A Qualitative Research on the Difference of Expectation to NPD Related to Two Occupational Categories in Japanese Enterprises

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Abstract—**Although it has been said that conceiving potential needs and customers is important for realizing innovations, companies have had difficulty in getting through new product development (NPD) looking toward the prospective demand because of high risk. Former studies have shown that there are differences of NPD strategies employed by companies depending on whether one aims NPD for potential needs or not. This study focuses not on the differences of NPD strategies in companies but on what each occupation expects for NPD. Several open-end-type questionnaire surveys on employees from Japanese companies who have experienced medium to long term perspective idea generating workshops have revealed that occupational categories can be divided into two groups by the differences of expectation to NPD; rapid-fire NPD expectation group and late bloomer NPD expectation group. The former group which consists of marketing experts and engineering experts, tends to expect just responding to existing needs and gaining profit expeditiously in NPD, and the latter that comprises of design experts and research experts, tends to expect realizing future innovations in NPD. This study implies the confrontation with two occupation groups prevent Japanese enterprises from realizing future innovations.**

I. INTRODUCTION AND RESEARCH QUESTION

It is said that it is important for companies to capture not apparent needs but potential needs in order to develop a breakthrough product because customers cannot reflect on their demands and explain them well [8]. Sony Walkman is a clear example of a new product resulted from insights into customer hidden needs [9]. According to [19], not only the market watchers but even Sony employees were skeptical about the profitability of Walkman during its development, because they judged Walkman not having the record function as valueless products for customers. Regardless of such circumstances, the development team believed in the potential needs of portable stereo as a means of enjoying personal music entertainment. Another example is Apple's series of portable devices. Steve Jobs had an insight into the importance of the online retail, and collaborated iTunes Music Store with iPod [1]. The even hidden needs for mobile internet was continuously sought and realized in another innovative product, iPhone [2]. However, NPD dealing with hidden needs always carries higher risks of failure of the market penetration compared to that relying on apparent needs, because the hidden needs may or may not be true.

Reference [16] points out the existence of companies' different attitudes toward NPD. They classify companies into three types: defender, prospector and analyzer. Defender gives priority to defend the high market share of existing products without challenging another new market. In contrast, prospector aims NPD meeting hidden needs in various new markets. Analyzer approaches both existing markets and new markets, which means analyzer adopt both the defender's strategy and the prospector's strategy. Reference [16] also insists that each groups have characters related to the prominent occupations of business management, for instance, each accounting group in defender has great influence on business management in each company. Reference [12] indicates that it is necessary for prospector to collaborate between the research division and the marketing department in a company. These studies imply that there are some differences between occupations whether they want to challenge NPD meeting hidden needs or not.

However, it has been not revealed clearly which NPD oriented occupations tend to foresee and reflect hidden future needs toward their job. This study is to make it clear through analyzing questionnaires answered by Japanese employees from each four types of occupations: marketing experts, engineering experts, design experts and research experts, who have all experienced scanning based foresight method (SBFM) [22]. The preference over this future oriented workshop should reveal each attitude toward innovation meeting hidden needs.

II. WHAT IS SBFM?

Developed by Stanford Research Institute in the 1970s, the method of scanning have been utilized by various companies for their consulting service since the 1980s [15]. Scanning is a method to give company a clear vision on its surrounding ongoing environment as a scenario in the market by consolidating each information from multiple factors including even those seem to be very external to them. As an expanded method of scanning [20] [2], SBFM is to integrate scanning-derived future consumers' lifestyle with future technological scenarios of the supply side in order to generate future product ideas [23].

Scanning targets the anticipated NPD for about 10 years which is the most difficult time span for companies to forecast. Market in the medium-term future is neither a simple extension of today nor a completely science-fictional future, nevertheless, it is an attractive length for companies to work on big technological development for NPD. In 10 years, both the market and technology should change in a proper extent, and therefore SBFM which is to reflect both into its result seems to be suitable to seek properly through this length of time.

Before explaining the specific method of SBFM, the authors show two criteria deciding the difficulty of demand

forecast: needs and customer, and confirm that SBFM deals with the area of innovation which is the most difficult to predict demand.

A. The map of NPD methods

As mentioned above, the risk of market penetration failure that hidden needs oriented NPD carries is higher than that relying on apparent needs. There are two criteria that decides the difficulty of demand forecast: the first is whether needs are apparent or hidden, and the second, whether the targeted customers are existing customers or potential customers. For each of the criterion, pursuing the latter is more difficult than the former. By integrating these two criteria into a table, multiple NPD methods can be plotted on this map, which will be called in this study the map of NPD methods (or simply, the map).

TABLE 1 THE GEOMETRICAL RELATION BETWEEN ANSOFF'S MATRIX AND THE MAP OF NPD METHODS
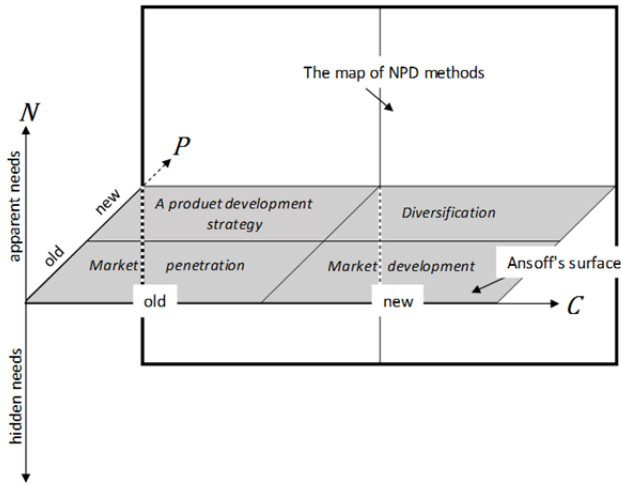
A related idea has been argued by Ansoff [4], which shows the matrix of product-market strategies by using the two axes: product line and markets, which are each divided into new and old. He insisted that companies should use the four strategies properly according to each combinations consisting of the axes: market penetration, market development, a product development strategy, and diversification. However, this argument lacks the vertical dimension of whether the demand is apparent or hidden, which the map of NPD methods contains in. In short, Ansoff's matrix and the map is vertically connected in the side of the newness of product (Table. 1).

The domains of three innovation theories: destructive innovation, sustaining innovation [6], and novel innovation [17], can be revealed by using the map of NPD methods (see Table 2). Destructive innovation can be plotted in the first quadrant of the map of NPD methods and sustaining innovation can be plotted in the second quadrant [6]. Leading companies tend to focus on only extending exist technologies by meeting the apparent needs of existing customers that would result in realizing only sustaining innovation. On the other hand, start-up companies try to develop cheap products having moderate performances by accepting the apparent needs of new customers which would consequently realize disruptive innovation. Therefore, the two innovation concepts can be come under the upper line of the map of NPD methods. On the contrary, novel innovation fits the lower line of the map. A novel innovation is an innovation responding to hidden needs. According to [17], novel innovation is the very innovation which [18] refers to, because innovation meeting apparent needs is just a series of minor improvements.

On the map, SBFM can be plotted in the lower right. The product ideas born through SBFM target markets in the future, about 10 years from now. In other words, SBFM would be regarded as a technique which give birth to the product ideas meeting future hidden needs of new customers, which means that it deals with the most difficult area of demand forecast: novel innovation [17].
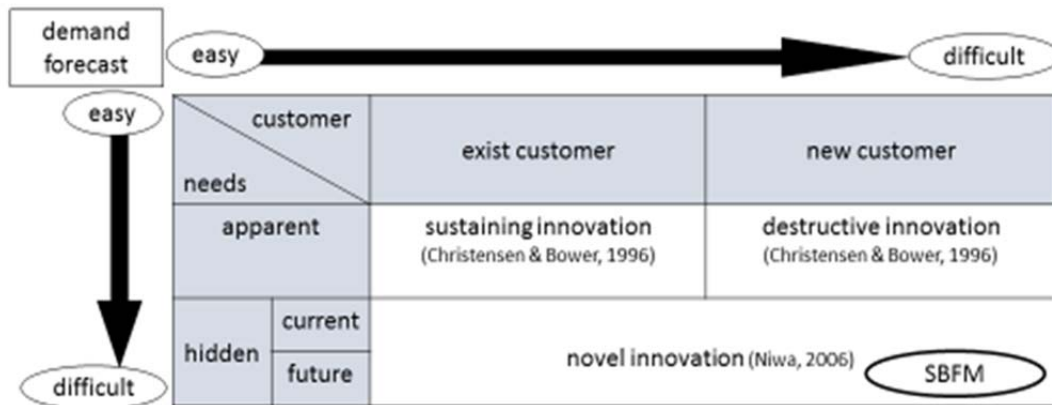
TABLE 2 THE MAP OF NPD METHODS

TABLE 3 THE IMPACT DYNAMICS

Future issue (supplier side)

	1. A kitchen will disappear from a house.	2. Family members will live more independently from each other.	3. Future house will consume less electricity and energy.
A. An identity crisis will become even worse.	1A	2A	3A
B. Persona will be linked in weak ties.	1B	2B	3B
C. At home work sustained by advanced IT will become more popular.	1C	2C	3C
D. A greener society which would go counter to the then technological society.	1D	2D	3D

Social change scenarios (consumer side)

B. The specific method of SBFM

SBFM is a foreseeing method which goes through by teamwork and often carried out in a workshop style for 2 days. The method is roughly divided into three steps: making social change scenarios by scanning method, considering future issue, and generating product ideas forcibly by integrating the social scenarios with the future issue.

First, the participants of the SBFM workshops try to infer the future consumers' lifestyles inductively (scanning). They aim to depict non-linear future scenarios by using resources called scanning materials which look like irrelevant information to technological development from various media all over the world; the news topics are such as unique consumer behaviors, fashion, or policy. Such apparently irrelevant information may show signs of some submerging obstacles to the spread of companies' technology. Such as the so-called butterfly effect [14], the information which seems to be irrelevant might effect on future markets. Scanning needs massive materials for supposing every possible scenario, however the amount of news understandable to human is limited. Therefore, from 100 to 200 news are used in the workshops of SBEM. The participants select some scanning materials and then make from 3 to 5 social change scenarios before the workshops. Each social change scenarios consists of from 4 to 10 scanning materials.

Second, in SBFM, the subjective future scenarios of main topics is called future issues. In contrast to the fact that social change scenarios are conducted from inductive inference, future issues should be built from deductive reasoning. The point of future issue is that it is derived purely from the problem in the industry itself, e.g. an automobile company's future issue would be topics related to cars, not about alternative transports. In order to make a precise SBFM, a future issue about a specific topic should be collected from the person in charge.

Finally, the future issues and the social change scenarios are integrated into what is called the impact dynamics matrix (Table. 3). Future product ideas considering the two aspects are filled in the impact dynamics matrix. Considering the three steps, SBFM is a technique depending on what is called abductive reasoning based on subjective inference.

III. WHO IS EAGER TO REALIZE FUTURE INNOVATION?

According to [10] and [11], a business person who works for a company is tacitly requested for a dual obligation; one to dedicate for the company, and the other to contribute for the growth of occupation group which he/she belongs to. Reference [10] calls an individual who has stronger loyalty to his or her company cosmopolitans, while calls an individual who has stronger loyalty to his/her expert group locals. These former study imply that there are differences of a way of thinking within occupation groups in a company. This study aim to identify which occupation groups work on the difficult NPD meeting hidden needs and targeting new customer.

A. Method

As previously mentioned, SBFM is an idea generation technique which targets the most difficult length of NPD period to seek through. On contrary, the preference to this future oriented method should disclose what type of employee motivates the realization of innovation to meet hidden needs. In order to make this query clear, the authors conducted an open-end-type questionnaire survey for participants experienced an SBFM workshop in Japan. The participants were collected from the various industries; construction, printing, information and communication technology, electric appliance, software manufacture, and precision instruments manufacture.

The 89 participants are divided into four occupations: 24 marketing experts, 23 engineering experts, 32 design experts and 10 research experts. The questionnaire consists of following two questions. The authors analyzed the answers of the questionnaire by after coding.

1. What do you think merits and demerits of SBFM are compared to general planning methods or design methods?
2. Do you think SBFM is useful for a persuasion to other persons?

B. Results

11 out of 89 participants answered that "I could not get serious about SBFM" or "SBFM is not useful to business." 10 out of 11 participants who are skeptical about using SBFM in business consist of marketing experts and engineering experts. It means that marketing experts and engineering experts are more skeptical about using SBFM in in business than design experts and research experts, which was statistically significant, Fisher's $p < .01$ (given in the Appendixes, Table. 4).

15 out of 89 participants answered that "I was worried about incorrect foresight of participants." 11 out of 15 participants who worried about incorrect foresight consisted of marketing experts and engineering experts. This means that marketing experts and engineering experts are more worried about incorrect foresight than design experts and research experts, which was marginally significant, Fisher's $p < .1$. However, as for SBFM, it would not be necessary to pursue the accuracy of foresight, because it is important to depict various non-liner future scenarios.

The result shown in Table. 5 (given in the Appendix) seems that marketing experts and engineering experts are skeptical about foreseeing future markets itself as well as SBFM. On the other hand, 19 out of 89 participants answered that "New ideas would be generated through SBFM". 10 out of 19 participants who expect SBFM to be useful to generating new ideas consist of marketing experts and engineering experts, which is not so different from the number of design experts and research experts. This result means that marketing experts and engineering experts are negative to using SBFM in business and skeptical about foreseeing future markets although some peoples of the occupations admit they could generate new ideas through SBFM (given in the Appendix, Table. 6).

IV. CONCLUSION & DISCUSSION

The results of the questionnaire revealed that there are differences of perception within occupations whether SBFM is useful in business or not. The differences show that occupations strongly effect on the employee's acceptance to SBFM in spite of the common goal set in the workshop: generating mid-term future product ideas. In other words, the differences shown in the experiment seems to result from the differences of what each occupations expects for NPD.

A. Rapid-fire NPD expectation group and late bloomer NPD expectation group

From the results of the questionnaire, the authors divide four occupation groups into two groups namely, rapid-fire NPD expectation group; marketing experts and engineering experts, and late bloomer NPD expectation group; design experts and research experts (Table. 7).

Marketing experts and engineering experts expect for NPD to develop rapidly products which meet apparent needs of exist customers; while they don't expect for NPD to develop the risky products which may meet future needs or not. They focus on continuing to the quantity of new products developed rapidly which expected to sell well now. It means that who belongs to rapid-fire NPD expectation group completely unable to challenge the difficult NPD meeting hidden needs and targeting new customer. Especially, marketing experts and engineering experts often play its role of solving problems one after another as soon as possible in their regular works, which would bad effect on the attitudes to challenging difficult NPD meeting hidden needs and targeting new customer.

In contrary, design experts and research experts expect for NPD to realize innovation by foreseeing hidden needs and considering appropriate approaches to new customers. They focus on the quality, in other words, innovativeness of new products needed long development term. Neither design experts nor research experts have planned new product ideas or new concept in their regular works; design experts who

TABLE 7 TWO NPD EXPECTATION GROUPS IN THE MAP OF NPD METHODS
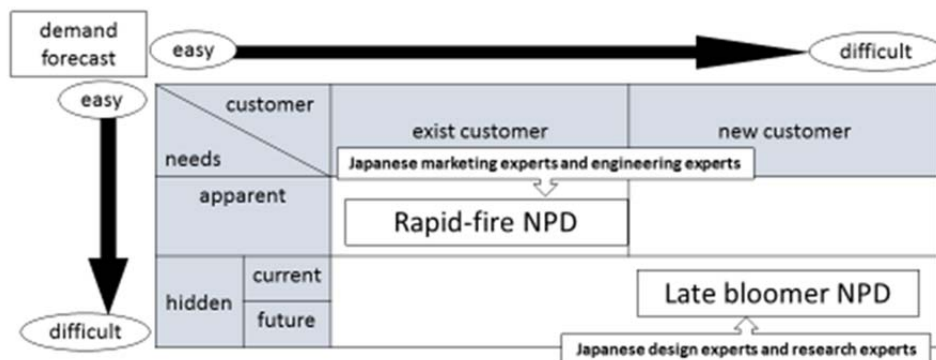
charge of drawing a design of finished new product ideas and research experts who charge of basic research of some technology. However, it seems that their long perspective to NPD in regular works have positive effects on their attitudes toward NPD meeting hidden needs and targeting new customer.

This difference between fire-rapid NPD expectation group and late bloomer NPD expectation group in Japanese companies could prevent realizing novel innovation. One of the research experts in a Japanese manufacture said that he couldn't have proposed drastic NPD that needs long term development period, because their superior marketing experts opposed such NPD. It is said that inter-occupational cooperation is essential in methods aiming novel innovation, such as SBFM or design thinking [5]. Nevertheless, this study has revealed the difference of enthusiasm between the two groups that might be preventing Japanese enterprises from realizing such series of significant innovations.

B. Beyond one's personal expertise

Existing studies have argued that the difference of viewpoint towards the future seen between the types of occupation is due to their education at university. Reference [7] has revealed that students major in social science or liberal arts tend to consider problems integrally while students in the field of natural science or engineering tend to examine issues analytically. Reference [24] points out that especially in Japan, most of the business persons feels a strong unconfident feelings beyond their expertise, because Japanese university have strictly distinguished education for natural science and engineering (NSE) from social science and liberal arts (SSLA), and vice versa, which causes a trouble in both of the groups: for the former, they tend to hesitate managing ambiguous issues and try keeping out from the un-expectable, while the later tend to rely on the past and lack the viewpoint towards the future.

However, by taking a look into the result of the experience mentioned above, educational background seems to have little to do with the attitude towards SBFM, even in Japan; employees having same educational background (engineering and research from NSE; marketing and designing from SSLA) don't necessarily have the same tendency, while late boomer NPD expectation group (designers and researchers) and rapid-fire NPD expectation group (engineers and marketer) contains of employees from both the educational groups.

This fact shows that the SBFM procedure requires a broad insight beyond one's personal expertise; university education have so far not focused on training such ability, and therefore, higher education background seems to have less influence on SBFM. It is more likely that the professional experience affects more on a person's faculty for foresight, which caused the difference in the experiment.

C. Who will lead the NPD meeting hidden needs and targeting new customer?

In addition to the results mentioned on the above, another interesting result is shown from answers of the questionnaires. 12 out of 89 participants answered that "SBFM is useful for persuading others." 8 out of 12 participants who expect SBFM to be useful to persuade others consists of designer experts. It means that designer experts expect SBFM to be useful to persuade others than other occupation experts, which was statistically significant, Fisher's $p < .05$ (given in the Appendix, Table. 8).

Reference [1] implies that scenarios help designers to consider appropriate solutions in a problem space. Designer experts deal with abstract parts of work, e.g. they must judge subjectively whether a design sample of a product is good or bad. It is said that abductive reasoning based on subjective inference is important for product design [21]. Therefore, they would hope to use SBFM for telling their own subjective consideration to other experts in regular work. This result clear that designer experts would be leaders of challenging the difficult NPD meeting hidden needs and targeting new customer.

D. Limits and Future Research

This study has some limitations mainly regarding survey samples. First, the sample sizes were recruited from only Japanese business persons participating only three workshops. The samples could be biased, to some extent, toward cooperate cultural differences. Second, the answers from the questionnaire were collected from only four types of occupations. Consequently, further research is needed on a broader sample, including other occupations.

In addition to the limitations regarding samples, there was a problem that the question items were too simple to examine the details of the differences within occupations. Although the number of question items was decreased for being careful not to impose a burden on participants in the workshops, further experiments would be required to collect detailed results.

REFERENCES

[1] Adner, R., "Innovation Success: How the Apple iPod Broke all Sony's Walkman Rules," 7 3 2012. [Online]. Available: http://knowledge.insead.edu/blog/insead-blog/innovation-success-how-the-apple-ipod-broke-all-sonys-walkman-rules-2791. [Accessed 15 4 2016].

[2] Albright, K.S., "Environmental Scanning: Radar for Success," The Information Management Journal, vol. May/June, pp. 38-44, 2004.

[3] Anggreeni, I. and M. Voort, "Supporting Scenario Building in Product Design," In Proceedings of the 22nd British HCI Group Annual Conference on People and Computers: Culture, Creativity, Interaction British Computer Society., vol. 2, pp. 111-114, 2008.

[4] Ansoff, I. H., "Strategies for diversification," Harvard business review, Boston, 1975.

[5] Brown, T., "Design Thinking," Harvard Business Review, vol. June, pp. 84-92, 2008.

[6] Christensen, C. M. and J. L. Bower, "Customer Power, Strategic Investment, and The Failure of Leading Firms," Strategic Management

Journal, vol. 17, pp. 197-218, 1996.

[7] Feist, G.J., "Synthetic and analytic thought: Similarities and differences among art and science students," Creativity Research Journal, vol. 4, no. 2, pp. 145-155, 1991.

[8] Goffin, K. and F. Lemke, "Uncovering your customer's hidden needs," European Business Forum, vol. Summer, no. 18, pp. 45-47, 2004.

[9] Goffin, K., Identifying Hidden Needs: Creating Breakthrough Products, New York: Palgrave Macmillan, 2010.

[10] Gouldner, A.W., "Cosmopolitans and Locals: Toward an Analysis of Latent Social Roles.I," Administrative Science Quarterly, vol. 2, no. 3, pp. 281-306, 1957.

[11] Gouldner, A.W., "Cosmopolitans and Locals: Toward an Analysis of Latent Social Roles. II," Administrative Science Quarterly, vol. 2, no. 4, pp. 444-480, 1958.

[12] Gupta, A. K., S. P. Raj and D. Wilemon , "A Model for Studying R&D. Marketing Interface in the Product Innovation Process," Journal of Marketing, vol. 50, no. 2, pp. 7-17, 1986.

[13] Laugesen, J. and Y. Yuan, "What factors contributed to the success of Apple's iPhone?," Mobile Business and 2010 Ninth Global Mobility Roundtable (ICMB-GMR), 2010 Ninth International Conference on, pp. 91-99, 2010.

[14] Lorenz, E.N., "Atmospheric predictability as revealed by naturally occurring analogues," Journal of the Atmospheric Sciences , vol. 26, no. 4, p. 636–646, 1969.

[15] Loveridge, D., Foresight: The Art and Science of Anticipating the Future, London: Routledge, 2008.

[16] Miles, R. E., C. C. Snow, A. D. Meyer and H. J. Coleman, Jr., "Organizational Strategy, Structure, and Process," The Academy of Management Review , vol. 3, no. 3, pp. 546-562, 1978.

[17] Niwa,K., Technology Management, Tokyo: University of Tokyo Press, 2006. [in Japanese

[18] Schumpeter, J. A., The Theory of Economic Development: An Inquiry Into Profits, Capital, Credit, Interest, and the Business Cycle, Piscataway: Transaction Publishers, 1934.

[19] Sony Corporation, "Sony Celebrates Walkman(R) 20th Anniversary," Sony, 1 January 1999. [Online]. Available:http://www.sony.net/SonyInfo/News/Press_Archive/199907/99-059/. [Accessed 20 January 2016].

[20] Stoffels, J.D., Strategic Issues Management A Comprehensive Guide to Environmental Scanning, Oxford: The Planning Forum, 1994.

[21] Taura, T., "Social Motive of Design ―Roles of Pre-Design and Post-Design in the Highly Advanced Technological Society," Special Issue of Japanese Society for the Science of Design, Vols. 20-1, no. 77, pp. 8-11, 2012. in Japanese

[22] Washida, Y., Foreseeing the future, Tokyo: NTT Publishing Co., Ltd., 2007. in Japanese

[23] Washida, Y., S. Mitsuishi and H. Horii, "A Future Scenario Generation Experiment in Socio-Technological Problems Using Scanning Method," Journal of sociotechnology research network, vol. 6, pp. 1-15, 2009. in Japanese

[24] Washida, Y., The design that conveys innovation, Tokyo: Yuhikaku Publishing, 2014. in Japanese

APPENDIXES

TABLE 4 THE NUMBER OF THE PARTICIPANTS WHO ARE SKEPTICAL ABOUT USING SBFM IN BUSINESS

	marketing experts and engneering experts	design experts and research experts	total
participants who are skeptical about using SBFM in business	10 (5/5)	1(1/0)	11
—	37(19/18)	41(31/10)	78
total	47(24/23)	42(32/10)	89

	Fisher's p (2-sided)
	0.0084 **

** p < .01

Note. The details of the number of each experts are shown in parenthesis as; (marketing experts/ engneering experts) and (design experts/ research experts).

TABLE 5 THE NUMBER OF THE PARTICIPANTS WHO ARE WORRIED ABOUT INCORRECT FORESIGHT

	marketing experts and engneering experts	design experts and research experts	total
participants who are worried about incorrect foresight	11(6/5)	4(3/1)	15
—	36(18/18)	38(29/9)	74
total	47(24/23)	42(32/10)	89

	Fisher's p (2-sided)
	0.0959

Note. The details of the number of each experts are shown in parenthesis as; (marketing experts/ engneering experts) and (design experts/ research experts).

TABLE 6 THE NUMBER OF THE PARTICIPANTS WHO EXPECT SBFM TO BE USEFUL TO GENERATING NEW IDEAS

	marketing experts and engneering experts	design experts and research experts	total
participants who expect SBFM to be useful to generating new ideas	10(4/6)	9(7/2)	19
—	37(20/17)	33(25/8)	70
total	47(24/23)	(32/10)	89
		Fisher's p (2-sided)	
		1.0000	

Note. The details of the number of each experts are shown in parenthesis as; (marketing experts/ engneering experts) and (design experts/ research experts).

TABLE 8 THE NUMBER OF THE PARTICIPANTS WHO EXPECT SBFM TO BE USEFUL TO PERSUADE OTHERS

	design experts	marketing experts, engneering experts, and research experts	total
participants who expect SBFM to be useful to persuade others	8	4(2/2/0)	12
—	24	53(24/23/10)	77
total	32	57	89
		Fisher's p (2-sided)	
		0.0244 *	

* $p < .05$

Note. The details of the number of each experts are shown in parenthesis as; (marketing experts/ engneering experts/ research experts).