person | social innovation | toilet game | weather | bicycle | document | recipe | joke | opinion | hobby | advice | photos | questions | university | farm | discussion | cons | idea | route | humor | gossip | person |
|--------------|---------|------------------------|-----------------|------------------|---------------|--------------|---------|----------|---------|------------|--------|-------------------|-------------|---------|---------|----------|--------|------|---------|-------|--------|--------|-----------|------------|------|------------|------|------|-------|-------|--------|--------|
| | | | | Similarity (Max) | Vector Length | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1E | 0.38 | roadway | 0.33 | 2.1 | 0.08 | 1.46 | 0.76 | 0.52 | 2.07 | 2.47 | 0.19 | 0.26 | 1.93 | 2.08 | 0.97 | 0.92 | 0.47 | 0.26 | 0.93 | 0.21 | 0.4 | 0.19 | 1.95 | 1 | 1.01 | 0.28 | 2.02 | 1.34 | 0.88 | 0.21 | 0.18 | 1.58 |
| | | | 0.38 | 0.25 | 0 | 0.15 | 0.03 | -0.02 | 0.01 | 0.06 | 0.05 | 0.02 | 0.01 | 0.08 | 0.11 | 0.38 | -0 | 0.03 | 0.07 | 0.02 | -0.06 | 0.06 | 0.01 | 0.02 | -0 | 0.02 | 0.07 | 0.02 | 0.03 | 0.16 | 0.04 | 0.06 |
| 2B | 0.23 | telecommunication | 0.23 | 0.06 | 0.1 | 0.23 | 0.03 | 0.08 | 0.09 | 0.05 | 0.02 | 0.14 | -0 | 0.14 | -0.03 | -0 | -0.06 | -0 | -0.05 | -0.01 | -0.02 | 0.01 | -0 | 0 | 0.06 | 0.02 | -0 | 0.04 | 0.05 | -0.03 | 0.03 | 0.05 |
| | | | 0.25 | 0.37 | 0.01 | 0.17 | 0.05 | 0.25 | 0 | 0.07 | 0.03 | 0.25 | 0.08 | 0.04 | -0 | 0.03 | -0.04 | 0 | 0.03 | 0.17 | 0.05 | 0.17 | 0.03 | 0.05 | 0.23 | 0.02 | 0.09 | 0.07 | 0.05 | 0.07 | 0.16 | 0.14 |
| 4-1A | 0.29 | sex education | 0.32 | 3.2 | 0.17 | 0.2 | 0.1 | 0.19 | 0.13 | 0.32 | 0.15 | 0.13 | 0.02 | 0 | 0.03 | 0.03 | 0.02 | 0.05 | 0.17 | 0.03 | 0.16 | 0.01 | 0.09 | 0.32 | 0.01 | 0.02 | 0.07 | 0.11 | -0 | 0.08 | 0.06 | 0.27 |
| | | | 0.32 | 3.2 | 0.17 | 0.2 | 0.1 | 0.19 | 0.16 | 0.19 | 0.13 | 0.32 | 0.15 | 0.13 | 0.02 | 0 | 0.03 | 0.03 | 0.02 | 0.05 | 0.17 | 0.03 | 0.16 | 0.01 | 0.09 | 0.32 | 0.01 | 0.02 | 0.07 | 0.11 | -0 | 0.08 |

Pairwise comparisons in a form of matrices were made between all the word pairs of existing cases within category as shown in the table 14. The average value of semantic similarities of the most similar pairs of cases within the category is measured for setting the threshold of deciding “high” and “low” in evaluation. For example, there are 9 existing business cases in the category IV, which is ‘big data analysis’, and the number of possible combinations in a pair is $n(n-1)/2 = 45$ pairs. Among those pairs, each case has a highest similar pair, in total there are 9 pairs that has highest similarity each other. The threshold value was computed from the average value of semantic similarities of those 9 pairs. In the example of the category IV, it is the average value of $[0.19, 0.52, 0.09, 0.14, 0.13, 0.06, 0.66, 0.66, 0.14] = 0.29$. According to this calculation, each category has its threshold value as follows: 1) Category I = 0.33; 2) Category II= 0.58; 3) Category III = 0.31; 4) Category IV = 0.29.

Table 14. The matrices of semantic similarity among the existing cases within a same structural category

| Category IV: Big data (N=9) | | KuraSushi | Amazon.c | Google Ja | Spysee | Biz micros | Global he | T card | POS | Google search | |
|--|-------------------------|-------------------|----------------|--------------------|-------------------------|----------------------|-----------|--------------------|----------|---------------------|------|
| Average similarities of the most similar pairs: 0.29 | | sushi; restaurant | shopping; book | typing; vocabulary | celebrity; relationship | monitoring; employee | epidemic | shopping; consumer | shopping | information; search | Max |
| KuraSushi | sushi; restaurant | | 0.12 | 0.02 | 0.05 | 0.03 | 0.00 | 0.12 | 0.19 | 0.05 | 0.19 |
| Amazon.com | shopping; book | 0.12 | | 0.05 | 0.03 | 0.04 | 0.03 | 0.35 | 0.52 | 0.10 | 0.52 |
| Google Japan | typing; vocabulary | 0.02 | 0.05 | | 0.04 | 0.04 | 0.01 | 0.01 | 0.03 | 0.09 | 0.09 |
| Spysee | celebrity; relationship | 0.05 | 0.03 | 0.04 | | 0.10 | 0.05 | 0.02 | 0.03 | 0.14 | 0.14 |
| Biz microscope | monitoring; employee | 0.03 | 0.04 | 0.04 | 0.10 | | 0.03 | 0.05 | 0.06 | 0.13 | 0.13 |
| Global health | epidemic | 0 | 0.03 | 0.01 | 0.05 | 0.03 | | 0.00 | 0.02 | 0.06 | 0.06 |
| T card | shopping; consumer | 0.12 | 0.35 | 0.01 | 0.02 | 0.05 | 0.00 | | 0.66 | 0.09 | 0.66 |
| POS | shopping | 0.19 | 0.52 | 0.03 | 0.03 | 0.06 | 0.02 | 0.66 | | 0.10 | 0.66 |
| Google search | information; search | 0.05 | 0.10 | 0.09 | 0.14 | 0.13 | 0.06 | 0.09 | 0.10 | | 0.14 |

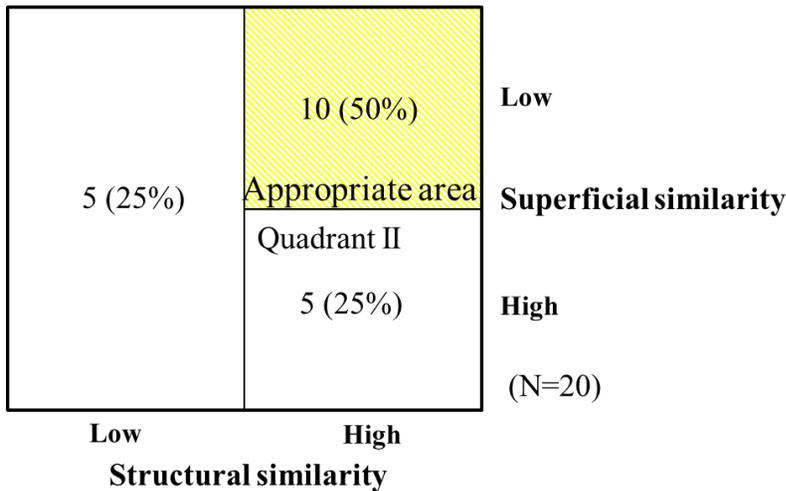
| Category I: intermedium (N=16) | Katariba café | Lang-8 language | Conyac translation | Creative agency for advertisement | Happy Campus homework ; | Couch Surfing travel; lodging | Lancers job | BOOK OFF book | Kopernik technology; poverty | Social funding fund raising; | Trippiece trip | Donor Voice fund raising; | Coconala skills | KAYAC, healthy conive idea | ImmoCentri innovation | Logo Tourname logo | Max |
|--|---------------|-----------------|--------------------|-----------------------------------|-------------------------|-------------------------------|-------------|---------------|------------------------------|------------------------------|----------------|---------------------------|-----------------|----------------------------|-----------------------|--------------------|------|
| Average similarities of the most similar pairs: 0.33 | high school; | language | translation | advertisement | homework ; | travel; lodging | job | book | technology; poverty | fund raising; | trip | fund raising; | skills | idea | innovation | logo | |
| Katariba café | high school; | 0.09 | 0.11 | 0.06 | 0.46 | 0.11 | 0.19 | 0.14 | 0.14 | 0.07 | 0.17 | 0.12 | 0.16 | 0.13 | 0.16 | 0.01 | 0.46 |
| Lang-8 | 0.09 | | 0.47 | 0.02 | 0.06 | 0.02 | 0.05 | 0.06 | 0.08 | 0.02 | 0.05 | 0.01 | 0.21 | 0.11 | 0.04 | 0.00 | 0.47 |
| Conyac | 0.11 | 0.47 | | 0.01 | 0.12 | 0.04 | -0.03 | 0.16 | 0.05 | 0.02 | 0.06 | -0.03 | 0.11 | 0.08 | 0.12 | -0.06 | 0.47 |
| Creative agency for advertisement | 0.06 | 0.02 | 0.01 | | 0.06 | 0.06 | 0.14 | 0.08 | 0.01 | -0.01 | 0.03 | 0.04 | 0.05 | 0.16 | 0.02 | 0.12 | 0.16 |
| Happy Campus homework; university | 0.46 | 0.06 | 0.12 | 0.06 | | 0.03 | 0.11 | 0.20 | 0.11 | 0.03 | 0.15 | 0.09 | 0.08 | 0.12 | 0.07 | 0.01 | 0.46 |
| Couch Surfing travel; lodging | 0.11 | 0.02 | 0.04 | 0.06 | 0.03 | | 0.04 | 0.04 | 0.10 | 0.11 | 0.34 | 0.10 | 0.05 | 0.11 | 0.01 | -0.03 | 0.34 |
| Lancers job | 0.19 | 0.05 | -0.03 | 0.14 | 0.11 | 0.04 | | 0.05 | 0.08 | 0.12 | 0.12 | 0.09 | 0.41 | 0.12 | 0.09 | 0.05 | 0.41 |
| BOOK OFF book | 0.14 | 0.06 | 0.16 | 0.08 | 0.20 | 0.04 | 0.05 | | 0.08 | 0.07 | 0.12 | 0.05 | 0.09 | 0.16 | 0.04 | 0.06 | 0.20 |
| Kopernik technology; poverty | 0.14 | 0.08 | 0.05 | 0.01 | 0.11 | 0.10 | 0.08 | 0.08 | | 0.11 | 0.05 | 0.06 | 0.17 | 0.07 | 0.30 | 0.00 | 0.30 |
| Social funding fund raising; investment | 0.07 | 0.02 | 0.02 | -0.01 | 0.03 | 0.11 | 0.12 | 0.07 | 0.11 | | 0.07 | 0.35 | 0.09 | 0.05 | 0.21 | 0.14 | 0.35 |
| Trippiece trip | 0.17 | 0.05 | 0.06 | 0.03 | 0.15 | 0.34 | 0.12 | 0.12 | 0.05 | 0.07 | | 0.09 | 0.05 | 0.18 | -0.01 | -0.01 | 0.34 |
| Donor Voice fund raising; donation | 0.12 | 0.01 | -0.03 | 0.04 | 0.09 | 0.10 | 0.09 | 0.05 | 0.06 | 0.35 | 0.09 | | 0.05 | 0.05 | 0.05 | 0.08 | 0.35 |
| Coconala skills | 0.16 | 0.21 | 0.11 | 0.05 | 0.08 | 0.05 | 0.41 | 0.09 | 0.17 | 0.09 | 0.05 | 0.05 | | 0.08 | 0.14 | 0.00 | 0.41 |
| KAYAC, healthy con idea | 0.13 | 0.11 | 0.08 | 0.16 | 0.12 | 0.11 | 0.12 | 0.16 | 0.07 | 0.05 | 0.18 | 0.05 | 0.08 | | 0.10 | 0.01 | 0.18 |
| ImmoCentri innovation | 0.16 | 0.04 | 0.12 | 0.02 | 0.07 | 0.01 | 0.09 | 0.04 | 0.30 | 0.21 | -0.01 | 0.05 | 0.14 | 0.10 | | 0.04 | 0.30 |
| Logo Tourname logo | 0.01 | 0.00 | -0.06 | 0.12 | 0.01 | -0.03 | 0.05 | 0.06 | 0.00 | 0.14 | -0.01 | 0.08 | 0.00 | 0.01 | 0.04 | | 0.14 |

| Category III: Collaboration (N=27) | | Dating expert | Dating exp | job: university | 400 Towa farmer | Agriculture | fishery | Academic | Collective housing | Statistics | person: disaster | Muji, crafts | Open idea | Innovation | Check A | USER creati | Bike lover's | Cook pad | social issue | uncyclop2 | interests | e-woman | YOMIURI | quora.co | NHK Gag | MAX | | | | | |
|--|----------------------------------|---------------|------------|-----------------|-----------------|-------------|---------|----------|--------------------|------------|------------------|--------------------|--------------------|------------|---------|-------------|----------------|----------|--------------|-----------|-----------|--------------|------------------|------------------|---------|-------|------|-------|------|------|--|
| Average similarities of the most similar pairs: 0.31 | | dating | dating | job: university | farmer | agriculture | fishery | academic | housing | statistics | person: disaster | products: consumer | social issue: idea | innovation | toilet | weather | bicycle: route | document | social issue | joke | hobby | social issue | advice: personal | question: s:idea | TV show | | | | | | |
| | Dating expert | | | 0.05 | 0.02 | 0.11 | 0.00 | 0.05 | 0.05 | 0.10 | 0.09 | 0.01 | 0.12 | 0.07 | 0.05 | 0.06 | 0.03 | 0.06 | 0.08 | 0.00 | 0.12 | 0.10 | 0.07 | 0.15 | 0.07 | 0.11 | 0.09 | 0.08 | 0.11 | 0.15 | |
| | Job hunting diary for university | 0.05 | | | 0.09 | 0.09 | -0.01 | 0.29 | 0.08 | 0.18 | 0.11 | 0.06 | 0.13 | 0.13 | 0.06 | 0.07 | 0.05 | 0.06 | 0.01 | 0.14 | 0.13 | 0.13 | 0.20 | 0.12 | 0.22 | 0.06 | 0.13 | 0.11 | 0.29 | | |
| | 400 Towa Service S | 0.02 | | 0.09 | | 0.55 | | 0.02 | 0.03 | 0.00 | 0.11 | 0.13 | 0.06 | 0.02 | -0.01 | 0.01 | 0.11 | 0.02 | 0.04 | 0.02 | 0.14 | 0.06 | 0.06 | 0.04 | 0.11 | 0.03 | 0.08 | 0.03 | 0.55 | | |
| | Agricultural Co-op | 0.11 | | 0.09 | 0.55 | | 0.08 | 0.08 | 0.18 | 0.14 | 0.17 | 0.20 | 0.09 | 0.39 | 0.06 | 0.11 | -0.02 | 0.01 | 0.02 | 0.15 | 0.01 | 0.04 | 0.05 | 0.10 | 0.13 | 0.05 | 0.04 | 0.03 | 0.55 | | |
| | fishery co-op | 0.00 | | -0.01 | 0.04 | 0.08 | | 0.02 | 0.03 | -0.02 | 0.09 | 0.02 | 0.02 | 0.05 | 0.00 | 0.06 | 0.01 | -0.01 | 0.02 | -0.05 | 0.03 | 0.02 | 0.02 | 0.03 | 0.00 | 0.02 | 0.02 | -0.02 | 0.09 | | |
| | Academic Society | 0.05 | | 0.29 | 0.02 | 0.08 | 0.02 | | 0.08 | 0.22 | 0.05 | 0.03 | 0.18 | 0.18 | 0.03 | 0.00 | -0.01 | 0.00 | 0.32 | 0.02 | 0.04 | 0.05 | 0.18 | 0.20 | 0.04 | 0.08 | 0.05 | 0.32 | | | |
| | Collective Housing | 0.05 | | 0.08 | 0.03 | 0.18 | 0.03 | 0.08 | | 0.23 | 0.17 | 0.12 | 0.15 | 0.17 | 0.15 | 0.00 | 0.03 | 0.05 | 0.00 | 0.24 | 0.03 | 0.07 | 0.13 | 0.16 | 0.00 | 0.06 | 0.04 | 0.24 | | | |
| | Statistics for Industr | 0.10 | | 0.18 | 0.00 | 0.14 | -0.02 | 0.22 | 0.23 | | 0.12 | 0.12 | 0.18 | 0.19 | 0.00 | 0.03 | 0.06 | -0.01 | 0.26 | 0.03 | 0.16 | 0.12 | 0.23 | 0.20 | 0.02 | 0.13 | 0.10 | 0.26 | | | |
| | Google Person Finder | 0.09 | | 0.11 | 0.11 | 0.17 | 0.09 | 0.05 | 0.17 | | | 0.07 | 0.21 | 0.13 | 0.10 | 0.07 | 0.10 | 0.09 | 0.06 | 0.21 | 0.10 | 0.15 | 0.13 | 0.19 | 0.26 | 0.06 | 0.15 | 0.13 | 0.26 | | |
| | Muji, crafts communi | 0.01 | | 0.06 | 0.13 | 0.20 | 0.02 | 0.03 | 0.12 | 0.12 | 0.07 | | 0.07 | 0.10 | 0.10 | 0.02 | 0.01 | 0.00 | 0.09 | 0.03 | 0.00 | 0.08 | 0.05 | 0.17 | -0.01 | 0.05 | 0.05 | 0.20 | | | |
| | social issue: idea | 0.12 | | 0.13 | 0.06 | 0.09 | 0.02 | 0.18 | 0.15 | 0.18 | 0.21 | 0.07 | | 0.22 | 0.09 | 0.07 | 0.03 | 0.07 | 0.02 | 0.56 | 0.21 | 0.21 | 0.11 | 0.43 | 0.27 | 0.05 | 0.37 | 0.12 | 0.56 | | |
| | Innovation Jam | 0.07 | | 0.13 | 0.02 | 0.39 | 0.05 | 0.18 | 0.17 | 0.19 | 0.13 | 0.10 | 0.22 | | -0.02 | 0.04 | 0.02 | 0.10 | 0.01 | 0.33 | 0.09 | 0.12 | 0.07 | 0.23 | 0.19 | 0.00 | 0.08 | 0.07 | 0.39 | | |
| | Check A Toilet: Uni | 0.05 | | 0.06 | -0.01 | 0.06 | 0.00 | 0.03 | 0.15 | 0.00 | 0.10 | 0.10 | 0.09 | -0.02 | | 0.02 | 0.09 | 0.04 | 0.00 | 0.09 | 0.10 | 0.08 | 0.10 | 0.12 | 0.07 | 0.13 | 0.05 | 0.06 | 0.10 | 0.15 | |
| | CRUE | 0.06 | | 0.07 | 0.01 | 0.06 | 0.02 | 0.05 | 0.00 | 0.03 | 0.07 | 0.02 | 0.07 | 0.04 | 0.02 | | 0.04 | 0.06 | 0.04 | 0.16 | 0.06 | 0.06 | 0.03 | 0.04 | 0.09 | 0.03 | 0.07 | 0.16 | 0.16 | | |
| | User creating weather | 0.03 | | 0.05 | 0.11 | 0.11 | 0.06 | 0.00 | 0.03 | 0.08 | 0.10 | 0.01 | 0.03 | 0.02 | 0.09 | 0.04 | | -0.02 | 0.00 | 0.02 | 0.05 | 0.06 | 0.10 | 0.02 | 0.06 | 0.33 | 0.03 | 0.10 | 0.33 | | |
| | bicycle: route | 0.06 | | 0.06 | 0.02 | -0.02 | 0.01 | -0.01 | 0.03 | 0.06 | 0.09 | 0.07 | 0.07 | 0.04 | 0.04 | 0.06 | 0.08 | | 0.01 | 0.05 | 0.03 | 0.10 | 0.07 | 0.11 | 0.04 | 0.08 | 0.01 | 0.09 | 0.08 | 0.11 | |
| | Bike lover's MAP | 0.08 | | 0.06 | 0.01 | 0.01 | 0.00 | 0.00 | 0.05 | -0.01 | 0.06 | 0.00 | 0.06 | 0.10 | 0.00 | 0.00 | -0.02 | 0.01 | 0.08 | 0.02 | 0.05 | 0.04 | 0.06 | 0.13 | -0.01 | 0.04 | 0.05 | 0.13 | 0.13 | | |
| | Google docs | 0.00 | | 0.01 | 0.04 | 0.02 | -0.01 | 0.00 | 0.00 | 0.07 | 0.04 | 0.09 | 0.02 | 0.01 | 0.09 | 0.04 | 0.00 | 0.05 | 0.01 | | 0.15 | 0.03 | 0.10 | 0.03 | 0.08 | -0.03 | 0.03 | 0.06 | 0.15 | | |
| | Cook pad | 0.12 | | 0.14 | 0.02 | 0.15 | 0.02 | 0.32 | 0.24 | 0.26 | 0.21 | 0.09 | 0.56 | 0.33 | 0.10 | 0.04 | 0.02 | 0.03 | 0.08 | 0.01 | 0.08 | 0.26 | 0.05 | 0.68 | 0.38 | 0.03 | 0.16 | 0.10 | 0.68 | | |
| | social issue | 0.10 | | 0.13 | 0.14 | 0.01 | -0.05 | 0.02 | 0.04 | 0.03 | 0.10 | 0.03 | 0.21 | 0.09 | 0.08 | 0.16 | 0.05 | 0.10 | 0.15 | 0.08 | 0.21 | 0.17 | 0.10 | 0.17 | 0.16 | 0.16 | 0.23 | 0.20 | 0.23 | | |
| | uncyclopedia | 0.07 | | 0.13 | 0.06 | 0.04 | 0.03 | 0.04 | 0.03 | 0.16 | 0.15 | 0.00 | 0.21 | 0.12 | 0.10 | 0.06 | 0.07 | 0.05 | 0.03 | 0.26 | 0.21 | | 0.16 | 0.44 | 0.33 | 0.01 | 0.16 | 0.13 | 0.44 | | |
| | 2channels | 0.15 | | 0.20 | 0.06 | 0.05 | 0.02 | 0.05 | 0.07 | 0.12 | 0.13 | 0.08 | 0.11 | 0.07 | 0.12 | 0.03 | 0.10 | 0.11 | 0.04 | 0.10 | 0.16 | 0.16 | | 0.09 | 0.23 | 0.19 | 0.13 | 0.13 | 0.23 | | |
| | Interests share | 0.07 | | 0.12 | 0.04 | 0.10 | 0.02 | 0.18 | 0.13 | 0.23 | 0.19 | 0.05 | 0.43 | 0.23 | 0.07 | 0.04 | 0.02 | 0.04 | 0.06 | 0.03 | 0.44 | 0.09 | | 0.40 | 0.01 | 0.19 | 0.11 | 0.11 | 0.68 | | |
| | e-woman roundtable | 0.11 | | 0.22 | 0.11 | 0.13 | 0.03 | 0.20 | 0.16 | 0.20 | 0.26 | 0.17 | 0.27 | 0.19 | 0.13 | 0.09 | 0.06 | 0.08 | 0.13 | 0.08 | 0.33 | 0.23 | 0.23 | 0.40 | 0.08 | 0.20 | 0.14 | 0.40 | | | |
| | YOMIURI ONLINE C | 0.09 | | 0.06 | 0.03 | 0.05 | 0.00 | 0.04 | 0.00 | 0.02 | 0.06 | -0.01 | 0.05 | 0.00 | 0.05 | 0.03 | 0.01 | -0.01 | 0.03 | 0.16 | 0.01 | 0.19 | 0.19 | 0.01 | 0.08 | | 0.06 | 0.21 | 0.33 | | |
| | Flickr | 0.08 | | 0.13 | 0.08 | 0.04 | 0.02 | 0.08 | 0.06 | 0.13 | 0.15 | 0.05 | 0.37 | 0.08 | 0.06 | 0.07 | 0.03 | 0.09 | 0.04 | 0.03 | 0.16 | 0.23 | 0.13 | 0.19 | 0.20 | 0.06 | 0.11 | 0.11 | 0.37 | | |
| | quora.com | 0.11 | | 0.11 | 0.03 | 0.03 | -0.02 | 0.05 | 0.04 | 0.10 | 0.13 | 0.05 | 0.12 | 0.07 | 0.10 | 0.16 | 0.10 | 0.08 | 0.05 | 0.06 | 0.20 | 0.13 | 0.13 | 0.11 | 0.14 | 0.21 | 0.11 | | 0.21 | | |
| | NHK Gag show | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

4.3 Results

20 new ideas were generated as the outcomes from four innovation workshops. According to the proposed evaluation method, 10 out of 20 ideas were assessed as appropriate ideas as shown in the figure 21).

Figure 21. The results of outcomes from the innovation workshops based on the proposed evaluation method



As we can see from the results, analogical thinking does not always promote domain-changing. 25% of participants were able to import the structural features from the source cases, however, unable to apply it to the new domain, which are superficially far from the existing domains. Other 25% of participants failed to apply the structural similarity from the any source cases. It could be assumed that those participants generated the ideas not from during the workshop using analogical thinking as instructed, but from the inherent idea in long-term memory and failed to match the analogue with the source cases. Similarity-based access to long-term memory most often produces mundane literal, i.e. superficial similarity matches (Gentner et al., 1993 ; Reeves & Weisberg, 1994; Ross, 1989). K. J. Holyoak (1985) also noted that superficial similarity plays larger part, when there is a lack of understanding of the conceptual ideas underlying the problems.

4.4 Issues in validation of the proposed method

To propose a new evaluation method, it needs to respond to threat to validity inherent in the design of evaluation method. Therefore, validation procedures are claimed to justify it. However, validity is generally achieved through accumulated evidence. A conclusion is valid when there is sufficient evidence and/or reasons to reasonably believe it is so (Polkinghorne, 2007). The purpose of the validation process is to convince readers of the likelihood that the support for the findings from a proposed method is strong enough that it can serve as a basis for understanding of and action in the related studies. This requires providing sufficient justification to readers for the claims we make. However, this study does not deal with large enough quantitative data, but the verbal and written descriptions given by participants. It is possible that certain data given by participants has obscure aspects. To overcome those drawbacks of data, this study tried to clarify each process of evaluation with detailed description, so that it can be repetitively applied in future studies and tested.

In general point of view, methods should be applicable and codifiable in a wide variety of circumstances by other researchers. The flaws of incorrect methods "are bound to manifest themselves in the vast multiplicity of their applications"(Rescher, 1977). A possible reason for the lack of validation of an evaluation method is the philosophical and methodological problems involved in validating methods (Moody, 2003). Rescher (1977) claimed that human knowledge consists of two types: 1) knowledge that, which define statements or assertions about the world; 2) knowledge how, which define ways of doing things. And he argues that an entirely different approach is required to validate methodological knowledge. In other words, if the methods have not truth value, but pragmatic value, it cannot be true or false, but only effective or ineffective. The validity of a method can only be established by applicative success in practice.

In this study, the objective of validation should not be to demonstrate that the method is "correct" but that it is rational practice to adopt the method based on its pragmatic success. However, despite its applicative success in practice, it requires to compare the results of the proposed evaluation method and those from the evaluation in terms of 'novelty', 'impact', and 'feasibility' of the generated ideas by judgement from experts or novices. Therefore, in future study, the

evaluation method will be improved to be a reliable and valid measure of the appropriateness in idea generation using analogical thinking.

5. Identification of factors for an appropriate idea generation

In the previous chapter, the results illustrated that an appropriate idea does not automatically occur whenever people were asked to generate an idea using analogical thinking after make them understand source ideas and build the knowledge on their structural features. Therefore, this study investigated what are the factors for an appropriate idea generation. For identifying factors, this study focuses on the factors which are controllable by workshop facilitation. Thus, all the data which are available from the workshop were analysed: each participant's performance in the categorization task; pattern in thinking process during the generation task. In addition, personal interview surveys were conducted after the workshop. Consequently, three factors were considered to have a significant relationship with the appropriateness of ideas generated using analogical thinking: 1) categorization skill; 2) deliberation before reaching the creative leap moment; and 3) having trial and error in setting a domain to be solved.

5.1 Performances in categorization as a factor of an appropriate idea generation

Despite the importance of analogical thinking, several questions were raised regarding the generation of new ideas from the source ideas and its structural mapping. One key question concerns the role of categorization in structural mapping. Many researchers have suggested that categorization may be importantly related to analogical reasoning (Bowdle & Gentner, 2005; Gentner & Markman, 1997; Hesse, 1966; K. J. Holyoak & Thagard, 1997; Sternberg, 1977). Generally, analogy research has treated categorization as an end result of analogical reasoning. Gentner and Markman (1997), for example, argue that determining that two items or situations are analogous is an important criterion in deciding that the two entities are members of a common category.

During the categorization task, participants created the labels for categories they classified as a group. For example, as shown in the table 15, the participant 2B initiate a category which is based on the mechanism of matching service, *"How about start from the service that make some matching? For example, the case no.16?(2B)"* and the participant 2A initiate a category based on the large data collection from users to provide information for other users. *"the other one, their structure is based more on collecting the from the large group And then passing that information to a single person(2A)"*. The refined and decided the final labels of their categories as 'service

chain: provider-middle man-consumer’ and ‘General public as resource’ through their discussion. The performance in categorization task is assessed by which labels of categories a participant created, and how many cases were classified under those labels, and how many of them actually fit under those categories. In the 1st- 4th workshops, there were eight groups in total, and each group created 5.5 labels on average, overall, 79% of cases were categorized correctly. Thus, if a subject categorized cases in the labels he or she created with more than 79% of correctness, his or her categorization skill was assessed as “high” (see the table 16).

Table 15. Example of the categorization by discussion

| Time | Duration(sec.) | Subject | Discourse |
|-----------------|----------------|-----------|--|
| 00:28:13 | 26 | 2A | Do you have any initial idea? |
| 00:28:15 | 2 | 2C | Not particularly |
| 00:28:24 | 9 | 2B | I wonder how much we can create. |
| 00:28:52 | 28 | 2B | So how about start from the services that make some match, matching |
| 00:29:02 | 10 | 2A | matching? |
| 00:29:04 | 2 | 2A | which one? |
| 00:29:07 | 3 | 2B | for example, No.16. match |
| 00:29:25 | 18 | 2B | And there's another one.. |
| 00:29:41 | 16 | 2A | I think I, when I read this, I recognized 3 types of structures. |
| 00:29:54 | 13 | 2A | So, one is e.g. the one you have in the left, those services , |
| 00:30:04 | 10 | 2A | They are, they connect one person. |
| 00:30:07 | 3 | 2A | Should we?... for another person? |
| 00:30:11 | 4 | 2A | But then, the other one, their structure is based more on |
| 00:30:22 | 11 | 2A | collecting the from the large group |
| 00:30:30 | 8 | 2A | And then passing that information to a single person |
| 00:30:37 | 7 | 2A | What's your think? |
| 00:30:39 | 2 | 2C | This is from the , maybe, consumer's point of view. |
| 00:30:43 | 4 | 2C | from the business point of view, which is like No.59, what they do is like, they create a competition, and the one who wins, he will be using that service |
| 00:30:54 | 11 | 2C | instead of giving the content to someone. |
| 00:30:57 | 3 | 2C | for more something to do more particular one |
| 00:31:05 | 8 | 2C | They create like an open competition, and they get a better result, so this is from the point of view of business |
| 00:31:12 | 7 | 2C | some of them are from the consumer's point of view, the you get a better result or something. |

Table 16. Performance in categorization task and idea generation task in the 1st-4th workshop

| Subject | Created label | No. of Cases | | (B)/(A) | Categorization skill | Appropriateness of a new idea |
|-----------------------|---|--------------|---------|---------|----------------------|-------------------------------|
| | | All (A) | Fit (B) | | | |
| 1A | Clients-Creators Intermediation | 7 | 6 | 91% | High | High |
| | Review based | 4 | 4 | | | |
| 1B | Collective intelligence | 7 | 5 | 55% | Low | Low |
| | Information distribution | 4 | 1 | | | |
| 1C | Frequency based | 4 | 4 | 100% | High | Low |
| | Monitoring | 1 | 1 | | | |
| 1D | Forum/Consulting, Ask question to users/Find users to solve a problem | 8 | 7 | 88% | High | High |
| 1E | None | 0 | 0 | 0% | Low | Low |
| Group 1 ³⁵ | | 35 | 28 | 80% | High | |
| 2A | General public as resource | 14 | 13 | 93% | High | High |
| 2B | service chain: provider-middle man-consumer | 8 | 8 | 100% | High | High |
| 2C | Increase efficiency of business | 3 | 3 | 100% | High | Low |
| Group 2 | | 25 | 24 | 96% | High | |
| 3-1A | Frequency analyzer | 4 | 4 | 86% | High | High |
| | Option provider | 2 | 1 | | | |
| | Info Exchange | 4 | 3 | | | |
| | connector | 4 | 4 | | | |
| 3-1B | Feedback based on opinion | 4 | 4 | 75% | Low | Low |
| | info sharing | 4 | 2 | | | |
| Group 3-1 | | 22 | 18 | 82% | High | |
| 3-2A | mass data | 8 | 4 | 72% | Low | Low |

³⁵ In the first workshop, as a pilot, 36 cases were given for the categorization task.

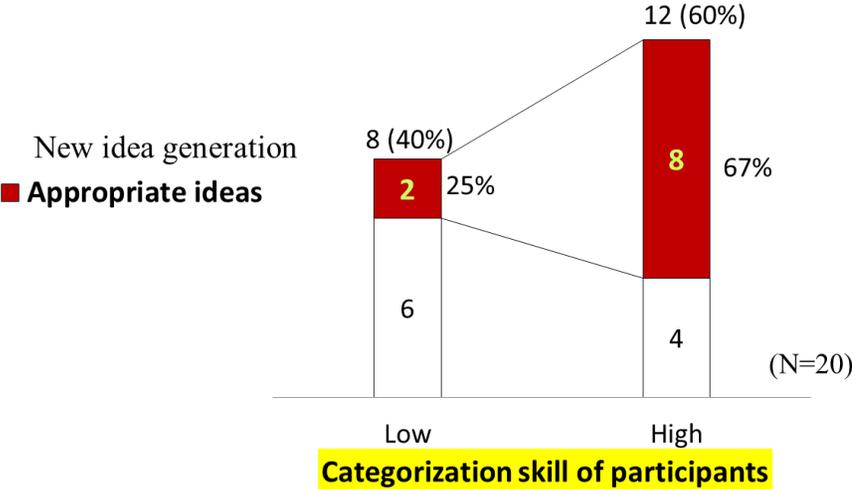
| | | | | | | |
|-----------|---|----|----|------|------|-------------------|
| | matching | 2 | 2 | | | |
| | user review | 8 | 7 | | | |
| 3-2B | sourcing | 6 | 5 | 83% | High | N/A ³⁶ |
| Group 3-2 | | 24 | 18 | 75% | Low | |
| 3-3A | public reviews | 4 | 2 | 50% | Low | Low |
| | sharing experience | 4 | 3 | | | |
| | sharing ideas | 6 | 2 | | | |
| 3-3B | consultation | 4 | 4 | 73% | Low | N/A |
| | recommendation | 7 | 4 | | | |
| Group 3-3 | | 25 | 15 | 60% | Low | |
| 4-1A | on-time information | 4 | 2 | 67% | Low | High |
| | suggestion | 2 | 2 | | | |
| 4-1B | recommendation to both sides | 4 | 3 | 64% | Low | High |
| | solution-giver | 7 | 4 | | | |
| 4-1C | expert's service | 2 | 2 | 75% | Low | Low |
| | predicting suggestion | 6 | 4 | | | |
| Group 4-1 | | 25 | 17 | 68% | Low | |
| 4-2A | linking supply and demand | 3 | 3 | 100% | High | High |
| 4-2B | crowd sourcing and reviewing | 4 | 3 | 82% | High | High |
| | expert advice | 3 | 2 | | | |
| | improving customer experience through recommendations | 4 | 4 | | | |
| 4-2C | information | 3 | 2 | 82% | High | High |
| | information and evaluation | 8 | 7 | | | |
| Group 4-2 | | 25 | 21 | 84% | High | |
| 4-3A | places review | 4 | 4 | 82% | High | High |
| | pool of knowledge | 3 | 2 | | | |

³⁶ In the two pair groups of group 3-2; and group 3-3, subjects were generated idea in pair, but main idea creation was performed by the participant 3-2A; and the participant 3-3A.

| | | | | | | |
|-----------|----------------------|-----|-----|------|---------|-----|
| | solution application | 2 | 2 | | | |
| | solution creation | 4 | 2 | | | |
| | tailor-made | 4 | 4 | | | |
| 4-3B | matching | 3 | 3 | 100% | High | Low |
| | review & comparison | 2 | 2 | | | |
| Group 4-3 | | 22 | 19 | 86% | High | |
| Total | | 203 | 160 | 79% | Average | |

Consequently, the relationship between the participant’s performance in categorization task and the appropriateness of a generated idea is identified. As shown in the figure 22, eight out ten appropriate ideas were generated by the participants with higher skills in categorization. 12 participants out of 20 showed high performance in categorization task, and 67% of them generated an appropriate idea, while only 25% of the low performance group in categorization task generated an appropriate idea.

Figure 22. Relationship between categorization skill and appropriate idea generation



In order to generate an appropriate idea using analogical thinking, understanding the underlying mechanism of source ideas is essential to expand a span of idea by breaking the conventionalized semantic relations within domains (Gentner, 1983; K. J. Holyoak & Thagard, 1996). For example, when a participant selected Amazon.com as a source idea, it is necessary to understand the business mechanism of “customized proposal based on the analysis of data from other consumers shopping behaviors”, instead of focusing on the domain of “shopping”.

5.2 Thinking process in ideation as a factor of appropriate idea generation

During the process of generating an idea, creators probably have experience of the sudden illumination, which is called the creative leap, or mental leap. For example, in creative design task, designers may clearly recognize breakthroughs or significant concept generation points, exclaiming ‘Ah-ha!’, ‘Eureka!’ or ‘Good idea!’. Cross (1997) pointed out that the sudden illumination is more like building a ‘creative bridge’ between the problem space and the solution space and expression of the concept actually ‘accumulates’ a lot of prior concepts, examples and discussion. Clement (2008) classified ‘breakthrough’; ‘scientific insight’; and ‘pure Eureka event’, and defined each term as follows: a breakthrough is a process that produces a key idea, which is an important component of a solution, and that overcomes a barrier that can block progress toward a solution; a scientific insight is a breakthrough occurring over a reasonably short period of time leading to a significant structural improvement in one’s model of a phenomenon; a pure Eureka event as an extremely sudden, reorganizing, extraordinary break away from the subject’s previous ideas. Here, “extraordinary” refers to processes such as unconscious that are different from normal thinking. If the idea came to mind unexpectedly and does not appear to be connected to the subject’s previous ideas during the process, this would constitute an evidence for an extraordinary and presumably unconscious thinking process.

However, it should be considered that whether this subject’s accomplishment is the result of a smooth incremental, buildup from previous ideas or it is sudden extraordinary break with the subject’s previous ideas. Clement (2008) concluded that the subject who created a novel idea in his experiment should be characterized as an impressive scientific insight triggered by a series of analogies, not as a pure Eureka event. In addition, after reviewing the literature on insight in

creative thinking, Perkins (1981) claimed that there is no convincing body of evidence that insights occur via special or extraordinary processes.

We assume that the creative moment should come after deliberation. In other words, longer incubation or more efforts before the moment of insight may help us to improve the performance in generating an idea. Therefore, it is important to investigate the thinking process while generating new ideas. In this study, thinking process in the idea generation task can be identified with analysis of the record from the APISNOTE, and interview survey (see the figure 23 and 24).

Figure 23. An example of ideation process shown in APISNOTE



In the interview, each participant indicated the note that makes the creative leap during the generation task. Based on the record in the APISNOTE, each process was coded as ‘mechanism’; ‘source retrieval’; ‘domain setting’; ‘domain refining’; ‘title’; and ‘others’ (see the table 17).

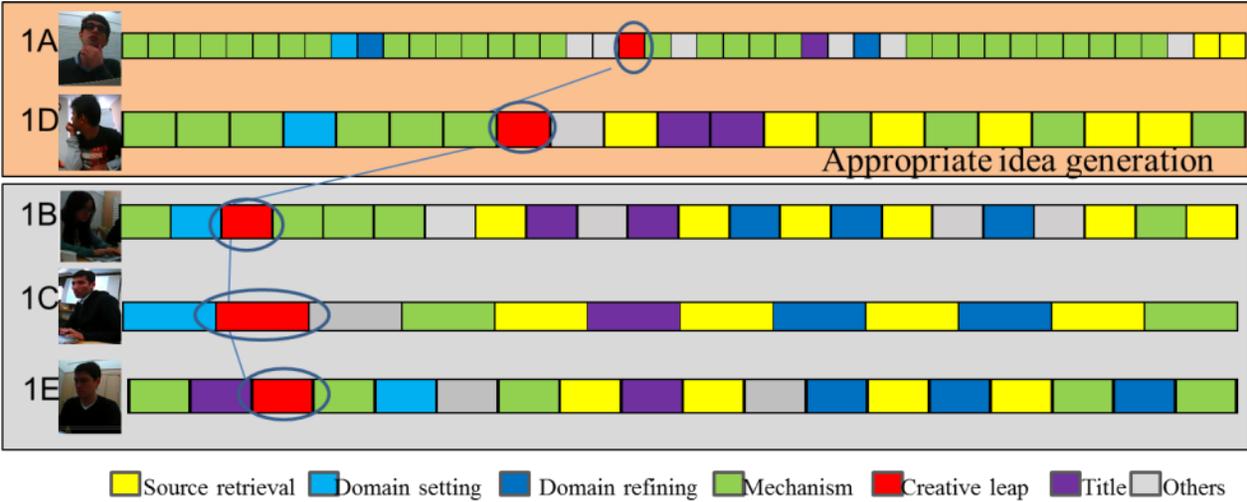
Table 17. A sample of coding for idea generation process

| No. | time record | time spending | Created Notes | Coding |
|-----|-------------|---------------|---|---------------------|
| 1 | 15:24:51 | | service chain: provider-middle man-consumer | Selecting mechanism |
| 2 | 15:24:51 | 00:00:00 | Case: Katariba cafe | Source retrieval |
| 2 | 15:24:51 | 00:00:00 | Case: Creative agency for everyone | Source retrieval |
| 2 | 15:24:51 | 00:00:00 | Case: Innocentive | Source retrieval |
| 2 | 15:24:51 | 00:00:00 | Case: Conyac | Source retrieval |
| 2 | 15:24:51 | 00:00:00 | Case: Kopernik | Source retrieval |
| 2 | 15:24:51 | 00:00:00 | Case: Lancers | Source retrieval |
| 2 | 15:24:52 | 00:00:01 | Case: lang-8 | Source retrieval |
| 2 | 15:24:52 | 00:00:00 | Case: Logo tournament | Source retrieval |
| 3 | 15:25:11 | 00:00:19 | professional people as resource | Mechanism |
| 4 | 15:34:22 | 00:09:11 | young people sometimes need help with homework | Domain setting 1 |
| 5 | 15:34:54 | 00:00:32 | homework coaching can be provided by many students | Domain refining |
| 6 | 15:35:09 | 00:00:15 | It's also possible to do it online | Mechanism |
| 7 | 15:37:40 | 00:02:31 | convenient - no need to arrange meeting place. Also no travel costs | Mechanism |
| 8 | 15:38:21 | 00:00:41 | Coaches: must at least have a high school diploma | Mechanism |
| 9 | 15:41:24 | 00:03:03 | homework coach matching service | Title |
| 10 | 15:42:27 | 00:01:03 | aligning reported mechanism | Mechanism |
| 11 | 15:52:57 | 00:10:30 | In Japan, people sometimes need assistance filling out complicated forms (especially foreigners) | Creative leap |
| 12 | 15:53:27 | 00:00:30 | There are many people who are good at filling out forms | Domain setting 2 |
| 13 | 15:54:59 | 00:01:32 | Not all foreigners have Japanese biligual friend to help them fill out forms | Domain refining |
| 14 | 15:55:19 | 00:00:20 | Forms can be scanned/photographed easily | Mechanism |
| 15 | 15:56:32 | 00:01:13 | Fill-my-form buddy matching service | Title |
| 16 | 16:00:34 | 00:04:02 | there are many foreign students in Todai | Domain setting 3 |
| 17 | 16:01:10 | 00:00:36 | Sometimes, when they go back to their country, they have many belongings which they should get rid of | Domain refining |
| 18 | 16:02:18 | 00:01:08 | many new students could use those belongings | Domain refining |
| 19 | 16:04:16 | 00:01:58 | Todai-portal for (foreign) students to share & buy belongings | Title |
| 20 | 16:13:49 | 00:09:33 | Analogy table | Analogy table |

| | | | | |
|----|----------|----------|---|------------------|
| 21 | 16:16:10 | 00:02:21 | Fill-my-form buddy matching service | Title |
| 22 | 16:16:52 | 00:00:42 | Japanese people proficient at filling our forms can register in a website | Mechanism |
| 23 | 16:19:20 | 00:02:28 | consumers scan/photograph form and send it to buddy. Buddy will explain how to fill in each blank | Mechanism |
| 24 | 16:23:20 | 00:04:00 | A randomly chosen provider verifies work. A commission is paid by the consumer. | Mechanism |
| 25 | 16:24:31 | 00:01:11 | People proficient at translation | Source retrieval |
| 26 | 16:25:35 | 00:01:04 | People proficient at bureaucracy | Domain refining |
| 27 | 16:26:01 | 00:00:26 | Work can be delivered digitally | Mechanism |
| 28 | 16:26:31 | 00:00:30 | Alternative to design companies which may charge high commission. | Mechanism |
| 29 | 16:28:24 | 00:01:53 | Alternative to consulting firms which charge high fees and are not accessible online. | Mechanism |

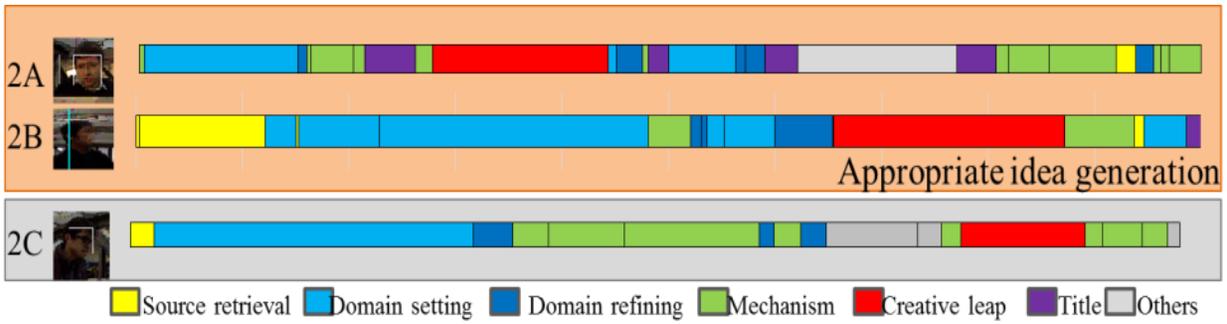
Figure 24. Thinking processes of each participant in the generation task: the 1st-4th workshop

a) The first workshop(N=5)

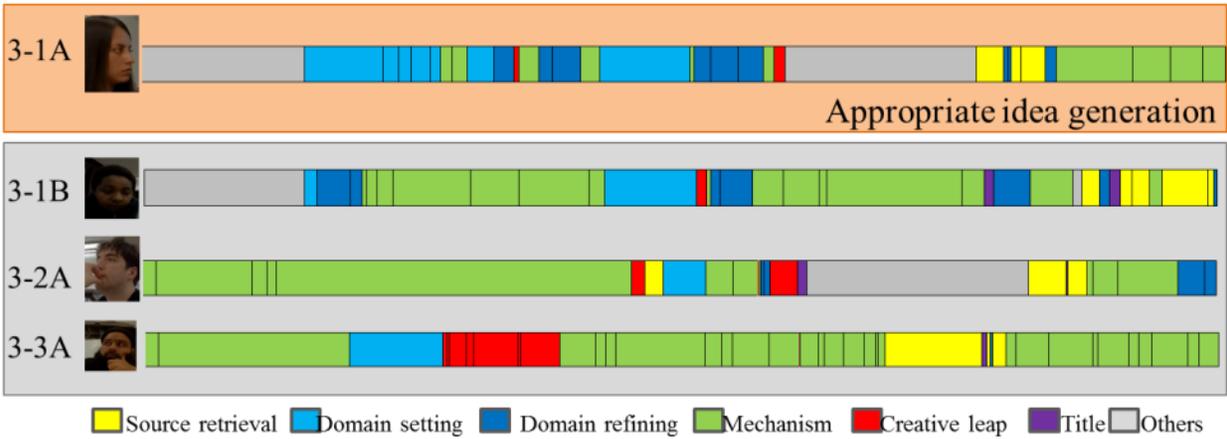


Note) Recording of time for creation of each note has been available since the second workshop. Thus, each sequence is evenly distributed in terms of time, for coding of the first workshop. However, since second workshop, each sequence was coded based on the spent time for creating each note.

b) The second workshop(N=3)

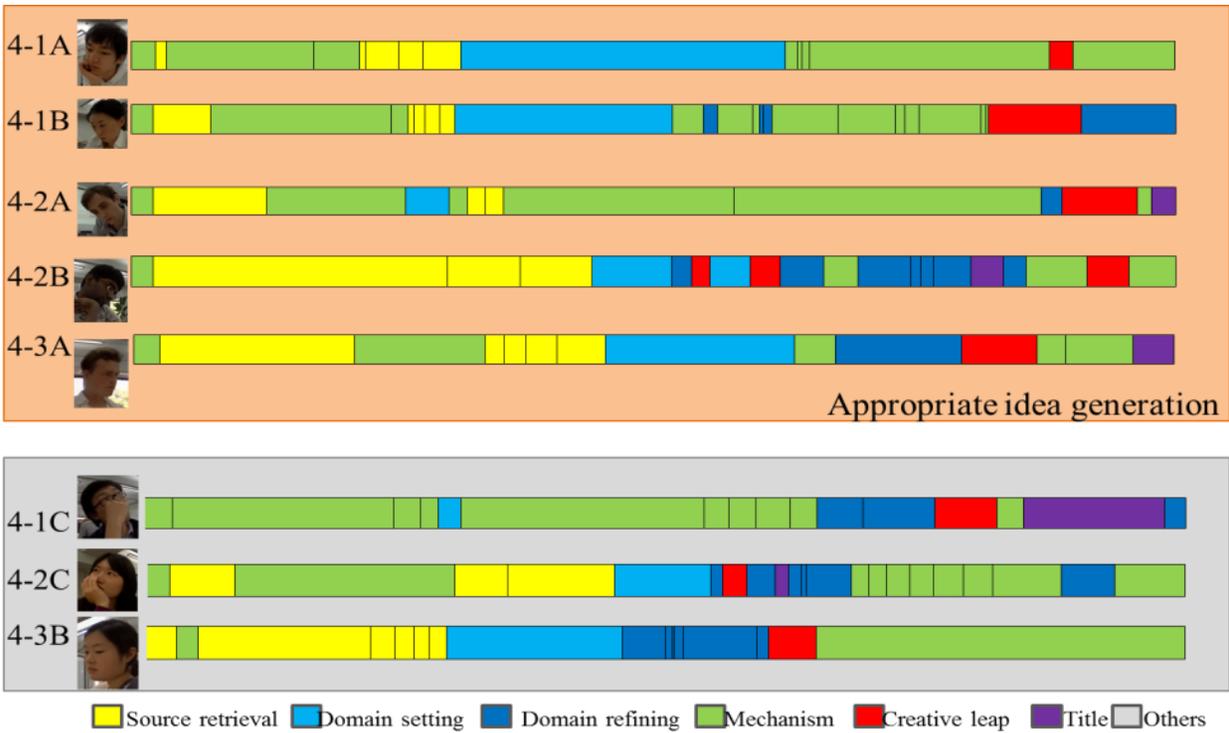


c) The third workshop(N=4)



Note) There were three groups of a pair in the third workshop. Two ideas were generated individually, the other two ideas were generated in a pair.

d) The fourth workshop



The degree of deliberation before reaching creative leap was defined as at which sequence of creating notes, a participant reached the creative leap moment(s) among all the ideation process in terms of the number of notes he or she created. If a participant indicated that he or she had the creative leap moment more than once, the average value was adopted. According to the histogram analysis (see the figure 25), it was found that five participants had ‘low’ level of deliberation, and the other 15 participants had ‘high’ level of deliberation before reaching the creative leap moment (see the table 18).

Figure 25. Histogram analysis of participants’ deliberation before reaching creative leap moment

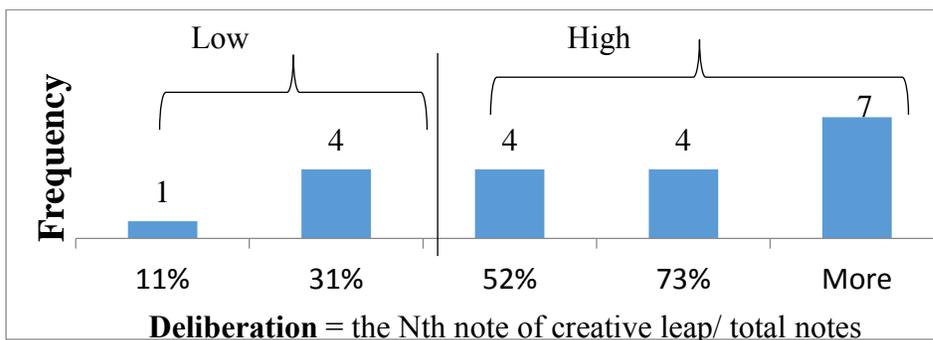
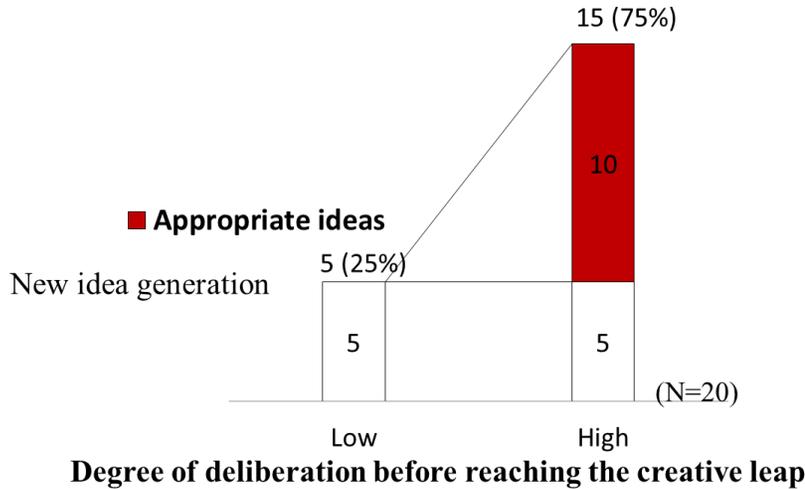


Table 18. The degree of deliberation before reaching the creative leap moment (in terms of the Nth order) and the appropriateness of a new idea

| Subject | the Nth note of creative leap (A) | total notes (B) | A/B | Deliberation | Appropriateness of new idea |
|---------|-----------------------------------|-----------------|-----|--------------|-----------------------------|
| 1A | 18 | 38 | 47% | High | High |
| 1B | 2 | 19 | 11% | Low | Low |
| 1C | 3 | 12 | 25% | Low | Low |
| 1D | 8 | 22 | 36% | High | High |
| 1E | 3 | 17 | 18% | Low | Low |
| 2A | 10 | 27 | 37% | High | High |
| 2B | 12 | 18 | 67% | High | High |
| 2C | 13 | 16 | 81% | High | Low |
| 3-2A | 15 | 26 | 58% | High | Low |
| 3-1A | 21 | 32 | 66% | High | High |
| 3-1B | 12 | 33 | 36% | High | Low |
| 3-3A | 10 | 41 | 24% | Low | Low |
| 4-1A | 13 | 15 | 87% | High | High |
| 4-1B | 9 | 12 | 75% | High | High |
| 4-1C | 13 | 17 | 76% | High | Low |
| 4-2A | 22 | 24 | 92% | High | High |
| 4-2B | 17 | 19 | 89% | High | High |
| 4-2C | 6 | 21 | 29% | Low | Low |
| 4-3A | 9 | 13 | 69% | High | High |
| 4-3B | 15 | 16 | 94% | High | Low |

Accordingly, the relationship between the deliberation before reaching the creative leap moment and the appropriateness of generated idea has been identified as shown in the figure 26.

Figure 26. Relationship between degree of deliberation before reaching the creative leap stage and the appropriate idea generation



Therefore, it is found that deliberation in the early stage of idea generation is prerequisite for appropriate idea generation. However, another factor should be explained for the 33% of participants who had deliberation could not generate an appropriate idea. In interviewing participants, we realized that participants who generate an appropriate idea reflected on their creative leap moment associating with the alteration in domains for a new idea.

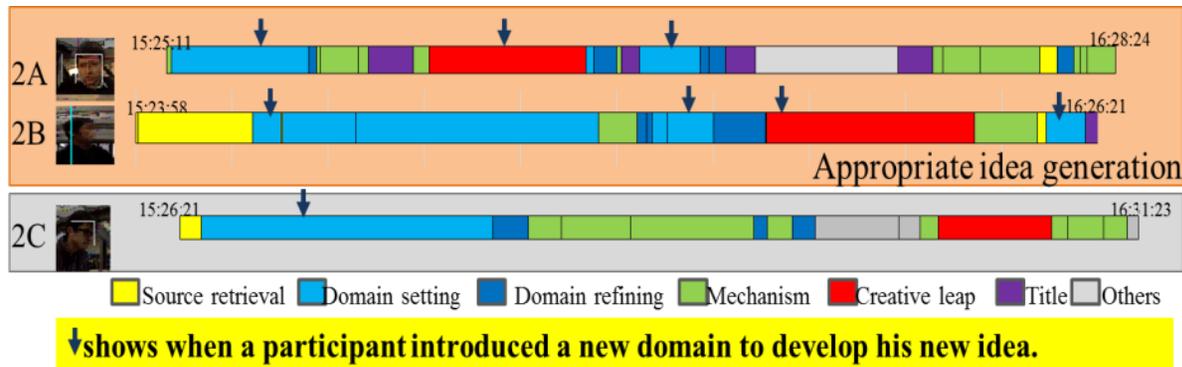
“First, I thought about homework coaching idea, but I didn’t think it’s novel, then I turn back to the mechanism I selected, then, I thought another idea about my own experience, and it could be solved with this mechanism. (2A)”

“First, for the map based database, I thought about the toilet information on the map, then when I see this bike map image, the wifi map came to my mind. (2B)”

“My creativity started with the medical examination, to start with this. I would say, it’s from this mechanism, “Frequency analyser”, and this fitness shaking bed as an alarm then I turned to blood donation idea. I think those two.(3-1A)”

From the interview survey with participants who generated an appropriate idea, it was found that ‘having trial and error’ is a crucial process for generating an appropriate idea.

Figure 27. Example of coding for participants’ trial and error before deciding the domain for a new idea



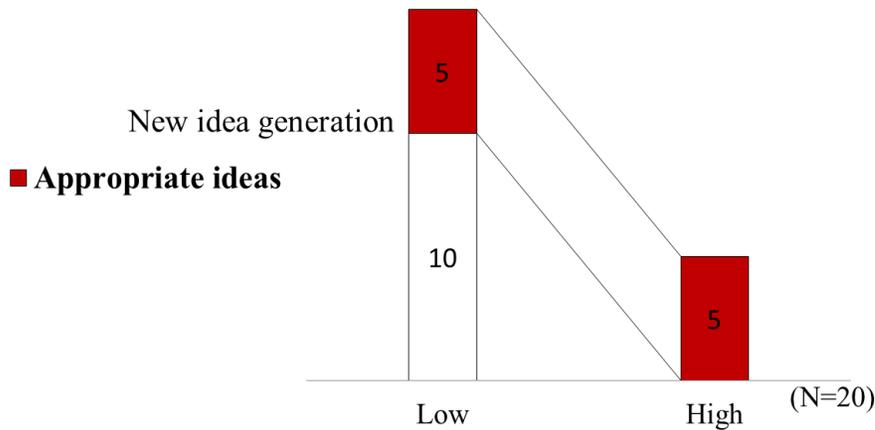
The degree of trial and error was measured by the number of domains considered for generating a new idea. If a participant considered more than three domains for generating a new idea, it is assessed as ‘high’. Also, if a participant deleted his or her previous notes more than five times before coming to think of the domain of the new idea, it was also regarded as having trial and error. The results from the 1st to 4th workshops, five out of twenty participants showed high degree of having trial and error in deciding a domain for a new idea (see the table 19) and all of those five participants generated an appropriate idea (see the figure 28). Thus, we can conclude that having high degree of trial and error before deciding the final domain for a new idea has significant relationship with the appropriateness of a generated idea.

Table 19. The degree of trial and error in finding the domain and the appropriateness of a new idea

| Subject | New idea | No. of domains considered | No. of deleted notes before introducing a domain | Degree of trial and error | Appropriateness of new idea |
|---------|----------------------------------|---------------------------|--|---------------------------|-----------------------------|
| 1A | Ultimate movie recommendation | 1 | 5 | High | High |
| 1B | beauty map | 1 | 0 | Low | Low |
| 1C | soft loan for educating the poor | 1 | 0 | Low | Low |
| 1D | quick geek fix | 1 | 0 | Low | High |

| | | | | | |
|-------|------------------------------------|---|---|------|------|
| 1E | city microscope | 1 | 0 | Low | Low |
| 2A | fill out my forms | 3 | 0 | High | High |
| 2B | wifi finder | 6 | 0 | High | High |
| 2C | PET finder | 1 | 0 | Low | Low |
| 3-2AB | job finder for graduate | 1 | 0 | Low | Low |
| 3-1A | blood donation | 6 | 0 | High | High |
| 3-1B | cut&fill | 2 | 0 | Low | Low |
| 3-3AB | e-database for shopping mall | 1 | 0 | Low | Low |
| 4-1A | moral education and sex education | 1 | 0 | Low | High |
| 4-1B | childcare | 1 | 0 | Low | High |
| 4-1C | Immersive education in microworlds | 1 | 0 | Low | Low |
| 4-2A | personal education | 1 | 0 | Low | High |
| 4-2B | Services for education | 3 | 0 | High | High |
| 4-2C | elite education | 1 | 0 | Low | Low |
| 4-3A | career change | 1 | 0 | Low | High |
| 4-3B | a job advisor | 1 | 0 | Low | Low |

Figure 28. Relationship between trial and error before deciding the domain for a new idea and the appropriateness of idea generated



Degree of having trial and error in finding the domain for a new idea generation

In conclusion, three main factors were found for enhancing the appropriateness of ideas generated using analogical thinking: 1) categorization skill; 2) deliberation before reaching the creative leap moment; 3) having trial and error for finding the domain of new idea generation. According to the results from four workshops with 22 participants, 60% of participants showed high level of categorization skill, 75% of participants showed high level of deliberation before reaching the creative leap moment, however, only 25% of participants had high level of trial and error in finding the domain of new idea.

Many studies indicate that when people facing complex problems, they tend to focus on a familiar ideas rather than to make efforts to think creatively (A. M. Collins & Loftus, 1975; Mednick, 1962; Tversky & Kahneman, 1974). This is mainly due to the limitations of working memory, in terms of its capacity (Brown, 1958; Miller, 1956). Baddeley (1997), who studied the role of memory and knowledge as basic cognitive mechanism of generating an idea, found that human have at least two types of memory: long-term memory as the storage area for an accumulation of knowledge; whereas working memory is the smaller, temporary workspace for items that are under active consideration at the moment. Because of limitations in the capacity of human’s working memory, we need a new workshop design and the facilitator that enable us to overcome those limitations.

Although there exist numerous studies which suggest several methods that have been demonstrated to encourage people to create new ideas, there are not enough research which

empirically identify factors for enhancing the appropriateness of new ideas, and how the facilitator stimulate people to strengthen those factors by developing a workshop design. Therefore, this study suggests a specific workshop design that effectively promotes participants to have more trial and error in finding the domain for new idea generation, of course this will lead participants have more deliberation before reaching the creative leap moment in their thinking process for an idea generation.

6. A proposal for workshop design

Goldschmidt (2001) noted that even though it is possible to train people to retrieve and activate that knowledge using analogical thinking in appropriate manner, in other words, applying high structural similarity with low superficial similarity between source and the target ideas, it is much harder than other training methods. In addition, Chupin (1998) reported a pedagogic experiment in which students of architecture are given cross-domain analogies with which they are required to work. Unfortunately the report does not give any information on the effect of this experimental procedure on students' performance. To overcome those drawbacks of existing research, this study proposes a workshop design and implements it to students to examine effectiveness of the proposed workshop design.

Our aim of the innovation workshop is to help participants using analogical thinking to generate appropriate ideas. According to the result of analysis in the chapter 5, it is found that there are three main factors for enhancing the appropriateness of ideas generated using analogical thinking: 1) categorization skill, 2) deliberation before reaching the creative leap moment, 3) trial and error in finding the problem domain. Therefore, a workshop design method should be developed for encouraging participants to promote each factor. However, categorization skill is hard to be trained through the workshop facilitation. It presumably results from personal level of knowledge, and group dynamics during the categorization task. Thus, this study focuses on the thinking process as a controllable factor by the workshop facilitation.

6.1. A workshop design proposal to promote thinking process for an appropriate idea generation

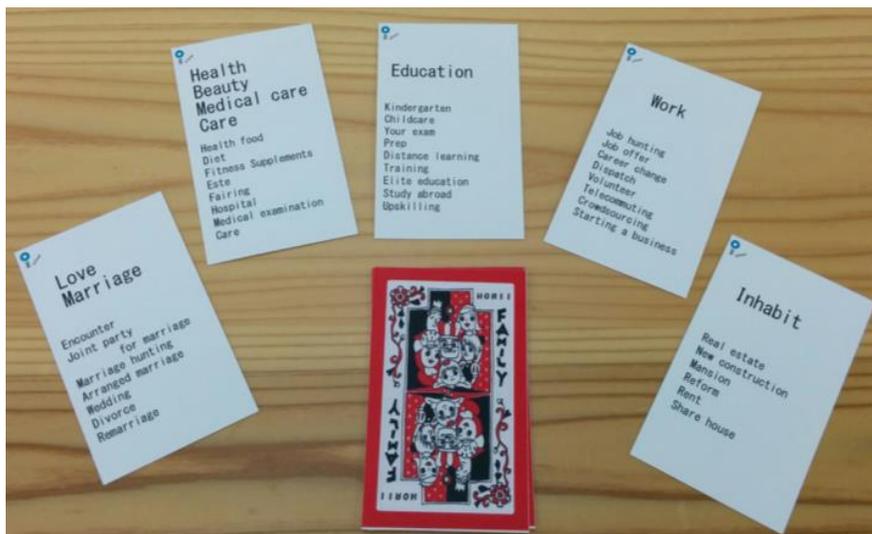
Deliberation for generating an appropriate idea does not impede serendipity, in other words, the accidental discovery of something valuable. Historically, conditions for new idea generation are both deliberate and accidental, for the reason that experience cannot be completely controlled and chances always may happen. Regardless the unexpected role of serendipity, training measures for participants and their deliberate efforts encourage generating appropriate ideas. Proposal of a workshop design regarding to thinking process for enhancing appropriateness using

analogical thinking is crucial, because if a workshop design method was carefully constructed, participants' deliberate efforts will perform better to discover new and original things.

Various researchers from diverse disciplines argued on providing external stimuli to initiate serendipitous flashes of insight (N. Bonnardel, 2000; Dugosh et al., 2000; Santanen, Briggs, & Vreede, 2004). Stimuli exhibit new potential analogies that otherwise would not be taken into consideration, which is a principle that is found in various approaches for generating an idea.

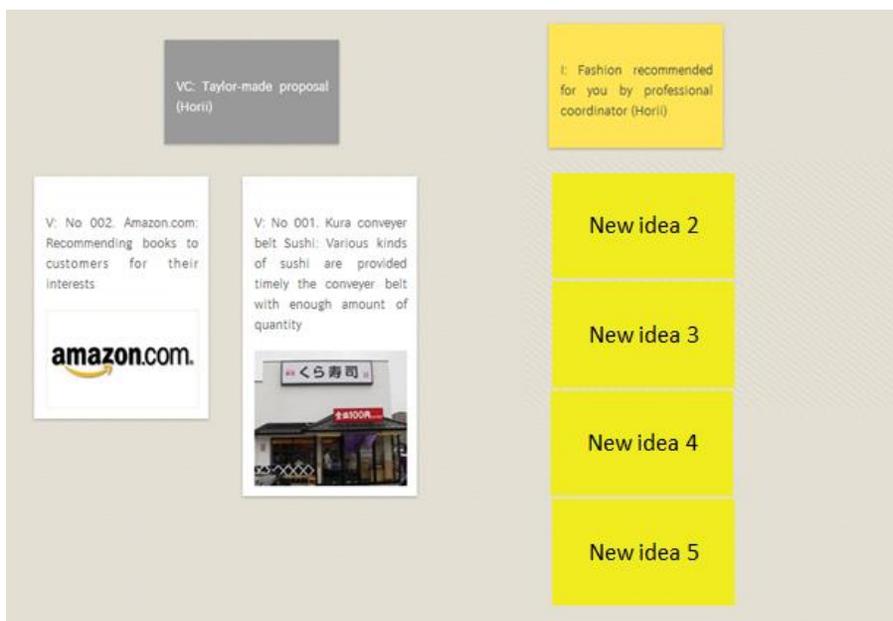
In this research, a workshop design is proposed to encourage participants to be actively involved in the process of generating ideas during the early stage of the generation task, in other words, having a deliberation before reaching the creative leap, or having a trial and error before deciding the domain for a new idea. Thus, the final domain selection step needs to be followed after self-reflection on the divergent ideation process which enables a participant to reach out further domains. Since the 5th workshop, new workshop design was developed and implemented, in order to foster deliberation before reaching the creative leap moment, and trial and error in finding the domain for a new idea generation. We presented the domain cards to participants to help them finding diverse domains for a new idea generation (see the figure 29).

Figure 29. Domain cards presented for finding the domain for new idea generation



Presenting numbers of domain candidates is not enough for encouraging participants to have high degree of deliberation before reaching the creative leap, as well as having trial and error in finding a domain for the new idea generation. The additional instruction was given for facilitating deliberation and having trial and error. Participants were asked to generate five new ideas as diverse as possible in terms of its business domain for 15 minutes, then completing a new idea generation using analogical thinking (see the figure 30).

Figure 30. Instruction for improving thinking process



Choose one new idea and complete an analogy table

I: Fashion recommended for you by professional coordinator (Horii)

Data bases are created for famous fashion coordinator from all their works

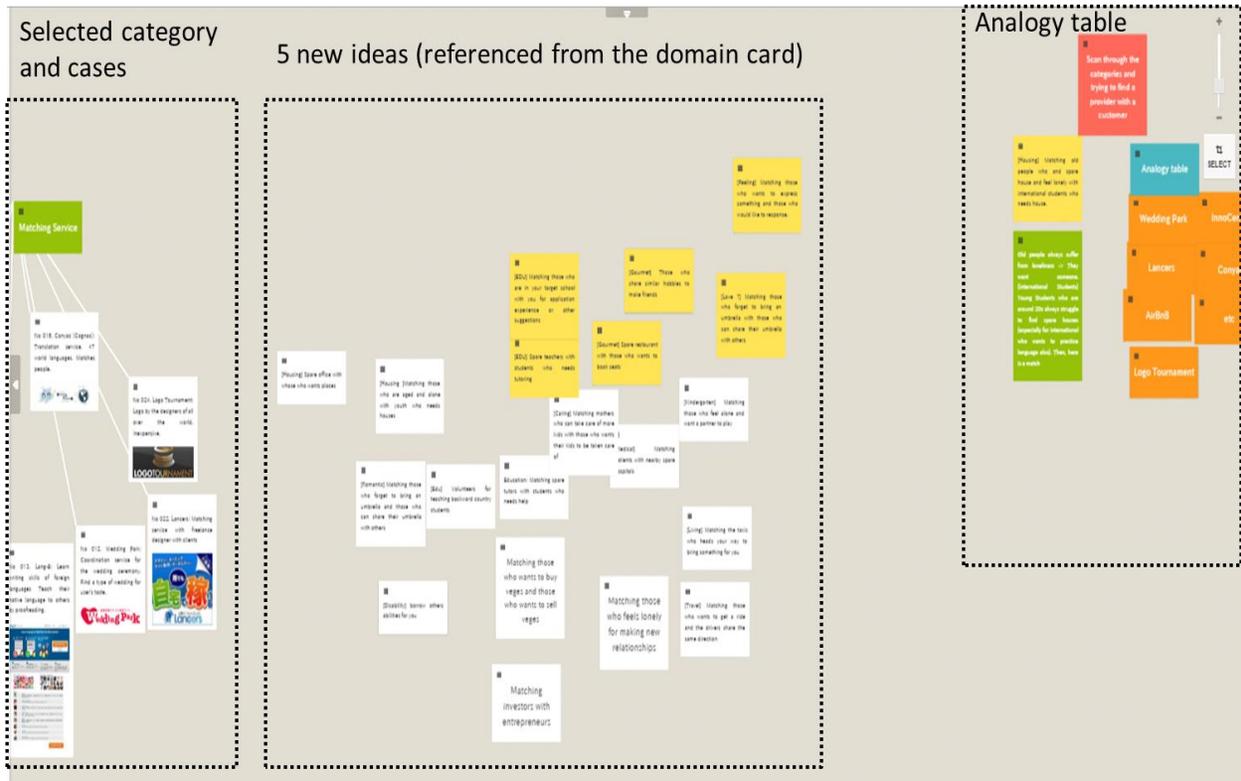
User choose one coordinator and a coordination of clothes, bags, and so on are recommended based on the history of the user's purchase and the database of the coordinator.

| Analogy Table | Taylor-made proposal |
|--|---|
| Amazon | Fashion for you |
| Books | Coordinated clothes, bags, shoes |
| Provided Value : Proposal of books that the user likes | Provided Value : Proposal of fashion by famous coordinators |
| Mechanism of value provision : Database of information browsing history and purchase history and analysis of similar customer data | Mechanism of value provision : Database of works of famous fashion coordinators + user's purchase history |

6.2. Results

The proposed workshop design asks all participants to generate five new ideas in yellow notes as diverse as possible, by referencing the given domain card, and they were encouraged to record what they are thinking about those new ideas using white notes, within 15 minutes. After, they were asked to select one idea among those five ideas to generate a new idea using analogical thinking (see the figure 31).

Figure 31. A sample result of the idea generation task after applying the proposed workshop design

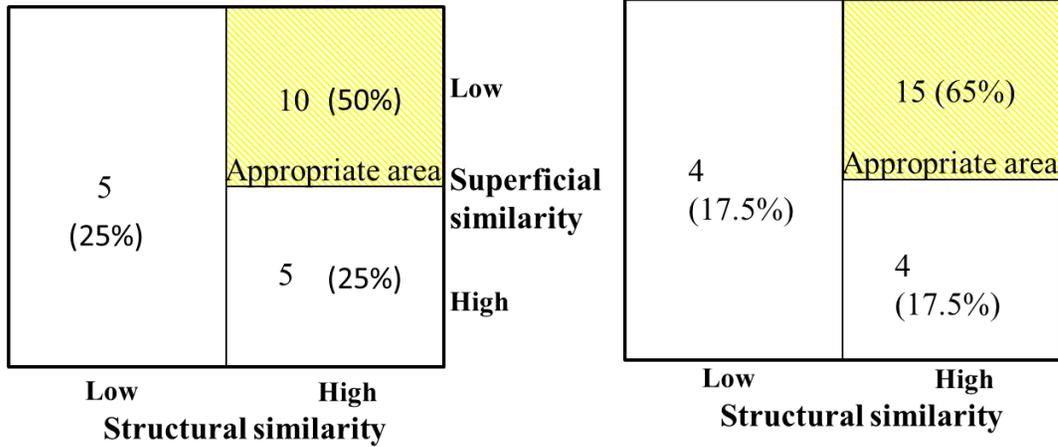


The outcomes of all participants were evaluated based on the identical evaluation method, which was proposed in the chapter 4. Comparing with the results from the 1st- 4th workshop, after applying the proposed workshop design, the proportion of appropriate idea generation has been increased from 50% to 65% (see the figure 32).

Figure 32. Comparison of results of the workshops between before (the 1st-4th) and after (the 5th-6th) the application of a new method

The 1st-4th workshop (N=20)

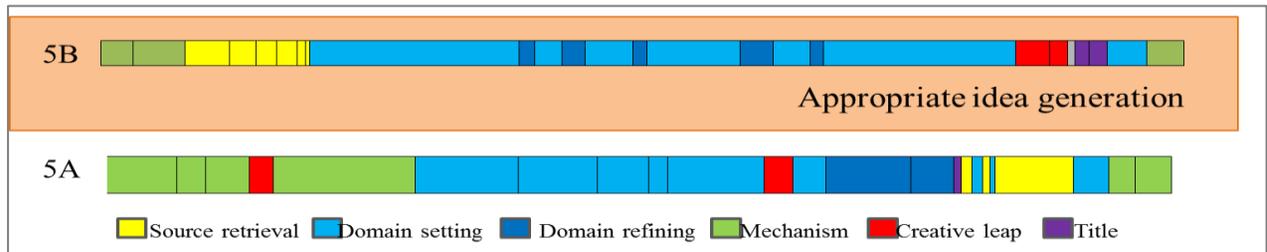
The 5th-6th workshop (N=23)



The proposed workshop design increased participant’s level of deliberation. 91% of participants had high degree of deliberation before reaching the creative leap moment under the new workshop design, while 75% of participants appeared to have high degree of deliberation in the previous workshops (see the figure 33 and 34).

Figure 33. Thinking processes of each participant in the generation task: the 5th – 6th workshops

a) the 5th workshop (N=2)



b) the 6th workshop (N=21)

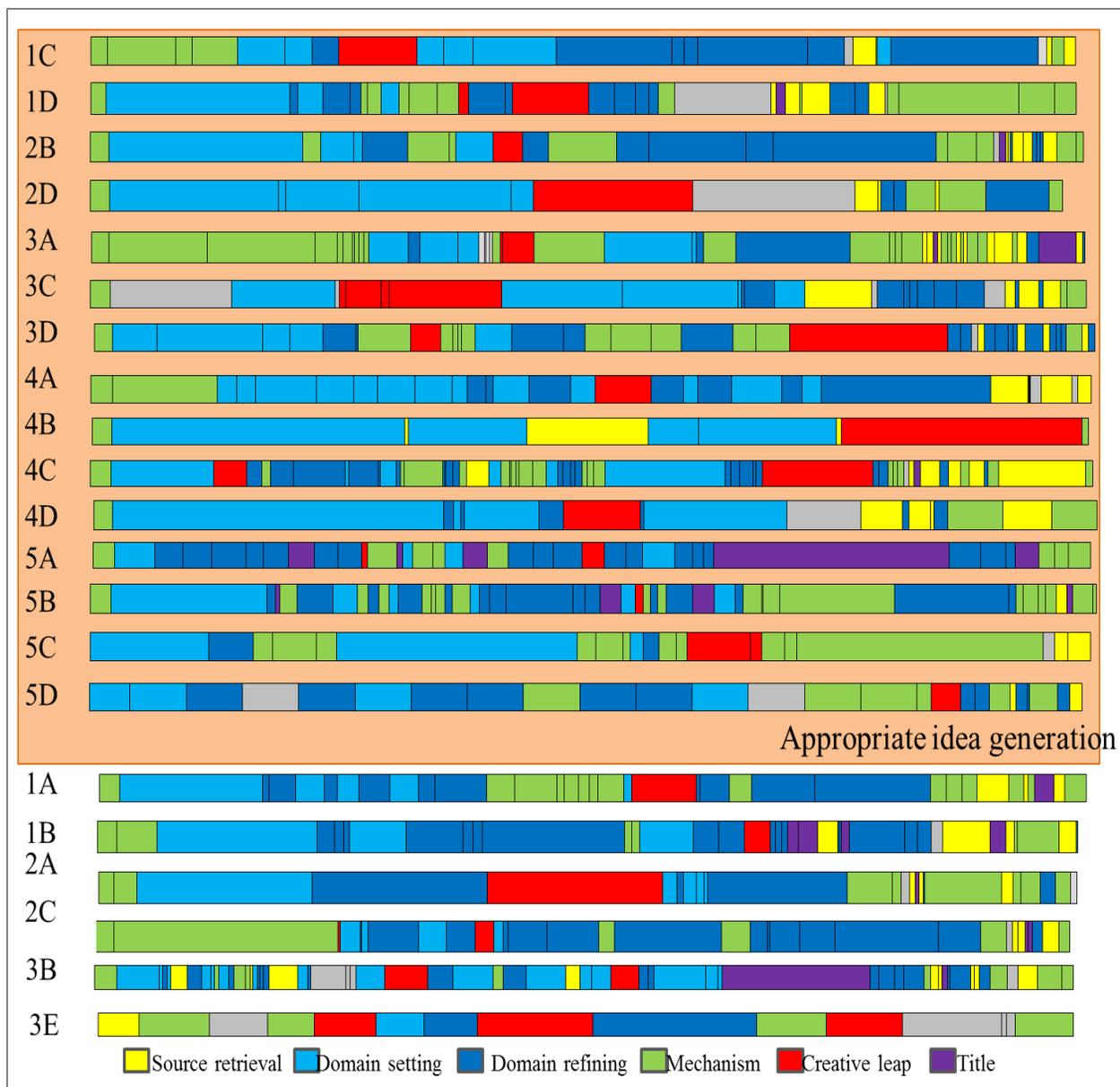


Table 20. The degree of deliberation before reaching the creative leap moment and the appropriateness of a new idea

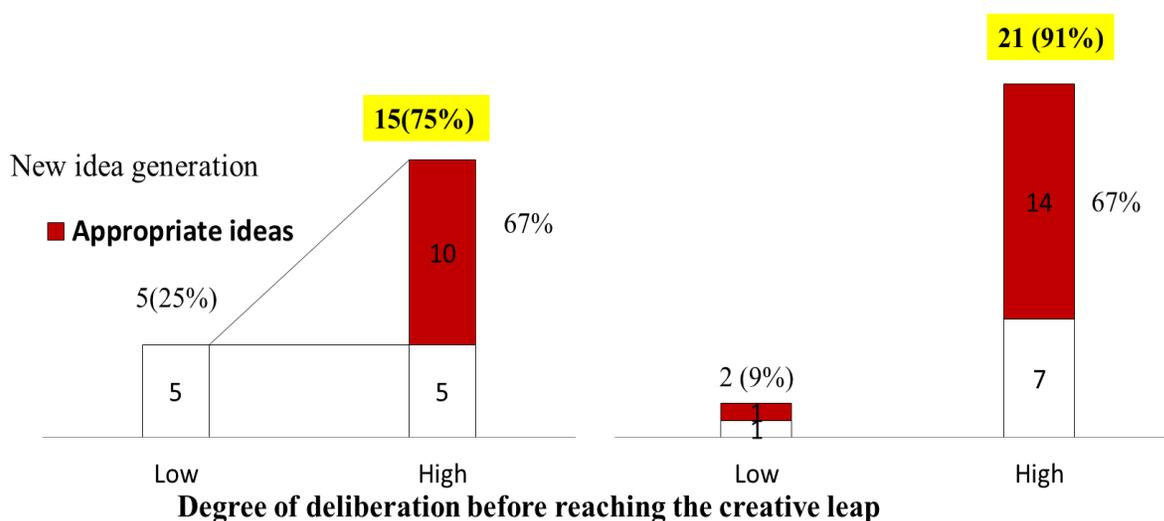
| Subject | the Nth note of creative leap (A) | total notes (B) | A/B | Deliberation | Appropriateness of new idea |
|---------|-----------------------------------|-----------------|-------|--------------|-----------------------------|
| 5A | 9 | 24 | 37.5% | High | Low |
| 5B | 20 | 26 | 76.9% | High | High |
| 6-1A | 21 | 36 | 58.3% | High | Low |
| 6-1B | 16 | 37 | 43.2% | High | Low |
| 6-1C | 8 | 25 | 32.0% | High | High |

| | | | | | |
|------|----|----|-------|------|------|
| 6-1D | 15 | 35 | 42.9% | High | High |
| 6-2A | 8 | 25 | 32.0% | High | Low |
| 6-2B | 10 | 32 | 31.3% | High | High |
| 6-2C | 7 | 32 | 21.9% | Low | Low |
| 6-2D | 7 | 17 | 41.2% | High | High |
| 6-3A | 20 | 51 | 39.2% | High | High |
| 6-3B | 32 | 60 | 53.3% | High | Low |
| 6-3C | 7 | 30 | 23.3% | Low | High |
| 6-3D | 16 | 40 | 40.0% | High | High |
| 6-3E | 8 | 15 | 53.3% | High | Low |
| 6-4A | 16 | 31 | 51.6% | High | High |
| 6-4B | 9 | 10 | 90.0% | High | Low |
| 6-4C | 23 | 60 | 38.3% | High | High |
| 6-4D | 8 | 19 | 42.1% | High | High |
| 6-5A | 17 | 37 | 45.9% | High | High |
| 6-5B | 26 | 47 | 55.3% | High | High |
| 6-5C | 15 | 22 | 68.2% | High | High |
| 6-5D | 17 | 26 | 65.4% | High | High |

Figure 34. Comparison of the degree of deliberation between before (the 1st-4th workshops) and after (the 5th-6th workshops) the application of new method

The 1st-4th workshop (N=20)

The 5th-6th workshop (N=23)



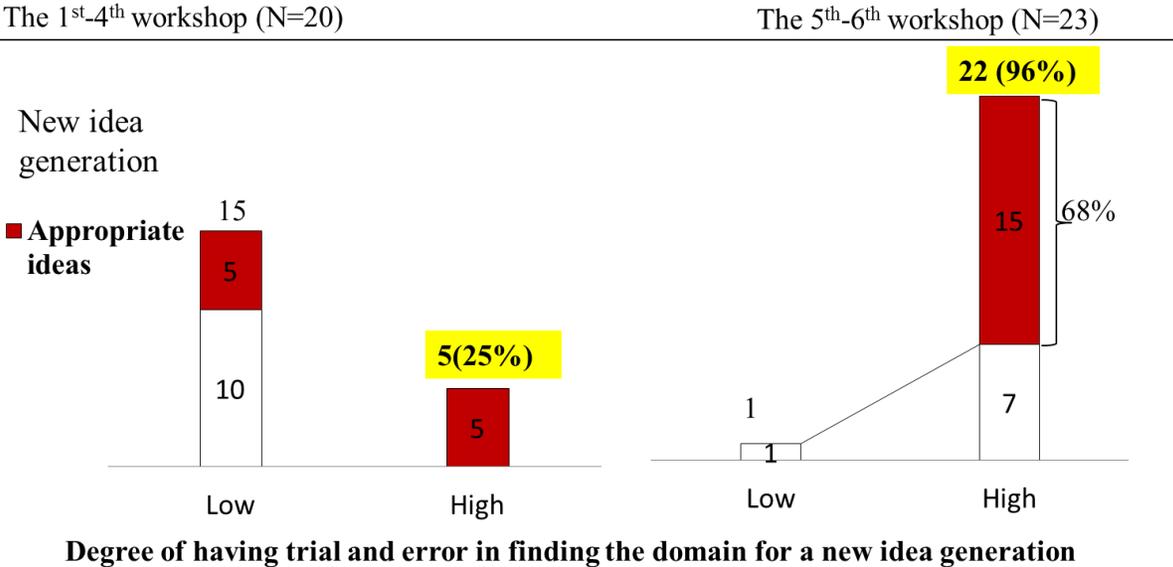
In addition, the proposed workshop design enhanced participants' level of having trial and error in finding a domain for generating a new idea. 96% of participants had high degree of trial and error in finding a domain for new idea under the new workshop design, while only 25% of participants appeared to have high degree of trial and error in the previous workshops (see the table 21 and figure 35).

Table 21. The degree of trial and error in finding the domain for a new idea: the 5th-6th workshops

| Subject | New idea | No. of domains considered | Degree of trial and error | Appropriateness of new idea |
|---------|---|---------------------------|---------------------------|-----------------------------|
| 5A | Job training by expertise | 5 | High | Low |
| 5B | House finder for professionals/students | 5 | High | High |
| 6-1A | What is he/she like? | 5 | High | Low |
| 6-1B | No garbage life | 4 | High | Low |
| 6-1C | Remote Chef | 6 | High | High |
| 6-1D | Res X: Cross-collaboration in specific fields | 4 | High | High |
| 6-2A | Group travel planning | 5 | High | Low |
| 6-2B | artSpace | 5 | High | High |
| 6-2C | Everyone's PARTY | 6 | High | Low |
| 6-2D | Dog sharing | 6 | High | High |
| 6-3A | Machine Learning Charity Impact Analysis | 6 | High | High |
| 6-3B | Service platform for new mothers | 16 | High | Low |
| 6-3C | Japanese Hospital Rating System | 7 | High | High |
| 6-3D | Crowdsourced Refugee Housing | 5 | High | High |
| 6-3E | Custom, handmade tailor goods by craftsmen | 1 | Low | Low |

| | | | | |
|------|---|----|------|------|
| 6-4A | Matching old people's house to international students | 11 | High | High |
| 6-4B | Starting business | 4 | High | High |
| 6-4C | collaborative diagnosis | 7 | High | High |
| 6-4D | studying abroad | 5 | High | High |
| 6-5A | Renting room for artists | 4 | High | High |
| 6-5B | Psychologist Tournament | 6 | High | High |
| 6-5C | Crowdsourcing divorce settlement | 4 | High | High |
| 6-5D | Blood matching | 4 | High | High |

Figure 35. Comparison of the degree of having trial and error between before (the 1st-4th workshops) and after (the 5th-6th workshops) application of new method



Participants' interview commentaries provided specific evidence of positive contribution of the proposed workshop design, presenting the exemplary domains for a new idea to have diverse

ideas first, then generating a new ideas using analogical thinking. The interview quotes from the participants who generated appropriate ideas are as follows:

5B *“The white notes were important to me. I wrote about business structure in white notes, and I made new ideas by combing these white notes with each domain card. To create new ideas, I tried to mix a couple of business domains here together, so I mixed ‘Job’ + ‘Housing’ then came to think of my new idea house finder for people who got a job in new place.”*

6-3A *“After having a bunch of ideas revolved around once or twice in a life time decisions, I realized there is value in algorithms to learn from feedback loop and repeated decision making. Therefore it led me to thinking of hard decisions that has repeatability in it and has emotional hard to quantify qualities”*

6-5B *“I came to think of this idea while thinking of other jobs that can be made into a tournament (selected mechanism)”*

6-1B *“I reached my idea through thinking about the category label I selected "contributing with~".”*

6-1D *“I came to think of it by the combination of artisanal methods and advanced manufacturing techniques”*

6-3C *“I felt Eureka, when I think about the searching a hospital (domain of the new idea)”*

6-4C *“I scanned through the categories and trying to find a provider with a customer”*

On the other hand, participants who did not stress out the importance of the proposed design workshop while the interview, could not generated an appropriate idea. The interview quotes from the participants who did not generated appropriate ideas are as follows:

6-1A *“I selected the category label “real voice”. People know reality, and people want to know reality. On the case of love, people want to know what he is like.”*

6-3B *“In the beginning, matching supply and demand, in the middle, similar idea came up about mothers don't feel alone.”*

6-3E *“I tag the expected consumer exactly to the items.”*

The results indicates that the proposed workshop design have significant effects on thinking process in the idea generation task. To test its effect on enhancing the appropriateness of generated ideas, it is important to examine the comparison of results of uncontrolled factor, which is the categorization skill of participants. In the 5th-6th workshop, there were six groups in total, and each group created 5.6 labels on average, overall, 73% of cases were categorized correctly. To assess a participant’s categorization skill, the same standard was adopted from the previous workshop evaluation. Thus, if a subject categorized cases in a label he or she created with more than 79% of correctness, his or her categorization skill was assessed as “high” (see the table 22).

Table 22. Performance in categorization task and idea generation task in the 5th – 6th workshops

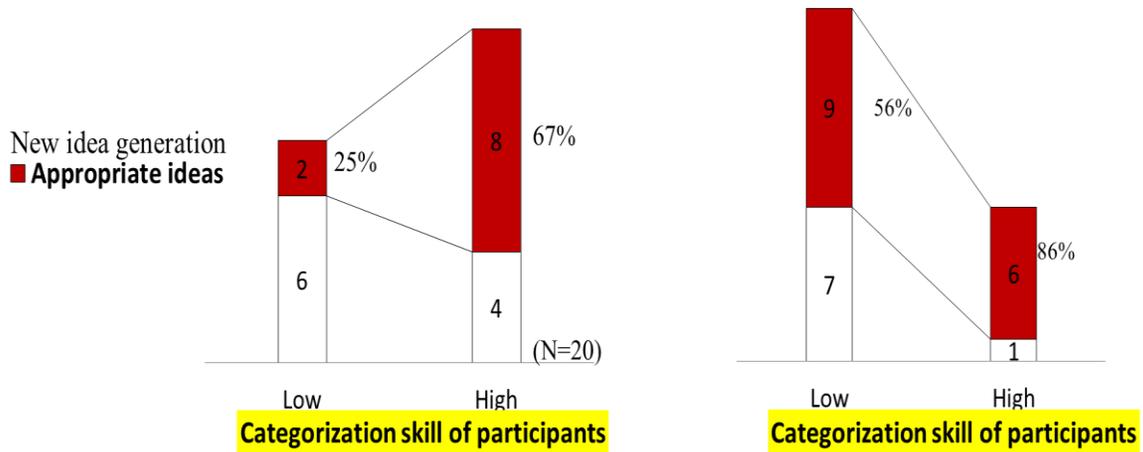
| Initiator | Created label | No. of Cases | | (B)/ (A) | Categorization skill | Appropriateness of new idea |
|-----------|--|--------------|---------|-------------|----------------------|-----------------------------|
| | | All (A) | Fit (B) | | | |
| 5A | Matching service | 5 | 3 | 50% | Low | Low |
| | Community contribution | 5 | 2 | | | |
| 5B | User generated contents | 4 | 3 | 53% | Low | High |
| | Collective solution finding | 4 | 1 | | | |
| | Personalized recommendation | 2 | 2 | | | |
| | Online marketplace | 5 | 2 | | | |
| Group 5 | | 25 | 13 | 52% | Low | |
| 6-1A | people trust people onsite, real voice | 8 | 4 | 50% | Low | Low |
| 6-1B | | 0 | 0 | 0% | Low | High |
| 6-1C | help to make choices, Rating System | 6 | 4 | 82% | High | Low |
| | connecting with specialists | 5 | 5 | | | |
| 6-1D | Participatory Approach, contribute with their skills | 4 | 3 | 83% | High | High |
| | Activity tracking | 2 | 2 | | | |
| Group 6-1 | | 15 | 12 | 80% | High | |

| | | | | | | |
|-----------|--|----|----|------|------|------|
| 6-2A | | 0 | 0 | 0% | Low | Low |
| 6-2B | Algorithm suggestions (B2C) | 7 | 4 | 72% | Low | High |
| | connecting people (matchmaking) | 2 | 2 | | | |
| | Crowdsourcing | 3 | 3 | | | |
| | Open collaboration platform: creation | 3 | 2 | | | |
| | Open collaboration platform: information | 2 | 1 | | | |
| | Social media advocacy | 8 | 6 | | | |
| 6-2C | | 0 | 0 | 0% | Low | High |
| 6-2D | | 0 | 0 | 0% | Low | High |
| Group 6-2 | | 25 | 18 | 72% | Low | |
| 6-3A | One entity tailoring info to consumers (algorithmic) | 9 | 3 | 33% | Low | High |
| 6-3B | | 0 | 0 | 0% | Low | Low |
| 6-3C | | 0 | 0 | 0% | Low | High |
| 6-3D | Crowdsourcing information | 7 | 7 | 100% | High | High |
| | Match specific skills with specific needs | 7 | 7 | | | |
| 6-3E | | 0 | 0 | 0% | Low | Low |
| Group 6-3 | | 23 | 17 | 74% | Low | |
| 6-4A | matching service | 7 | 6 | 91% | High | High |
| | prediction | 4 | 4 | | | |
| 6-4B | | 0 | 0 | 0% | Low | Low |
| 6-4C | | 0 | 0 | 0% | Low | High |
| 6-4D | crowd creating contents | 6 | 5 | 79% | Low | Low |
| | get advice from others | 8 | 6 | | | |
| Group 6-4 | | 25 | 21 | 84% | High | |
| 6-5A | Big Data Utilisation | 1 | 1 | 50% | Low | High |
| | Ranking system | 3 | 1 | | | |

| | | | | | | |
|-----------|--|-----|-----|------|------|------|
| 6-5B | Crowdsourcing | 2 | 2 | 100% | High | High |
| 6-5C | crowd funding | 1 | 1 | 83% | High | High |
| | Matchmaking | 4 | 3 | | | |
| | Screwing Somebody Over | 1 | 1 | | | |
| 6-5D | Collective input | 3 | 2 | 85% | High | High |
| | Recommendation + customers just choose | 4 | 3 | | | |
| | review (experience) | 3 | 3 | | | |
| | review (product) | 3 | 3 | | | |
| Group 6-5 | | 25 | 20 | 80% | High | |
| Total | | 143 | 104 | 73% | Low | |

As shown in the figure 36, the proposed workshop design enhances the appropriateness of new idea especially those who showed low categorization skill. Before applying the new workshop design, 67% of participants with high categorization skill generated an appropriate idea, and this ratio increased to 86% under the proposed workshop design. Moreover, the effect is drastic among the participants with low categorization skill. In the previous workshops, only 25% of them could generate an appropriate idea, while 56% of them who didn't present high categorization skill appeared to generate an appropriate idea after applying the proposed workshop design.

Figure 36. Comparison of the categorization performances between before (the 1st-4th workshops) and after (the 5th-6th workshops) the application of new workshop design



From the results, we conclude that the proposed workshop design effectively enhanced the appropriateness in idea generation using analogical thinking. When the participants were required to have 15 minutes for increasing the span of considered domains with the cue of example domains as external stimulus before using analogical thinking to generate an idea, people generate an idea that is, on average, more appropriate.

7. Conclusion and discussion

7.1 Implications of findings from the results

Though we are all aware of the importance of generating new ideas for innovation, and there exist many workshop programs which are facilitating new idea generation for innovation, still, there is the lack of structured theory on new idea generation.

As an educational program designer, the research goal should direct to how we can enhance the thinking skill of participants by facilitation which encourages them to create more appropriate ideas through the instruction of innovation workshop. In this regard, this study proposes a novel definition on appropriateness of the new idea generated by analogical thinking to overcome the limitations in existing definitions on related terms such as creativity, and novelty. In addition, it also proposes an effective evaluation method for the appropriateness of new ideas generated using analogical thinking. The results from the implementation of the proposed evaluation method provide insights, especially for those who study on the development of educational programs for promoting innovation. Based on the detailed description of the evaluation method in this thesis, researchers can replicate assessment in further studies.

The objective of this study is not only to develop an evaluation method on new ideas, but also to identify factors which are influencing on the performance in an idea generation. In respect to this, this research investigated the relationship between performances in categorization and an idea generation, also, the relationship between the thinking process in ideation and the appropriateness of a generated idea. In regard to an appropriate idea generation, meaningful relationships were founded with participant performance in categorization, deliberation before reaching the creative leap moment, and having trial and error in finding the domain for an new idea generation. Furthermore, this study is distinctive from other existing studies, while almost all of past research evaluated the outcomes, which are the new ideas itself, our proposed method allows us to trace the source of ideas, including personal thinking process.

For education program designers, it is important to develop a workshop design method, which enhances the appropriateness in idea generation. The results of this study found that high degree of deliberation to reach the creative leap moment and having trial and error in finding the domain

for a new idea generation enhances the appropriateness in idea generation during the workshop. In terms of educational practice, effective facilitation is needed to influence on the appropriate idea generation using analogical thinking. The results from the proposed workshop design supported that facilitation interventions are required for ideation.

Pedagogical actions during the workshop are useful for participants in order to show them how to use analogical thinking for an appropriate idea generation by understanding the superficial similarity and structural similarity. Notably, a specific guidance should lead them to explore various domains with the given samples as cues, as well as to connect these domains with the structure of mechanism for a solution. Such thinking process allows more knowledge to be involved in combinations for the generation task, therefore more appropriate ideas to be generated.

7.2 Limitations in this study and proposals for further research

There are some limitations in this study and they should be improved in further studies as follows:

The first limitation is that we used only 43 sample ideas to be tested. There were several restrictions in recruiting participants: they should be interested in the innovation workshop for participating voluntarily, but who had never experienced the same topic of workshop before, and participants should be able to speak English. Data collection by recruiting participants from many different nationalities increases the generalizability of findings, however, the number of subjects was relatively small and the demographic characteristic of samples were limited to English speakers as a second language or mother tongue, undergraduate or graduate school students in their twenties or thirties. In further study, more workshops need to be conducted to increase a number of samples to give more robust statistical supports on the findings. In addition, learning effect also should be examined with the experienced participants.

The second limitation is related to the ideation tool we used for workshop, which is the APISNOTE. We used data from single mode in idea generation, which is a text format idea by a computer-aided mode using the APISNOTE. Therefore, the verbalised ideas but not produced in

a text format, and non-verbal ideas, such as sketching were not included in the scope of analysis. Furthermore, participants showed different level of usability of the APISNOTE. Some participants actively used the APISNOTE for their idea generation, while some of them merely used it only to fulfil the instruction. In average, participant generated 27.8 notes during the generation task, in minimum 10 notes and maximum 61 notes, standard deviation is 12.5. In further study, usability of the APISNOTE should be improved, also, the scope of data should be expanded not only confines to the text data, but also includes the sketches or other non-verbal data.

The third limitation is the topic of the idea generating task in this study was given to the participants, confined to the collective intelligence service. During the workshop, subjects were free to select the domain of problem to be solved after attaining knowledge of the business mechanisms by reading the booklet of the 25 case studies and group discussion, however, in our real lives, there are many cases that the problem to be solved is given in unknown domain and a range of knowledge is limited. In further studies, the topic of idea generation tasks should expand to diverse fields such as new products development, social services, and personal behaviours based on the needs of participants.

The fourth limitation is related the issues in validation of the proposed evaluation method. In further studies, we should validate the proposed evaluation method by having trained raters who test the proposed evaluation method. In addition, comparison of the results of the proposed evaluation method and the evaluation of novelty and impact by experts and novice people should be examined. However, in spite of this limitation, our approach is important not only because it allows us to overcome weaknesses in current assessment methods which depend on subjective judgement, but also it enables further studies of how people generates appropriate ideas by observing all the ideation process. The proposed method in this study makes us possible not to be biased in favor of any particular rater's subjectiveness.

Lastly, appropriate idea generation can be encouraged in many ways in various setting. However, this study presents a workshop design method that promotes the deliberation by increase the number domain of new ideas in the early stage of the idea generation task. In further study, more methods which enhance the performance of new idea generation task should be developed and

tested. For example, participants may improve their categorization skill by applying some techniques: such as focusing on the outstanding structural features for the title of a category rather than comparing a pair of cases each other, which was usually observed pattern in the categorization task.

BIBLIOGRAPHY

- Akin, Ö., & Akin, C. (1996). Frames of reference in architectural design: analysing the hyperacclamation (A-h-a-!). *Design Studies*, 17(4), 341-361. doi: 10.1016/S0142-694X(96)00024-5
- Albert, R. S., & Runco, M. A. (1988). Independence and the creative potential of gifted and exceptionally gifted boys. *Journal of Youth and Adolescence*, 18(3), 221-230.
- Amabile, T. M. (1988). A model of creativity and innovation in organizations. *Research in organizational behavior*, 10(1), 123-167.
- Amabile, T. M., Conti, R., Coon, H., Lazenby, J., & Herron, M. (1996). Assessing the work environment for creativity. *Academy of management journal*, 39(5), 1154-1184.
- Baddeley, A. D. (1997). *Human memory: Theory and practice*: Psychology Press.
- Baregheh, A., Rowley, J., & Sambrook, S. (2009). Towards a multidisciplinary definition of innovation. *Management decision*, 47(8), 1323-1339.
- Barnett, H. G. (1953). Innovation: the basis of cultural change.
- Basadur, M., Runco, M. A., & Vega, L. (2000). Understanding how creative thinking skills, attitudes and behaviors work together: A causal process model. *The Journal of Creative Behavior*, 34(2), 77-100.
- BCG. (2014). The 50 Most Innovative Companies. from https://www.bcgperspectives.com/content/articles/innovation_growth_digital_economy_innovation_in_2014/
- Becker, S. W., & Whisler, T. L. (1967). The innovative organization: A selective view of current theory and research. *Journal of Business*, 462-469.
- Benkler, Y. (2006). *The wealth of networks: How social production transforms markets and freedom*: Yale University Press.
- Berlyne, D. E. (1960). *Conflict, arousal, and curiosity* (Vol. xii). New York, NY, US: McGraw-Hill Book Company.
- Bettencourt, L. M. A., Lobo, J., Strumsky, D., & West, G. B. (2010). Urban Scaling and Its Deviations: Revealing the Structure of Wealth, Innovation and Crime across Cities. *PLoS ONE*, 5(11), e13541. doi: 10.1371/journal.pone.0013541

- Bingham, C. B., & Kahl, S. J. (2013). How to use analogies to introduce new ideas. *MIT Sloan Management Review*, 54(2), 10-12.
- Blair, C. S., & Mumford, M. D. (2007). Errors in idea evaluation: Preference for the unoriginal? *The Journal of Creative Behavior*, 41(3), 197-222.
- Blanchette, I., & Dunbar, K. (2000). How analogies are generated: The roles of structural and superficial similarity. *Memory & Cognition*, 28(1), 108-124. doi: 10.3758/BF03211580
- Bonnardel, N. (2000). Towards understanding and supporting creativity in design: analogies in a constrained cognitive environment. *Knowledge-Based Systems*, 13(7-8), 505-513. doi: 10.1016/S0950-7051(00)00067-8
- Bonnardel, N., & Marmèche, E. (2004). Evocation processes by novice and expert designers: Towards stimulating analogical thinking. *Creativity and Innovation Management*, 13(3), 176-186.
- Bowdle, B. F., & Gentner, D. (2005). The career of metaphor. *Psychological review*, 112(1), 193.
- Brown, J. (1958). Some tests of the decay theory of immediate memory. *Quarterly Journal of Experimental Psychology*, 10(1), 12-21.
- Bruner, J. S. (1979). *On knowing: Essays for the left hand* (Vol. 67): Harvard University Press.
- Carlson, C. R., & Wilmot, W. W. (2006). *Innovation: the five disciplines for creating what customers want*. New York: Crown Business.
- Carlson, W. B., & Gorman, M. E. (1992). A cognitive framework to understand technological creativity: Bell, Edison, and the telephone. *Inventive minds: Creativity in technology*, 48-79.
- Casakin, H. (1997). *The role of analogy and visual displays in architectural design*. (Doctoral), Israel Institute of technology. Available from <http://worldcat.org/z-wcorg/> database.
- Casakin, H. P., & Goldschmidt, G. (2000). Reasoning by visual analogy in design problem-solving: the role of guidance. *Environment and Planning B*, 27(1), 105-120.
- Cattell, H. E., & Mead, A. D. (2008). The sixteen personality factor questionnaire (16PF). *The SAGE handbook of personality theory and assessment*, 2, 135-178.
- Charness, N., Tuffiash, M., Krampe, R., Reingold, E., & Vasyukova, E. (2005). The role of deliberate practice in chess expertise. *Applied Cognitive Psychology*, 19(2), 151-165.

- Chi, M. T., Bassok, M., Lewis, M. W., Reimann, P., & Glaser, R. (1989). Self-explanations: How students study and use examples in learning to solve problems. *Cognitive Science*, 13(2), 145-182.
- Chupin, J.-P. (1998). The analogical phases of architectural design in studio teaching. *Research In Design Education (EAAE/ARCC Proceedings)*, published by Martha Scotford, Jean-François Mabardi, and Richard Schneider, Raleigh, North Carolina State University, 93-102.
- Clement, J. (2008). *Creative Model Construction in Scientists and Students: The Role of Imagery, Analogy, and Mental Simulation*: Springer.
- Collins, A. M., & Loftus, E. F. (1975). A spreading-activation theory of semantic processing. *Psychological review*, 82(6), 407.
- Collins, R. (2000). *The sociology of philosophies : a global theory of intellectual change*. Cambridge, Mass.; London: Belknap Press of Harvard University Press.
- Conn, S. R., & Rieke, M. L. (1994). *16PF fifth edition technical manual*: Institute for Personality & Ability Testing, Incorporated.
- Connolly, T., Jessup, L. M., & Valacich, J. S. (1990). Effects of anonymity and evaluative tone on idea generation in computer-mediated groups. *Management science*, 36(6), 689-703.
- Connolly, T., Routhieaux, R. L., & Schneider, S. K. (1993). On the effectiveness of group brainstorming test of one underlying cognitive mechanism. *Small Group Research*, 24(4), 490-503.
- Corley, C., & Mihalcea, R. (2005). *Measuring the semantic similarity of texts*. Paper presented at the Proceedings of the ACL workshop on empirical modeling of semantic equivalence and entailment.
- Cropley, A. J. (1999). Creativity and cognition: Producing effective novelty. *Roeper review*, 21(4), 253-260.
- Cross, N. (1997). Creativity in Design: Analyzing and Modeling the Creative Leap. *Leonardo*, 30(4), 311-317. doi: 10.2307/1576478
- Cross, N. (2011). *Design Thinking: Understanding How Designers Think and Work*: Berg.
- Csikszentmihályi, M. (1990). The domain of creativity. In M. A. R. R. S. Albert (Ed.), *Theories of creativity* (pp. 190-212). Thousand Oaks, CA, US: Sage Publications, Inc.

- Czikszentmihalyi, M., & Getzels, J. (1988). Creativity and problem finding in art. *The Foundations of Aesthetics, Art, and Art Education*, 91-116.
- Damanpour, F. (1996). Organizational complexity and innovation: developing and testing multiple contingency models. *Management science*, 42(5), 693-716.
- Davenport, T. H. (2013). *Process innovation: reengineering work through information technology*: Harvard Business Press.
- De Dreu, C. K. (2003). Time pressure and closing of the mind in negotiation. *Organizational Behavior and Human Decision Processes*, 91(2), 280-295.
- Dean, D. L., Hender, J. M., Rodgers, T. L., & Santanen, E. L. (2006). Identifying quality, novel, and creative Ideas: Constructs and scales for idea evaluation. *Journal of the Association for Information Systems*, 7(10), 646-698.
- Department for Innovation, Universities, & Skills. (2008). Innovation Nation. In T. U. Gov. (Ed.).
- Dertouzos, M. L., & Moses, J. (1979). Computer age: a twenty-year view.
- Devadasan, P. (2011). *Collaborative intelligence measure for knowledge based service industry*.
PURDUE UNIVERSITY.
- Dorst, K., & Cross, N. (2001). Creativity in the design process: co-evolution of problem–solution. *Design Studies*, 22(5), 425-437. doi: 10.1016/S0142-694X(01)00009-6
- Du Plessis, M. (2007). The role of knowledge management in innovation. *Journal of knowledge management*, 11(4), 20-29.
- Dugosh, K. L., Paulus, P. B., Roland, E. J., & Yang, H.-C. (2000). Cognitive stimulation in brainstorming. *Journal of Personality and Social Psychology*, 79(5), 722.
- Duit, R. (1991). On the role of analogies and metaphors in learning science. *Science Education*, 75(6), 649-672. doi: 10.1002/sce.3730750606
- Dunbar, K. (1995). How scientists really reason: Scientific reasoning in real-world laboratories. *The nature of insight*, 396, 73.
- Dunbar, K. (2001). The analogical paradox: Why analogy is so easy in naturalistic settings yet so difficult in the psychological laboratory. *The analogical mind: Perspectives from cognitive science*, 313-334.
- Dunbar, K., & Blanchette, I. (2001). The in vivo/in vitro approach to cognition: the case of analogy. *Trends in Cognitive Sciences*, 5(8), 334-339. doi:
[http://dx.doi.org/10.1016/S1364-6613\(00\)01698-3](http://dx.doi.org/10.1016/S1364-6613(00)01698-3)

- Duncker, K., & Lees, L. S. (1945). On problem-solving. *Psychological Monographs*, 58(5), i-113. doi: 10.1037/h0093599
- Dunn, R., Dunn, K., & Price, G. E. (1982). Productivity environmental preference survey. *Lawrence, KS: Price Systems*.
- Dyer, J. H., Gregersen, H. B., & Christensen, C. M. (2009). The Innovator's DNA. (cover story). *Harvard business review*, 87(12), 60-67.
- Edmunds, P. (2006). *SwarmSketch*. Paper presented at the PDC.
- Evans, K., & Sims Jr, H. (1997). Mining for innovation: The conceptual underpinnings, history and diffusion of self-directed work teams. *Creating tomorrow's organizations: A handbook for future research in organizational behavior*, 269-291.
- Eysenck, H. J. (1967). *The biological basis of personality* (Vol. 689): Transaction publishers.
- Eysenck, H. J. (1990). Genetic and environmental contributions to individual differences: The three major dimensions of personality. *Journal of personality*, 58(1), 245-261.
- Fagerberg, J., Mowery, D. C., & Nelson, R. R. (2006). *The Oxford Handbook of Innovation*: OUP Oxford.
- Falkenhainer, B., Forbus, K. D., & Gentner, D. (1989). The structure-mapping engine: Algorithm and examples. *Artificial Intelligence*, 41(1), 1-63.
- Fayyad, U. M., Piatetsky-Shapiro, G., & Smyth, P. (1996). *Knowledge Discovery and Data Mining: Towards a Unifying Framework*. Paper presented at the KDD.
- Felder, R. M., Woods, D. R., Stice, J. E., & Rugarcia, A. (2000). The future of engineering education II. Teaching methods that work. *Chemical Engineering Education*, 34(1), 26-39.
- Feldman, D. H., Csikszentmihalyi, M., & Gardner, H. (1994). *Changing the world: A framework for the study of creativity*: Praeger Publishers/Greenwood Publishing Group.
- Finke, R. A., Ward, T. B., & Smith, S. M. (1992). *Creative cognition: Theory, research, and applications*: MIT press Cambridge, MA.
- Forbus, K. D., Ferguson, R. W., & Gentner, D. (1994). *Incremental structure-mapping*. Paper presented at the Proceedings of the sixteenth annual conference of the Cognitive Science Society.

- Forbus, K. D., & Oblinger, D. (1990). *Making SME greedy and pragmatic*. Paper presented at the Program of the Twelfth Annual Conference of the Cognitive Science Society, Cambridge, Massachusetts.
- Ford, C. M. (1995). Creativity Is a Mystery. *Creative Action in Organizations: Ivory Tower Visions and Real World Voices*, 12.
- Gates, B., Myhrvold, N., Rinearson, P., & Domonkos, D. (1995). The road ahead.
- Gentner, D. (1983). Structure - Mapping: A Theoretical Framework for Analogy*. *Cognitive Science*, 7(2), 155-170.
- Gentner, D., Brem, S., Ferguson, R. W., Markman, A. B., Levidow, B. B., Wolff, P., & Forbus, K. D. (1997). Analogical reasoning and conceptual change: A case study of Johannes Kepler. *The journal of the learning sciences*, 6(1), 3-40.
- Gentner, D., & Jeziorski, M. (1993). The shift from metaphor to analogy in Western science.
- Gentner, D., & Markman, A. B. (1997). Structure mapping in analogy and similarity. *American psychologist*, 52(1), 45.
- Gentner, D., & Medina, J. (1998). Similarity and the development of rules. *Cognition*, 65(2-3), 263-297. doi: [http://dx.doi.org/10.1016/S0010-0277\(98\)00002-X](http://dx.doi.org/10.1016/S0010-0277(98)00002-X)
- Gentner, D., & Medina, J. (1998). Similarity and the development of rules, SA Sloman and LJ Rips,(eds.), *Similarity and symbols in human thinking*: MIT Press, Cambridge, MA.
- Gentner, D., Rattermann, M. J., & Forbus, K. D. (1993). The roles of similarity in transfer: Separating retrievability from inferential soundness. *Cognitive psychology*, 25(4), 524-575.
- Gick, M. L., & Holyoak, K. J. (1980). Analogical problem solving. *Cognitive psychology*, 12(3), 306-355.
- Gick, M. L., & Holyoak, K. J. (1983). Schema induction and analogical transfer. *Cognitive psychology*, 15(1), 1-38.
- Glenn, J. C. (2009). Collective intelligence: one of the next big things. *Futura* 28 (2009): 4.
- Glynn, S. M., Britton, B. K., Semrud-Clikeman, M., & Muth, K. D. (1989). Analogical reasoning and problem solving in science textbooks *Handbook of creativity* (pp. 383-398): Springer.
- Goel, A. K. (1997). Design, Analogy, and Creativity. *IEEE Expert: Intelligent Systems and Their Applications*, 12(3), 62-70. doi: 10.1109/64.590078

- Goldschmidt, G. (1995). Visual displays for design: Imagery, analogy and databases of visual images. *Visual databases in architecture*, 53-74.
- Goldschmidt, G. (2001). Visual analogy: A strategy for design reasoning and learning. *Design knowing and learning: Cognition in design education*, 199-220.
- Gomes, P., Seco, N., Pereira, F. C., Paiva, P., Carreiro, P., Ferreira, J. L., & Bento, C. (2006). The importance of retrieval in creative design analogies. *Knowledge-Based Systems*, 19(7), 480-488.
- Gregorc, A. (1982). An adult's guide to style. Columbia, CT: Gregorc Associates. *Inc. Management for Modern Families. Englewood.*
- Guilford, J. (1950). Creativity. *American psychologist*, 5(9), 444-454. doi: 10.1037/h0063487
- Guilford, J. (1959a). Personality, New York: McGraw-Hill. *Guion. RM. & Gottier. RF (1965). Validity of personality measures in personnel selection. Personnel Psychotogy*, 18, 135-164.
- Guilford, J. (1959b). Three faces of intellect. *American psychologist*, 14(8), 469.
- Hardiman, P. T., Dufresne, R., & Mestre, J. P. (1989). The relation between problem categorization and problem solving among experts and novices. *Memory & Cognition*, 17(5), 627-638.
- Harrington, D. M., Block, J., & Block, J. H. (1983). Predicting creativity in preadolescence from divergent thinking in early childhood. *Journal of Personality and Social Psychology*, 45(3), 609-623. doi: 10.1037/0022-3514.45.3.609
- Hesse, M. B. (1966). *Models and analogies in science* (Vol. 7): University of Notre Dame Press Notre Dame.
- Hocevar, D. (1981). Measurement of creativity: Review and critique. *Journal of Personality assessment*, 45(5), 450-464.
- Hofstadter, D. R. (2008). *Fluid concepts and creative analogies: Computer models of the fundamental mechanisms of thought*: Basic Books.
- Holyoak, Lee, H. S., & Lu, H. (2010). Analogical and category-based inference: A theoretical integration with Bayesian causal models. *Journal of Experimental Psychology: General*, 139(4), 702-727. doi: 10.1037/a0020488
- Holyoak, K. J. (1985). The pragmatics of analogical transfer. *The psychology of learning and motivation*, 19, 59-87.

- Holyoak, K. J., & Koh, K. (1987). Surface and structural similarity in analogical transfer. *Memory & Cognition*, 15(4), 332-340.
- Holyoak, K. J., & Thagard, P. (1989). Analogical mapping by constraint satisfaction. *Cognitive Science*, 13(3), 295-355.
- Holyoak, K. J., & Thagard, P. (1996). *Mental leaps: Analogy in creative thought*: MIT press.
- Holyoak, K. J., & Thagard, P. (1997). The analogical mind. *American psychologist*, 52(1), 35.
- Howe, J. (2008). *Crowdsourcing: How the power of the crowd is driving the future of business*: Random House.
- Ipeirotis, P. G., Provost, F., & Wang, J. (2010). *Quality management on amazon mechanical turk*. Paper presented at the Proceedings of the ACM SIGKDD workshop on human computation.
- Johnson, S. (2010). *Where good ideas come from: The natural history of innovation*: Penguin UK.
- Jones, C. (2011). *Accidents May Happen*: Delacorte Books for Young Readers.
- Keane, M. T., Ledgeway, T., & Duff, S. (1994). Constraints on analogical mapping: A comparison of three models. *Cognitive Science*, 18(3), 387-438.
- Khasky, A. D., & Smith, J. C. (1999). Stress, relaxation states, and creativity. *Perceptual and motor skills*, 88(2), 409-416.
- Kim, E., & Horii, H. (2015). A Study on an Assessment Framework for The Novelty Of Ideas Generated By Analogical Thinking. *Procedia - Social and Behavioral Sciences*, 195(C), pp. 1396-1406. doi: 10.1016/j.sbspro.2015.06.435
- Kimberly, J. R. (1981). Managerial innovation. *Handbook of organizational design*, 1(84), 104.
- Kintsch, W. (2001). Predication. *Cognitive Science*, 25(2), 173-202.
- Kirton, M. (1976). Adaptors and innovators: A description and measure. *Journal of Applied psychology*, 61(5), 622.
- Koblin, A. M. (2009). *The sheep market*. Paper presented at the Proceedings of the seventh ACM conference on Creativity and cognition.
- Koestler, A. (1964). *The act of creation*. Oxford, England: Macmillan.
- Laham, D. (1997). *Latent semantic analysis approaches to categorization*. Paper presented at the Proceedings of the 19th annual conference of the Cognitive Science Society.

- Landauer, T. K., & Dumais, S. T. (1997). A solution to Plato's problem: The latent semantic analysis theory of acquisition, induction, and representation of knowledge. *Psychological review*, 104(2), 211.
- Landauer, T. K., Foltz, P. W., & Laham, D. (1998). An introduction to latent semantic analysis. *Discourse processes*, 25(2-3), 259-284.
- Langley, P., Simon, H. A., Bradshaw, G. L., & Zytkow, J. M. (1987). *Scientific discovery: Computational explorations of the creative processes*. Cambridge, MA: The MIT Press.
- Larey, T. S., & Paulus, P. B. (1999). Group preference and convergent tendencies in small groups: A content analysis of group brainstorming performance. *Creativity Research Journal*, 12(3), 175-184.
- Lau, S., & Li, W.-L. (1996). Peer status and perceived creativity: Are popular children viewed by peers and teachers as creative. *Creativity Research Journal*, 9(4), 347-352.
- Lencioni, P. M. (2002). Make your values mean something. *Harvard business review*, 80(7), 113-117.
- Lévy, P. (1997). *Collective intelligence*: Plenum/Harper Collins.
- Lévy, P. (2010). From social computing to reflexive collective intelligence: The IEMML research program. *Information Sciences*, 180(1), 71-94.
- Lieberman, H., Smith, D., & Teeters, A. (2007). *Common Consensus: a web-based game for collecting commonsense goals*. Paper presented at the ACM Workshop on Common Sense for Intelligent Interfaces.
- Lonergan, D. C., Scott, G. M., & Mumford, M. D. (2004). Evaluative aspects of creative thought: Effects of appraisal and revision standards. *Creativity Research Journal*, 16(2-3), 231-246.
- MacKinnon, D. W. (1992). The highly effective individual. *Genius and eminence*, 2, 179-193.
- Malone, T. W., Laubacher, R., & Dellarocas, C. (2009). *Harnessing Crowds: Mapping the Genome of Collective Intelligence*. Rochester, NY: Social Science Research Network.
- Maltzman, I. (1960). On the training of originality. *Psychological review*, 67(4), 229.
- Markman, A. B., & Gentner, D. (1993). Structural alignment during similarity comparisons. *Cognitive psychology*, 25(4), 431-467.
- Medin, D. L. (1989). Concepts and conceptual structure. *American psychologist*, 44(12), 1469.

- Mednick, S. (1962). The associative basis of the creative process. *Psychological review*, 69(3), 220.
- Milgram, R. M., Milgram, N. A., Gaby, R., & Rabkin, L. (1978). Quantity and Quality of Creative Thinking in Children and Adolescents. *Child Development*, 49(2), 385-388. doi: 10.2307/1128702
- Miller, G. A. (1956). The magical number seven, plus or minus two: some limits on our capacity for processing information. *Psychological review*, 63(2), 81.
- Miyake, N. (1986). Constructive interaction and the iterative process of understanding. *Cognitive Science*, 10(2), 151-177.
- Mobley, M. I., Doares, L. M., & Mumford, M. D. (1992). Process analytic models of creative capacities: Evidence for the combination and reorganization process. *Creativity Research Journal*, 5(2), 125-155. doi: 10.1080/10400419209534428
- Moody, D. L. (2003). The method evaluation model: a theoretical model for validating information systems design methods. *ECIS 2003 proceedings*, 79.
- Morgan, D. N. (1953). Creativity today: A constructive analytic review of certain philosophical and psychological Work. *Journal of Aesthetics and Art Criticism*, 1-24.
- Most Innovative Companies - BusinessWeek. (2014/01/09/02:02:48). *Businessweek.com*. from http://www.businessweek.com/magazine/toc/10_17/B4175innovative_companies.htm
files/632/B4175innovative_companies.html
- Mumford, M. D., & Whetzel, D. L. (1996). Insight, creativity, and cognition: On Sternberg and Davidson's The nature of insight. *Creativity Research Journal*, 9(1), 103-107.
- Myers, I. B., McCaulley, M. H., & Most, R. (1985). Manual, a guide to the development and use of the Myers-Briggs type indicator: Consulting Psychologists Press (Palo Alto, Ca.).
- Nakatsu, R. T. (2009). *Reasoning with Diagrams: Decision-Making and Problem-Solving with Diagrams*: Wiley.
- Negroponte, N. (1996). *Being digital*: Vintage.
- Nicholls, J. G. (1972). Creativity in the person who will never produce anything original and useful: The concept of creativity as a normally distributed trait. *American psychologist*, 27(8), 717.
- Novick, L. R. (1988). Analogical transfer, problem similarity, and expertise. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 14(3), 510.

- Nyström, H. (1993). Creativity and entrepreneurship. *Creativity and Innovation Management*, 2(4), 237-242.
- O'Quin, K., & Besemer, S. P. (1989). The development, reliability, and validity of the revised creative product semantic scale. *Creativity Research Journal*, 2(4), 267-278. doi: 10.1080/10400418909534323
- Osborn, A. F. (1953). *Applied Imagination: Principles and Procedures of Creative Problem-solving*.
- Parameswaran, M., & Whinston, A. B. (2007). Social computing: An overview. *Communications of the Association for Information Systems*, 19(1), 37.
- Parnes, S. J. (1967). *Creative behavior workbook*: Scribner.
- Passino, K. M., Seeley, T. D., & Visscher, P. K. (2008). Swarm cognition in honey bees. *Behavioral Ecology and Sociobiology*, 62(3), 401-414.
- Pennebaker, J. W., Kiecolt-Glaser, J. K., & Glaser, R. (1997). Disclosure of Traumas and Immune Function: Health Implications for Psychotherapy. *Eminent Creativity, Everyday Creativity, and Health*, 287.
- Perkins, D. N. (1981). *The mind's best work: A new psychology of creative thinking*: Cambridge, MA: Harvard University Press.
- Perkins, D. N. (1997). Creativity's camel: The role of analogy in invention. *Creative thought: An investigation of conceptual structures and processes*, 523-538.
- Polkinghorne, D. E. (2007). Validity issues in narrative research. *Qualitative inquiry*, 13(4), 471-486.
- Prabhakaran, R., Green, A. E., & Gray, J. R. (2014). Thin slices of creativity: Using single-word utterances to assess creative cognition. *Behavior research methods*, 46(3), 641-659.
- Quinn, A. J., & Bederson, B. B. (2011). *Human computation: a survey and taxonomy of a growing field*. Paper presented at the Proceedings of the SIGCHI conference on human factors in computing systems.
- Reeves, L., & Weisberg, R. W. (1994). The role of content and abstract information in analogical transfer. *Psychological bulletin*, 115(3), 381.
- Rescher, N. (1977). Methodological pragmatism: A systems-theoretic approach to the theory of knowledge.
- Rhodes, M. (1961). An analysis of creativity. *Phi Delta Kappan*, 305-310.

- Rogers, E. M., & Adhikarya, R. (1979). Diffusion of innovations: An up-to-date review and commentary. In D. Nimmo (Ed.), *Communication yearbook* (Vol. 3, pp. 67-81). New Brunswick, NJ: Transaction Books.
- Ross, B. H. (1987). This is like that: The use of earlier problems and the separation of similarity effects. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 13(4), 629.
- Ross, B. H. (1989). Distinguishing types of superficial similarities: Different effects on the access and use of earlier problems. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 15(3), 456.
- Runco, M. A. (2014). *Creativity: Theories and themes: Research, development, and practice*: Elsevier.
- Runco, M. A., & Albert, R. S. (2005). Parents' personality and the creative potential of exceptionally gifted boys. *Creativity Research Journal*, 17(4), 355-367.
- Runco, M. A., & Pritzker, S. R. (1999). *Encyclopedia of creativity* (Vol. 2): Elsevier.
- Salcedo, J. (2006). *Using implicit and explicit theories of creativity to develop a personality measure for assessing creativity*. (Ph.D.), Fordham University, United States -- New York. Retrieved from <http://search.proquest.com/docview/305333359/abstract/141DEAE11EB4A96F185/1?accountid=14357>
- files/585/1.html Available from ProQuest
- Salton, G., & McGill, M. J. (1983). *Introduction to modern information retrieval*: McGraw-Hill Book Company.
- Santanen, E. L., Briggs, R. O., & Vreede, G.-J. D. (2004). Causal relationships in creative problem solving: Comparing facilitation interventions for ideation. *Journal of Management Information Systems*, 20(4), 167-198.
- Sarlemijn, A., & Kroes, P. A. (1988). Technological analogies and their logical nature *Technology and Contemporary Life* (pp. 237-255): Springer.
- Sawyer, R. K. (2012). *Explaining Creativity: The Science of Human Innovation* (2nd ed.). New York: Oxford University Press.
- Schmeck, R. R., & Grove, E. (1979). Academic achievement and individual differences in learning processes. *Applied Psychological Measurement*, 3(1), 43-49.

- Schumpeter, J. (1934). *The Theory of Economic Development: An Inquiry into Profits, Capital, Credit, Interest, and the Business Cycle* (Cambridge, MA). *Originally published in German (1912) as Theorie der wirtschaftlichen Entwicklung.*
- Schut, M. C. (2010). On model design for simulation of collective intelligence. *Information Sciences, 180*(1), 132-155.
- Seidler-de Alwis, R., & Hartmann, E. (2008). The use of tacit knowledge within innovative companies: knowledge management in innovative enterprises. *Journal of knowledge management, 12*(1), 133-147.
- Shimazu, H., & Koike, S. (2007). KM2. 0: Business knowledge sharing in the Web 2.0 age. *NEC Technical Journal, 2*(2), 50-54.
- Simon, H. A. (1995). *Explaining the ineffable: AI on the topics of intuition, insight and inspiration.* Paper presented at the Proceedings of the 14th international joint conference on Artificial intelligence - Volume 1, Montreal, Quebec, Canada.
- Singh, P., Lin, T., Mueller, E. T., Lim, G., Perkins, T., & Zhu, W. L. (2002). Open Mind Common Sense: Knowledge acquisition from the general public *On the move to meaningful internet systems 2002: Coopis, doa, and odbase* (pp. 1223-1237): Springer.
- Sjoberg, L. (1974). *Cognitive theory of similarity.* Paper presented at the MULTIVARIATE BEHAVIORAL RESEARCH.
- Snyder, A. W., Mulcahy, E., Taylor, J. L., Mitchell, D. J., Sachdev, P., & Gandevia, S. C. (2003). Savant-like skills exposed in normal people by suppressing the left fronto-temporal lobe. *Journal of integrative neuroscience, 2*(02), 149-158.
- Steinberg, H., Sykes, E. A., Moss, T., Lowery, S., LeBoutillier, N., & Dewey, A. (1997). Exercise enhances creativity independently of mood. *British Journal of Sports Medicine, 31*(3), 240-245.
- Sternberg, R. J. (1977). *Intelligence, information processing, and analogical reasoning: The componential analysis of human abilities:* Lawrence Erlbaum.
- Sternberg, R. J. (2001). What is the common thread of creativity? Its dialectical relation to intelligence and wisdom. *American psychologist, 56*(4), 360.
- Stokes, P. (1999). Novelty. In M. A. Runco & S. R. Pritzker (Eds.), *Encyclopedia of creativity* (Vol. 2, pp. 297-304). New York: Academic Press.

- Suri, R., & Monroe, K. B. (2003). The effects of time constraints on consumers' judgments of prices and products. *Journal of consumer research*, 30(1), 92-104.
- Suzuki, H., Ohnishi, H., & Shigemasu, K. (1992). *Goal-directed processes in similarity judgement*. Paper presented at the Proc. of the 14 th Annual Conference of the Cognitive Science Society.
- Taylor, D. W., Berry, P. C., & Block, C. H. (1958). Does group participation when using brainstorming facilitate or inhibit creative thinking? *Administrative science quarterly*, 23-47.
- Thompson, V. A. (1965). Bureaucracy and innovation. *Administrative science quarterly*, 1-20.
- Toffler, A., Longul, W., & Forbes, H. (1981). *The third wave*: Bantam books New York.
- Torrance, E. (1974). The Torrance tests of creative thinking-TTCT Manual and Scoring Guide: Verbal test A, figural test. *Lexington, KY: Ginn*.
- Trianni, V., Tuci, E., Passino, K. M., & Marshall, J. A. (2011). Swarm cognition: an interdisciplinary approach to the study of self-organising biological collectives. *Swarm Intelligence*, 5(1), 3-18.
- Tversky, A., & Kahneman, D. (1974). Judgment under Uncertainty: Heuristics and Biases. *Science*, 185(4157), 1124-1131. doi: 10.1126/science.185.4157.1124
- Ueda, K. (2000). Analogical Scientific Discoveries : Cognitive Case Studies(Discovery Science). *Journal of Japanese Society for Artificial Intelligence*, 15(4), 608-617.
- Van de Ven, A. H. (1986). Central problems in the management of innovation. *Management science*, 32(5), 590-607.
- Vanderhaeghen, D., Fettke, P. D. P., & Loos, P. (2010). Organizational and technological options for business process management from the perspective of web 2.0. *Business & Information Systems Engineering*, 2(1), 15-28.
- Vicenzi, R. (2000, 2000). *Creating conditions for creativity and innovation in organizations*. Paper presented at the Management of Innovation and Technology, 2000. ICMIT 2000. Proceedings of the 2000 IEEE International Conference on.
- Wallas, G. (1926). The art of thought. *New York, NY, Harcourt. B.(1994). " Structured Im Generation." Cognitive Psychology*, 27(1), 1-40.

- Wandmacher, T., Ovchinnikova, E., & Alexandrov, T. (2008). Does latent semantic analysis reflect human associations. *European Summer School in Logic, Language and Information (ESSLLI'08)*.
- Ward, S. L., Byrnes, J. P., & Overton, W. F. (1990). Organization of knowledge and conditional reasoning. *Journal of Educational Psychology*, 82(4), 832.
- Weisberg, R. W. (1995). Case studies of creative thinking: Reproduction versus restructuring in the real world.
- Weisberg, R. W. (1999). Creativity and Knowledge: A Challenge to Theories. In R. J. Sternberg (Ed.), *Handbook of creativity*. New York: Cambridge University Press.
- Welling, H. (2007). Four mental operations in creative cognition: The importance of abstraction. *Creativity Research Journal*, 19(2-3), 163-177.
- West, M. A., & Anderson, N. R. (1996). Innovation in top management teams. *Journal of Applied psychology*, 81(6), 680.
- Winston, P. H. (1982). Learning new principles from precedents and exercises. *Artificial Intelligence*, 19(3), 321-350. doi: [http://dx.doi.org/10.1016/0004-3702\(82\)90004-2](http://dx.doi.org/10.1016/0004-3702(82)90004-2)
- Wolfers, J., & Zitzewitz, E. (2004). Prediction markets: National Bureau of Economic Research.
- Wolfradt, U., & Pretz, J. E. (2001). Individual differences in creativity: personality, story writing, and hobbies. *European Journal of Personality*, 15(4), 297-310. doi: 10.1002/per.409
- Woodley, M. A., & Bell, E. (2011). Is collective intelligence (mostly) the general factor of personality? A comment on Woolley, Chabris, Pentland, Hashmi and Malone (2010). *Intelligence*, 39(2), 79-81.
- WORLD'S MOST ADMIRER COMPANIES: INNOVATION. *CNN*. from http://money.cnn.com/magazines/fortune/mostadmirer/2011/best_worst/best1.html
- The World's Most Innovative Companies List. (2014/01/09/01:45:43). *Forbes*. from <http://www.forbes.com/innovative-companies/list/>
- Yamamoto, K. (1965). EFFECTS OF RESTRICTION OF RANGE AND TEST UNRELIABILITY ON CORRELATION BETWEEN MEASURES OF INTELLIGENCE AND CREATIVE THINKING*. *British Journal of Educational Psychology*, 35(3), 300-305.

APPENDICES

APPENDIX A: Transcription sample of the categorization task

1) The first workshop

Date: February 15th (Saturday), 2014

Time: 13:00-17:00

Place: 3F, Engineering Building No. 11, Hongo Campus

| No. | Subject | Dialogue | Video time | | Duration (sec.) |
|-----|---------|---|------------|-----|-----------------|
| | | | Min | Sec | |
| 1 | 1C | Amazon and Tabelog are similar | 4 | 41 | 5 |
| 2 | 1A | Yeah, it's like the same system | 4 | 46 | 2 |
| 3 | 1C | book... recommended and food also. | 4 | 48 | 4 |
| 4 | 1A | Yeah...I agree | 4 | 52 | 9 |
| 5 | 1C | Kura sushi... | 5 | 1 | 8 |
| 6 | 1A | Yeah, Kura sushi | 5 | 9 | 2 |
| 7 | 1C | Kura sushi is also maybe... | 5 | 11 | 3 |
| 8 | 1A | Yeah, I know, amazon like... | 5 | 14 | 1 |
| 9 | 1E | Number ? | 5 | 15 | 10 |
| 10 | 1C | okay, that is also recommending.... | 5 | 25 | 3 |
| 11 | 1D | Do we want to divide groups into the kind of product they are working with, the kind of things they are providing. Is it like food, travel, or... | 5 | 28 | 11 |
| 12 | 1C | Nonono...it's gonna be similarity... | 5 | 39 | 0 |
| 13 | F* | Nonono...similarity | 5 | 39 | 0 |
| 14 | 1D | Similarity. | 5 | 39 | 4 |
| 15 | F | we are going to use analogical thinking | 5 | 43 | 2 |
| 16 | 1D | in terms of how they ... and provide service. | 5 | 45 | 1 |
| 17 | F | Yeah yeah. | 5 | 46 | 32 |
| 18 | 1D | why have we categorized these two, three together? | 6 | 18 | 7 |
| 19 | 1A | I think it's reviewing, its common and, nono, reviewing is common with amazon and tabelog. | 6 | 25 | 6 |
| 20 | 1D | because there are a lot of reviews. Because the ... is review based, | 6 | 31 | 16 |

| | | | | | |
|----|----|--|---|----|----|
| | | rakuten travel is review based, ...everything is probably review based. | | | |
| 21 | 1A | um, no. but for example, like Google, like the Google input is not review based. But its kind similar to amazon in a sense that people who type this based on frequency of association. What you buy at amazon and what you type in Google... | 6 | 47 | 10 |
| 22 | 1D | ok ok. | 6 | 57 | 1 |
| 23 | 1A | um, yeah. | 6 | 58 | 3 |
| 24 | 1D | it's like interconnected. | 7 | 1 | 1 |
| 25 | 1A | yeah... | 7 | 2 | 17 |
| 26 | 1A | yeah, there's a strong case to classify with review based, like amazon and tabelog. The cosmetic one (@cosme) is also review based, I think... its also review based. I think it's close to tabelog. | 7 | 19 | 20 |
| 27 | 1E | ...a bit. | 7 | 39 | 4 |
| 28 | 1C | this no. 5 POS system is also this thing about mostly bought things. | 7 | 43 | 22 |
| 29 | 1E | so you suggest this with this group? | 8 | 5 | 1 |
| 30 | 1C | I think is. Because it also recommends the... | 8 | 6 | 6 |
| 31 | 1E | based on the frequency? | 8 | 12 | 2 |
| 32 | 1C | based on frequency. But it doesn't categorize as the amazon, it only recommends based on frequency. Let us skip for now, we can sense later. | 8 | 14 | 24 |
| 33 | 1D | um, we can probably create a group where people explain and they have reviews for a thing. It's not a product that is been said, because they are being recommended, because you bought these things. But reviews where people go and search for something, they get reviews for that. That can be a group? Like we can have a | 8 | 38 | 20 |
| 34 | 1A | review based? | 8 | 58 | 4 |
| 35 | 1D | these are like products which you search on line and products are based on what you are searching for. But these are something you go and search for. | 9 | 2 | 8 |
| 36 | 1A | it is like frequency based, and it has two different concepts. But I think amazon has both. It's like there are reviews, but recommendation based on what people bought. | 9 | 10 | 10 |
| 37 | 1D | so you just have a commend like probably... | 9 | 20 | 13 |
| 38 | 1D | I think frequency based is (pointing to the screen) | 9 | 33 | 2 |
| 39 | 1E | this one? (moving the pic) | 9 | 35 | 0 |
| 40 | 1D | yeah. | 9 | 35 | 5 |
| 41 | 1E | then this one (POS) suggesting frequency. | 9 | 40 | 0 |

| | | | | | |
|----|----|--|----|----|----|
| 42 | 1C | this one is frequency based, yeah. | 9 | 40 | 1 |
| 43 | 1D | that is frequency based, | 9 | 41 | 0 |
| 44 | 1D | tabelog is review based actually. | 9 | 41 | 17 |
| 45 | 1E | here this trouble others ... | 9 | 58 | 3 |
| 46 | 1D | um, probably one group will problem shooting where people go and they say what is the problem they are having and they try to find solution for it. | 10 | 1 | 11 |
| 47 | 1E | trouble shooting. | 10 | 12 | 1 |
| 48 | 1D | trouble shooting, for trouble like. | 10 | 13 | 2 |
| 49 | 1A | no, for trouble it's just a bit like rakuten travel. | 10 | 15 | 5 |
| 50 | 1D | like trouble shooting, there was a thing like a, where people, Innocentive, you know this one, like if you go search for the problems, they try to solve the problems. | 10 | 20 | 13 |
| 51 | 1E | um, like a... | 10 | 33 | 1 |
| 52 | 1D | like you ask questions and you reply, like a forum, like a forum. | 10 | 34 | 4 |
| 53 | 1C | consulting... | 10 | 38 | 0 |
| 54 | 1D | like a consulting! | 10 | 38 | 5 |
| 55 | 1A | yeah, it's like yahoo answer. Except that... | 10 | 43 | 1 |
| 56 | 1D | yeah, yeah, yeah. | 10 | 44 | 1 |
| 57 | 1A | except that people in ... don't joke around. | 10 | 45 | 29 |
| 58 | 1D | this should come to there. (No 10 is moved by D) | 11 | 14 | 3 |
| 59 | 1E | this one? | 11 | 17 | 1 |
| 60 | 1D | nonono, this one (No 11 Innocentive is moved under tag Forum) | 11 | 18 | 3 |
| 61 | 1E | oh yeah yeah. Sorry. so this one is, um... (hesitate a little) | 11 | 21 | 10 |
| 62 | 1D | (pointing to No 7), consulting with senior members for career choices, what is this one? | 11 | 31 | 7 |
| 63 | 1C | that is meeting at a particular place. | 11 | 38 | 2 |
| 64 | 1D | no, this is, ... where you can contact your seniors, alumni. And they suggest some career options. | 11 | 40 | 7 |
| 65 | 1E | also forum | 11 | 47 | 1 |
| 66 | 1D | So forum/consulting. | 11 | 48 | 34 |
| 67 | 1E | here it is, interests share... (moving No50 interests share under Forum). Do you think this match this? | 12 | 22 | 12 |
| 68 | 1D | yeah, it's here. | 12 | 34 | 1 |

| | | | | | |
|----|----|--|----|----|----|
| 69 | 1A | yeah, that's good. | 12 | 35 | 8 |
| 70 | 1A | I think we can move the Google suggestion (No. 24) and this one, I think we can move it to frequency based. | 12 | 43 | 10 |
| 71 | 1D | hum, hum. You are right there. | 12 | 53 | 3 |
| 72 | 1E | this one also frequency based? no. (No.1 kura sushi) | 12 | 56 | 2 |
| 73 | 1D | yeah yeah. | 12 | 58 | 1 |
| 74 | 1A | yeah yeah, the kura sushi is frequency based, like recommending sushi... based on the pattern of consumption. | 12 | 59 | 11 |
| 75 | 1D | Cookpad (No.19), easy to find a favored recipe | 13 | 10 | 6 |
| 76 | 1D | is it forum or? | 13 | 16 | 1 |
| 77 | 1B | I think the 23 is more like a consulting, forum. | 13 | 17 | 3 |
| 78 | 1A | which one are you talking? 23... yeah, it is. | 13 | 20 | 8 |
| 79 | 1D | ...one more thing, one more group, where the public create information. Like the weather of days(No. 4)... | 13 | 28 | 9 |
| 80 | 1C | the weather of days, bike's map (No. 8). | 13 | 37 | 3 |
| 81 | 1D | and bikes, so it's like intelligence through public participation. I don't know how to... it's like you all give some information and this one big thing, this information created through the public participation. | 13 | 40 | |
| 82 | 1E | public participation? (typing the new group nam | | | |
| 83 | 1D | ok, public participation | | | |
| 84 | 1B | collective intelligence is... | 13 | 57 | 1 |
| 85 | 1D | collective intelligence, yes! | 13 | 58 | 1 |
| 86 | 1E | collective intelligence, yes! | 13 | 59 | 2 |
| 87 | 1C | proper word. | 14 | 1 | 11 |
| 88 | 1D | so the bike one, the weather one, they all come to there. That one, also (No. 4, No8 and No 13 are moved to CI by D) | 14 | 12 | 15 |
| 89 | 1C | number 13 also about weather. | 14 | 27 | 14 |
| 90 | 1A | oh, number 20 is like forum/consulting. You know like translation. You know it's like you ask, is it that, you ask people to translate. | 14 | 41 | 7 |
| 91 | 1B | I think it is in forum... | 14 | 48 | 0 |
| 92 | 1E | like duolingo? (shake head) | 14 | 48 | 2 |
| 93 | 1A | no... it's like you need something translated. Then somebody will translate for fee. | 14 | 50 | 4 |
| 94 | 1B | translate it... | 14 | 54 | 2 |
| 95 | 1E | (nod) um, yeah! like kind of for, um... | 14 | 56 | 6 |

| | | | | | |
|-----|----|--|----|----|----|
| 96 | 1E | share document on Internet (No.26 happy campus)? | 15 | 2 | 4 |
| 97 | 1C | information, information sharing? | 15 | 6 | 6 |
| 98 | 1C | let us create a group, like information.. | 15 | 12 | 2 |
| 99 | 1E | information sharing. | 15 | 14 | 0 |
| 100 | 1C | yeah. | 15 | 14 | 24 |
| 101 | 1E | here, (No. 27) data express stories..., so it's consulting. Agree? | 15 | 38 | 22 |
| 102 | 1B | I think it's more like the, hum, the category | 16 | 0 | 5 |
| 103 | 1E | the category | 16 | 5 | 0 |
| 104 | 1B | yeah. | 16 | 5 | 2 |
| 105 | 1E | should we make another one? | 16 | 7 | 3 |
| 106 | 1B | nonono, I mean just like the, hum.. 16; | 16 | 10 | 10 |
| 107 | 1D | I think this optimization of mechanizing (No. 51), I think should go to the frequency based. | 16 | 20 | 6 |
| 108 | 1E | number? | 16 | 26 | 1 |
| 109 | 1D | there, 51. | 16 | 27 | 6 |
| 110 | 1D | (No28) comparing... I think it's review based. | 16 | 33 | 3 |
| 111 | 1A | yeah. | 16 | 36 | 1 |
| 112 | 1C | there is one, another, hum, kind of like innovative ideas... there is number 50 and, um. | 16 | 37 | 20 |
| 113 | 1E | innovative ideas? | 16 | 57 | 1 |
| 114 | 1C | yeah, innovative ideas | 16 | 58 | 10 |
| 115 | 1A | I think number 16 is CI. It's learning languages with the help of native speakers. You collaborate. You learn a language and you teach your native language. | 17 | 8 | 11 |
| 116 | 1D | your own language. So it's collective... | 17 | 19 | 1 |
| 117 | 1A | collective intelligence. I would say. I don't know. What do you think? | 17 | 20 | 4 |
| 118 | 1E | you were saying (to B) ? | 17 | 24 | 1 |
| 119 | 1C | um, number 23 and number 50 are similar. Um, innovative ideas. | 17 | 25 | 5 |
| 120 | 1D | you can put it (No.27)here, forum and consulting. | 17 | 30 | 0 |
| 121 | 1A | and it's a bit like forum and consulting at the same time. | 17 | 30 | 3 |
| 122 | 1B | yeah (agree with E), it's kind of like in the middle of two topics (groups) | 17 | 33 | 6 |
| 123 | 1A | yeah, actually, number 16 might be forum/consulting rather. | 17 | 39 | 3 |
| 124 | 1E | which one? 16? | 17 | 42 | 1 |

| | | | | | |
|-----|----|--|----|----|----|
| 125 | 1A | 16, yeah. It's not quite CI, it's more like based on actual question you have. | 17 | 43 | 7 |
| 126 | 1B | I think the dating one (No. 27) is more like amazon. Because it's based on some real experience. | 17 | 50 | 10 |
| 127 | 1A | yeah. | 18 | 0 | 1 |
| 128 | 1B | just like review that.. | 18 | 1 | 1 |
| 129 | 1A | it's like rakuten travel or amazon. | 18 | 2 | 1 |
| 130 | 1B | yeah, yeah. | 18 | 3 | 2 |
| 131 | 1E | review base? | 18 | 5 | 1 |
| 132 | 1B | yeah! | 18 | 6 | 3 |
| 133 | 1D | it's like they share their date experience and then review what they ... is this, haha | 18 | 9 | 4 |
| 134 | 1A | no, I mean I don't review the person, yeah.. | 18 | 13 | 3 |
| 135 | 1D | is this somebody says the problem and they | 18 | 16 | 2 |
| 136 | 1C | nono. About the place, the dating place. | 18 | 18 | 2 |
| 137 | 1D | oh, dating place. Then it is review based here. | 18 | 20 | 30 |
| 138 | 1D | I think wedding park is also review based. | 18 | 50 | 6 |
| 139 | 1E | which, number? | 18 | 56 | 2 |
| 140 | 1D | 14. Find a type of wedding for the users. So you just go the | 18 | 58 | 3 |
| 141 | 1A | it's review base. | 19 | 1 | 1 |
| 142 | 1D | yeah. The review based. | 19 | 2 | 16 |
| 143 | 1B | I think we should have an information distribution kind of thing for the cookpad and wikileaks.. | 19 | 18 | 9 |
| 144 | 1D | which one? | 19 | 27 | 1 |
| 145 | 1B | that information distribution. | 19 | 28 | 2 |
| 146 | 1D | information distribution, ah.. that's it! | 19 | 30 | 1 |
| 147 | 1B | you know, for the cookpad and wikileaks. | 19 | 31 | 0 |
| 148 | 1C | title, oh, yes. | 19 | 31 | 2 |
| 149 | 1D | ok, it's included. | 19 | 33 | 3 |
| 150 | 1A | but... | 19 | 36 | 1 |
| 151 | 1C | so wikileaks | 19 | 37 | 1 |
| 152 | 1D | wikileaks | 19 | 38 | 8 |
| 153 | 1A | I think cookpad is more like CI. It's like you post your recipe and you can look at other people's recipe. | 19 | 46 | 5 |

| | | | | | |
|-----|----|---|----|----|----|
| 154 | 1E | yes! | 19 | 51 | 3 |
| 155 | 1A | it's like you just create information you wanna share, and | 19 | 54 | 3 |
| 156 | 1D | what about the ewoman ? | 19 | 57 | 3 |
| 157 | 1C | that seems, similar to consulting? | 20 | 0 | 2 |
| 158 | 1E | number 8. Do you agree? | 20 | 2 | 3 |
| 159 | 1D | ewoman round table...(description of No.8). | 20 | 5 | 5 |
| 160 | 1E | consulting? | 20 | 10 | 1 |
| 161 | 1D | I think yeah, consulting. | 20 | 11 | 2 |
| 162 | 1E | CI? | 20 | 13 | 1 |
| 163 | 1D | nono, consulting. | 20 | 14 | 0 |
| 164 | 1E | consulting. | 20 | 14 | 6 |
| 165 | 1E | happy campus ...(description of Happy Campus!). CI, no, information distribution. | 20 | 20 | 6 |
| 166 | 1D | information, yeah! | 20 | 26 | 6 |
| 167 | 1E | this one (No. 50), what do you think. CI or information distribution? | 20 | 32 | 5 |
| 168 | 1C | information distribution. | 20 | 37 | 2 |
| 169 | 1A | I would say CI. | 20 | 39 | 1 |
| 170 | 1A | cause it's | 20 | 40 | 1 |
| 171 | 1E | or maybe both? | 20 | 41 | 1 |
| 172 | 1A | yeah, it's like everybody contributes their ideas and look at other people's idea. | 20 | 42 | 9 |
| 173 | 1D | there's another one. Innovative ideas topic (group). | 20 | 51 | 3 |
| 174 | 1E | what? Oh! | 20 | 54 | 4 |
| 175 | 1C | oh, innovative ideas. That seems similar to innovative ideas, because, um, innovative ideas by (description of No. 50)... | 20 | 58 | 15 |
| 176 | 1B | I think the, 23 is more like CI. | 21 | 13 | 6 |
| 177 | 1E | 23? | 21 | 19 | 1 |
| 178 | 1B | we don't need another one for innovative ideas. | 21 | 20 | 5 |
| 179 | 1E | so you mean just remove this? | 21 | 25 | 1 |
| 180 | 1B | yeah. | 21 | 26 | 1 |
| 181 | 1E | ok. | 21 | 27 | 3 |
| 182 | 1D | business microscope | 21 | 30 | 5 |

| | | | | | |
|-----|----|---|----|----|----|
| 183 | 1C | these are, sort of, there are two different kinds of, there are some of, um, day to day activity, day to day, um, living? | 21 | 35 | 10 |
| 184 | 1D | Lancers (No. 46).. | 21 | 45 | 0 |
| 185 | 1B | you means, um, the daily.. | 21 | 45 | 1 |
| 186 | 1C | yeah, and some are about the CI. Um, yeah, about 23 and 15. Some are about, um. | 21 | 46 | 7 |
| 187 | 1B | 23, yeah. | 21 | 53 | 5 |
| 188 | 1E | 23. | 21 | 58 | 1 |
| 189 | 1C | for example, the bike lover's map is for day to day | 21 | 59 | 4 |
| 190 | 1B | um (nodding).. | 22 | 3 | 1 |
| 191 | 1C | and the, about number 23, the recruiting ideas and solutions. Social issues, they are not day to day, but, it is quite broad, | 22 | 4 | 16 |
| 192 | F | you don't have to categorize everything. If you have nice group, that's fine. You can have 5, 4 groups. Some of the cards, if you don't use, that's fine. No problem. | 22 | 20 | 20 |
| 193 | 1B | or do you think it's better to include 23 into the Forum/ consulting? | 22 | 40 | 7 |
| 194 | 1C | um, not the forum, ok, it is CI. | 22 | 47 | 9 |
| 195 | 1A | I think 23 should be forum/consulting. | 22 | 56 | 3 |
| 196 | 1B | yeah, maybe, it's very.. | 22 | 59 | 1 |
| 197 | 1A | it's really like you have an issue and you try to find solution with people. | 23 | 0 | 4 |
| 198 | 1B | yeah, yeah. | 23 | 4 | 3 |
| 199 | 1D | or we just create a new group for 23, 50 and the other one. This one. (point to the screen) | 23 | 7 | 13 |
| 200 | 1E | which one? | 23 | 20 | 1 |
| 201 | 1D | number 21. | 23 | 21 | 3 |
| 202 | 1B | 21. | 23 | 24 | 1 |
| 203 | 1D | it's all like you share ideas. | 23 | 25 | 2 |
| 204 | 1E | creative agency (description of 21).. | 23 | 27 | 1 |
| 205 | 1D | all like sharing ideas. Number 21, 50 and number 23. | 23 | 28 | 6 |
| 206 | 1E | sharing ideas. (typing the title, new group created) | 23 | 34 | 0 |
| 207 | 1D | yeah, but do we need a new group or we just.. | 23 | 34 | 8 |
| 208 | 1D | I don't know. I guess, I think it's clear to group. It's easier to like just.. | 23 | 42 | 20 |
| 209 | 1A | I think 21 is more like forum/consulting. It's like you need to create, to get some work done. | 24 | 2 | 6 |

| | | | | | |
|-----|----|--|----|----|----|
| 210 | 1E | I think these two groups are very close to each other. | 24 | 8 | 7 |
| 211 | 1D | this (the new group, sharing ideas) is like a, um, you think of an idea, you create it, and people starts to review it. | 24 | 15 | 7 |
| 212 | 1A | no, I think IDEO is finding solution to problems. So it's close to innocentive, anyway. But I think that 21 it's more like you need some aid made, so you look for a person to do it. | 24 | 22 | 19 |
| 213 | 1D | okay, like.. | 24 | 41 | 4 |
| 214 | 1A | so it's like the translation job. I think they both belong to forum/consulting. And it seems that your looking for somebody to do some work, are you looking for an answer to a problem. So I think they are kind of similar anyway. | 24 | 45 | 14 |
| 215 | 1D | so, these two are here (pointing to group f/c) and you can delete the group (of sharing ideas or innovative ideas).. | 24 | 59 | 10 |
| 216 | 1E | this one, travel other's real (No. 10), this might be consulting (f/c)? | 25 | 9 | 7 |
| 217 | 1D | yeah, yeah, yeah, consulting. | 25 | 16 | 4 |
| 218 | 1E | you, you all agree? | 25 | 20 | 3 |
| 219 | 1C | it may be similar to amazon, because it is based on experience? | 25 | 23 | 5 |
| 220 | 1E | find a solution/ got a job done. | 25 | 28 | 1 |
| 221 | 1A | I think, I think that's (what D just said) like explanation for what I think this group would be. It's like what it does is to find a solution to a problem, or get a job done. | 25 | 29 | 10 |
| 222 | 1C | travel,...(description of No. 10) oh, that is similar to rakuten travel. | 25 | 39 | 10 |
| 223 | 1E | where is rakuten travel? | 25 | 49 | 1 |
| 224 | 1C | there, there, that is amazon, similar to amazon. Review based. because it is based on the experiences of travelers. | 25 | 50 | 14 |
| 225 | 1A | I think for travel, ... description is more like people they share their experience from specific travel. | 26 | 4 | 5 |
| 226 | 1E | yeah, like forum. | 26 | 9 | 1 |
| 227 | 1A | yeah, it's more like forum. It's like you share your experience and you can ask people about their experience. But it's not like commercial. | 26 | 10 | 2 |
| 228 | 1D | um, it's forum, sure. | 26 | 12 | 3 |
| 229 | 1D | users can see ...(description of No. 53), I think this one, number 53, I think it's CI, where you have a topic and everybody just drop in what their interest is. | 26 | 15 | 22 |
| 230 | 1E | yeah. | 26 | 37 | 2 |
| 231 | 1E | business micro...(description of No. 82), no. This one, No.15, information distribution maybe. | 26 | 39 | |

| | | | | | |
|-----|----|---|----|----|----|
| 232 | 1D | Ekiten, search for...(description of No.15 | | | |
| 233 | 1C | ah, it is. | 26 | 50 | 2 |
| 234 | 1C | search nearby restaurant (description of No.15)... similar to | 26 | 52 | 0 |
| 235 | 1E | or it should be consulting. | 26 | 52 | 5 |
| 236 | 1D | I think it's... | 26 | 57 | 4 |
| 237 | 1E | it could be like distribute | 27 | 1 | 0 |
| 238 | 1D | it's not like consulting, it doesn't help you. Just, information distribution (saying at the same time with B) | 27 | 1 | 2 |
| 239 | 1C | it's similar to collective (CI) | 27 | 3 | 2 |
| 240 | 1E | here, ok. (dragging No. 15 under ID) | 27 | 5 | 1 |
| 241 | 1D | you just know what is there, there's no need... | 27 | 6 | 14 |
| 242 | 1B | I think the 58 should go to consulting. | 27 | 20 | 4 |
| 243 | 1E | this one? | 27 | 24 | 0 |
| 244 | 1B | yeah. | 27 | 24 | 4 |
| 245 | 1D | ideas from different person...(description of No58) | 27 | 28 | 1 |
| 246 | 1C | what is this about, user...(description of No58). It is also similar to another weather. The weather, weather reports created by users. | 27 | 29 | 19 |
| 247 | 1E | this one? (No.4) | 27 | 48 | 1 |
| 248 | 1C | CI, yeah. | 27 | 49 | 2 |
| 249 | 1D | user creating? | 27 | 51 | 1 |
| 250 | 1C | user creating. Weather news project(No.4). ideas from different perspective, of different living streets. | 27 | 52 | 9 |
| 251 | 1D | ask questions, find... | 28 | 1 | 1 |
| 252 | 1A | I think that's what the have in common. Like for example, um, innocitive and IDEO is, it's like about finding someone or some solution | 28 | 2 | 17 |
| 253 | 1A | But some is, for example, the career café, is more about just asking a question to users. Um, like 4 travel (No. 10) is the same. Like you ask a question is very open and in that sense. | 28 | 19 | 14 |
| 254 | 1E | oh, this one (No. 82 Biz Microscope) is interesting... business...(description of No. 82) | 28 | 33 | 7 |
| 255 | 1D | ...business...(description of No. 82) | 28 | 40 | 8 |
| 256 | 1C | I couldn't understand. | 28 | 48 | 2 |
| 257 | 1D | what do they do. (laugh) make the employees speak better? | 28 | 50 | 7 |
| 258 | F | as I said, you don't have to use everything. | 28 | 57 | 3 |

| | | | | | |
|-----|----|---|----|----|----|
| 259 | 1D | well just put others. (laugh) | 29 | 0 | 2 |
| 260 | 1B | others. (laugh) | 29 | 2 | 1 |
| 261 | 1D | mysterious. (laugh) | 29 | 3 | 5 |
| 262 | F | but if that is interesting, you can create title and only single service exists. | 29 | 8 | 7 |
| 263 | 1E | yeah, it's very interesting. | 29 | 15 | 2 |
| 264 | 1C | I could not understand (what) it was. | 29 | 17 | 2 |
| 265 | 1E | for example, you.. | 29 | 19 | |
| 266 | F | Facilitator explained what the Biz microscope is. | | | |
| 267 | 1B | this is more like information sharing. | 29 | 26 | 4 |
| 268 | 1C | (listening to instructor's explanation) it is a kind of monitoring. | 29 | 30 | 3 |
| 269 | 1D | it's office spy. (laugh) | 29 | 33 | 5 |
| 270 | 1C | monitoring, yeah, it's spy. (laugh) | 29 | 38 | 5 |
| 271 | 1C | monitoring, create another one, monitoring. | 29 | 43 | 0 |
| 272 | 1B | yeah, yeah. | 29 | 43 | 2 |
| 273 | 1D | I don't.. their work.. | 29 | 45 | 6 |
| 274 | 1E | slash other, no, there's no (other) | 29 | 51 | 14 |
| 275 | 1E | ...(description of 62) BOP | 30 | 5 | 3 |
| 276 | 1D | what is BOP? | 30 | 8 | 4 |
| 277 | F | bottom of the pyramid is..(explain..). | 30 | 12 | 2 |
| 278 | 1D | bottom of the pyramid. Oh, okay, ok. | 30 | 14 | 17 |
| 279 | 1D | Lancers...(description of No.46) | 30 | 31 | 12 |
| 280 | 1C | number 59...(description of No.59) | 30 | 43 | 2 |
| 281 | 1D | these two are similar actually, this one (No.59) and this one(No.46). Actually you have something, you just give it all to the public to design. And they have to create a create of designer or etc. and you pay them. It's like a business. | 30 | 45 | 15 |
| 282 | 1C | occupation? | 31 | 0 | 1 |
| 283 | 1E | this one? | 31 | 1 | 1 |
| 284 | 1D | number 59 and number 46. | 31 | 2 | 2 |
| 285 | 1A | I would say like the 59 is close to 21. It's like you need some creative job done and you find people to do this. | 31 | 4 | 8 |
| 286 | 1D | um hum. (nodding) like I want this (with one hand), and I have this (with another hand) and you just connect them. That it. | 31 | 12 | 5 |

| | | | | | |
|-----|----|---|----|----|----|
| 287 | 1A | yeah. It's like I need somebody to create this logo or this ad, and users are like ... | 31 | 17 | 7 |
| 288 | 1D | (finishing E's sentence) I can do that for you. | 31 | 24 | 0 |
| 289 | 1A | I can do the logos and ads. So they have contest or something. | 31 | 24 | 3 |
| 290 | 1E | so these two (21 and 59)? | 31 | 27 | 3 |
| 291 | 1D | and 46 also. It's like, um, you know, kind of like mediate between the | 31 | 30 | 2 |
| 292 | 1C | innovation by competition? | 31 | 32 | 5 |
| 293 | 1A | you know, like freelancers and clients. | 31 | 37 | 0 |
| 294 | 1D | freelancers and clients. | 31 | 37 | 2 |
| 295 | 1A | it's like intermediation. | 31 | 39 | 2 |
| 296 | 1D | yeah. | 31 | 41 | 3 |
| 297 | 1C | innovation by competition? Maybe? | 31 | 44 | 4 |
| 298 | 1D | maybe, I don't know. Both? | 31 | 48 | 1 |
| 299 | 1C | open, from open competition? The innovation is. | 31 | 49 | 5 |
| 300 | 1D | it likes.. | 31 | 54 | 1 |
| 301 | 1C | creativity. | 31 | 55 | 0 |
| 302 | 1A | I think the intermediation is.. | 31 | 55 | 1 |
| 303 | 1C | OK. | 31 | 56 | 3 |
| 304 | 1A | I don't know. I like my title. | 31 | 59 | 1 |
| 305 | 1D | what is KAYAC, what is this? | 32 | 0 | 2 |
| 306 | 1C | (read KAYAC's description) that, I couldn't. I misunderstood this. | 32 | 2 | |
| 307 | F | FAcilitator explained KAYAC | | | |
| 308 | 1A | in that case... | 32 | 40 | 2 |
| 309 | 1C | (asking instructor) oh, the Kopernik and KAYAC seems similar? | 32 | 42 | 5 |
| 310 | F | the K is more like create some fund. Like they want to develop some product for developing countries, and when scientist and technician they make a concept or design on website, and they post it on website and they can collect some fund from the company and they can make it. They can distribute it to poor countries. | 32 | 47 | 31 |
| 311 | 1C | innovation for science. | 33 | 18 | 2 |
| 312 | 1D | we just group these two like saying promoting start of.. I mean when you start a company? | 33 | 20 | 5 |
| 313 | 1E | startup? | 33 | 25 | 0 |
| 314 | 1C | nono. | 33 | 25 | 2 |

| | | | | | |
|-----|----|--|----|----|----|
| 315 | 1D | yeah, startups. | 33 | 27 | 1 |
| 316 | 1C | innovation for.. | 33 | 28 | 1 |
| 317 | 1B | no, I think the Kopernik is more like intermediation. Like between the fund and projects. | 33 | 29 | 1 |
| 318 | 1E | this one(62)? | 33 | 30 | 1 |
| 319 | 1B | yes. For example, you can see it says that on the Internet, there are tech so they can attract some fund to develop those tech. | 33 | 31 | 23 |
| 320 | 1D | oh, ok. | 33 | 54 | 9 |
| 321 | 1B | I think the KAYAC still goes to the consulting. | 34 | 3 | 4 |
| 322 | 1E | consulting? | 34 | 7 | 1 |
| 323 | 1B | yes, because says in the material, if you want to have ideas from different perspective of different industries, ... free to ask what choice you want. | 34 | 8 | 11 |
| 324 | 1D | ok. | 34 | 19 | 1 |
| 325 | 1B | so it's more like ask question and somebody answers. | 34 | 20 | 1 |
| 326 | 1D | asking the industry. | 34 | 21 | |
| 327 | F | Instruction | | | |
| 328 | F | amazon should be linked to this? (pointing to frequency based) | 38 | 53 | 3 |
| 329 | 1C | no. | 38 | 56 | 1 |
| 330 | 1A | I think it should, it should be linked to frequency based as well. | 38 | 57 | 4 |
| 331 | 1E | yeah, yeah, yeah. Amazon. | 39 | 1 | 2 |
| 332 | 1B | en hum. | 39 | 3 | 5 |
| 333 | 1E | oh, yeah, it's frequency based. | 39 | 8 | 5 |
| 334 | 1C | can you keep with both topics? | 39 | 13 | |

*F: Facilitator

2) The second workshop

Date: December 26th (Friday), 2014

Time: 13:30-18:00

Place: i.school studio, 4F, Engineering Building No. 11, Hongo Campus

| No | video time | Duration (sec.) | Sub-ject* | Dialogue |
|----|------------|-----------------|-----------|--|
| 1 | 00:24:43 | | F* | Before you start, I'll give you information. |
| 2 | 00:24:57 | 14 | F | If you compare the Amazon, and the Sushi bar , they have no superficial similarity. |
| 3 | 00:25:07 | 10 | F | When I say superficial similarity, Amazon is web service and Sushi is real service. |
| 4 | 00:25:15 | 8 | F | And food - bookstore, so they are different. |
| 5 | 00:25:18 | 3 | F | That means, superficial similarity is low. |
| 6 | 00:25:27 | 9 | F | But, structural similarity, that means a service mechanism is same. |
| 7 | 00:25:34 | 7 | F | They have the history of purchase and recommendation, |
| 8 | 00:25:45 | 11 | F | In a sense, they have structural similarity. |
| 9 | 00:25:47 | 2 | F | We believe that we can create innovative service or ideas with high structural similarity and low superficial similarity. |
| 10 | 00:26:01 | 14 | F | So you are going to create the group of services based on structural similarity. |
| 11 | 00:26:11 | 10 | F | Not superficial similarity, do you understand? |
| 12 | 00:26:14 | 3 | 2B | e.g., amazon and this sushi is in the same group |
| 13 | 00:26:20 | 6 | F | Yes, that's right. |
| 14 | 00:26:25 | 5 | F | Then, I think when you read material, you must have found that some of the services are similar. |
| 15 | 00:26:34 | 9 | F | Based on your sense, you create services, a group of services, and then you create title note to each group like amazon and dushi bar to tailor-made proposal. |
| 16 | 00:26:52 | 18 | F | ok? |
| 17 | 00:26:54 | 2 | F | You're going to give a title with a gray note. |
| 18 | 00:27:00 | 6 | F | This is what you're going to do. |
| 19 | 00:27:05 | 5 | F | It's a group work, so you discuss. |
| 20 | 00:27:10 | 5 | F | If somebody moves (the note) then it moves on the all the displays. |
| 21 | 00:27:15 | 5 | 2C | We have to create this, like for the more? Or for just to 25 different |
| 22 | 00:27:20 | 5 | F | For 25 cases |
| 23 | 00:27:22 | 2 | 2C | Then we have to connect that for like structural similarity to small one? |
| 24 | 00:27:28 | 6 | F | more? |
| 25 | 00:27:29 | 1 | 2C | shopping mall |
| 26 | 00:27:30 | 1 | F | Nonono. That's just introduction. |
| 27 | 00:27:33 | 3 | F | Forget about the shopping mall |
| 28 | 00:27:37 | 4 | F | So, today we create new service, but the new service can be anything. |
| 29 | 00:27:44 | 7 | 2C | Ok! |
| 30 | 00:27:47 | 3 | F | Ok? Are you ready? Ok. Why don't you start? |

| | | | | |
|----|----------|----|----|--|
| 31 | 00:28:13 | 26 | 2A | Do you have any initial idea? |
| 32 | 00:28:15 | 2 | 2C | Not particularly |
| 33 | 00:28:24 | 9 | 2B | I wonder how much we can create. |
| 34 | 00:28:52 | 28 | 2B | So how about start with cooking from the service that make some match, matching |
| 35 | 00:29:02 | 10 | 2A | matching? |
| 36 | 00:29:04 | 2 | 2A | which one? |
| 37 | 00:29:07 | 3 | 2B | for example, No.16. match |
| 38 | 00:29:25 | 18 | 2B | And there's another one.. |
| 39 | 00:29:41 | 16 | 2A | I think I, when I read this, I recognized 3 types of structures. |
| 40 | 00:29:54 | 13 | 2A | So, one is e.g. the one you have in the left, those services , |
| 41 | 00:30:04 | 10 | 2A | They are, they connect one person. |
| 42 | 00:30:07 | 3 | 2A | Should we?... for another person? |
| 43 | 00:30:11 | 4 | 2A | But then, the other one, their structure is based more on |
| 44 | 00:30:22 | 11 | 2A | collecting the from the large group |
| 45 | 00:30:30 | 8 | 2A | And then passing that information to a single person |
| 46 | 00:30:37 | 7 | 2A | What's your think? |
| 47 | 00:30:39 | 2 | 2C | This is from the , maybe, consumer's point of view. |
| 48 | 00:30:43 | 4 | 2C | from the business point of view, which is like No.59, what they do is like, they create a competition, and the one who wins, he will be using that service |
| 49 | 00:30:54 | 11 | 2C | instead of giving the content to someone. |
| 50 | 00:30:57 | 3 | 2C | for more something to do more particular one |
| 51 | 00:31:05 | 8 | 2C | They create like an open competition, and they get a better result, so this is from the point of view of business |
| 52 | 00:31:12 | 7 | 2C | some of them are from the consumer's point of view, the you get a better result or something. |
| 53 | 00:31:19 | 7 | 2A | I think one difference certainly that, in some services, you are passing on just general knowledge or opinions, |
| 54 | 00:31:31 | 12 | 2A | and other services, they are, your actually doing actual services, design your website, design the logo.. |
| 55 | 00:31:42 | 11 | 2B | So on the left, they all match one that provides some matching. |
| 56 | 00:31:50 | 8 | 2B | ok, I'll try to group another one that you mention that they gather the information. |
| 57 | 00:31:59 | 9 | 2B | So I move this ... |
| 58 | 00:32:02 | 3 | 2B | and this |
| 59 | 00:32:03 | 1 | 2C | Which one is the No.53? |
| 60 | 00:32:04 | 1 | 2B | This one is bulletin board |
| 61 | 00:32:05 | 1 | 2C | Oh yeah |
| 62 | 00:32:07 | 2 | 2B | And what else? |
| 63 | 00:32:09 | 2 | 2A | That, the one of eating.. No.03 |
| 64 | 00:32:14 | 5 | 2B | Ah, yeah, No.3 |
| 65 | 00:32:16 | 2 | 2A | And, there's also the one about the riding the bicycle. |

| | | | | |
|-----|----------|----|----|---|
| 66 | 00:32:24 | 8 | 2A | It's in the top row |
| 67 | 00:32:47 | 23 | 2A | So, which one still we have? |
| 68 | 00:32:53 | 6 | 2B | It is matching, but it's based on like, competition, something like, |
| 69 | 00:32:58 | 5 | 2A | Yeah, so it's certainly not, |
| 70 | 00:33:01 | 3 | 2B | Not the direct matching like this but, I put it right side |
| 71 | 00:33:10 | 9 | 2B | No.59, it's also create something that based on the ranking system, so I think it could be here. It's brainstorming too. |
| 72 | 00:33:24 | 14 | 2C | But, about the ranking of the person like No.21, is it you rank by yourself? Or they'll rank what you design. |
| 73 | 00:33:37 | 13 | 2B | I think the rank is by |
| 74 | 00:33:43 | 6 | 2C | So there's a two things, right? |
| 75 | 00:33:44 | 1 | 2C | One, we go to the website we do some rating and the other is, we create something and the business man or the company, they rate us. |
| 76 | 00:33:56 | 12 | 2C | On the basis of the level of the idea. |
| 77 | 00:33:59 | 3 | 2C | So No.59, they rate us, and No.8, and No.03 we rate those things |
| 78 | 00:34:12 | 13 | 2B | try to gather.. The website that provide into many... |
| 79 | 00:34:20 | 8 | 2B | This one... |
| 80 | 00:34:28 | 8 | 2B | This and also No.17 |
| 81 | 00:34:46 | 18 | 2C | I'm not sure, maybe this one, which is connecting the social issues, No.23 |
| 82 | 00:34:54 | 8 | 2C | Creating ideas... |
| 83 | 00:35:05 | 11 | 2B | I think,.. |
| 84 | 00:35:12 | 7 | 2A | I think some of the |
| 85 | 00:35:16 | 4 | 2B | You can move around (the notes), please |
| 86 | 00:35:26 | 10 | 2A | Of course, all of them satisfying somebody's needs. |
| 87 | 00:35:31 | 5 | 2A | either some person, who wants to looking for finding the good restaurants |
| 88 | 00:35:36 | 5 | 2A | like a recommendation |
| 89 | 00:35:39 | 3 | 2A | or you have the other ones, are people who are looking for specific service. |
| 90 | 00:35:46 | 7 | 2A | I don't think the structure changes dramatically. |
| 91 | 00:35:51 | 5 | 2A | I think they all have in common, you're trying to facilitate you solution for some kind of need. |
| 92 | 00:36:04 | 13 | 2C | Normally, how many categories do you think there would be, on the basis of structure. |
| 93 | 00:36:11 | 7 | 2A | I think one structure, of course, we have to ambiguous, everybody have a different structure, |
| 94 | 00:36:23 | 12 | 2A | But I think one common trait is, e.g. the one in the left, where you're providing using the service at the platform to provide in specific service from one person to one person. |
| 95 | 00:36:43 | 20 | 2B | I think obviously, group the other one |
| 96 | 00:36:56 | 13 | 2B | Some of these, they not sell the products by themselves |
| 97 | 00:37:05 | 9 | 2B | Apart from this one(No.1&2) |
| 98 | 00:37:11 | 6 | 2B | This is all selling the products. |
| 99 | 00:37:29 | 18 | 2A | If you try to go deeper, in the once, in the left, that group |
| 100 | 00:37:39 | 10 | 2A | you have a like a pool of the resources, which is people are talented: |

| | | | | |
|-----|----------|----|----|---|
| | | | | developers or artists. |
| 101 | 00:37:51 | 12 | 2C | Expert?, opinion professional |
| 102 | 00:37:54 | 3 | 2A | So, here in the one in the left, have some kind of professional as resources, |
| 103 | 00:38:04 | 10 | 2A | And you're trying to |
| 104 | 00:38:07 | 3 | 2B | I'll move No.21 to left side to |
| 105 | 00:38:10 | 3 | 2C | Yeah, maybe yes. |
| 106 | 00:38:11 | 1 | 2B | It's not directly match, |
| 107 | 00:38:13 | 2 | 2C | No.21's the direct one. |
| 108 | 00:38:16 | 3 | 2C | And that in the competition they came up |
| 109 | 00:38:18 | 2 | 2A | The other, such as No.16, the resource are not professional, just people in general. |
| 110 | 00:38:29 | 11 | 2A | So, layman, but still, I need |
| 111 | 00:38:31 | 2 | 2A | If you collect, you know, opinions from layman, |
| 112 | 00:38:34 | 3 | 2A | it's your turn to some kind of having useful information. |
| 113 | 00:38:40 | 6 | 2C | yeah. |
| 114 | 00:38:43 | 3 | 2C | So, in general, this one is from kind of professional, we don't need to re-doing, they all professional, |
| 115 | 00:38:47 | 4 | 2C | this one is like raw data, and |
| 116 | 00:38:52 | 5 | 2C | they should be I think, rated. Right? |
| 117 | 00:38:56 | 4 | 2C | everyone is like No.08, and this one, they rated and .. Information.. |
| 118 | 00:39:02 | 6 | 2A | I think in this one you have just normal people, they give their opinion, once you have collected opinions, |
| 119 | 00:39:14 | 12 | 2A | obiously, you have noticed, No.03, whatever becomes more popular, |
| 120 | 00:39:23 | 9 | 2C | No.62 |
| 121 | 00:39:28 | 5 | 2A | This is the one who develop, I think solutions for developing countries, |
| 122 | 00:39:36 | 8 | 2B | So what do you think? |
| 123 | 00:39:38 | 2 | 2A | I think it's also some kind of |
| 124 | 00:39:41 | 3 | 2C | professionals? |
| 125 | 00:39:42 | 1 | 2A | Yes. Definitely. Professional. |
| 126 | 00:39:48 | 6 | 2C | This one also will be a, |
| 127 | 00:39:50 | 2 | 2C | Is this like a google one? Is this from the professionals or |
| 128 | 00:39:56 | 6 | 2C | from like, the , using the doing the reviews of gathering these things and then. |
| 129 | 00:40:02 | 6 | 2A | I think |
| 130 | 00:40:04 | 2 | 2B | It should be on the top because they provide the service bu themselves, not |
| 131 | 00:40:09 | 5 | 2B | e.g. from the left side, |
| 132 | 00:40:13 | 4 | 2C | Professionals ... |
| 133 | 00:40:15 | 2 | 2B | But the provider, they're not providing the service by themselves. |
| 134 | 00:40:22 | 7 | 2B | like, try to match, try to find the best for the users. |
| 135 | 00:40:29 | 7 | 2C | No.24 provide by themselves, they don't do the... |
| 136 | 00:40:31 | 2 | 2B | Yeah |

| | | | | |
|-----|----------|----|----|---|
| 137 | 00:40:33 | 2 | 2A | Does it make a difference? |
| 138 | 00:40:40 | 7 | 2A | I think , e.g., |
| 139 | 00:40:47 | 7 | 2A | eventhough No.24, e.g. , there's no person ,no other 3rd party which is providing the service, |
| 140 | 00:41:00 | 13 | 2A | It's just a piece of software. |
| 141 | 00:41:04 | 4 | 2B | It is a piece of software. |
| 142 | 00:41:07 | 3 | 2B | I think No.5 & No.24 is quite similar. |
| 143 | 00:41:10 | 3 | 2A | So you have |
| 144 | 00:41:13 | 3 | 2B | Some kind of hardware you use to collect the data |
| 145 | 00:41:16 | 3 | 2A | You could use that as a category so you services which require at least like two human, or whatever it takes place |
| 146 | 00:41:29 | 13 | 2A | in the other one which requires only software |
| 147 | 00:41:32 | 3 | 2A | So I think, e.g. the ones in the right, you're not deaking with a person directly, |
| 148 | 00:41:38 | 6 | 2A | you're just dealing with, kind of ratings in the smartphone app. |
| 149 | 00:41:45 | 7 | 2C | So, in general, we can say that this one comes from the credible source, professionals, right? |
| 150 | 00:41:53 | 8 | 2C | So, they must be like more reliable, in some ways. |
| 151 | 00:41:58 | 5 | 2C | Then, like this .. Things |
| 152 | 00:42:01 | 3 | 2A | Well, I think, |
| 153 | 00:42:05 | 4 | 2C | In a normalized .., I mean, not like the |
| 154 | 00:42:09 | 4 | 2A | I thinkg normalized, like, in this, in the ones in the right, |
| 155 | 00:42:16 | 7 | 2A | You're still going to .. |
| 156 | 00:42:19 | 3 | 2A | e.g. if you follow the recommendation, you'll probably end up with good restaurant. |
| 157 | 00:42:23 | 4 | 2A | So I think, you know, the quality of the recommendation is not bad, it's just ones in the right |
| 158 | 00:42:33 | 10 | 2A | They are using normal peopla as the resource, |
| 159 | 00:42:37 | 4 | 2C | Yeah, their experience and this one is from.. |
| 160 | 00:42:39 | 2 | 2A | This, they're not using normal people, they just have resource they're actively looking at the group of profesisonals |
| 161 | 00:42:50 | 11 | 2C | So, a professional base and experience .. Practical |
| 162 | 00:42:53 | 3 | 2A | Yeah |
| 163 | 00:43:03 | 10 | 2B | In that case, |
| 164 | 00:43:14 | 11 | 2C | No.14 should be here, right? |
| 165 | 00:43:23 | 9 | 2B | on the left? |
| 166 | 00:43:26 | 3 | 2C | I think the right |
| 167 | 00:43:37 | 11 | 2B | they provide |
| 168 | 00:43:46 | 9 | 2B | information about the place so.. |
| 169 | 00:43:55 | 9 | 2B | they provide, but it's not gathered by the other users , no.14 |
| 170 | 00:44:09 | 14 | 2B | that information on this website is gathered by a the website itself. |
| 171 | 00:44:22 | 13 | 2B | Not shared |
| 172 | 00:44:25 | 3 | 2C | Ah, from the users? |

| | | | | |
|-----|----------|----|----|---|
| 173 | 00:44:27 | 2 | 2B | So I think it should go on the left |
| 174 | 00:44:32 | 5 | 2B | The group, as Daniel said, |
| 175 | 00:44:36 | 4 | 2B | Ok. And what about No.11? |
| 176 | 00:44:38 | 2 | 2B | matching, matching |
| 177 | 00:44:42 | 4 | 2A | No.11 is definitely profesisonal |
| 178 | 00:44:46 | 4 | 2B | what about No.10? |
| 179 | 00:44:51 | 5 | 2C | No.62? |
| 180 | 00:45:14 | 23 | 2A | I think the one, No.7 is also in the left because, |
| 181 | 00:45:22 | 8 | 2B | here? |
| 182 | 00:45:23 | 1 | 2A | uhm, because it's using actual university student as the source |
| 183 | 00:45:32 | 9 | 2C | TheNo.62 could be on the left, because it's actually getting a social issues |
| 184 | 00:45:39 | 7 | 2C | from a NGO, something like going for the funding for developing countries |
| 185 | 00:45:48 | 9 | 2B | I think it's same... because their information |
| 186 | 00:45:52 | 4 | 2C | which one? |
| 187 | 00:45:57 | 5 | 2B | No.7 |
| 188 | 00:46:02 | 5 | 2C | I think , maybe they're like local people , professional compare to but, |
| 189 | 00:46:11 | 9 | 2C | in other sense, they're also users on their experience |
| 190 | 00:46:17 | 6 | 2C | but the user in this case, it's getting from professional people. |
| 191 | 00:46:21 | 4 | 2C | So, we can say that , maybe the senior members are kind of professional or in... |
| 192 | 00:46:29 | 8 | 2B | So it's kind of matching other.. |
| 193 | 00:46:33 | 4 | 2C | Yeah. |
| 194 | 00:46:35 | 2 | 2A | I think maybe.. Try to focus on another structure |
| 195 | 00:46:44 | 9 | 2A | because I think now we agree at least that we can identify the type of resources which they're using. |
| 196 | 00:46:56 | 12 | 2A | But, I think we can still , maybe, make a final category. |
| 197 | 00:47:05 | 9 | 2A | I think 2 is a little bit, not a.... |
| 198 | 00:47:16 | 11 | F | After you create categories, you're going to put title. |
| 199 | 00:47:21 | 5 | F | And title is quite important. This should summarize service mechanism, or structural similarity. Or provided values of those services |
| 200 | 00:47:34 | 13 | F | This should be in a short sentence, it should explain. |
| 201 | 00:47:40 | 6 | F | And you can do a grouping, categorization, at the same time you can create title. |
| 202 | 00:47:49 | 9 | F | And, so if you put title of the group, then your discussion become more deeper |
| 203 | 00:48:04 | 15 | 2C | we put the titles..so... |
| 204 | 00:48:12 | 8 | 2C | I'm still not sure about the google. |
| 205 | 00:48:22 | 10 | 2B | Because I think there's more than one structures. |
| 206 | 00:48:27 | 5 | 2B | It's quite different from..... |
| 207 | 00:48:29 | 2 | 2C | Yeah |
| 208 | 00:48:30 | 1 | 2A | But in regards to what is different, |

| | | | | |
|-----|----------|----|----|--|
| 209 | 00:48:35 | 5 | 2C | Because it's getting, doing the slangs, like local languages of people, and google itself is using that provider as input. |
| 210 | 00:48:51 | 16 | 2C | on the internet or something, I don't know... |
| 211 | 00:48:54 | 3 | 2B | I think it's like, when you type Japanese, |
| 212 | 00:49:00 | 6 | 2C | Yeah, so new vocabulary or something.. Yeah, that kind of.. |
| 213 | 00:49:05 | 5 | 2C | But in other ones, like Amazon and sushi. |
| 214 | 00:49:11 | 6 | 2C | It's kind of more, as technical, QR or something, they use technology. |
| 215 | 00:49:21 | 10 | 2C | This is kind of, it's not survey, like a new trend of a vocabulary. |
| 216 | 00:49:27 | 6 | 2A | So, I think you could say some services are made to give to provide additional convenience. |
| 217 | 00:49:43 | 16 | 2A | Others could say, they are clearly made to help you to save money. |
| 218 | 00:49:50 | 7 | 2C | Yeah. |
| 219 | 00:49:51 | 1 | 2A | e.g. the ones on the left, you have a this matching between translator , service provider and service seekers |
| 220 | 00:50:01 | 10 | 2A | I think they are there to minimize your cost because you're.. |
| 221 | 00:50:07 | 6 | 2A | You have to many, to make a proposal many many , while you have contract. |
| 222 | 00:50:15 | 8 | 2A | Then you contract which one you want. That's... |
| 223 | 00:50:19 | 4 | 2B | the one from the customers, so it should be on the left, |
| 224 | 00:50:30 | 11 | 2A | No. no. that one is for the right. |
| 225 | 00:50:33 | 3 | 2A | Because, that one is using just the, I think, just input from many many people, and they compiling it into some kind of slang dictionary. |
| 226 | 00:50:44 | 11 | 2B | They provide themselves, not ..., these, they provide others' idea then you have to decide by yourself |
| 227 | 00:50:58 | 14 | 2A | Hah... |
| 228 | 00:51:06 | 8 | 2C | But, How do they know about the vocabulary, form the internet? Or they do some survey? Like.. |
| 229 | 00:51:13 | 7 | 2A | I think they use for that one people use google to search they use the input for that. To build the database |
| 230 | 00:51:30 | 17 | 2C | Ah. |
| 231 | 00:51:35 | 5 | 2A | So, I think , uh, if you look at each service provider and you look at the idea from there how are they profiting this service. |
| 232 | 00:51:57 | 22 | 2A | So, I think that could give use some insight to some other type of... |
| 233 | 00:52:03 | 6 | 2C | Yeah, that's right, because the No.2 and No.1 they're like doing efficient time management and improving the efficiency..like for customer.. Right? |
| 234 | 00:52:15 | 12 | 2C | Something which user wants for.. |
| 235 | 00:52:20 | 5 | 2C | and the from a point of view, like the left one, especially, the No.24, they're kind of making for more users, maybe, that, you write something and som vocabulary comes up. |
| 236 | 00:52:34 | 14 | 2C | And the.. And also, the left one is more |
| 237 | 00:52:41 | 7 | 2C | solving, more like a , in a way, not technical... |
| 238 | 00:52:51 | 10 | 2C | Because this is just making a database giving something , this is kind of more social... how to say.. |
| 239 | 00:53:04 | 13 | 2C | advice.. |
| 240 | 00:53:07 | 3 | 2A | So, I think, e.g. the one No.2 and No.24, they are actively using this scheme to improve their |
| 241 | 00:53:18 | 11 | 2C | user-friendly |

| | | | | |
|-----|----------|----|----|--|
| 242 | 00:53:19 | 1 | 2A | user-friendliness, or efficiency |
| 243 | 00:53:23 | 4 | 2B | You guys're right. |
| 244 | 00:53:25 | 2 | 2A | But as for the other ones, they're I don't think they maybe care a lot of their user-friendliness, they more like looks making profits |
| 245 | 00:53:37 | 12 | 2C | Hmm. |
| 246 | 00:53:40 | 3 | 2B | You mean, this No.5, because I think if you, from a view point, this is provider, I think this on the right. |
| 247 | 00:53:55 | 15 | 2B | Maybe their income gather from the advertisement, they didn't sell anything . |
| 248 | 00:54:00 | 5 | 2A | Yeah, I think in many ones , you don't have to pay anything to use the services. |
| 249 | 00:54:08 | 8 | 2A | So basically the service provider have to find some kind of ideas to integrate the services into the portfolios |
| 250 | 00:54:17 | 9 | 2A | But the ones in the left, they are, I think they actively making money with this. |
| 251 | 00:54:23 | 6 | 2C | Because they're professionals, right? I mean, |
| 252 | 00:54:26 | 3 | 2A | Not because of professional, but e.g., I'm pretty sure that you have to pay money to actually be a member of one of this website. |
| 253 | 00:54:34 | 8 | 2A | Whereas, I see you don't have to pay.. Most likely, you don't have to pay any money to the other services. |
| 254 | 00:54:52 | 18 | 2A | I think maybe we should start writing some categories. |
| 255 | 00:54:57 | 5 | 2B | I'm trying to group the website that they provide the services by themselves or they try to find the professionals to solve a problems |
| 256 | 00:55:17 | 20 | 2A | I would say, the one category's structure is certainly that |
| 257 | 00:55:25 | 8 | 2A | professionals as a resource |
| 258 | 00:55:41 | 16 | 2C | In general, a person going to the internet and he wants information, so |
| 259 | 00:55:49 | 8 | 2C | there're different category, right? |
| 260 | 00:55:52 | 3 | 2C | The professional one, and from user's experience, and then some other perspectives. |
| 261 | 00:55:59 | 7 | 2C | So maybe we start like, to writing this two in that way. |
| 262 | 00:56:04 | 5 | 2C | we can categorize, yeah. |
| 263 | 00:56:35 | 31 | 2C | I think they're, what they're doing in the No.01 and No. 05, they're actually balancing the supply and the demand. |
| 264 | 00:56:48 | 13 | 2C | In an efficient time, doing efficient time management. |
| 265 | 00:56:52 | 4 | 2C | Because No,1 is some sort of Right? So number of people... and similiarly No.05, |
| 266 | 00:57:04 | 12 | 2C | It just get the historical data selling goods and they're also kind of doing some sort of balancing the supply and demand |
| 267 | 00:57:18 | 14 | 2A | I think, many of this make the efficiency-driven , so you want to increase efficiency of your business and other ones profit-driven |
| 268 | 00:57:37 | 19 | 2A | you don't, so there's maybe ... |
| 269 | 00:57:46 | 9 | 2A | There isn't much of aspect that you want to optimize but e.g. |
| 270 | 00:57:51 | 5 | 2A | These enable to have, the ones in the left , having possibility of somebody is looking for the service |
| 271 | 00:58:03 | 12 | 2A | And then, they being able to basically choose from many many people, professionals they are |
| 272 | 00:58:11 | 8 | 2A | They're just using the fact that people're interested in this offering to just make money. |
| 273 | 00:58:18 | 7 | 2C | But for that, No.24 and No.02, they're kind of user-friendly in that way. |

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| 274 | 00:58:26 | 8 | 2C | Right? Because they're trying to make their website or services more user-friendly. |
| 275 | 00:58:33 | 7 | 2C | No.01&05, time management. |
| 276 | 00:58:37 | 4 | 2B | Nono. No24 is not website, it's a .. |
| 277 | 00:58:43 | 6 | 2A | It's for your smartphone, also for computer. |
| 278 | 00:58:48 | 5 | 2C | Ah. Ok |
| 279 | 00:58:51 | 3 | 2C | So, it just for the person who is using not only for .. |
| 280 | 00:58:54 | 3 | 2B | Yeah, not only for ... |
| 281 | 00:59:11 | 17 | 2A | so... one maybe , make profit.. |
| 282 | 00:59:30 | 19 | 2B | Anyway, this group can be same to this group, they gather information from the customers |
| 283 | 00:59:44 | 14 | 2B | And they use their some kind of development, to provide better service. |
| 284 | 00:59:55 | 11 | 2C | Maybe then, we can divide into like that professional people, then into profit base and maybe other category. |
| 285 | 01:00:05 | 10 | 2C | reliable something. |
| 286 | 01:00:13 | 8 | 2C | because these two(No.1&5) are mainly time management |
| 287 | 01:00:19 | 6 | 2C | these No.2 and.. Find demand, supply and demand. |
| 288 | 01:00:33 | 14 | 2A | I think the way , the ones in the left. You're jumping this new crowd-sourcing model |
| 289 | 01:00:45 | 12 | 2A | just to make a profit. |
| 290 | 01:00:50 | 5 | 2A | And this could be, e.g. match translators and people who want translation. |
| 291 | 01:00:57 | 7 | 2A | others are trying to increase the efficiency of the existing business |
| 292 | 01:01:04 | 7 | 2A | I think for the ones in the right. E.g. |
| 293 | 01:01:11 | 7 | 2A | No.08 how do they, what's their incentive behind to implementing crowd sourcing |
| 294 | 01:01:19 | 8 | 2A | of course, it's convenient for bicycle riders but nobody does , I don't think they're just doing this out of good will |
| 295 | 01:01:30 | 11 | 2A | There has to be some other incentive, maybe I'm too pessimistic |
| 296 | 01:01:35 | 5 | 2B | As I mention, maybe, it is provide, make some profit by advertisement |
| 297 | 01:01:46 | 11 | 2A | So here, of course, you can provide valuable knowledge |
| 298 | 01:01:52 | 6 | 2A | people use their service and then they can get cash from advertisement , ah, revenue. |
| 299 | 01:01:59 | 7 | 2C | Yeah. |
| 300 | 01:02:01 | 2 | 2A | So.. But I think that also into making profit for novel business model just not collecting |
| 301 | 01:02:13 | 12 | 2A | like the fee from , here you collect the fee directly from the recipient, and here from the maybe advertisement agency |
| 302 | 01:02:23 | 10 | 2B | Maybe some of them mainly, they are not taking any fees |
| 303 | 01:02:28 | 5 | 2A | I think some of them can be think as just out of good will , for the better world, such as |
| 304 | 01:02:35 | 7 | 2B | e.g. No.7, I think they not charge any fees on student. |
| 305 | 01:02:40 | 5 | 2A | yeah. |
| 306 | 01:02:44 | 4 | 2C | career advice, these are like this |
| 307 | 01:02:48 | 4 | 2B | kind of income.. Their website like advertisement. |

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| 308 | 01:02:53 | 5 | 2C | Yeah, so their website will become popular or somethink like, they can run advertisement or something.. |
| 309 | 01:03:04 | 11 | 2B | Anyway, mentioned in that... |
| 310 | 01:03:08 | 4 | 2A | you could say like that maybe some of them. Their driving factors to starting the service |
| 311 | 01:03:16 | 8 | 2A | is just a noble cause, I want to provide bicycle riders' experience in Japan. |
| 312 | 01:03:25 | 9 | 2A | I want to provide 3rd world countries with that technology |
| 313 | 01:03:30 | 5 | 2A | so, maybe like, even though they might be making revenue, I think the source of the idea is a also some kind of |
| 314 | 01:03:43 | 13 | 2A | It could be also seen in the structures |
| 315 | 01:03:46 | 3 | 2A | structural profit making... |
| 316 | 01:03:50 | 4 | 2C | one is like, from the point of view, business like No.2, No.5 and No.1 |
| 317 | 01:03:57 | 7 | 2C | Other one is like giving advice , professional advice to local people, |
| 318 | 01:04:03 | 6 | 2C | this one is like getting something from the local people's ratings or surveys like these things |
| 319 | 01:04:12 | 9 | 2C | And the one, how do you differentiate the left one, and the this one? |
| 320 | 01:04:19 | 7 | 2B | This one and this one.. What I categorize into two groups, maybe as you mention, |
| 321 | 01:04:27 | 8 | 2B | They have kind of similar structure that they provide from professional |
| 322 | 01:04:33 | 6 | 2B | but, professional with I categorized on the left one , they provide information by themselves. |
| 323 | 01:04:44 | 11 | 2B | but these in the middle, the information they provide is from other users. And they're matching it. |
| 324 | 01:04:54 | 10 | 2A | You could say like a service, basically |
| 325 | 01:05:01 | 7 | 2C | They're middleman? The one is middleman? |
| 326 | 01:05:03 | 2 | 2B | Oh yes. The middle is the middlemen |
| 327 | 01:05:07 | 4 | 2A | middlemen and the other is just provider and consumers |
| 328 | 01:05:11 | 4 | 2B | Yeah.. |
| 329 | 01:05:13 | 2 | 2A | Ok |
| 330 | 01:05:14 | 1 | 2B | I mention, maybe we can group this together. |
| 331 | 01:05:21 | 7 | 2B | This gathered information, the users to improve their services. |
| 332 | 01:05:42 | 21 | 2B | But this No.27, maybe not. |
| 333 | 01:05:45 | 3 | 2B | because they... paln you date, consulting.... |
| 334 | 01:05:54 | 9 | 2C | This is from local one, right? |
| 335 | 01:05:55 | 1 | 2B | I'm not sure about No.27. let me see the information first. |
| 336 | 01:06:04 | 9 | 2B | No.14 find the spot for your wedding, but No.27, I'm not so sure. |
| 337 | 01:06:24 | 20 | 2B | ... consulting... |
| 338 | 01:06:25 | 1 | 2C | They consultants |
| 339 | 01:06:34 | 9 | 2C | Maybe we can divide like in that way, consultants and the other one. |
| 340 | 01:06:40 | 6 | 2B | Consulting but, they spot ranking. User ranking. Hmmm.. |
| 341 | 01:06:51 | 11 | 2B | just a moment. Let's see ... |
| 342 | 01:07:23 | 32 | 2B | Their website. OH! Sorry. Date2.jp |

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| 343 | 01:07:53 | 30 | 2B | It seems like they provide information, just provide information. |
| 344 | 01:08:01 | 8 | 2B | But they don't match |
| 345 | 01:08:04 | 3 | 2A | Yes, there's no like, they're not the middlemen, |
| 346 | 01:08:11 | 7 | 2B | Yeah, they're not the middlemen |
| 347 | 01:08:12 | 1 | 2A | They're provider |
| 348 | 01:08:14 | 2 | 2B | It should be on the right side. |
| 349 | 01:08:20 | 6 | 2C | From the No.14, I think, here they wrote that we can read the experience of the different people, |
| 350 | 01:08:31 | 11 | 2B | Which one? |
| 351 | 01:08:31 | 0 | 2C | No.14 , you can read the reviews of people from their experience, but they provide the coordinating service. Right? |
| 352 | 01:08:41 | 10 | 2B | Yeah, they provide ... information... |
| 353 | 01:09:02 | 21 | 2B | Hmm. They do not provide , No.14 |
| 354 | 01:09:05 | 3 | 2C | No. they provide the coordination service for the wedding ceremony. |
| 355 | 01:09:12 | 7 | 2B | Ah! I see... |
| 356 | 01:09:21 | 9 | 2B | The main reason that... to use that service, ok. I see. |
| 357 | 01:09:45 | 24 | 2A | So, I made two, so one post-it has service chain : the provider - consumer, so there's no middle man. |
| 358 | 01:09:54 | 9 | 2A | And the other is service chain it's on the top . |
| 359 | 01:10:02 | 8 | 2A | I think we starts... |
| 360 | 01:11:15 | 73 | 2A | I'm trying to make a post-it, which is a |
| 361 | 01:11:20 | 5 | 2A | Maybe, you can make it as a like No.14, the idea is, |
| 362 | 01:11:26 | 6 | 2A | it would increase the quality of the lifestyle. |
| 363 | 01:11:31 | 5 | 2C | This professional people, should not, shouldn't be here? |
| 364 | 01:11:37 | 6 | 2C | I mean the professional people in No.1, No.5.... Right? |
| 365 | 01:11:42 | 5 | 2C | They're getting the information from the local users. |
| 366 | 01:11:46 | 4 | 2A | Where is No.1? |
| 367 | 01:11:49 | 3 | 2C | I mean this the left on the bottom(No.1) |
| 368 | 01:11:53 | 4 | 2A | I think it should be here. |
| 369 | 01:11:59 | 6 | 2A | actually I think it's same about the |
| 370 | 01:12:02 | 3 | 2C | No.5? |
| 371 | 01:12:02 | 0 | 2A | No.24 . |
| 372 | 01:12:05 | 3 | 2A | Because this actually using the input from all the regular people, not professional |
| 373 | 01:12:14 | 9 | 2C | I think the professional people in this tap for the second line, right? This one... |
| 374 | 01:12:23 | 9 | 2C | The line of No.62, right? So it should be here. |
| 375 | 01:12:51 | 28 | 2B | service chain : provider-consumer |
| 376 | 01:13:24 | 33 | 2C | No.59 could be in this? They're in a way middleman |
| 377 | 01:13:27 | 3 | 2C | Because they're organizing the event, the competition. |
| 378 | 01:13:34 | 7 | 2B | They're middleman. |

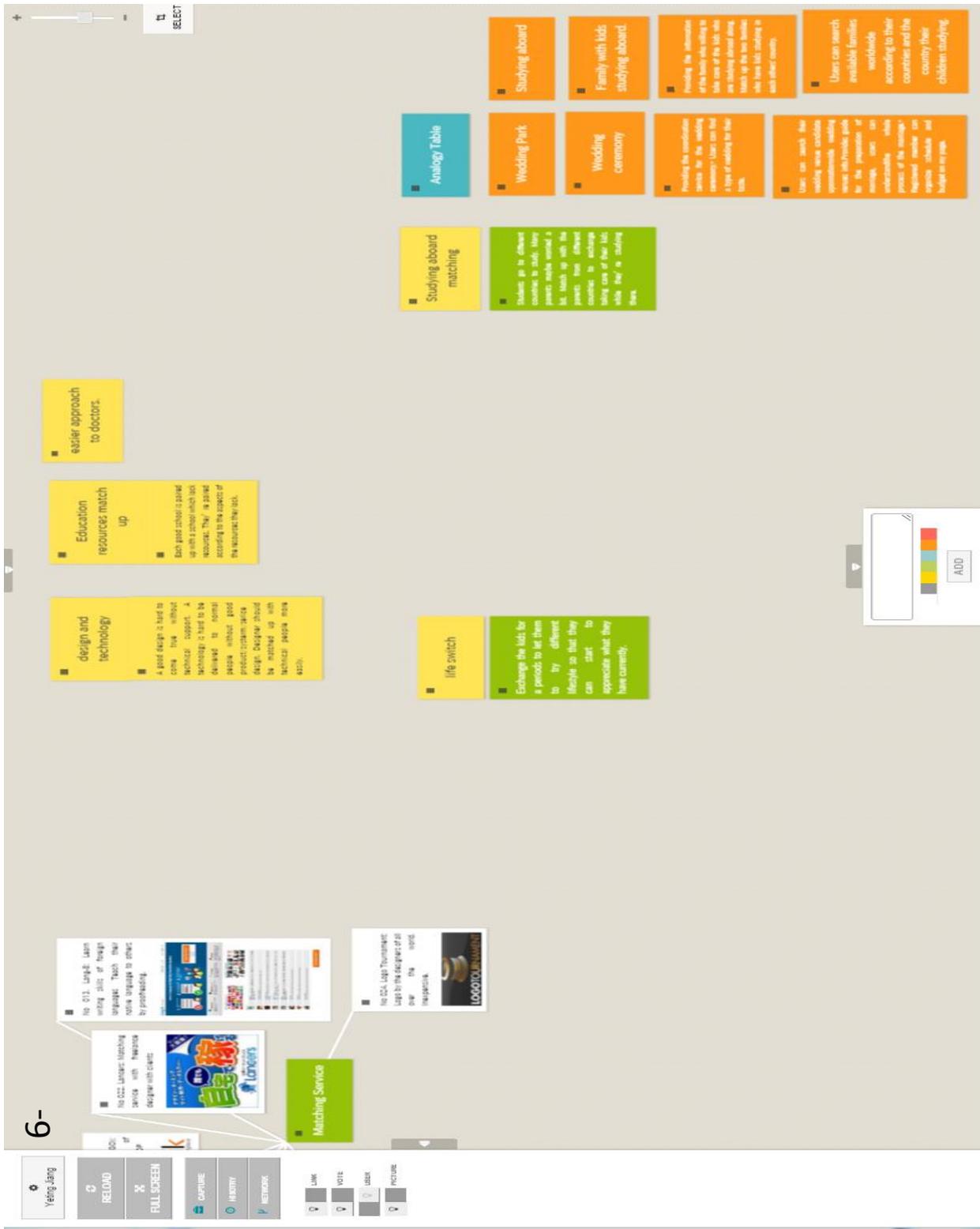
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| 379 | 01:13:36 | 2 | 2C | They're all. Right? I mean the No.59 |
| 380 | 01:13:41 | 5 | 2B | No59, and yeah, No.62. too |
| 381 | 01:13:43 | 2 | 2B | I think they're same like ... |
| 382 | 01:13:45 | 2 | 2C | Providing a platform. |
| 383 | 01:13:49 | 4 | 2B | Yeah. |
| 384 | 01:13:50 | 1 | 2C | How about the business one? The increase the efficiency of the business. |
| 385 | 01:13:56 | 6 | 2C | There should be No.2, No.1 should be there. |
| 386 | 01:14:05 | 9 | 2C | And no.5 |
| 387 | 01:14:13 | 8 | 2C | when we say efficiency of business, we're talking about both saving cost and time. |
| 388 | 01:14:19 | 6 | 2C | or and making user friendly? Like three? |
| 389 | 01:14:23 | 4 | 2A | Yeah. |
| 390 | 01:14:25 | 2 | 2C | so, In that case, |
| 391 | 01:14:27 | 2 | 2B | No.1 should be moved, yeah, exactly. |
| 392 | 01:14:33 | 6 | 2C | How about No.24 then? |
| 393 | 01:14:36 | 3 | 2B | No.24, I think it's really hard. |
| 394 | 01:14:39 | 3 | 2C | How about No.24 then? |
| 395 | 01:14:41 | 2 | 2C | Because they're also kind of making user friendly thing, right? |
| 396 | 01:14:45 | 4 | 2A | But I think we can have this in the increase of the efficiency of the business can be , |
| 397 | 01:14:59 | 14 | 2A | you can say that apply that both to a professional people as resources and use general public as resource |
| 398 | 01:15:09 | 10 | 2C | I think in there, if we can make the big three circles, then, we can like, put something in between two circles as well |
| 399 | 01:15:18 | 9 | 2C | which can be in both. So there're like all the, |
| 400 | 01:15:23 | 5 | 2C | there're some categories that, which can be In all three, two or only one. |
| 401 | 01:15:30 | 7 | 2A | I'll put "Increase efficiency" in the middle, and going to.. |
| 402 | 01:15:39 | 9 | F | Can I interrupt you a moment? |
| 403 | 01:15:41 | 2 | F | You don't have to use all that notes. |
| 404 | 01:15:44 | 3 | F | Important thing is create the nice group. |
| 405 | 01:15:48 | 4 | F | And that is useful for the idea creation for the next step. |
| 406 | 01:15:52 | 4 | F | so, if some of the notes don't fit, then you can exclude. |
| 407 | 01:15:58 | 6 | 2C | Ah, ok. |
| 408 | 01:16:00 | 2 | F | If you create three of four, certain numbers of nice group, that would be fine. |
| 409 | 01:16:19 | 19 | F | How many more minutes you need? |
| 410 | 01:16:21 | 2 | 2A | 5 mins, maybe |
| 411 | 01:16:22 | 1 | F | ok. It's good. 3 o'clock. You finish, and then we take a break. |
| 412 | 01:16:42 | 20 | 2A | we should be able to select that, more ideas.... |
| 413 | 01:16:58 | 16 | 2A | It looks, the funny thing is, it looks different in your screen and mine. |
| 414 | 01:17:01 | 3 | 2B | oh, really? |

| | | | | |
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| 415 | 01:17:04 | 3 | 2A | just a little bit. |
| 416 | 01:17:13 | 9 | F | You know, when the synchronization is not complete, you reload |
| 417 | 01:17:20 | 7 | 2B | Because you make the change from your computer. |
| 418 | 01:17:29 | 9 | F | if it looks different, please reload. |
| 419 | 01:17:32 | 3 | 2A | I think it fairly looks similar. |
| 420 | 01:17:37 | 5 | F | It should be same |
| 421 | 01:17:47 | 10 | 2C | In general, like a, how many categories ..? |
| 422 | 01:17:55 | 8 | 2A | I think we have, this professional, the resource type as a top category, |
| 423 | 01:18:04 | 9 | 2A | and then, sub category as the increase the efficiency of the business. |
| 424 | 01:18:14 | 10 | 2A | like a business incentive, and also the |
| 425 | 01:18:20 | 6 | 2A | maybe the type of services, which is middlemen |
| 426 | 01:18:34 | 14 | 2C | which one is that one? |
| 427 | 01:18:37 | 3 | 2A | I think you should do the updating. |
| 428 | 01:18:43 | 6 | 2A | It looks like lose the synchronization of my computer. |
| 429 | 01:18:54 | 11 | 2B | Can you try to move something in your computer? |
| 430 | 01:18:58 | 4 | 2A | OK, I'm trying to move another thing |
| 431 | 01:19:07 | 9 | F | I understand it's not so clear. But please make clear group. |
| 432 | 01:19:13 | 6 | F | And then put the title to the group. |
| 433 | 01:19:17 | 4 | F | So you have separate group |
| 434 | 01:19:31 | 14 | 2B | General public... |
| 435 | 01:19:37 | 6 | 2C | Can we increase font size? |
| 436 | 01:19:39 | 2 | 2B | Is it too big? |
| 437 | 01:19:42 | 3 | F | Nono. It's okay |
| 438 | 01:19:49 | 7 | 2C | This one is big one, right? The general public |
| 439 | 01:19:54 | 5 | 2B | Yeah, the general public .. |
| 440 | 01:19:55 | 1 | 2C | How can we increase font size? |
| 441 | 01:20:04 | 9 | 2B | The font size will be optimized according to your number of layers you typed |
| 442 | 01:20:11 | 7 | 2C | I mean, like a, I want increase the font size because it should be |
| 443 | 01:20:16 | 5 | 2B | You cannot do it I think |
| 444 | 01:20:17 | 1 | 2C | OK. |
| 445 | 01:20:17 | 0 | 2B | It is optimized on your letter |
| 446 | 01:20:26 | 9 | 2C | So this is one category, general public as resource |
| 447 | 01:20:36 | 10 | 2B | No.2... |
| 448 | 01:20:40 | 4 | 2A | Hmm. |
| 449 | 01:20:40 | 0 | 2B | And, |
| 450 | 01:20:44 | 4 | 2C | No.14, and.. |
| 451 | 01:20:48 | 4 | 2C | middleman |
| 452 | 01:21:06 | 18 | 2B | Sensei, Can we..... |

| | | | | |
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| 453 | 01:21:17 | 11 | F | Create again, yeah. Please |
| 454 | 01:21:51 | 34 | 2B | This is middleman |
| 455 | 01:21:53 | 2 | 2C | Middleman and the ... |
| 456 | 01:21:53 | 0 | 2C | This one should also be the middleman, the... |
| 457 | 01:22:06 | 13 | 2B | Daniel, can I move this one? Because.. Maybe this can be any categories |
| 458 | 01:22:15 | 9 | 2B | What do you think? Too many notes here.. I think... |
| 459 | 01:22:22 | 7 | 2C | I think either have making profit .. Increase efficiency. |
| 460 | 01:22:28 | 6 | 2B | I think so, this one... |
| 461 | 01:22:31 | 3 | 2A | But I think it's important things to keep in mind... |
| 462 | 01:22:33 | 2 | 2C | Maybe, ah... |
| 463 | 01:22:46 | 13 | 2B | This, middleman , so, all of them are middleman. |
| 464 | 01:22:53 | 7 | 2B | So, this group and as a middleman too and professional too. Both right? |
| 465 | 01:22:58 | 5 | 2A | I think they go, kind of hand in hand. |
| 466 | 01:23:03 | 5 | 2A | If you want to use professional people as a resources, then you need some kind of to do, yeah some kind of middleman |
| 467 | 01:23:10 | 7 | 2B | ok. There, they stay together. |
| 468 | 01:23:15 | 5 | F | Great! |
| 469 | 01:23:20 | 5 | F | This is not used? (General public as resource) |
| 470 | 01:23:24 | 4 | 2C | No. I think not |
| 471 | 01:23:26 | 2 | 2B | Do you mean this and... |
| 472 | 01:23:30 | 4 | 2A | Nonono. We can delete it because that also goes hand in hand, use the general public. |
| 473 | 01:23:33 | 3 | F | Oh! Good. You create 4 groups, right |
| 474 | 01:23:38 | 5 | 2C | No, three groups, this one is sub. I mean like, |
| 475 | 01:23:39 | 1 | F | Sub! Ok, 3 groups |
| 476 | 01:23:43 | 4 | 2C | or, I mean, not sub actually.. |
| 477 | 01:23:46 | 3 | F | Understood, just fine, ok. All right, three o'clock. Shall we take a short break? |
| 478 | 01:23:54 | 8 | 2A | 10min |

*F: Facilitator

APPENDIX B: Samples of the new ideas recorded in the APISNOTE



6
Sauri's Idea

RELOAD

FULL SCREEN

CAPTURE

HISTORY

NETWORK

LINK

VOTE

USER

PICTURE

brother zyler

No DTI. Creative agency for everyone. (The DTI) Anyone can be a creator. Printing, screen, reduce risk and cost.

No DTI. Kopernik/NGO: Commercialization of technologies for the SDG.

Participatory Approach

contributes with their skills

no garbage life!

cooking resource share

mainly for those who live alone. It is difficult for them to use all of what they bought

put what you bought on a sharing refrigerator

if there is something unused after several days, it will be used as compost in home.

category your experience

where have you been?

informations, musicals, activities...and so on.

each share house

informa... has its category

houses on a website

from young to old

buy what you need for cooking

share with other people near your house

if you can use it all, someone will use it.

cooking resource sharing

no garbage life!

share cooking resource

real place

analogy table

IDEO

share ideas

on web

no garbage life!

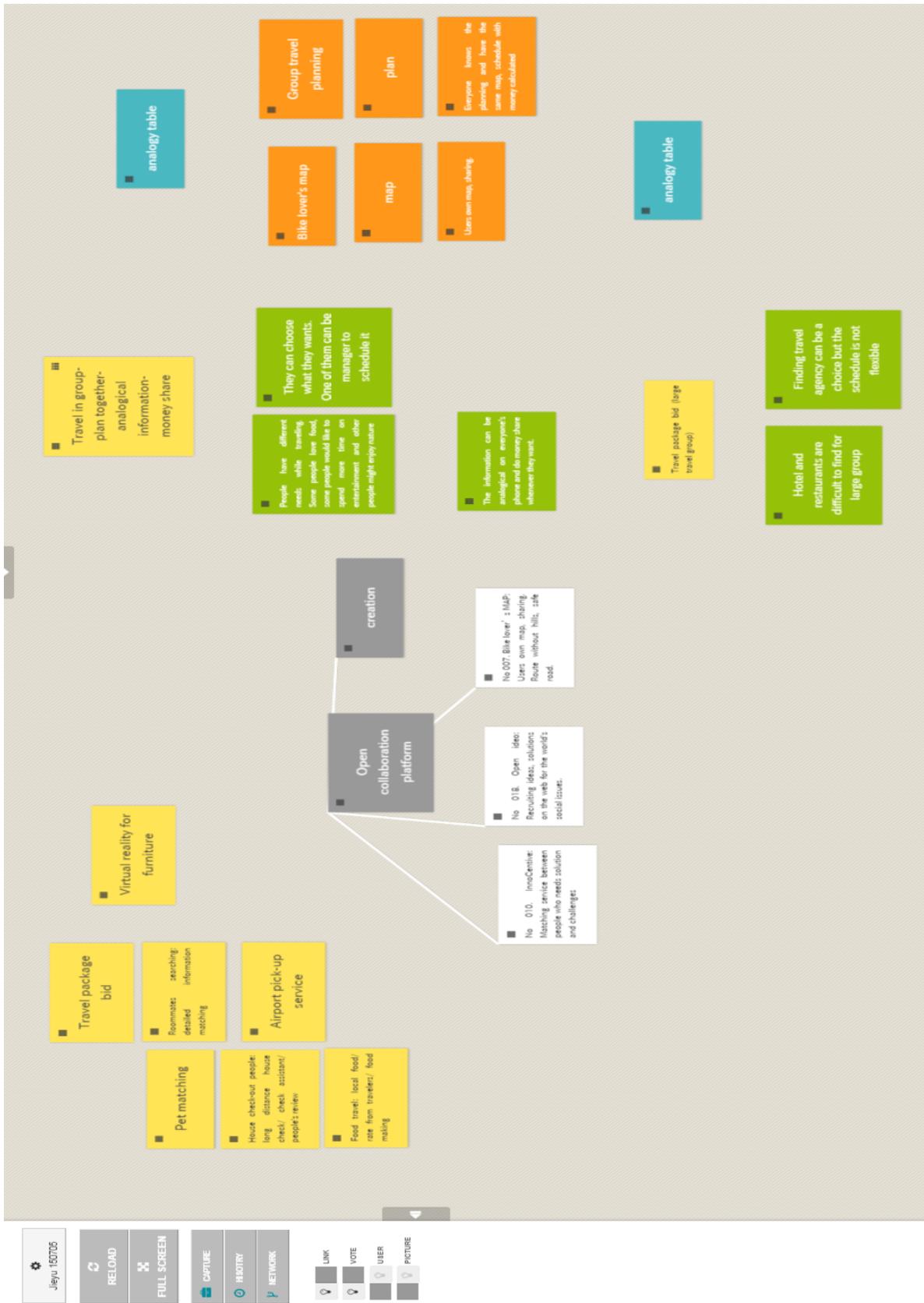
cooking resource share

mainly for those who live alone. It is difficult for them to use all of what they bought

put what you bought on a sharing refrigerator

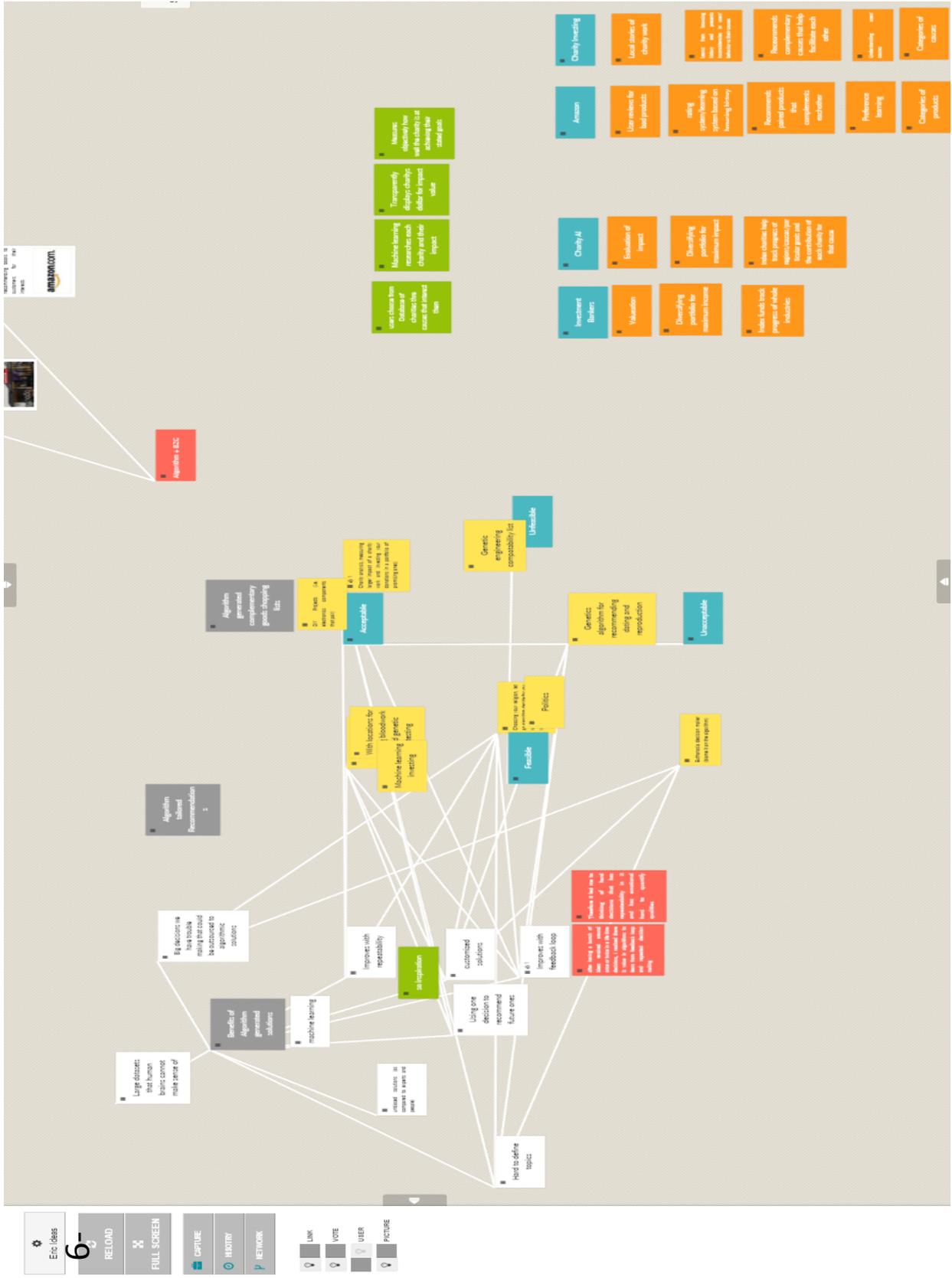
if there is something unused after several days, it will be used as compost in home.

ADD



Jsgu 160705
 RELOAD
 FULL SCREEN
 CAPTURE
 HISTORY
 NETWORK
 LINK
 VOTE
 USER
 PICTURE





Eric Ideas
 6
 RELOAD
 FULL SCREEN
 CAPTURE
 HISTORY
 NETWORK
 LINK
 VOTE
 USER
 PICTURE

