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Designing the Workshop Process for Generating Innovative Ideas: Theoretical and Empirical Approach

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Abstract

Generating new ideas is exceedingly important in today's rapidly changing environment. Although numerous academic institutes provide workshop programs to generate innovative ideas, little theoretical or empirical research exists which investigates the thinking processes of idea generation for enhancing the appropriateness of ideas generated through workshop facilitation. This study reviewed existing models of creative process and found that incubation and deliberation process is crucial for generating a new idea. Thus, we propose a workshop process and effective tasks that encourage participants to generate appropriate ideas. We conducted two different types of workshops: with deliberation session and without it. As a result, we observed a slightly but statistically significant relationship between having a deliberation session and generating an appropriate idea. This paper proposes a workshop design method based on theoretical and empirical supports to enhance thinking skills of participants in new idea generation.

Keywords: innovation workshops, workshop design, creative process, workshop task design, innovative ideas, deliberation, idea generation

1. Introduction

1.1 Background

Despite its importance, innovation is difficult to initiate. To facilitate the beginning of the innovation process, it is necessary to investigate how we generate new ideas. Galbraith (1982) claimed that a person who generates an idea triggers every innovation. In this regard, many academic institutions all over the world have established educational programs that focus on the creation of new ideas with the hopes of promoting innovation. Also, reflecting this increasing need for innovation, many institutions have provided innovation workshop or creativity programs to generate new ideas and, foster innovative leaders.

Although many workshop programs have been offered by various educational institutes to generate innovative ideas, there have been few studies on workshop design methods. Workshop originally means a workplace, but nowadays, it means a participatory, both-directional group experience activity, held in a variety of fields including education, training, arts, and community building. According to Sork (1984), the term workshop means "a relatively short-term, intensive, problem-focused learning experience that actively involves participants in the identification and analysis of problems and in the development and evaluation of solutions" (p.5). However, not all the workshops inspire participants to generate appropriate ideas for solving problems. Although idea generation seems to depend on individual cognitive abilities, workshop design methods also facilitate the generation of appropriate ideas.

For designing an education program that encourages innovative idea generation, 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 vague to establish an evaluation method in a general context. The existing methods of evaluation on new ideas are based on subjective judgments of a certain number of raters and their evaluations vary widely, depending on the personal perception of raters. In addition, only a few studies have expressly examined how idea evaluation operates in spite of numerous studies in innovation education (Lonergan, Scott, & Mumford, 2004). Thus, this study is

to present an evaluation method for appropriateness of ideas by excluding subjective judgments as far as possible; furthermore, it proposes a workshop design for enhancing the appropriateness in generating ideas.

1.2 Appropriateness of the Idea Generated for Its Innovativeness

Numerous measures have been used to evaluate ideas in previous studies, but almost all of them have limitations, such as evaluators misunderstanding the guidelines for evaluation, or evaluators' biases. Evaluation methods for new ideas often involve subjective judgments, are time-consuming, lack comprehensiveness, or adopt instruments that have no theoretical grounding (Salcedo, 2006). In addition, risk-avoiding behaviors when assessing the new ideas are also problematic. 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 & Monroe, 2003). However, it is important to recognize that these pragmatic economic standards are not the only attributes people might consider when appraising new ideas (Blair & Mumford, 2007).

To overcome those limitations, this study proposes to evaluate the appropriateness of the ideas generated through innovation workshop (Kim & Horii, 2015; Kim & Horii, 2016). Runco (2014) mentioned that the maximum level of originality could be regarded as psychosis, and innovation needs more effectiveness than creativity, but more originality than routine problem solving. Koestler (1964) stated that all innovative ideas in the history of scientific thought could be explained in terms of cross-fertilization between different disciplines. In this regard, we defined the appropriate idea as an idea that has a similar mechanism with the existing successful ideas but proposed to solve the problems in different domains.

However, generating an idea that adopts an underlying mechanism of existing ideas but solving problems in a different domain is not easy. Most of the ordinary people are not trained to make an effort to think more differently, and they tend to solve problems as their usual practice. As our society changes rapidly and technology advances, we are facing complex problems more than ever before. Thus we need to design the workshop process that promotes participants to generate appropriate ideas.

1.3 Theoretical Foundations for Workshop Process and Task Design

Designing ideation workshop involves a couple of subtasks and a number of methods for each subtask. And those subtasks should direct participants to generate desired output of the workshop. To design the subtasks, it needs to understand the cognitive processes behind the idea generation. There are numbers of models on process that describes creative procedures in idea generation (Bransford & Stein, 1984; Burnard et al., 2006; Gordon, 1961; Guilford, 1967; Isaken, Dorval, & Treffinger, 2000; Kelley, 2001; QCA, 2004; Sawyer, 2012; Scott, Leritz, & Mumford, 2004; Sternberg, 2006; Wallas, 1926). The procedures of those models range from two to eight steps as shown in Figure 1. The simplest model suggests two stages – divergent think and convergent thinking. The most comprehensive model summarizes all the other models in eight stages – find the problem, acquire the knowledge, gather related information, incubation, generate ideas, combine ideas, select the best ideas, and externalize ideas.

Among those eight stages, the stage of the incubation is regarded as the most crucial for generating new ideas(Cross, 1997; Holyoak & Thagard, 1996). Incubation is the stage that a new idea comes across our mind unconsciously. After acquiring the relevant and irrelevant knowledge, we need to take time off for the unconscious mind that processes and associates the information (Beeftink, Van Eerde, & Rutte, 2008; Ellwood et al., 2009). We expect a creative insight or inspiration during or after the incubation stage. The Western cultural model of creativity (Sawyer, 2011) used to have beliefs that the essence of creativity is the sudden moment of insight, and ideas emerge spontaneously, fully formed from the unconscious mind of the creator. For example, the most famous story of this is the Eureka moment of Archimedes, however, Biello (2006) demonstrated that the story is false because the scale had already existed so that Archimedes could use the scale to measure the weight of crown. Moreover, measuring the amount of water displaced is not reliable because of the surface tension of water.

The action theory (Belgrad, 1998), as well as the associationist model (Bain, 1864) opposed to those beliefs of the Western cultural model for the reason that creativity occurs while executing related works or processing a huge amount of information and making connections between the information. Rationalists (Weisberg, 1986;1993) noted that reasoning, knowledge, training and education is necessary for creating a new idea. By analyzing the process of creation of renowned artists (e.g. Jackson Pollock), Weisberg (1993) claimed that creative ideas emerge from a long process of careful deliberation, not from sudden insight. Gruber and Barrett (1974) also demonstrated that Charles Darwin's groundbreaking innovative theory of natural selection emerged from a multitude of small and incremental insights, not from sudden illumination.

In education practice, we need to design the process of workshop by providing appropriate subtasks with instruction.

Also, to direct participants to complete the subtask within a limited time, we need to develop the methods or tools for facilitation that encourage participants to fulfill the tasks. Several institutions have developed and shared the guidelines for designing workshops recently(IDEO, 2011; Ogilvie & Liedtka, 2011). However, there are still few papers that propose an effective process and appropriate methods of innovation workshop with a theoretical background as well as empirical data. In this regard, this study suggests an effective process of the innovation workshop that enhances the appropriateness of the ideas generated.

Wallas (1926)		Preparation		Incubation	Insight		Verification	Elaboration
Gordon (1961)		Groundwork	Immersion		Divergent exploration		Selection	Articulation of solution, development, transformation, implementation
Guilford (1967)			Divergent thinking				Convergent thinking	
Bransford and Stein (1984)	Identify problems, define goals	Learn	Look	Explore possible strategies				Act and anticipate outcomes
Isaken et al. (2000)	Framing problems	Exploring data		Constructing opportunities	Generating ideas	Developing solutions		Building acceptance
Kelley (2001)			Observation		Brain-storming			Rapid prototyping, refining, implementation
QCA (2004)	Questioning and challenging		Envisaging what might be	Keeping options open	Exploring ideas	Making connection and seeing relationship	Reflecting critically on ideas	
Scott et al. (2004)	Problem finding	Information gathering		Concept search	Generating ideas	Conceptual combination	Idea evaluation	Implementation planning and action monitoring
Burnard et al. (2006)	Posing questions		Immersion	Play	Being imaginative			self-determination
Sternberg (2006)	Redefining problems	Knowing the domain		Taking time off	Generating ideas	Cross-fertilize ideas	Judging ideas	Sell the idea, persevere
Sawyer (2012)	Find the problems	Acquire the knowledge	Gather related information	Incubation	Generating ideas	Combine ideas	Select the best ideas	Externalize ideas

Figure 1. Cognitive processes for generating new ideas

2. Method

As mentioned in the subsection 1.3, the innovation workshop consists of a number of tasks and instructing methods that enable us to fulfill each task. The major goal of this study is to design the tasks and effective methods for each task based on the cognitive processes of creation. This chapter describes how we developed the tasks and instruction methods according to the theoretical backgrounds of cognitive process for generating new ideas, and how we collected and analyzed empirical data.

2.1 Workshop Process Design: Tasks and Instructions

In this section, we present the process of innovation workshop and the required task in each session. The most distinctive point from the theoretical models in the previous subsection is that it facilitates deliberation before the session of generating a new idea.

2.1.1 Define Goals: Setting a Theme of the Workshop – creating a New Service Idea Based on Collective Intelligence

In contemporary economies, service businesses account for most of the value created. Amongst them, the collective intelligence service has received much attention in the field of innovation. 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). In the innovation workshop of this study, we focus on the collective intelligence service as a business model and set the goal of the workshop as creating a new service business idea using collective intelligence. However, this is a sample topic of the innovation workshop, and it can be changed with diverse topics, for example, creating ideas for social innovation in local communities.

2.1.2 Acquiring Knowledge: Read the Case Material of Existing Successful Businesses as a Pre-task

For this session, we prepared the case material and distributed it to the participants a couple of days before the workshop. To collect the cases, we asked the students who took a related class to list up a couple of collective intelligence services and 71 cases were gathered. Among them, we selected 25 cases that represent the examples of the different business mechanisms (see APPENDIX). The case material gives the information about the overview, value proposition, the mechanism for creating value, and the motivation for users of each service (see Figure 2). All participants were asked to read the 25 collective intelligence business case studies as a pre-task.

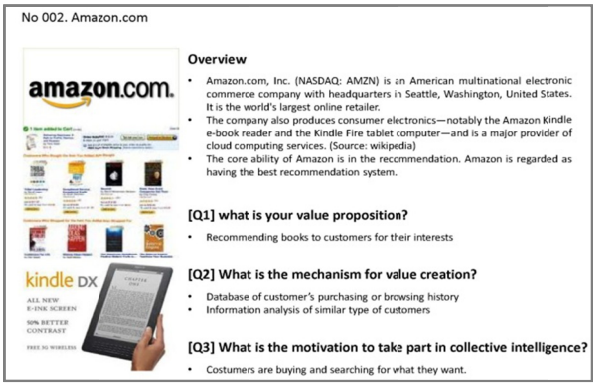

Figure 2. Sample of the case material that presented to the participants

2.1.3 Immersion: Categorization Task

Since the conceptual information of the existing business models has not been taught to participants, the formation of concepts from acquired information must be a fundamental learning phenomenon. 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). In this session, participants were instructed to categorize the given cases based on the mechanism of creating value and then assign a title to each category within 50 minutes (see Figure 3). For example, the case of amazon.com should not be categorized as shopping or book, but categorized with the services that have a similar business mechanism that analyzes big data to give a customized recommendation for each user. It was allowed to leave uncategorized cases.

Figure 3. Instruction sample given to the participants

2.1.4 Incubation: Break

During this session, we asked participants to choose the category of business mechanism they prefer while having a tea break for ten to fifteen minutes. An alternative off-task session can be added for distracting participants from the results of the previous session.

2.1.5 Deliberation: Ideas Combination Task

Many studies have suggested that when people face complex problems, they tend to focus on familiar ideas rather than make an effort to think creatively (Collins & Loftus, 1975; Mednick, 1962; Tversky & Kahneman, 1974). Thus, we designed the task for promoting deliberation by presenting participants the cue for divergent thinking in the format of text card that shows the possible business domains for generating new ideas (see Figure 4). In this session, participants were asked to combine the mechanism of value creation they selected during the incubation session with several business domains as diverse as possible within twenty minutes. Participants were allowed to refer the presented domain cards or consider other business domains.

Love & Marriage	**Health, Beauty & Medical care**	**Education**	**Work**	**Inhibit**
Encounter	Health Food	Kindergarten	Job hunting	Real estate
Party for marriage	Diet	Childcare	Job offer	New construction
Marriage hunting	Fitness Supplements	Exam	Career change	Mansion
Arranged marriage	Esthetic	Prep	Dispatch	Reform
Wedding	Hospital	Distance learning	Volunteer	Rent
Divorce	Medical examination	Training	Telecommuting	Share house
Remarriage		Elite education	Crowdsourcing	
		Study abroad	Starting a business	
		Upskilling		

Figure 4. The cards of diverse business domains presented to the participants

2.1.6 Idea Generation: Analogical Thinking Task

Researchers in the fields of cognitive psychology, cognitive science, artificial intelligence, learning science, creative research, and education have identified analogical thinking as one of the key mechanisms for creative thinking (Finke, Ward, & Smith, 1992; Gentner et al., 1997; Hesse, 1966; Holyoak & Thagard, 1989; Koestler, 1964; Perkins, 1997). In this session, we asked participants to select the business domain from the previous task and use analogy table to encourage them to create new service idea in an appropriate manner (see Figure 5).

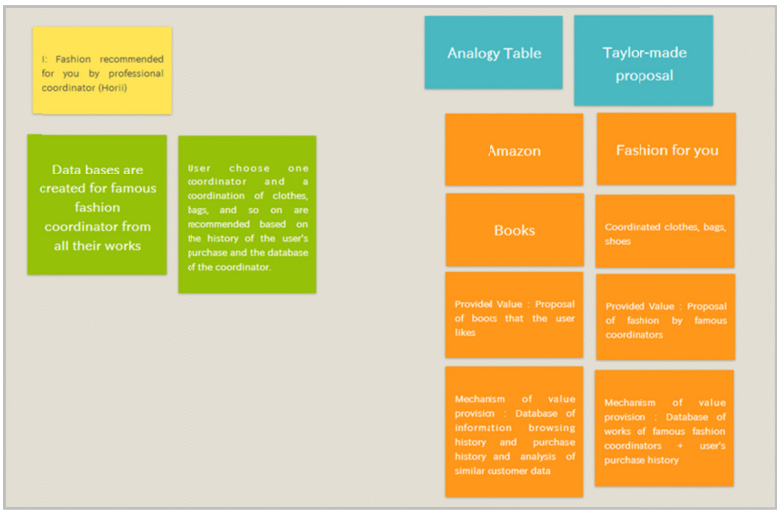

Figure 5. The sample of a new idea generated using analogical table

2.1.7 Judging Ideas: Evaluation Task

After generating a new service idea, participants were asked to share it with group members and evaluate those ideas by three criteria, which are novelty, impact on the market and society, and feasibility. Through this evaluation session, they were asked to select one or two best idea(s) by the discussion of group members.

2.1.8 Externalizing an Idea: Presentation

For the final session of the workshop, each group was asked to give a five-minute presentation using the template presented in Figure 6.

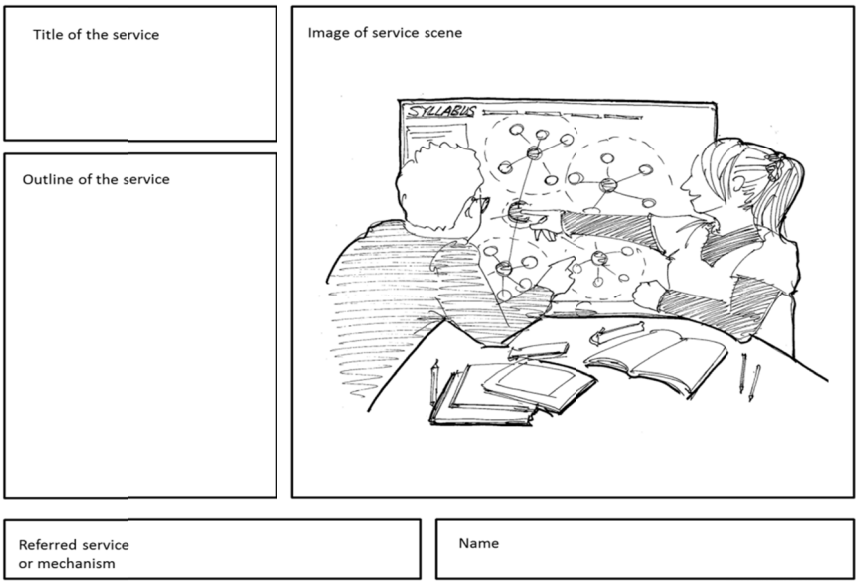

Figure 6. The template for the presentation session

2.2 Participant Characteristics

The aim of designing the innovation workshop is to suggest an example of workshop process, to be utilized by various institutions that are interested in creating new ideas. We allow open participation, however, there were several restrictions in recruiting participants for this study. Participants should to be English speakers but able to attend the workshop taking place in the campus of the University of Tokyo, willing to participate voluntarily for half-day without reward, and have no previous experience of the workshop with the same topic.

2.3 Data Analysis

2.3.1 Recording Data

We recorded entire workshops with panoramic view cameras set in each table of a group to transcribe discourses of participants. Also, we developed the software, APISNOTE (http://www.apisnote.com), which is the electronic version of sticky note that records the notes created by participants with the time stamp and helps us to trace back the idea generation process by showing the notes created consecutively in time sequence. APISNOTE was used for facilitating innovation workshop and recording data efficiently in this study (see Figure 7). Each group has a big-shared screen and each participant can access the shared screen with personal devices.

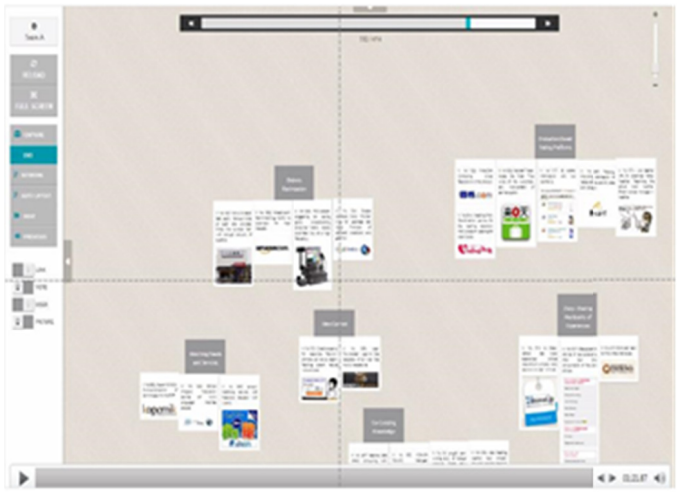

Figure 7. Categorization by participants, recorded in APISNOTE

2.3.2 Evaluation of the Outcomes

As mentioned in the subsection 2.1.6, the participants were asked to generate a new idea individually. After the workshop, all those generated ideas were evaluated in terms of the appropriateness. The appropriate idea refers to a generated idea that has a similar mechanism for creating values with source cases, but the domain of the business is different from all the other cases using that mechanism. For example, if a participant created a new service idea for travel industry using the mechanism of human computation, which is asking a large number of users to input data, this idea was evaluated as non-appropriate because the similar services for travelers are already presented in the case material. However, if a participant created a travel service idea using the mechanism of the big data analysis to give a customized recommendation for each user, this idea would be evaluated as appropriate because there is no such a case with the category of that business mechanism.

2.4 Research Design

As mentioned in the subsection 1.3, the incubation stage is crucial for innovative idea generation among the eight stages of cognitive processes for generating new ideas. However, incubation does not always promote creative insight or inspiration. Thus we designed idea combination task right after the incubation session to encourage participants to have deliberation. To demonstrate the effectiveness of this task for deliberation, we divided the participants into two groups: the first group skipped the deliberation session, but the second group had the deliberation session.

3. Results

3.1 Recruitment

Participants were recruited from students enrolled in the related courses and students or researchers registered in our mailing list. Participants were informed that the aim of the workshop was to generate a new service idea using collective intelligence. In total, 43 university students and two researchers from 20 different countries participated in the innovation workshop for this study (29 males and 16 females). We formed two groups under the equal condition in terms of its members as much as possible. Participants were divided into two different groups to compare the performances between groups: the first group (N=22, 7 females and 15 males; 14 Asians and 9 non-Asians), and the second group (N=23, 9 females and 14 males; 15 Asians and 8 non-Asians).

3.2 Data Analysis

Among twenty-two participants of the first group, twenty of them generated a new idea individually and two participants were failed to generate a new idea. As mentioned in the subsection 2.3.1, all participants used their own laptop to use APISNOTE, the electronic sticky notes. Each participant was assigned a user account set for the workshop and asked to write notes to create ideas using APISNOTE (see Figure 8). Participants created twenty-two notes in average for the generation task (min=12, max=41, SD=8.5).

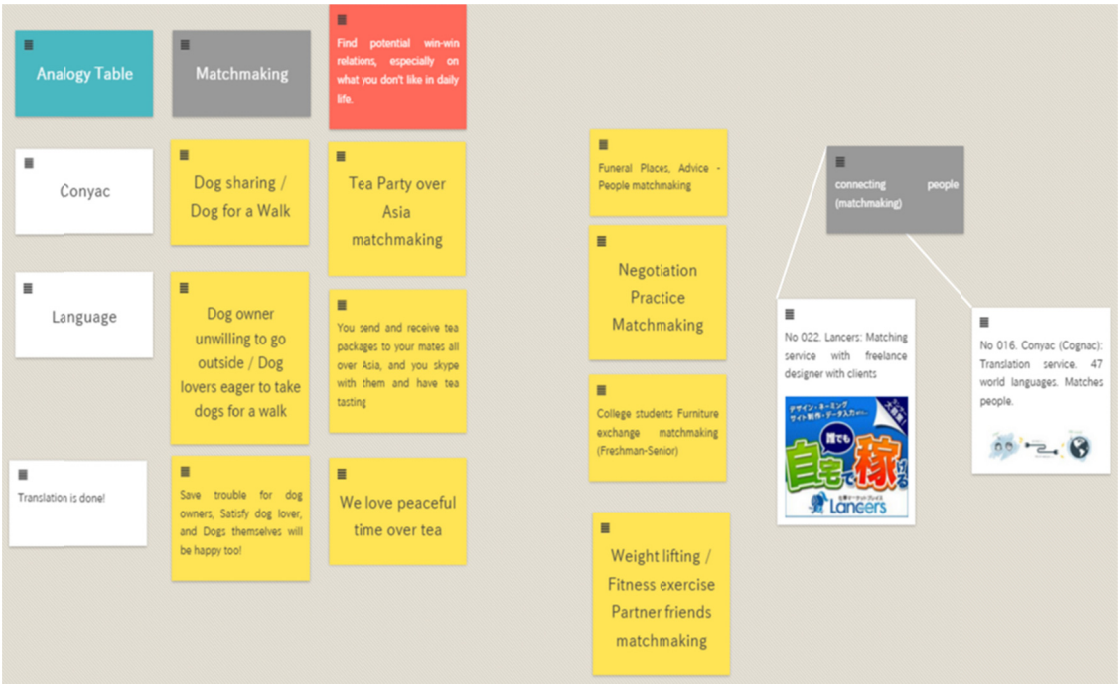

Figure 7. An idea generated by a participant, recorded in APISNOTE

All the ideas generated were evaluated by the method described in the subsection 2.3.2. As results of evaluation, ten out of twenty generated ideas were assessed as appropriate ideas. Among the ten participants who failed to generate an appropriate idea, five of them were able to import the business mechanism from the source cases, however, unable to apply them to the new domain. The other five subjects failed to apply the underlying business mechanism of any source cases.

On the other hand, all participants of the second group were able to generate a new idea individually as a result of the analogical thinking task. Participants created thirty-two notes in average for idea generation (min=10, max=60, SD=13). As results of evaluation, sixteen out of twenty-three participants generated appropriate ideas (See Table 1). According to the chi square test of the contingency table of the appropriateness in generated ideas from the first and the second group, we found that there is a tentatively significant relationship between the having deliberation session and the appropriateness of ideas generated ($\chi^2 = 2.68$, df = 1, p-value = 0.1016). Due to the small sample size, the data analysis shows exploratory results rather than confirmative results.

Table 1. Comparison of results of the workshops between groups

	Number of participants generated an appropriate idea	Number of participants who did not generate appropriate idea	Total
The first group (with deliberation session)	10	12	22
The second group (without deliberation session)	16	7	23

There might be a doubt that the second group could perform better not because they had the deliberation session but because they had a higher level of intelligence or more time. However, the participants' level of education as well as the time limit on generating ideas was controlled same in both groups for the fair comparison. The participants in the first group were asked to generate a new idea using analogical thinking within forty-five minutes, while the participants in the second group were allowed fifteen minutes for the deliberation session and thirty minutes for the idea generation session.

4. Discussion

Most people acknowledge the importance of generating new ideas for innovation and many workshop programs are provided to facilitate new idea generation. Nevertheless, there have been very few studies on designing the process of innovation workshops, which explains the theoretical background for designing each subtask and suggests effective methods with empirical data. To design an effective workshop process that enhances the appropriateness of ideas generated, this study focuses cognitive processes that are controllable by the workshop facilitation, rather than the personalities or knowledge levels of subjects, which are difficult to be controlled by the instructions or facilitations during the workshop.

As an educational program designer, the research goal should direct to how we can enhance the thinking skill of participants by facilitation that encourages them to create more appropriate ideas through the instruction of innovation workshop. In this regard, this study proposes a novel definition on the appropriateness of the new ideas generated through innovation workshop to overcome the limitations in existing definitions of related terms such as creativity.

The findings of this study provide empirical evidence to support the effectiveness of the proposed workshop process and tasks, which is 1) setting a theme of the workshop, 2) pre-task for acquiring knowledge by providing the case material, 3) categorization task for structuring the knowledge, 4) incubation, 5) combination task for deliberation, 6) idea generation task using analogical thinking, 7) evaluation task, 8) presentation.

The results from the implementation of the proposed evaluation method and the workshop process might provide insights, especially for those who study on the development of educational programs for promoting innovation. Based on the detailed description of the process and tasks of the workshop in this paper, researchers can replicate and improve their workshop process in further studies.

However, there are several limitations in this study. Innovative idea generation can be encouraged in various settings. Nonetheless, this study presents a workshop process and tasks that confine to promote the deliberation in finding a business domain for generating new ideas. Other subtasks need be designed to encourage participants to generate innovative ideas in further study. Also, the scope of data we analyzed for this study was limited to the outputs of the one or two specific subtasks – idea combination task, and analogical thinking task. Although the aim of the innovation

workshop was to generate those outputs, it still needs to investigate how the each subtask influenced for participants to generate the final ideas. In addition, the theme of the innovation workshop in this study is presented as generating new service ideas based on collective intelligence, however, it needs to be diversified, for example, creating new ideas that enhance our quality of life using new technologies. Lastly, but not leastly, the sample size of the data was too small to draw a definitive and satisfying conclusion. In further study, our conclusions need to be verified with larger numbers of participants.

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Appendix The 25 collective intelligence service cases presented to the participants (Alphabetical order)

1. 4travel.jp: Sharing their own travel experience with the possibility of helping others to make a decision on their travel.

2. Amazon.com: Recommending books to customers for their interests

3. @ cosme (https://www.cosme.net): Products are ranked and rated by the user's comments, and this is more reliable rather than advertisement or commercial.

4. Bike lover's MAP (https://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 a small income by translating a few sentences.

6. Cook pad (https://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 (https://www.innocentive.com): The seekers, the people who have a problem, disclose the issues with a 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 (https://cafe.katariba.net): Providing a place to speak about the future career and build the relationship with university students.

12. Kopernik (https://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 on 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 an analysis of customers database, Waste management system by the IC chip that is affixed to the back of the plate

14. Lancers (https://www.lancers.jp): The online Marketplace providing matching service with a freelance designer with clients for designing logos or web pages.

15.Lang-8 (https://lang-8.com): Building the database and matching users. And Users can check the list of members who need proofread services of their own language.

16. Logo Tournament (https://logotournament.com): The 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 shows it in the order of lowest prices, and also collects the reviews from users.

20. Rakuten Travel (https://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 (https://tabelog.com): We can see the rank of the restaurants and their information posted by the user.

22. User creating weather news: You can report the weather information from mobile phone conveniently.

23. Wedding Park (https://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 (https://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 checks the wording before posting. So, compared with other sites, users feel safe to use.

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