

# How Do Young Researchers Take the Steps toward Startup Activities? *A Case Study of a One-day Workshop for Entrepreneur Education*

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**Keywords:** Business Startup, Creativity, KEYS Scale, Knowledge Creation, Business Plan Refinement Workshop.

**Abstract:** This is an exploratory study of how young researchers with specific scientific knowledge, through deep conversations with mentors from industry in a Business Refinement Workshop (BRWS), are likely to change their original business plans, and what the factors are that will stimulate them to take action for business startup. It was found that the BRWS did lead to changes in business plan issues and solutions, but these changes did not necessarily lead to specification of the business plans. It was also found that a positive perception to the discrepancy of the mentors' comments was a factor that could stimulate startup activity after the workshop.

## 1 INTRODUCTION

On January 2, 2010, the *Washington Post* reported that in the U.S. economy there was zero net job creation in the first decade of the twenty-first century. Even though the U.S. economy has grown steadily over the past 70 years and has been a driving force in the world market, in recent years the climate for job creation has been changing. Ford (2015) notes that companies like Google and Facebook, for example, have succeeded in achieving massive market share while hiring only a tiny number of people relative to their size and influence. And also he claims that "predicable" jobs, that is fundamentally routine jobs and jobs requiring a degree of expertise, will be taken over by machines. The result will be the playing out of similar scenarios to those of Google and Facebook in nearly all new industries created in the future.

According to a 2010 Kauffman Foundation report, startups, or age zero firms, have been the main creator of new jobs in the U.S. since the 1970s. The report notes that "job creation at startups remain stable, while net job losses at existing firms are highly sensitive to the business cycle". Startups are indispensable for net job acceleration, but they are not so active in Japan.

The Global Entrepreneurship Monitor (GEM) provides one of the most comprehensive surveys on entrepreneurship around the world. Its 2014 report

crystalizes the situations of more than 206,000 individuals in 73 economies. In this report, based on the World Economic Forum Global Competitiveness Index, Japan is classified as an Innovation-driven Economy. The United States, many EU countries (such as Germany and the United Kingdom), and Singapore are in the same category. But the report also indicates that Japanese society gives less social value to startups compared to the other countries listed above. Also, at this point in time, the Japanese people in general seem to have fewer of the individual attributes that lead to entrepreneurship activities. For example, the percentage of Japanese people who consider starting a new business a "desirable career choice" is 31% while those of the other four countries is over 50%. Since social value plays a pivotal role in an individual's action to become an entrepreneur (Kwon and Arenius, 2010), this data strongly indicates the vulnerable situation of the startup business in Japanese culture.

Japan's Ministry of Education, Culture, Sports, Science and Technology (MEXT) is aware of the importance of fostering nascent entrepreneurs and of providing education for innovation, and there are two MEXT programs dealing with this. The Program for Leading Graduate Schools (Leading Program) initiated in 2011 supports 62 graduate programs to nurture next-generation leaders having broad perspective and creativity. The program clearly aims to produce quality graduate students with various

career choices (in contrast to traditional academic-centered careers), that include starting up a new business. Additionally, in 2014, MEXT also started the Enhancing Development of Global Entrepreneur (EDGE) program which currently supports 13 programs specifically aimed at accelerating innovation through entrepreneurial education on startups and organizations. Still, though the government is actively pushing for entrepreneur education, the program curriculums still involve a lot of trial and error. In summary, Japanese entrepreneur education is still at the predawn stage.

The question is how to bridge higher education with the encouragement of nascent entrepreneurs; or more precisely, how to transform young researchers with scientific expertise into nascent entrepreneurs who can create new jobs through the diffusion of innovation. This is not only a challenge for Japan but also one for the global community.

## 2 LITERATURE REVIEW

### 2.1 The Variables That Affect the Decision to Start a Business

Clercq and Arenius (2006) statistically analysed data collected for the 2002 Global Entrepreneurship Monitor and concluded that knowledge-based factors have a strong impact on the decision to engage in business startup activities. According to their regression analysis of the likelihood of being engaged in business startup activity, "specific skills" and "personally knowing an entrepreneur" significantly affected the dependant variable in all their sample subgroups—a control group, a Belgium group, and a Finland group. As to education level, they found that a secondary degree had a positive effect in the control group, but a post-secondary degree did not affect the dependant variable in any of the groups. This result suggests that specific skills and exposure to knowledgeable others are significant factors, while higher education does not necessarily push people to become nascent entrepreneurs. Highly elaborated existing knowledge is supposed to be indispensable in generating new ideas and engaging in business startup, but the accumulation of existing knowledge does not necessarily link to business startup activity. There is a need to bridge existing knowledge and external knowledge, and to transform an individual's tacit knowledge to shared knowledge. How can we bridge these different kinds of knowledge?

Nonaka and Toyama (2003) state that "knowledge creation is a synthesizing process through which an organization interacts with individuals, transcending emerging contradictions that the organization faces", and "one can share the tacit knowledge of others through shared experience". In order to transform tacit knowledge to shared new knowledge, socialization and efforts to transcend contradictions are needed (Saijo *et al*, 2014). Saijo *et al*, (2014) executed an action study in which a 4-wheel electric power-assisted bicycle was lent to frail elderly people and observed how physiotherapists created new knowledge in assisting the frail elderly people to ride the newly invented AT-device: a 4-wheel electric power-assisted bicycle. In this research, having a new device evaluated within the context of a care facility served as an impetus to transform the tacit knowledge of professional caregivers into explicit knowledge. This required close collaboration among the device maker, researchers, and caregivers, and the city hall staff also played an important role as intermediaries bringing together diverse professionals and the staff of the care facilities.

This previous study points to the importance of knowledge creation formed through collaboration or interaction among people with different backgrounds who work together to transcend difficulties. In seeking to push highly educated people to start a business, it can be helpful to find a way to encourage knowledge creation among them.

If knowledge creation is a process by which organizations interact with people to create new and useful knowledge that will help them transcend difficulties or achieve challenging goals, then it seems reasonable to consider creativity to be the product of knowledge creation.

### 2.2 Creativity and Innovation

Amabile *et al*, (1996) defined creativity as "the production of novel and useful ideas by individuals or teams of individuals". Creativity is not merely a result of an individual's characteristics but also the result of the interaction between an individual and work circumstances. Creativity is a key factor in starting a new business, but it is still not clear how to encourage or foster this creativity.

KEYS: Assessing the Climate for Creativity (formerly, Work Environment Inventory) gives six stimulant scales and two obstacle scales affecting creativity (Amabile, *et al*, 1996). KEYS was developed based on the human capital theory, especially the interactionist concept (Woodman, Sawyer, and Griffin, 1993). KEYS focuses on how

workers perceive the relationship between the work environment and team creativity. Amabile *et al.*, (1996) compared highly creative projects and low creative projects in a construct-validity study. For the stimulant scales, KEYS gives Organizational Encouragement, Supervisory Encouragement, Work Group Supports, Freedom, Sufficient Resources, and Challenging Work. The obstacle scales are Workload Pressure and Organization Impediments. They analysed the relation between work environment perceptions and creativity by collecting data totally 12,525 with variety of functions and departments and organizations. The results show that in the six scale of challenging work, organizational encouragement, work group supports, freedom, organizational impediments, and supervisory encouragement, there is strong discrimination between two levels of creativity. The study concluded that high-creativity projects were generally rated higher on the stimulant KEYS scales and lower on the obstacle scales (Amabile *et al.*, 1996). It was also concluded that this result was not affected by other project variables: project length, size of project team, organization of project team, etc.

The present paper deals with a one-day entrepreneur workshop for Leading Program students as an inter-organization project, and evaluates the factors which positively affect a student's motivation to undertake business startup activities using the KEYS scale framework. We applied the four positive scales which were shown to be highly effective in Amabile *et al.*, 1996: challenging work, work group supports, organizational encouragement and supervisory encouragement.

### 3 CASE STUDY METHODOLOGY

#### 3.1 Background

One of the goals of the Leading Program, being implemented at prestigious graduate schools in Japan, is to nurture students so that they will acquire the competence suitable for the following roles: (1) leader, to solve social problems with their expertise, and (2) project manager, to trigger innovation via communication with various stakeholders. However, it is difficult for students to experience leader and/or manager roles in a collaborative project while they are undertaking graduate study. As a result, students lack experience in applying their academic knowledge to solving problems in the real world. We

believe that this can only be remedied by actually providing a setup where students and people from industry co-create solutions.

We therefore arranged to have the Four Leading Programs at the Tokyo Institute of Technology organize a one-day Business-plan Refinement Workshop (BRWS) in which students and people from industry communicated with each other to co-create a solution.

#### 3.2 Research Questions

In introducing the BRWS we began with two questions: (1) How can the BRWS be evaluated in terms of the positive KEYS factors—organizational encouragement, supervisory encouragement, work group supports, and challenging work—that stimulate the individual's creativity within the team? By describing the BRWS in terms of the KEYS factors, we can evaluate the environment's effectiveness in stimulating the creativity of the participants by exposing them to external knowledge for getting new and useful ideas. (2) Which factors are effective in stimulating highly educated young researchers to take action on startup activities? By searching for these factors, we seek to develop a methodology for stimulating creative ideas for business startups.

The four categories of the first question were further broken down into additional questions as follows:

**Organizational Encouragement:** What are the distinguishing characteristics of the BRWS and the ways in which MEXT, the organizers, and the participating university encourage Leading Program students to participate in this event, and what was their level of satisfaction with the workshop?

**Supervisory Encouragement:** How do mentors and students cooperate in drafting a creative business plan in the BRWS setting, and how do researchers changed their business plan in order to create new and useful ideas?

**Work group Supports:** In the BRWS, how did young researchers perceive their mentors' suggestions for refining their business plan?

**Challenging Work:** How do students link their workshop and post-workshop action to their business startup?

By evaluating the effectiveness of the one-day BRWS, as an environment in which young researchers refine their business plans through deep communication with their mentors, we seek to develop a methodology for stimulating creative ideas for business startups.

### 3.3 Method

Participants in the BRWS were: 22 young researches (10 masters and 12 PhD students in Leading Programs at 7 universities) and 20 mentors from 5 major companies and 9 venture companies. The Tokyo Institute of Technology, the first author's place of work, organized this event and Leave a Nest Co., Ltd, the last author's place of work, sponsored and facilitated the workshop. Students submitted their business plan proposals 1 month before the workshop, and 10 teams were selected to participate in the BRWS. The business plans were submitted to a panel of judges just before the workshop, and then again after they had been refined in the workshop. The refining of the business plans was carried out in the workshop by 10 inter-organizational teams comprising the above mentioned students and business persons.

Three months after the workshop, 10 people who were involved in BRWS from the sponsor company were asked to evaluate the originality and practicality of the revised business plan PowerPoint presentations that came out of the BRWS. Around the same time we followed-up with interviews of the student participants to see what kind of activity may have been triggered by the workshop. One of our co-authors interviewed 15 students by phone. One of the interviews was disqualified because the student did not answer all the questions, and the remaining 14 student interviews were analysed for the present study. Permission was obtained from all 14 students and from the organizing university to use the interview data.

- *Period:* March 5, 2016 to July 5, 2016  
*BRWS:* March 5, 2016  
*Post event evaluation:* June 16 to July 9, 2016  
*Post event participant interviews:* June 16 to July 7, 2016
- *Targets:* 1) Masters and PhD students in Leading Programs (hereafter "young researchers") who participated in both the BRWS and the post event interviews; and  
 2) Business persons in the major companies and venture companies who participated in the BRWS as mentors (hereafter "mentors"); and  
 3) Employees from the sponsor company who took on the roles of supporter and facilitator at the BRWS and who were asked to compare the original and revised versions of the business plans (hereafter "evaluators").
- *Methods:* Rating pre- and post-BRWS business plan PowerPoint presentations made by the young

researchers, and making quantitative and qualitative analyses of the post-workshop interviews of the students.

The objective of the present study is to seek the factors stimulating young researchers to take action on startup activities. By using KEYS, we can evaluate the effectiveness of the environment in stimulating creativity, i.e., knowledge creation, and get a grasp on whether the participants are sufficiently exposed to external knowledge to get new and useful ideas. We therefore put the data acquired through the BRWS and interviews into the KEYS scales framework to derive indices for evaluating the effectiveness of the environment.

#### 3.3.1 Organizational Encouragement and Supervisory Encouragement

Organizational encouragement is the encouragement provided by an organization to its people. Supervisory encouragement is related to the work models, goals, and support provided by supervisors (Amabile *et al*, 1996). In this article we describe how we organized this event and how MEXT, the organizing university and other member universities encouraged young researchers to participate this event.

Table 1: Students' business plan topics and mentors' industry sectors.

Group	Business plan topic and mentor industry sectors	# of students (post-event interviewees)
A	Exhaust gas treatment & plant factories <i>Agriculture, Media service</i>	2 (2)
B	Applying ICT in the operation of locally based corporate childcare facilities <i>Education, IT</i>	3 (1)
C	Enzyme treatment system for wastewater containing oils and fats <i>Device manufacturer, Biotech service</i>	2 (2)
D	Shotgun cloud working system for employing older workers and enhancing specialized skills of younger workers <i>Education (2 mentors from one company)</i>	2 (0)
E	A Water-powered acetylene engine motor vehicle <i>Car industry (2 mentors from one company)</i>	1 (1)
F	Revitalizing Odaka town - Fukushima after the triple disaster <i>IT, Angel Investor</i>	2 (1)
G	Reducing the waiting list for daycare and increasing the number of daycare workers <i>IT (2 mentors from one company)</i>	3 (2)
H	Development of a "sleep controller" and new business model using IoT for better treatment of sleep disorders <i>Device manufacturer, Telecom</i>	3 (3)
I	Small in-wheel motor and dissemination of a new sport: CarryOtto <i>Device manufacturer (2 mentors from one company)</i>	1 (1)
J	Ubiquitous healthcare service system based on the SPA architecture model for smart hospital <i>Device manufacturer, Food</i>	2 (1)

Information on this event was distributed by MEXT to all of the 62 Leading Programs in Japan. MEXT also advised each program to disseminate the information to young researchers and to call for proposals. The event was held in Tokyo, and travel expenses were covered by each program. Though the event included a poster session in addition to the BRWS, this article does not discuss the poster session since the authors' focus is on elucidating the effect of interaction between the young researchers and their mentors during the BRWS. The mentors from industry were actively recruited by the sponsor. Table 1 summarizes the students' business plans, and gives the industry sector of the mentors for the first session. Except for the E team, each team had two mentors in each session.

The mentor's business category is given under the title of each proposal. It is italicized if the company is a venture company. Here venture company is defined as one within 10 years of corporate registration.

Figure 1 shows the step by step flow of the BRWS. The time frame for each step is shown in the left column. The name of the step, activity, and the student and mentor's activity are summarized. The middle column shows the direction of communication.

If the students mainly explained things to their mentors, then the arrow points to the right. If the mentors were mainly explaining and/or giving feedback to the students, the arrow points to the left. If there was free exchange of opinions, then a double arrow is used. Each step is explained as follows. Step 0: Before the workshop starts, the students present their ideas. Step 1: the BRWS starts with brief guidance from the workshop facilitator. Step 2: Students and mentors fill in three different worksheets together. Step 3: Mentors are changed, and the students explain the ideas discussed in Step 2, with the new mentors giving feedback. Step 4: The original mentors return and the 3 worksheets filled out in Step 2 are revised. At this time, the teams of students and mentors are advised to resolve the questions that arose in Step 2 and 3. Step 5: Presentations are made of the polished ideas created in the workshop. During the workshop, mentors made suggestions for commercialization speaking from totally different perspectives. Deep communication lead to further reworking of the proposed plans.

As an index for organizational encouragement, the degree of participant satisfaction was investigated.

Time Frame (min)	Step	Name of the activity	Direction of communication	Activity of students (S)	Activity of mentors (M)
45	0	Original presentation • 4 min for presentation, • No Q&A from judges	➔	• Presentation	• Listening to each presentation
20	1	Workshop Guidance • To explain the time frame of the workshop • To explain how to use 3 worksheets	N/A	• Listening to facilitators' guide	
90	2	Workshop Round 1 • Fill in Worksheet 1 • Fill in Worksheet 2 • Fill in Worksheet 3	↔	• Exchange information • Co-create business scheme	
30	3	Workshop Round 2 • Mentor exchange and discussion	➔	• To explain the idea generated in Round1	• Listening to the idea presented by the team assigned newly
140			➔	• To discuss about the issue brought up by new mentors	• Asking questions to students' plan
80	4	Workshop Round 3 • Mentor exchange (back to originally assigned mentors) and iterate Worksheet 1~3 to polish the business plan • To make final presentation slides	➔	• To explain the discussion in Round 2	• Trying to understand the point of which other mentors questioned
220			↔	• Exchange information • Co-create business scheme	
100	5	Final presentation • 5 min for presentation • 5 min Q&A from judges	➔	Presentation of the polished plan	Listening to each presentation
	6	Questionnaire Survey • Degree of satisfaction (4-point scale) • Free description on good points of this workshop			

Figure 1: Flow of the BRWS.

Also, as an index for supervisory encouragement, the students were questioned about the degree of disparity they felt in the mentors' comments

### 3.3.2 Work Group Supports and Challenging Work

The variables that appeared to make the largest contribution to enhancing the creativity of the teams were work group supports and challenging work. An individual assigned a difficult objective is the most creative when supported by the team (Amabile, T.M et al., 1996). The tasks assigned to the young researchers in the BRWS were quite difficult. As explained above, the students were repeatedly required to polish their proposals and twice were subjected to differing comments from two different sets of mentors. After this they worked again with the first set of mentors to revise their proposals and prepare a PowerPoint presentation to be made before a panel of judges. This process resulted in disparity between the students' original proposals and the polished versions, which can be seen in a comparison of the proposals made before and at the end of the BRWS. In this study, 10 evaluators were asked to evaluate the portions of the proposals that had changed.

The objective of the BRWS was to transform the young researchers' existing knowledge into new and effective ideas for business startups offering solutions to social problems. The evaluations of the changes in the PowerPoint presentations therefore focused on the changes that may or may not have taken place in the proposals' issues and specific milestones for achieving those objectives, and these were used as the indices for judging the degree of novelty and innovation.

### 3.3.3 Factors Stimulating Young Researchers to Take Action Leading to Startup Activities

In the post-event interviews, 14 young researchers were asked the following questions.

- 1) Was there anything in the mentors' comments and advice that was incompatible with your proposal or ideas?
- 2) How would you rank the sense of disparity you felt on a scale of 1 to 5?
- 3) Why did you feel they were incompatible with your ideas?
- 4) Did you take any action to implement your plan after the event ended?
- 5) How would you rank that action on a scale of 1 to 5?

Each interview was conducted by telephone by one of the co-authors. Tapes of the telephone interviews were then transcribed and the data for this study was generated from the interview transcripts. The emergence of novel and useful ideas required that the young researchers find disparity in the mentors' comments regarding their business plans. Whether their perception of this disparity was positive or negative was also a factor to be taken into consideration. For the purposes of this article, the 14 interviewees' responses to the question of disparity were divided into 67 sentences and two co-authors other than the interviewing co-author used these sentences to judge whether the response was positive, negative, or neutral. This evaluation was based on the extent to which the sentences indicated a new awareness on the part of the young researcher. Responses were judged to be neutral when they indicated that the young researchers did not feel the comments to have influenced their own actions. Below is an example of this coding results, the coding concordance rate was 95.5%.

Positive: *The mentor's question, "Can't the treated discharge water be used again?" was unexpected and new idea.*

Negative: *I did not find it helpful.*

Neutral: *The comments of the mentors differed according to whether they represented a major company or a venture business.*

Correlation and regression analysis were carried out using the following variables: The *response variables* as to whether or not action toward business startup was taken after the workshop; the *evaluation variables* of the PowerPoint presentations (degree to which changes were introduced for new issues; new solutions; specificity of proposed milestones); and the *explanatory variables of the interviews* (degree of perception of disparity, ways of perception of disparity: positive-neutral-negative). For the statistical analyses, Esumi multivariate data analysis Excel software (version 6.0) was used.

## 4 RESULT

### 4.1 KEYS Positive Factor Evaluation for BRWS

#### 4.1.1 Organizational Encouragement and Supervisory Encouragement

The young researchers participating in the workshop received financial support from MEXT, and their

universities also treated the workshop as a part of their Leading Program curriculum. A high 80% responded that they were satisfied with the BRWS. Figure 2 shows what the students felt were the good points of the workshop. There may be some objection to using degree of satisfaction as a measurement of "organizational encouragement", but the objective of this study was not to measure the perception of encouragement but to seek out the results of the encouragement, and the degree of satisfaction in the workshop was therefore used as a measure. Figure 2 shows the breakdown of the responses to the multiple choice question on satisfaction.

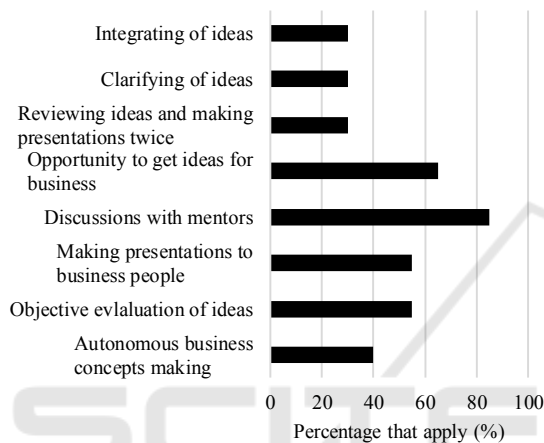


Figure 2: Good points of the workshop.

Most of the students (85%) selected "Discussion with mentors" as one of the good points. The second-largest number of students (65%) selected "Opportunity to get ideas for business". On the other hand, fewer students selected "Autonomous business concepts making (40%)" and "Reviewing ideas and making presentations twice (30%)".

#### 4.1.2 Work Group Supports and Challenging Work

We calculated the correlation factors between the three variables (reconstructed issues in business plans, reconstructed solutions, and proposed milestones) of the PowerPoint presentation evaluations between the specificity of the milestones and the ratio of reconstructed (a) issues/(b) solutions.

Variables in each case were derived as follows: for the ratio of issues and solution reconstruction, the ratio of evaluators who judged the issues or solutions to be reconstructed; and for the specificity of the milestones, the mean value of 4-scale evaluation of the milestone specificity. The results showed in Figure 4. From these results, we concluded that there

is no correlation between increases in the ratio of business plan reconstruction and improvements in the specificity of the business plans.

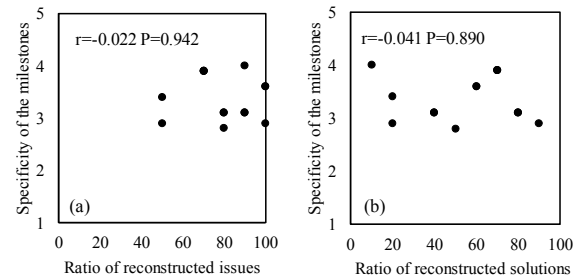


Figure 3: Relation between specificity of the milestones and ratio of reconstructed (a) issues/(b) solutions.

#### 4.2 Factors Stimulating Young Researchers to Take Action Leading to Startup Activities

Multiple regression analysis was carried out using the explanatory variables of PowerPoint presentation and the interviews. Stepwise regression analysis was applied, and it led us to have two significant explanatory variables for the response variable of presence/absence of action (Y). They were the degree of perception of disparity (X<sub>1</sub>) and positive perception to this disparity (X<sub>2</sub>).

$$Y = -1.37 + 0.28X_1 + 1.15X_2 \quad (1)$$

Adjusted R-square was 0.90, and since the P values were all statistically significant, it was determined that variables with sufficient explanatory power had been selected. Figure 4 shows structure determining whether or not action is taken.

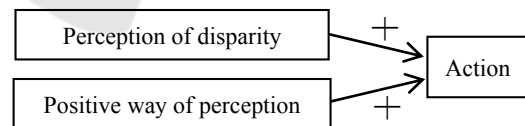


Figure 4: Structure determining whether or not action is taken.

### 5 CONCLUSION AND FURTHER RESEARCH

This was an exploratory study of the factors that will stimulate young researchers with specific scientific knowledge, when engaged in deep conversations with mentors from industry in a Business Refinement Workshop (BRWS), to take action for a business startup. In describing the BRWS environment of

knowledge creation in terms of the KEYS factors, it was found that this environment did lead to the reconstruction of business plan issues and solutions, but not necessarily to specific business plan milestones. Although there was no correlation between the milestones' specificities and the reconstruction of business plan issues/solutions, we did find that the perception of disparity in the mentors' comments could stimulate startup activity after the workshop. This finding expands on prior work by Clercq and Arenius (2006) who found that exposure to external knowledge may enhance the likelihood to engage in business startup activity. In other words, not merely exposure to external knowledge, but also perception of disparity, are key factors that push the participants towards starting a business. Moreover, we also found that positive perceptions of the disparity could be another factor stimulating such activity.

This study can be deemed to have the following limitations.

- 1) The KEYS scales were used to evaluate the effectiveness of the workshop, but no introspective study of the KEYS scales has been made and there is therefore no way to judge if the indices used in this study are consistent with the KEYS scales.
- 2) There is no record of the actual interaction that took place in the workshop and therefore no way of knowing what kinds of comments had positive disparity.
- 3) There was no evaluation of the milestone specificities of the original business plans, and therefore no way of knowing how they changed through the BRWS.

Despite these limitations, it was still possible to get some insight into the methodology of a workshop directed at stimulating highly educated human resources towards starting up their own businesses. Hereafter, we would like to gain further insight by introducing methods that will overcome the above limitations, and open up pathways to tying specialized knowledge to business startups and education that will accelerate innovation.

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