

## Wanted Scenario Graph: Wants-based Mapping Method for Discovering Novel Ideas

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**Abstract**—In this paper, Wanted Scenario Graph is proposed by extending Scenario Graph. The Scenario Graph is one of forced association measures and also one of structured mind mapping methods to generate potential scenarios for new products and services while visually organizing contextual information. Wanted Scenario Graph is a method for idea creation with consideration of wants into the scenario graph by adding the wants as a component of the graph, in order to discover novel ideas. We test 19 people with Wanted scenario graph for an identical theme, which is anything you like to have for safety and security in the future. It is described that Wanted Scenario Graph by individuals is useful when it is used for creating new ideas.

### I. INTRODUCTION

Scenario Graph is one of Forced Association Measures and also one of structured mind mapping methods to generate potential scenarios for new products and services while visually organizing contextual information. This method has been developed at Stanford University in 2007 by Kim et al [1] as a part of Scenario-based amorphous design methodology [2]. The steps to use the Scenario Graph are the following:

a) A designer put Where, What (Activity), When and User

stage (Who) as columns

- b) The designer brainstorms any words for each column at a time
- c) The designer picks some word up from each column, and to connect those words to generate a scenario as a result of idea creation.

As an example, Nakajima et al show a result of Scenario Graph as shown in figure 1 [5], which shows Hikikomori as Who, stock as What (Activity), housing as where, and growing as when. This example of generated scenario is named Hikikomori Insurance.

By introduction of Scenario Graph into industries and academia, it has helped designers in idea creation to discover unmet needs, new values, and unexpected behaviors of potential customers as one of forced association measures. And Yagita et al validates the effectiveness of Scenario Graph for a case when an individual person uses [7]. However, after an idea creation work with Scenario Graph, there are people who feel and faces a difficulty of creating any ideas. Because any created ideas have a possibility of meaningless or not useful caused by just connecting the words at column, which are who, what, where, when. People

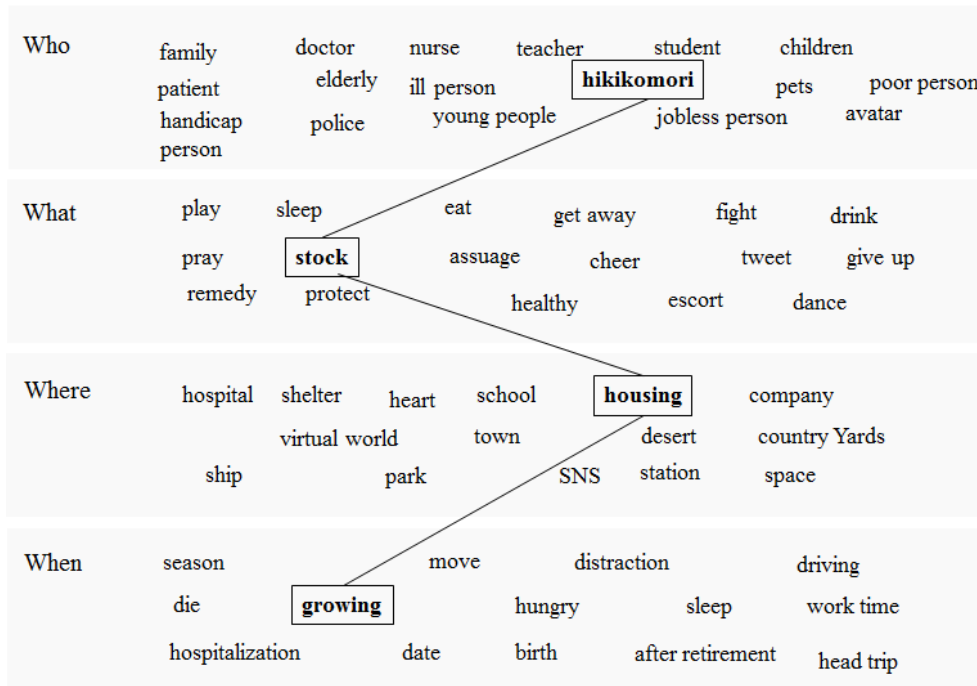


Figure 1 An example of Scenario Graph [5]

are able to make a new scenario with who, what, where, when however the created new scenario is not related why, or needs of people. Therefore, at this moment, in an idea creation, there is an unspecified requirement that Scenario Graph requests people to think about why the created scenario is meant or useful, not only novel.

Under the above circumstances, Wanted Scenario Graph is developed based on Scenario Graph. Scenario Graph is expanded and modified by considering wants of human in order to make better scenario. Therefore the main objective of this thesis is to test the effectiveness of the Wanted Scenario Graph by individual in idea creation.

II. PREVIOUS WORK

Scenario Graph has been developed at Stanford University in 2007 by Kim et al [1] as one of the method of Scenario-based amorphous design methodology [2]. Scenario Graph is a structured mind mapping methodology that aids design teams to generate potential scenarios for new products and services while visually organizing contextual information. Since its introduction in industry and academia, the Scenario Graph has helped design teams capture new values and behaviors of potential customers during the problem formulation stage. Its effectiveness of Scenario Graph is validated by Yagita et al [7] and it shows that people with Scenario Graph is able to create more novel ideas than people with Brain storming on identical theme. Scenario Graph is basically utilized on the rules of Brainstorming. The rule is focusing on generate a number of ideas, no criticism, acclaim outstanding and unusual ideas and Combine idea with idea existed and improve ideas by idea existed [6]. So by using Scenario Graph, the free imagination situation is same as Brainstorming. By focusing on a process of Scenario Graph, design team to freely think and imagine about any related words and also to put those words with no limitation at 4 columns consisting of Who, What, Where and When, then design team and connect 4 words from each column for the 1 scenario. This is a different point comparing Brainstorming that Scenario Graph only needs connection work between word from who, what, where and when, for just making 1

scenario. And with Scenario Graph, the design team can imagine and choose words without any constraints from who, what, where, and when-no randomly or randomly. So it seems to be easy to step away from existing intellection.

In order to propose Wanted Scenario Graph by considering wants on Scenario Graph, basic human requirements should be clarified. Maslow mentioned that seven kinds of needs that are physiological needs, safety needs, belongingness and love needs, esteem needs, self-actualization needs, Desires to know and understand, and fulfill the aesthetic needs [3] [4]. The idea by Maslow has not yet been validated. However the suggested each level can be used as categories from a classification point of view. Therefore, we utilize seven kinds of needs of humans as shown in Table 1.

From above previous works, Wanted scenario Graph utilize the existing columns as same as Scenario Graph which are who, what, where, when. However, one of column is displaced by one of wants depend on the theme or given constraint, when scenario is made by connecting words.

III. HOW TO USE WANTED SCENARIO GRAPH

First half of the procedure of Wanted scenario Graph is almost the same as Scenario Graph. Steps for conducting Wanted scenario Graph are as follows (also see examples of Wanted scenario Graph shown in Figure 2):

1. Decide utilize all the columns: who, what, where, when or not, depending on a theme or given constraint.
2. Put the wants as additional column compared to Scenario Graph
3. Place seven kinds of wants at the column of wants
4. Think and imagine freely words on the column of who, what, where, when and write down the words at the each column.
5. Select the one word from the each column for one new scenario.
6. Draw lines between the selected words to connect words between the all columns as the new scenario.
7. Name the title of idea on the connected scenario
8. Repeat to make another scenario as much as possible.

TABLE 1 KINDS OF NEEDS BASED ON MASLOW’S CLASSIFICATION

Category of Needs	Examples
Physiological needs (PHY)	Sleep, food, water, breathing, sex, excretion and homeostasis
Safety needs (SAF)	Employment, security of body, resources, health, morality, family and property
Belongingness and Love needs (BEL)	Family, friendship and sexual intimacy
Esteem needs (EST)	Confidence, self-esteem, achievement, respect by others and respect of others
Self-actualization needs (ACT)	Creativity, lack of prejudice, spontaneity, problem solving, acceptance of facts and morality
Desires to know and understand (KNO)	To know, to explain, to understand and satisfy curiosity
Aesthetic needs (AES)	Needs of beautiful surroundings and aesthetic needs

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Let us explain in detail the example of the Wanted scenario Graph as shown in Fig 2. Fig 2 shows an example of a result by Wanted Scenario Graph for an idea creation. The theme of idea creation is given that anything you will like to have for safety and security in the future. The theme already has a constraint which is “in the future”. Hence the column “when” is not utilized in the example. There are columns which are wants, who, what, when from top to bottom. On the top column, seven kinds of wants are given. All the words on each column are generated freely. There are 13 words on

the column of who, 14 words on the column of what, 15 words on the column of where. And total 7 new scenarios are generated and all the scenarios are named as shown in Table 2. Table 2 shows named all scenarios and component of words.

For example, scenario no.1 is consisting of physiological needs as wants, Idol as who, Bear off as what and the space as where. Then, the scenario no. 1 is named “The space toilet” as a novel idea.

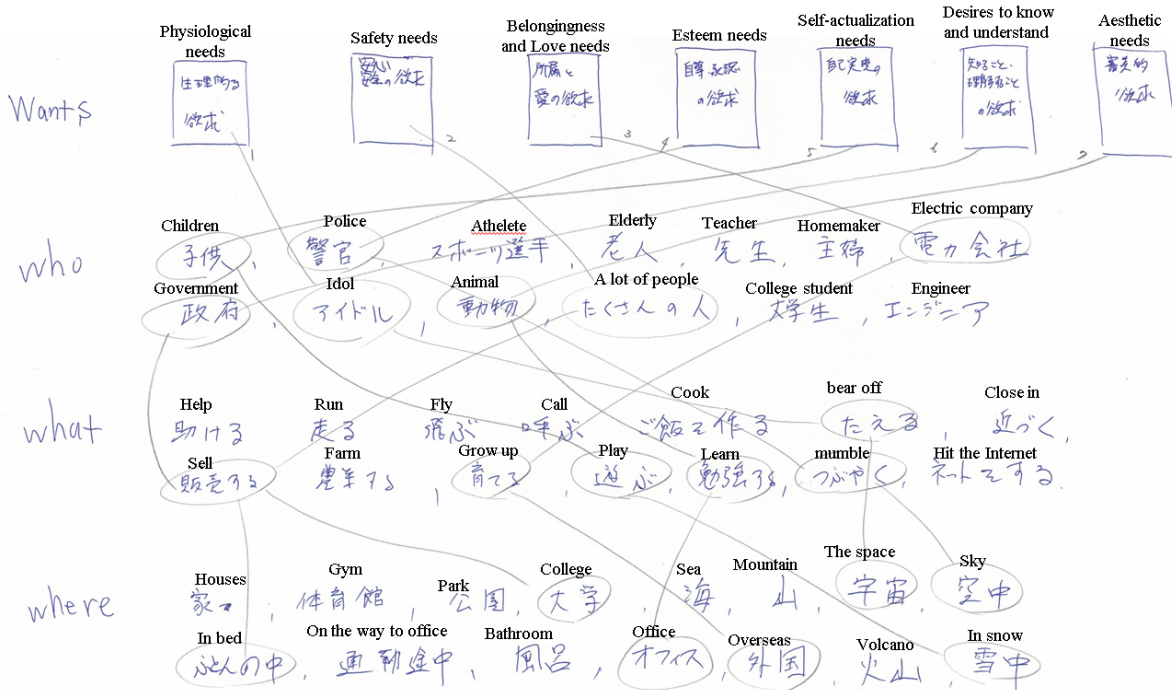


Figure 2 An example of Wanted scenario Graph

TABLE 2 NAMED ALL SCENARIOS AND COMPONENT OF WORDS

No.	Name of scenario	Wants	Who	What	Where
1	The space toilet	Physiological needs	Idol	Bear off	The space
2	Business of safety right	Safety needs	A lot of people	Sell	College
3	Growing up Japanese culture and Japanese specialty goods in overseas for public relations	Belongingness and Love needs	Electric company	Grow up	Overseas
4	Patrol in sky for increase of presence	Esteem needs	Police	Mumble	Sky
5	Snow attraction providing capability of running fast and painless by slip	Self-actualization needs	Children	Play	In snow
6	Tax for knowledge	Desires to know and understand	Government	Sell	In bed
7	Animal counseling	Aesthetic needs	Animal	Learn	Office

IV. EXPERIMENT CONDITIOIN

We have approached 19 participants to validate an effectiveness of Wanted Scenario Graph in idea creation. The participants have tried to generate ideas individually with Wanted Scenario Graph. The theme is given that anything you will like to have for safety and security in the future. And duration for idea creation is set identical: 10 minutes. Then, the each idea by idea creation with Wanted Scenario Graph is evaluated from its novelty point of view by one professional from industry who has over 40 years' experience in development and engineering. And the evaluation method for each idea is like a closed question. On the metrics of novelty, the evaluator scores 1 point if the evaluator thinks that the idea is novel, but if the evaluator thinks that the idea is not novel, the evaluator scores 0 point.

In addition, a questionnaire about the effectiveness of Wanted Scenario Graph is performed as another validation. Prior to start the experiment, we explained that the basic rules of idea creation which are focusing on generating a number of ideas, no criticism, acclaim outstanding and unusual ideas and Combine idea with idea existed and improve ideas by idea existed. Those basic rules come from the Brainstorming [XX].

V. EXPERIMENT RESULT

Table 3 shows the background of all the participants and generated ideas by the experiment. In total, 127 ideas generated by 19 participants. The average of generated ideas per person is 6.7. And 44 ideas from 127 ideas are evaluated as a novel idea.

TABLE 3 BACKGROUND OF ALL THE PARTICIPANTS AND GENERATED IDEAS

No.	Participant	Age	Wants	Who	What	Where	Name of scenario	Evaluation result
1	Company employee A	35	Esteem	Myself	Win prize	Japan	Award	0
2			Self actualization	Myself	Make something never seen	Family	Creation	0
3			Aesthetic	Myself	Read	Alone	Time to myself	0
4			To know and understand	Myself	Learn	Alone	Time to myself	0
5	Professor A in engineering department at university	30	Safety	Sister	Bed	Japan	Usual day in the past	0
6			Safety	Niece	Bed	Japan	Usual day at this moment	0
7			Safety	Father	Pillow	Barcelona	Preparation of trip	0
8			Aesthetic	Elephant	Shovel	Chile	Traditional construction method	0
9			Aesthetic	Water flea	Shovel	Chile	Hearty construction method	0
10			Aesthetic	Myself, father and mother	Toast	Paris	Gorgeous trip in Paris	0
11			To know and understand	Talent	Stadium	USA	Undistinguished by submerged into people	1
12			Belongingness and Love	Penguin	Aquarium	Antarctica	Penguin with brand	1
13			Aesthetic	Monkey	Mountain	Germany	Luxury Photo	0
14			Aesthetic	Lizard	Mountain	Germany	Delicious food	0
15			Belongingness and Love	Penguin	Aquarium	Sea	Penguin without brand	0
16			Belongingness and Love	Penguin	Pool	Sea	Float	0
17			Safety	Niece	Flying pan	Volcano	Protector	0
18			Aesthetic	Water flea	Shovel	Personal computer	Data mining	0
19			Aesthetic	Elephant	Shovel	Personal computer	Bigger analysis of correlation	0
20	Graduate student A in engineering department at university	23	Aesthetic	Politician	Enjoy	Road	Solution of frustration by VR for politician	1
21		23	Aesthetic	Company employee	Run	Park	Promotion of diet for employee	0
22		23	Self actualization	President	Fight	Theater	Presidents battle of autobiography	1
23		23	Self actualization	Neet	Play	Inside car	Equipment to make a room like a car	1
24	Homemaker A	40's	Belongingness and Love	Family	Make	Park	Room for laugh	0

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25			Belonging-ness and Love	Children	Play	Park	Toy box	0
26			Belonging-ness and Love	Friend	Walk	Paddy Fields	Sports gym	0
27			Belonging-ness and Love	Myself	Watch movie	Home	My world	1
28			To know and understand	Teacher	Work	School	Hang in thinking	0
29			Safety	Father	Work	Company	Safety home teacher	0
30	High school student A	18	Belonging-ness and Love	Family	Play	Amusement park	Enjoyable time	0
31			Aesthetic	Myself	Eat	Shop	Eating	0
32			Self actualization	Myself	Run	Park	Possible by doing	0
33			Physiological	Myself	Sit	House	Home is comfort	0
34	Homemaker B	50's	Safety	Family	Live	Houses	Living with Eco	0
35			Belonging-ness and Love	Family	Grow	Houses	(Not named)	Not evaluated
36			Physiological	Family	Eat	Houses	Safety food	0
37			Physiological	Family	Drink	Houses	(Not named)	
38			Physiological	Friend	Drink	Houses	(Not named)	
39			Belonging-ness and Love	People from Fukushima	Help	Locality	System to eliminate anxietas of Nuclear energy	0
40			Belonging-ness and Love	People living in Tokyo and Koshinetsu	Live	Locality	(Not named)	Not evaluated
41			Belonging-ness and Love	People facing natural disaster	Live	Locality	(Not named)	Not evaluated
42			To know and understand	People in afflicted area	Grow	Locality	(Not named)	Not evaluated
43			Safety	People facing natural disaster	Live	Fukushimapo wer plant	(Not named)	Not evaluated
44	Homemaker C	50's	Self actualization	Children	Fly	My home	Home Park	0
45			Safety	Father	Walk	My home	Rehabilitation	0
46			Safety	Mother	Walk	My home	Excise for health first	0
47			Physiological	Uncle	Eat	Family home	Road of corpulence	1
48			Esteem	Myself	Hit	Train	Heaven for mobile	1
49	College student A in law school at university	18	Belonging-ness and Love	Student	Walk	Tokyo	Tokyo station to have a new friend by walking by students	1
50			Belonging-ness and Love	Children	Laugh	Forest	Children can laugh by forest	0
51			To know and understand	Lawyer	Listen	School	Lawyer solve problem happened at school	1
52			To know and understand	President	Learn	Court	(Not named)	Not evaluated
53			Aesthetic	Ms. Atsuko Maeda	Cry	Tokyo	Room for being relax by always watching Ms. Atsuko at Akihabara	1
54			Esteem	Police	Internet	Park	Park to be able to confirm information of police	1
55			Esteem	Prosecutors	Happen	Court	System to know court by getting chewed out by prosecutors	1
56			Aesthetic	Teacher	Mumble	Bookstore	Bookstore to sell a book of mumble by teacher due to stress	1
57	College student B in economics department at university	22	To know and understand	King	Rotate	Office	Royal library	0
58			To know and understand	Illustrator	Circuit	Classroom	Intern illustrator	0
59			To know and understand	Musician	Accept	Concrete jungle	Life in megalopolis	0

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60			Aesthetic	Government official	Caress	Volcano	Geologic condition	mania of Government official	1
61			Aesthetic	Judge	Touch	Forest	Basking in the woods		0
62			Self actualization	Cook	Go home	Office	Write a cooking book		0
63			Self actualization	Common man	Fly	Private house	Birdman		0
64			Physiological	College student	Reborn	In soil	Living dead		0
65			Physiological	Researcher	Shout	Higher building	Stress release		0
66	College student C in faculty of education at university	18	Physiological	Dog	Run	Alley	Long hall for dog run		0
67			To know and understand	Teacher	Write	High school	Teacher writes on black board at high school		0
68			To know and understand	Sister	Eat	University	Sister eats school cafeteria		0
69			Aesthetic	Composer	Listen	Library	Be able to listen music by lots of composer at library		1
70			Aesthetic	Ms. Muraji Kaori	Flip	On chair	Ms. Muraji plays guitar on a chair		1
71			Aesthetic	Father	Drink	River	Father drinks water of river		0
72			Safety	Seller	Cut	Mountain	A man cutting tree at mountain		0
73			Safety	Mother	Walk	Mountain	Healthy family		0
74			Safety	Staff	Talk	Library	Annoying library due to talk of staff		0
75			Safety	Researcher	Think	River	A man thinking at river		0
76	College student D in engineering department at university	19	Aesthetic	Teacher	Bear off	School	Simulation of class to avoid claim from monster parent		1
77			Aesthetic	Student	Appreciate	Train	Art show inside train and get promotion fee		1
78			To know and understand	Station attendant	Seat out	Shopping center	Congestion prediction at station with neighborhood facilities		1
79			Safety	Disemployment	Flow	Station	Output job offer in order of promotion fee		1
80			Esteem	Government official	Find	Library	Return by result for government official and establishment of library in the ministry		1
81	College student E in engineering and resource science at university	22	Safety	Foreigner	Knead	Stairway	Hotel for immigrant		1
82			Esteem	Adult	Change	In Sky	Experience of self-actualization		1
83			Esteem	Student	Shine	In dream	Program of successful experience in dream		1
84			Self actualization	Elderly	Move	Mountain	Increase motivation in life and lifetime		1
85			To know and understand	Patient	Come up	In dream	Understanding of disease condition		1
86			To know and understand	Actor	Find	In water	Improve capability of actor		1
87	High school student B	15	To know and understand	Myself	Write	Road	Note everywhere		1
88			Physiological	Elderly	Walk	In bed	Walking in bed		1
89	High school student C	15	Belongingness and Love	Children	Play	School	Club activity		0
90			Self actualization	Normal man	Climb up	Everest	Accomplishment of climbing		0
91			Safety	President	Eat	Luxury restaurant	Desire to be rich		0
92			To know and understand	Researcher	Research	University	Something not invented		0
93	High school student D	15	Belongingness and Love	Male	Play	City	Not embarrassed by everyone		1
94			Esteem	Neet	Gather	Mountain	Overcome here now		1
95	High school student E	16	Physiological	American	Trip	Arena of war	Cushion		0
96			Belongingness and Love	Myself	Circle	Moon	Club		0
97			Belongingness and Love	Myself	Spring	Russia	(Not named)		Not evaluated
98			Belongingness and	Parent	Wear	Restaurant	Cloth change of baby		0

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			Love					
99			Belonging-ness and Love	Teacher	Select	National legislature	(Not named)	Not evaluated
100			Esteem	Employee	Fight	University	Career up	0
101			Esteem	Friend	Take	Russia	(Not named)	Not evaluated
102			Esteem	Soccer player	Investigate	Tokyo tower	Place of toilet	0
103			To know and understand	Nintendo	Learn	畑	New game for agriculture	0
104			To know and understand	Nintendo	Select	Hawaii	Stage of game	0
105			Physiological	Staff	Take	Tokyo tower	(Not named)	Not evaluated
106			To know and understand	Staff	Fight	Tokyo tower	(Not named)	Not evaluated
107			Esteem	Friend	Take	Tokyo tower	(Not named)	Not evaluated
108			Physiological	Doctor	Upend	Factory	Method of stress release	0
109			Physiological	Tennis player	Note	Snow mountain	Practice for game at Moscow	1
110			Physiological	Groom	Burn	On sea	Survival when ship is foundering	1
111			To know and understand	General manager	Fly	In TV	Warp	0
112			To know and understand	Student at Tokyo university	Drop	Kiyomizu temple	Real probability of survival by dropping off from Kiyomizu temple	1
113			Aesthetic	Archaeologist	Cave	Tokyo tower	Viewing obsolescence of culture	1
114			Aesthetic	Ichiro	Bite	Head of a cliff	Food for adrenalin	1
115			Aesthetic	Mr.Maric	Hit	Savanna	Magic even if animals in savanna is moved	1
116			Self actualization	Stuntman	Remember	Disney land	Image training at Cinderella castle by dropping off as a stunt	1
117			Self actualization	Scientist	Tense	Hawaii	Pursue the academic track during a trip to Hawaii	1
118			Self actualization	Dog	Read	Pool	Champion of dog in swimming	0
119			Self actualization	Children	Look	Sun	Lens for entering sun	1
120			Esteem	Alpaca	Cultivate	Field of grass	Want to evolution	0
121			Safety	Baby	Live	House	Survival	0
122			To know and understand	Bug	Walk	Forest	Thinking life of bugs	0
123			Self actualization	Condemned	Grow up	Park	Homeless class at outside	1
124			Safety	Politician	Bike riding	Break in one's life	Bike riding by politician for safety and decrease crime rates	1
125			Safety	Dachshund	Create	My home	Monitoring system of pet	0
126			Belonging-ness and Love	Motorist of JR	Care	Akihabara	Service for healing experience of JR Yamanote line	1
127			Physiological	Flower shop	Fly	Workplace	Flavor of flower for relaxation world	0
		50's						
	Homemaker D							
		17						
	High school student F							
		28						
	Corporate operator							

Then, regarding the questionnaire to the participants, Table 4 shows the result. The participants answer four questions about the effectiveness of Wanted Scenario Graph. The questions are consisting of “Q1: Have you generated ideas that you don’t think normally?”, “Q2: During the experiment, you forget the theme and think freely?”, “Q3: By this method, can you continue to think more ideas over 10

minutes?” and “Q4: Have you fun with this method?”. And the participant rates on a minus five to plus five scales. In this scale, the plus five means strongly agreed with the question. And minus five means strongly disagreed with the question. And zero means no preference. Fig 3 shows the average ratings of each question.

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TABLE 4 THE RESULT OF QUESTIONNAIRE

Participant	Q1: Have you generated ideas that you don't think normally?	Q2: During the experiment, you forget the theme and think freely?	Q3: By this method, can you continue to think more ideas over 10 minutes?	Q4: Have you fun with this method?
Company employee A	-5	5	-5	0
Professor A in engineering department at university	2	5	0	0
Graduate student A in engineering department at university	4	2	5	4
Homemaker A	1	4	1	
High school student A	-1	0	3	3
Homemaker B	1	-5	2	5
Homemaker C	1	5	1	4
College student A in law school at university	2	-2	0	2
College student B in economics department at university	2	5	5	2
College student C in faculty of education at university	2	5	5	5
College student D in engineering department at university	2	-2	4	5
College student E in engineering and resource science at university	4	-4	5	5
High school student B	1	0	-2	3
High school student C	2	1	2	0
High school student D	4	0	4	5
High school student E	4	-1	1	5
Homemaker D	2	4	5	5
High school student F	3	1	4	5
Corporate operator	5	4	5	5

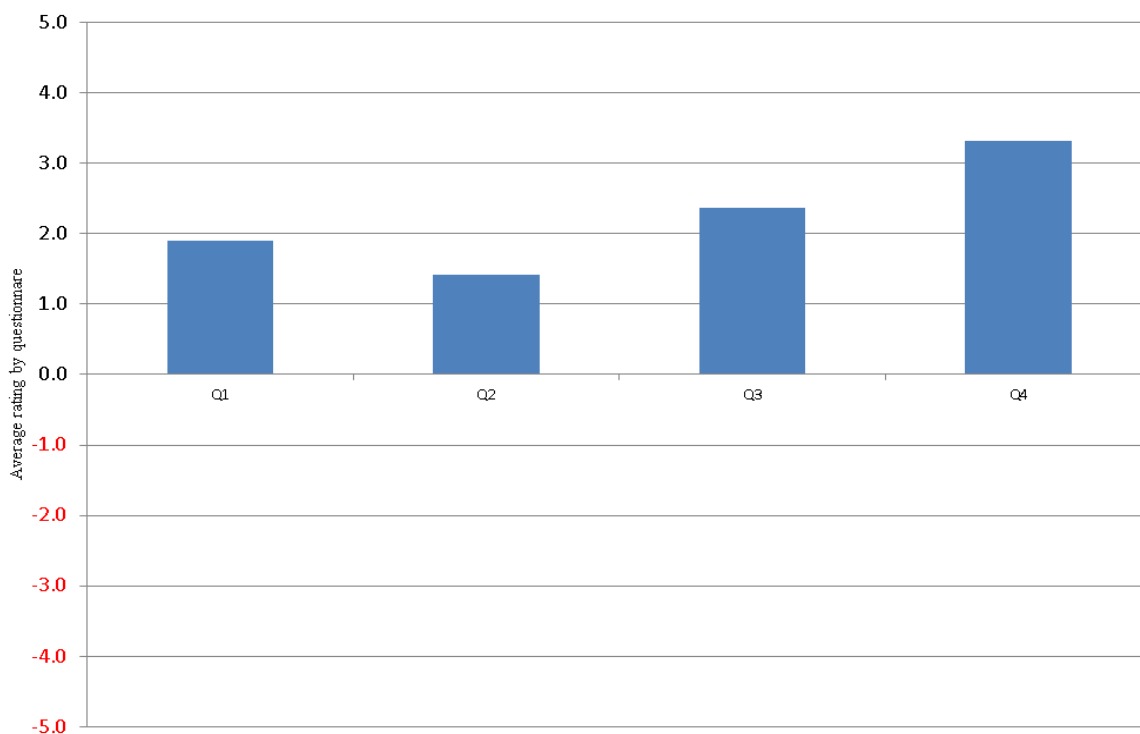


Figure 3 Average ratings of each question



Fig 3 shows positive feedback for all questions. That means for all the participants, Wanted Scenario Graph in idea creation is effective in idea creation. Especially in this study, wants as the element has been applied in addition to Scenario Graph and it is described that the wants is one of effective element in idea creation. Because it is observed that connecting work between Wants and Who,What,Where makes the participants be creative based on the idea evaluation and questionnaire results. Therefore thinking wants with other element of idea is one of a way for novel idea. Based on both the evaluation of idea generated from a novel point of view and positive feedback of the questionnaire, it is described that Wanted Scenario Graph is useful as one of forced association measures in idea creation.

## VI. CONCLUSION AND FUTURE WORK

Wanted Scenario Graph is proposed by extending Scenario Graph. In the experiment, 19 people with Wanted Scenario Graph generate 6.7 ideas per person on average. And questionnaire to participants shows a positive feedback for useful point of view. Therefore Wanted Scenario Graph to be useful when it is used for creating new ideas. As a future work, the effectiveness of Wanted Scenario graph should be conducted with statistical analysis by the increasing number of subject peoples. And by application of the proposed method to a real case, the effectiveness can be further illustrated. In addition, people in academic and industry normally works with someone as a team but not alone so the effectiveness is further also investigated. To consider the situation with using the proposed method, it is also necessary to validate the effectiveness of Wanted Scenario Graph not only by individuals but also by team.

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