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## What are Potential Barriers to Prohibit Cross Border University-Industry Collaboration between India and Japan?

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**Abstract**--There is a lot of past researches on university-industry collaboration aiming at the creation of new industry. However, most researches have been done within the scope of domestic collaboration within a specific country. With the importance of open innovation, it is expected to make cross border collaboration between university and industry. Each country has a different culture, historical background, level of technology, varying industries, law and regulation, and political and economic systems, etc. Therefore, it is assumed that we should have different approaches and there exist different factors to promote cross border collaboration.

This research focus on the potential barriers existing between different countries, such as the quality of international human resource, balance between university and industry, international legal function like patent law and its regulations, networking ability, etc. Through interviews to different stakeholders in different countries, some critical factors are extracted and tries to identify the success factors to be proposed, expecting further promotion of cross border collaboration and qualified technology transfer together with creating new cutting edge global technology management.

### I. INTRODUCTION

Based on the report from Ministry of Education, Culture, Sports, Science and Technology (MEXT) in Japan regarding the activity of Industry-Academic Collaboration in Japanese universities [1], the total number of joint research between Japanese universities and corporations was 15,544 and the total number of sponsored research was 6,056. On the other hand, the total number of joint research between Japanese university and foreign corporation was 185 and the total number of sponsored research between Japanese universities and foreign corporations was 88. This resulted that the Japanese universities had joint research with foreign corporation at 1.1% and sponsored research at 1.4%, and we can recognize that cross border collaboration is really behind the time in this current era of global society.

Under this situation, Japanese government has been promoting Industry-Academic Collaboration on a global basis for the main purpose of synergy effect by conducting joint/sponsored research for open innovation era [2]. The main reason for the promotion of international Industry-Academic Collaboration is to get synergy effect between universities and corporation beyond country borders, with the actual numbers of 1.1% and 1.4% expected to grow much higher in the future.

Since this is within the collaboration area, "Success Factor" of international Industry-Academic Collaboration (that we seek) is expected to include 1) Area of lack of communication 2) Area of miscommunication and 3) Area of

common understanding. In this research, we try to extract "Success Factor" of international Industry-Academic Collaboration with those critical elements.

There are few studies conducted in Japan which explains "Why activities of international Industry-Academic Collaboration are low".

First one is from MEXT in Japan in 2006 [2]. The study has pointed out the following issues to be improved based on interviews with 43 universities.

- Education of talents who are familiar with intellectual property on a global basis
- Strengthening of the legal department in university for international negotiation and licensing
- Promotion of international Industry-Academic Collaboration, including collaboration between universities in Japan and foreign countries
- Aggressive intellectual property strategy in foreign countries with support from government
- Networking among regional universities to share information of potential seeds

Another study was conducted by Tokyo Institute of Technology (TITECH) in 2008 that pointed out following issues [3].

- Balance between university and industry
- Enhancement of global communication
- Commercialization
- Prevention of inappropriate information disclosure
- Intellectual property right in Asian countries
- Enhancement of global management

We can recognize common issues between these two reports by pointing out common area of reported issues. The first combination is between "Education of talents who are familiar with Intellectual property on global basis" and "Enhancement of global management". This combination explains the necessity of talented individuals who are familiar with intellectual property and management in global basis. The second combination is between "Strengthening of the legal in university for international negotiation and licensing" and "Prevention of inappropriate information disclosure". This combination explains the necessity of legal capability in universities for negotiation, licensing and proper intellectual property management, including information handling. The third combination is between "Aggressive intellectual property strategy in foreign countries and government's support" and "Intellectual property right in Asian countries". This combination explains the fact that universities in Japan

are not filing enough patent applications in foreign countries, especially in Asian countries even though many corporations are moving their manufacturing functions to Asian countries. The cost of filing patent applications in those countries and patent systems in Asian countries is examined in the research of TITECH [3]. The fourth combination is between “Networking among regional universities to share information of potential seeds” and “Enhancement of global communication”. This combination explains how communication is critical in international collaboration. We must recognize that each country has its own language and culture. The difference of culture provides great deal for communication and this combination should be an important guideline for further study on this matter.

It can be assumed that we should focus on a specific country in order to consider the “Success Factor” of international Industry-Academic Collaboration because it would provide more concrete guidelines. We focused on India and Japan in this research. Based on the report from Kyushu University in 2007 [4], the total number of international Industry-Academic Collaboration between Japan and India was only 2 cases, out of total number of 27 cases that indicates that the collaboration is still in the beginning stage. On the other hands, collaboration with Korea was 16 cases, China was 12 cases and US was 12 cases.

Additionally, based on the report from World Bank [5], India has experienced rapid GDP growth as shown in Fig 1. Further, India and Japan have different industrial areas as shown in Fig. 2. It should be considered that in order for the best synergy effect of the collaboration, it is optimal to seek a partner who has a different industry area. This is in order for both of them to collaborate with one another in their strong area and to support each together. As noted in the research from MEXT [2] and TITECH [3], there are many issues for international Industry-Academic Collaboration and there must be strong motivation in order for the collaboration to succeed. If the collaboration was between countries that had the same types of industries, there may be great concern in each country that competition could be an obstacle for success. That is the reason why we focus between India and Japan in this research.

This research is about international collaboration beyond country borders. It must be pointed out that even between universities between India and Japan, there should be many differences that we need to confirm and consider. In this research, we try to extract 1) Area of lack of communication, 2) Area of miscommunication and 3) Area of common understanding between universities in India and Japan with inputs from both sides as shown in Fig. 3.

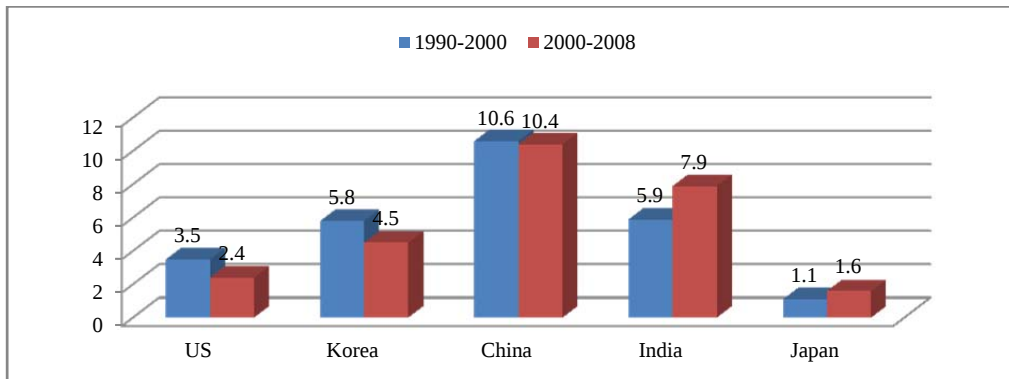


Figure 1: GDP annual growth of India

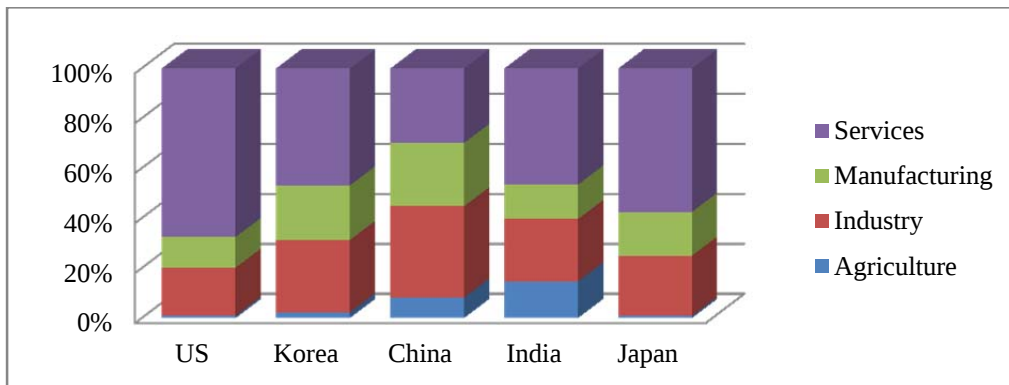


Figure 2: Industrial area of India in 2008

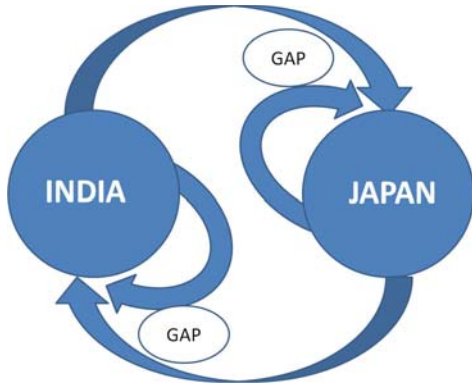


Figure 3: Relationship map between india and japan

The uniqueness of this research is to study inputs on the same subject matter from both countries. As shown in Fig. 3, we try to obtain input about Japan from both India and Japan in addition to the input about India from both countries.

It should be noted that it is always important to understand the differences between what one country believes about itself and what the other believes. The understanding of the gap as illustrated in Fig. 3 is a critical factor for success.

There is a research conducted to study understanding in the high level but this research dives into more detail for further analysis [6]. We therefore prepared questionnaires to ask both Indian and Japanese universities and tried to obtain input from both sides.

## II. PRIOR RESEARCH

In this research, we first considered factors that can be extracted from the previously mentioned reports because there are many issues on international collaboration and we must approach with better picture. While we list up issues from previously mentioned reports [2] [3], we try to conduct text analysis of the reported issues. We first obtained the result on Table 1 and Fig.4 from the MEXT report in Japan [2]. Table 1 shows the frequency of words that appeared in the reports and Fig.4 shows weight of relationship between each word. Bigger circles and bold lines show stronger relationships. We have also obtained results on Table 2 and Fig.5 from a report of TITECH [3] that show the same analysis to Table 1 and Fig.4 respectively.

TABLE 1: TEXT ANALYSIS RESULT FROM MEXT REPORT INTERNATIONAL

| Noun              | Frequency of Appearance | Noun with "do" | Frequency of Appearance |
|-------------------|-------------------------|----------------|-------------------------|
| University        | 51                      | Research       | 20                      |
| Overseas          | 36                      | Support        | 19                      |
| Property          | 25                      | Reinforcement  | 17                      |
| Enterprise        | 16                      | Support        | 16                      |
| Industry-academic | 15                      | Patent         | 16                      |
| Property          | 11                      | Function       | 11                      |
| Talent            | 11                      | Application    | 10                      |
| Intellectual      | 11                      | Agreement      | 8                       |
| Headquarter       | 9                       | Practical use  | 7                       |
| Expense           | 8                       | Rear           | 7                       |
| Information       | 8                       | Send           | 7                       |
| Funds             | 6                       | Rear           | 6                       |
| Judicial affairs  | 6                       | Control        | 6                       |

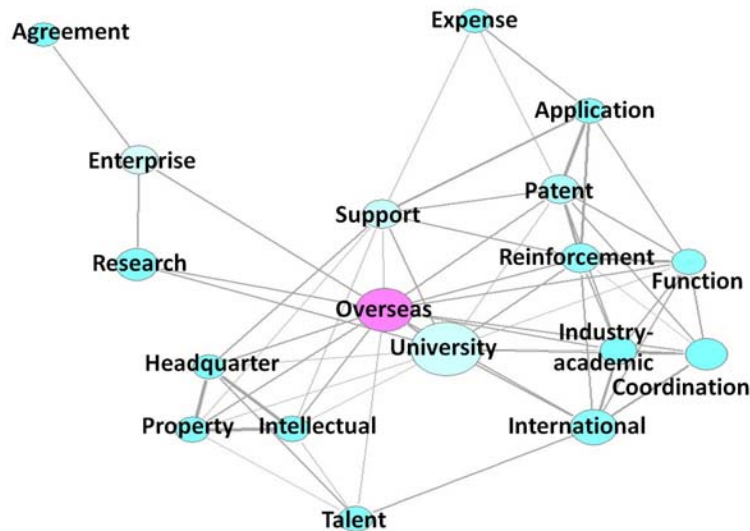


Figure 4: Text analysis result from mext report international

TABLE 2: TEXT ANALYSIS RESULT FROM TITECH REPORT

| Noun              | Frequency of Appearance | Noun with "do" | Frequency of Appearance |
|-------------------|-------------------------|----------------|-------------------------|
| University        | 29                      | Research       | 30                      |
| Countries         | 24                      | Coordination   | 22                      |
| Industry-academic | 21                      | Existence      | 11                      |
| Enterprise        | 20                      | Propulsion     | 9                       |
| International     | 16                      | Participation  | 8                       |
| Technology        | 14                      | Activity       | 7                       |
| Management        | 12                      | Collaboration  | 7                       |
| Talent            | 12                      | Acquisition    | 7                       |
| Industry          | 11                      | Development    | 6                       |
| Our Country       | 10                      | Measure        | 6                       |
| Commerce          | 10                      | Leak           | 6                       |
| Market            | 9                       | Practical use  | 5                       |

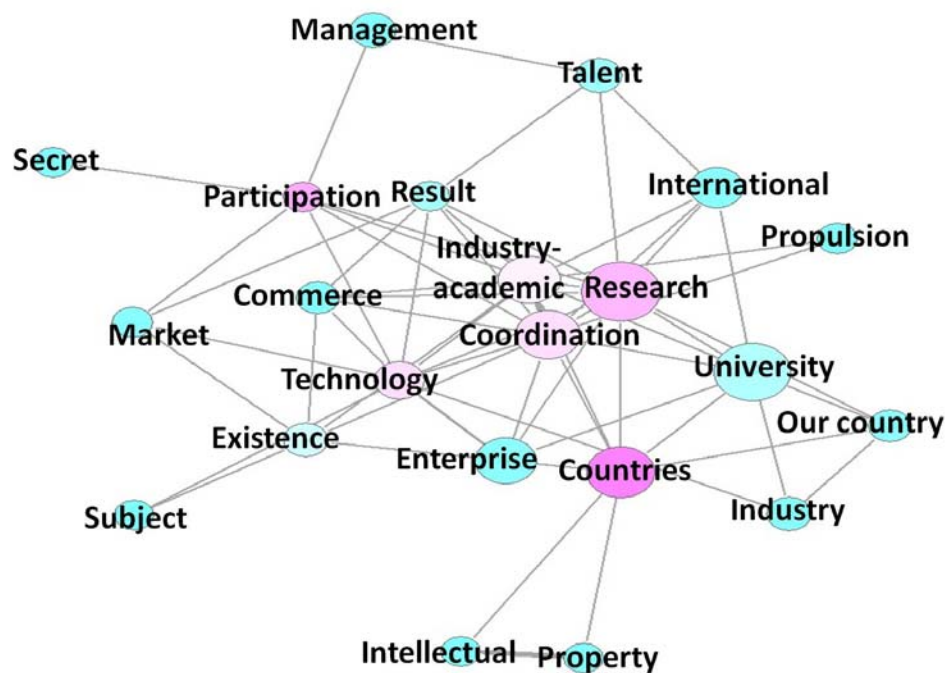


Figure 5: Text analysis result from titech report

Since there are two independent reports that have different authors and text length, we have to isolate those two reports in the data analysis. We have also conducted data analysis in Japanese because the original reports are in Japanese. After the analysis, we have translated it into English for the purpose of this report. We have to respect the particular structure of text to avoid any potential impact in the case we translated it into English before the analysis. The analysis was done using text mining software (KH Coder Software) that adopts “ChaSen” as its main algorithm.

In the Fig.4, we notice several points that take our attention. First, the word “Enterprise” is located far from other words. This means that “Enterprise” based on

international collaboration is still far from realization. The word “Support” is connected to “Application” and “Patent”, which may indicate that collaboration needs more support in patent filing overseas. “Talent” is connected to “Intellectual”, “Property” and “Overseas”, which means that talented individuals who are familiar with intellectual property matter on a global basis are important.

In Fig.5, it is pointed out that “Participation” is in the center of the words and connected to many words such as “Management”, “Market”, “Technology” and “Coordination”. It should be pointed out that aggressive participation in the market with technology management is a critical element. It is also pointed out that “Talent” is connected to

“Management”, “International” and “Result”. This means that talented individuals who can manage on a global basis are important for certain results.

Additionally, it should be emphasized that none of those reports [2] [3] excluded issues arising out of domestic collaboration. As many reports have been analyzed, there are many issues in domestic Industry-Academic Collaboration that we also need to consider when we approach international collaboration. The report from MEXT in Japan has pointed out the following issues in domestic collaboration [7].

- Execution of joint or sponsored research
- International Industry-Academic Collaboration
- Specific research area

- Venture companies originating from universities
- Industry-Academic Collaboration based on practical status in universities
- Talent education and acquisition with intellectual property skill sets

It is assumed that we have to consider these issues in addition to the issues discussed before. Hence we try to analyze this data by the same method using text mining software (KH Coder Software) and obtained Table 3 and Fig.6.

TABLE 3: TEXT ANALYSIS RESULT FROM MEXT REPORT DOMESTIC

| Noun              | Frequency of Appearance | Noun with "do" | Frequency of Appearance |
|-------------------|-------------------------|----------------|-------------------------|
| University        | 44                      | Research       | 44                      |
| Property          | 26                      | Coordination   | 20                      |
| Intellectual      | 25                      | Patent         | 19                      |
| Subject           | 22                      | Insufficiency  | 15                      |
| Field             | 20                      | Investigation  | 14                      |
| Enterprise        | 19                      | Activity       | 13                      |
| Industry-academic | 19                      | Collaboration  | 10                      |
| Talent            | 18                      | Enforcement    | 10                      |
| International     | 17                      | Application    | 9                       |
| Technology        | 15                      | Rear           | 8                       |
| Overseas          | 13                      | Activity       | 8                       |
| Strategy          | 11                      | Reinforcement  | 8                       |

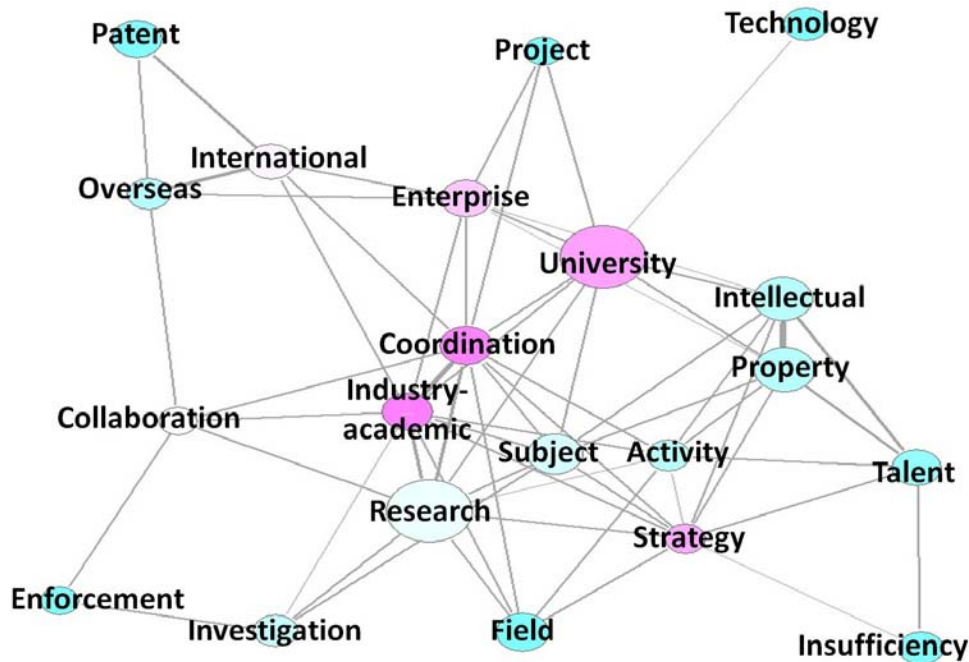


Figure 6: Text analysis result from mext report domestic

In Fig.6, it is pointed out that the words “Patent” and “International” are far away from “University”, which means that there must be more support for universities to file patent applications in foreign countries. Again, “Talent” is connected to “Intellectual”, “Property” and “Strategy”, emphasizing the importance of talent who is familiar with intellectual property and strategy.

### III. QUESTIONNAIRE SURVEY REGARDING INTERNATIONAL ACADEMIC-INDUSTRY COLLABORATION BETWEEN INDIA AND JAPAN

In this research, we try to collect data using questionnaires based on the report by TITECH [3] as a basis of questionnaire. In the report, six distinct problem areas were extracted. Since we try to obtain inputs from both sides as Fig.3, we adopt PEST (Political, Economic, Social, Technology) [8] and VRIO (Value, Rarity, Imitability, Organization) [9] analysis in addition to the issues in the report. Questions using PEST is suitable to ask about another side from an external point of views and questions using VRIO analysis is suitable to ask about itself from an internal point of view. However, we had to expect challenges in this method due to the state of international collaboration between India and Japan. The collaboration is still new [4] and knowledge about the other side may be very limited. This research could focus on more

advanced international collaboration such as between Korea and Japan. However, in this research we try to contribute to the advancement of international collaboration between India and Japan that is still in the initial stage. Additionally, it must be pointed out again that knowing area of lack of communication is also critical to consider success factor of the collaboration.

Based on the reported issues and the PEST and VRIO analysis, we have generated questions listed in the APPENDIX. Questions are the same set of questions but one is written in Japanese to be asked to universities in Japan and another set is written in English to be asked to universities in India. In order to avoid any bias in the answers, we converted a certain number of questions into negative questions based on random numbering. This method is considered in order to avoid any judgment of level of any country.

In the answering field, we have “Strongly Agree”, “Agree”, “Disagree” and “Strongly Disagree”. We also have the answer field of “I Don’t Know” because some questions may be unknown to certain people and it is not appropriate to lead input to any direction, not even to “Not Sure”.

We sent the questionnaires to 6 universities in India and Japan because they have filed international patent application in PCT as shown in Table 4, according to reports from Fujitsu Research Institute [8] and report from MEXT in Japan [9].

TABLE 4: NUMBER OF PATENT APPLICATION FROM INDIA AND JAPAN

| List of Indian institutions which have filed patent applications in 1998-2002         | No. of Applications |
|---------------------------------------------------------------------------------------|---------------------|
| IITs filling at Kolkata Office (includes application from IIT Kharagpur & Gawahati)   | 75                  |
| IISc Bangalore                                                                        | 40                  |
| IITs filling at Delhi Office (includes applications from IIT Delhi, Kanpur & Roorkee) | 31                  |
| University of Delhi                                                                   | 29                  |
| IIT Mumbai                                                                            | 22                  |
| IIT Chennai                                                                           | 14                  |
| AIIMS, New Delhi                                                                      | 14                  |
| Goa University                                                                        | 4                   |
| Jawahar Lal Nehru University                                                          | 3                   |
| National Sugar Institute, Kanpur                                                      | 2                   |
|                                                                                       |                     |
| List of Japanese university which have filed patent applications in 2010              | No. of Applications |
| Tohoku University                                                                     | 494                 |
| The University of Tokyo                                                               | 670                 |
| Tokyo Institute of Technology                                                         | 287                 |
| Nagoya University                                                                     | 247                 |
| Kyoto University                                                                      | 357                 |
| Osaka University                                                                      | 270                 |

The number of requests sent to Japanese universities was 14 and number of requests sent to Indian universities was 23.

#### IV. RESULT

We obtained 8 inputs from Japanese universities and 6 inputs from Indian universities. We expected this difficulty of getting inputs from questionnaires because the collaboration is a new area therefore there are not so many people who are familiar with this matter. The response rate was 57% in Japan and 26% in India. Fortunately, we have been able to receive inputs from people who are in universities and handling international collaboration in Japan and India. Since international Industry-Academic Collaboration is still a new area, those inputs are extremely valuable.

We put the following weights to answers;

Strongly Agree=(5), Agree=(4), Disagree=(2), Strongly Disagree=(1)

Fig.7, Fig.8, Fig.9 and Fig.10 show the number of answers to each question. For this section only, we assign weight (3) for the answer "I Don't Know". The questions 122 throughout 169 in Fig.7 were about Japan and questions 222 throughout 269 in Fig.8 were about India based on inputs from Japanese universities. The questions 122 throughout 169 in Fig.9 were about Japan and questions 222 throughout 269 in Fig.10 were about India based on inputs from Indian universities.

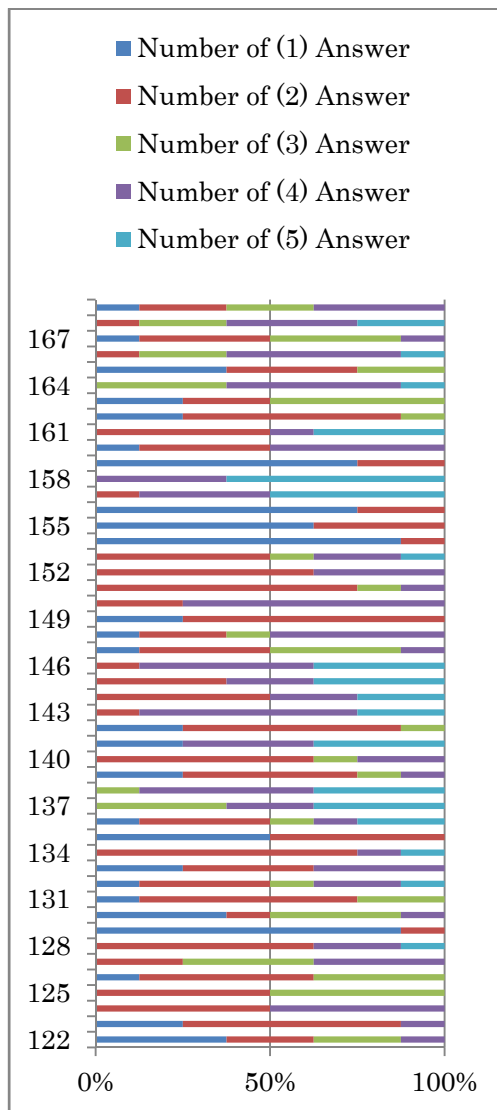


Figure 7: About Japan from Japan

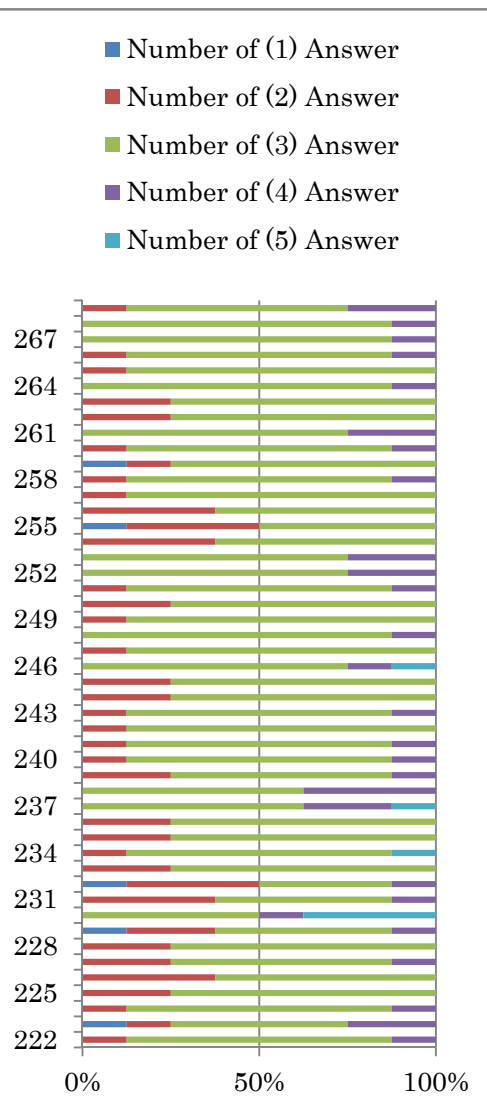


Figure 8: About India from Japan

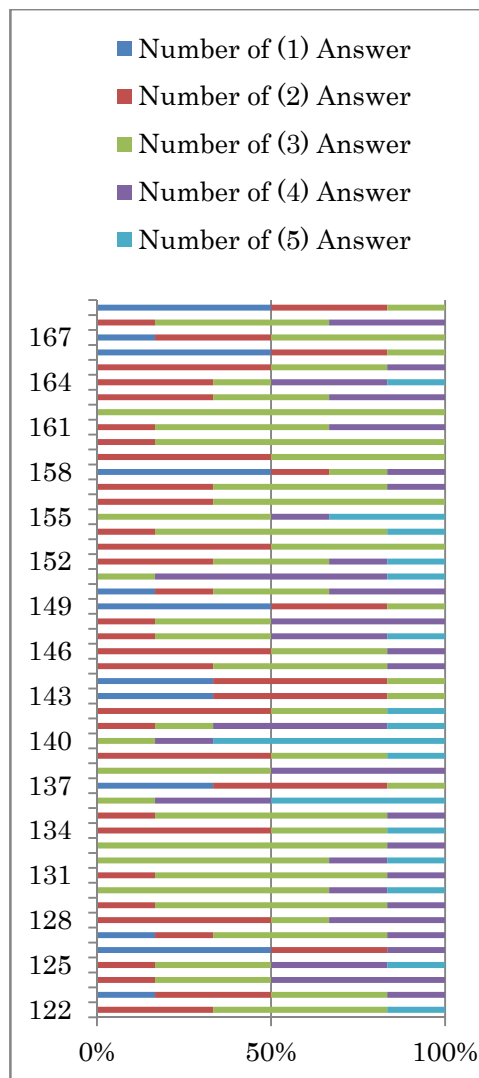


Figure 9: About Japan from India

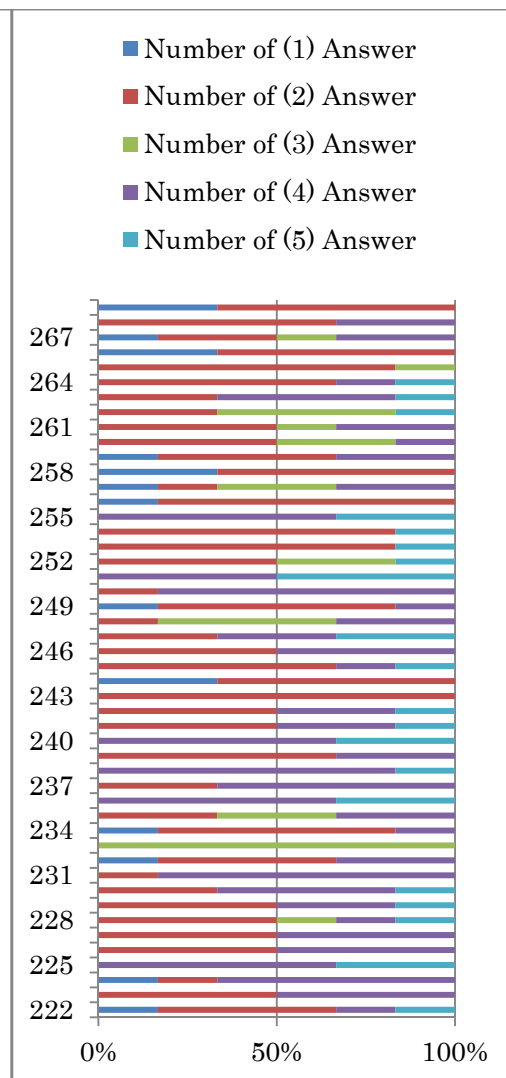


Figure 10: About Japan from India

As we see in the Table 5, the answer “I Don’t Know” has a relatively high frequency in the categories of “Prevention of Inappropriate Information Disclosure” about Indian universities based on inputs from Japanese universities that means “Prevention of Inappropriate Information Disclosure” about Indian universities is not well known to Japanese universities. It is also pointed out that category of “Enhancement of Global Management” about Indian universities is not well known to Japanese universities. Global management skill is a skill set that can manage projects beyond country borders. Therefore, the skill set involves intellectual property, management, participation, market, international, coordination and collaboration. All of those words are listed in previous Fig.4, Fig.5 and Fig.6 but there is no word of “Global Management” itself in those figures. This means that this skill set is buried within various capacities and it should be recognized that the skill set needs experience in a comprehensive area.

It should also be pointed out that “Enhancement of Global Communication” and “Intellectual Property Right in Asian Countries” about Japanese universities are not well known to Indian universities. Further study is required to determine whether there is enough information or if there is enough global communication skill itself. However, it can be assumed that there is room for improvement in Japanese universities to present their development of global communication skill to other countries. The “Intellectual Property Right in Asian Countries” of Japanese universities is not well known to Indian universities. It must be pointed out that the information of this activity might be less important rather than the actual activity to obtain the right in Asian countries.

The following answers obtained the largest differences between average points of each country. It can be assumed that they could be areas of misunderstanding.

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| Number | Question                                                                                                                                          | Point from Japan | Point from India |
|--------|---------------------------------------------------------------------------------------------------------------------------------------------------|------------------|------------------|
| 155    | Research outcome of Japanese universities are not advanced enough to obtain intellectual property right.                                          | 1.375            | 4.667            |
| 137    | Technology level in Japan is advanced enough for global communication of researchers of Japanese universities.                                    | 4.600            | 1.600            |
| 158    | In Japan, there are regulations or laws that support the acquisition of intellectual property right of research outcome of Japanese universities. | 4.625            | 1.800            |

TABLE 5: NUMBER OF “I DON’T KNOW” ANSWERS

| Category                                           |                           | Ratio of (3) Input from Japanese University | Ratio of (3) Input from Indian University |
|----------------------------------------------------|---------------------------|---------------------------------------------|-------------------------------------------|
| Balance between University and Industry            | About Japanese University | 19%                                         | 35%                                       |
| Enhancement of Global Communication                |                           | 16%                                         | 52%                                       |
| Commercialization                                  |                           | 6%                                          | 29%                                       |
| Prevention of Inappropriate Information Disclosure |                           | 9%                                          | 31%                                       |
| Intellectual Property Right in Asian Countries     |                           | 0%                                          | 54%                                       |
| Enhancement of Global Management                   |                           | 30%                                         | 40%                                       |
| Balance between University and Industry            | About Indian University   | 66%                                         | 2%                                        |
| Enhancement of Global Communication                |                           | 63%                                         | 17%                                       |
| Commercialization                                  |                           | 73%                                         | 0%                                        |
| Prevention of Inappropriate Information Disclosure |                           | 80%                                         | 10%                                       |
| Intellectual Property Right in Asian Countries     |                           | 70%                                         | 10%                                       |
| Enhancement of Global Management                   |                           | 80%                                         | 10%                                       |

It should be pointed out again that the purpose of this research is not to discuss the level of any country. Rather, we should discuss which area we must focus on in the collaboration. The result from question 155 shows that research activities of Japanese universities are viewed from a different perspective in India. It may be required for Japanese universities to discuss and evaluate further for improvement. The evaluation must look into the number of intellectual property right that Japanese universities have obtained, and compare it to universities in other countries. The result of question 137 may require further clarification because the

question may be understood in a different way in each country.

The result from question 158 from Indian universities may suggest to Japan further improvement of regulations or laws to support research that Japanese universities is conducting for the acquisition of its intellectual property right based on understanding on Indian side. This result is related to the result from question 155 and require further study.

The following answers obtained have the smallest differences between average points of each country. It can be assumed that these could be areas of common understanding.

| Number | Question                                                                                                       | Point from Japan | Point from India |
|--------|----------------------------------------------------------------------------------------------------------------|------------------|------------------|
| 239    | Research outcome created by Indian universities are not unique enough to be commercialized.                    | 2.667            | 2.667            |
| 265    | In Indian universities, organizations are well developed to support joint projects with Japanese universities. | 2.000            | 2.000            |
| 129    | In Japan, technology level is not advanced enough for Japanese universities to conduct basic research.         | 1.800            | 1.883            |

The result from question 239 explains that research activities of Indian universities are recognized as unique to be commercialized in both countries. The result from question 265 indicates that the low level of international collaboration between Japan and India may be improved by the development of organization in Indian universities. The result from question 129 may suggest that the technology level of Japanese universities is recognized as advanced for basic research but this result must be evaluated with the result from question 155 in Indian universities. From Indian universities' point of view, Japanese universities have advanced technology to conduct basic research but the outcome of research still not enough to obtain intellectual property right.

## V. CONCLUSION

From this study, we have extracted the following results from the perspectives of Japanese and Indian universities.

- 1) Area of lack of communication
  - a. Prevention of Inappropriate Information Disclosure of Indian universities
  - b. Enhancement of Global Management of Indian universities
  - c. Enhancement of Global Communication of Japanese universities
  - d. Intellectual Property Right in Asian Countries of Japanese universities
- 2) Area of miscommunication
  - a. Research outcome of Japanese university for intellectual property right
  - b. Technology level in Japan for global communication of researchers of Japanese university
  - c. Regulation and laws in Japan for intellectual property acquisition of Japanese university
- 3) Area of common understanding
  - a. Research outcome of Indian universities is unique enough for commercialization
  - b. Development of organization in Indian universities for international collaboration
  - c. Technology level in Japanese universities to conduct basic research

This result suggests us to conduct further study in each area. Further study must be done from the area of lack of communication as the first step because information is a critical element of successful international collaboration. It should be pointed out that there are areas to clarify for the collected inputs. For example, question 137 that reads "Technology level in Japan is advanced enough for global communication of researchers of Japanese universities" may not be clear enough because the word "Technology" could be interpreted as more than pure "Technology" itself. As same to other matters, the initial stage of any activity has a lot of challenges because there are few people who are familiar with the matter, not much experience and little knowledge. It could be more reasonable to wait until when we see more

experience and data in the field so that it would be easier to get input for the analysis. However, it is extremely important to conduct research or study in the early stage of the matter because it can provide guidelines despite the lack of information in the field.

Even though we still need more input to be able to conduct statistics analysis, we have been able to find 1) Area of lack of communication, 2) Area of miscommunication and 3) Area of common understanding between Japan and India to figure out the "Success Factor" of the collaboration between two countries.

First step of the "Success Factor" is to eliminate lack of communication, miscommunication and enhance common understanding, followed by further research and continuous improvements.

At the last, we send our best regards and all of our appreciation to those who provided extremely valuable input and we sincerely hope to work together in moving forward for both India and Japan simultaneously.

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## APPENDIX

|                                         |   |     | Question about Indian Universities                                                                                                                                        |     | Question about Japanese Universities                                                                                                                                        |
|-----------------------------------------|---|-----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Personal Attribute                      |   |     | Are you teacher or professor in university? (Yes or No)                                                                                                                   |     |                                                                                                                                                                             |
|                                         |   |     | Are you staff of department that responsible for international industry-academic collaboration in university? (Yes or No)                                                 |     |                                                                                                                                                                             |
|                                         |   |     | Are you Indian?                                                                                                                                                           |     |                                                                                                                                                                             |
|                                         |   |     | Are you living in India?                                                                                                                                                  |     |                                                                                                                                                                             |
|                                         |   |     | Are you Japanese?                                                                                                                                                         |     |                                                                                                                                                                             |
|                                         |   |     | Name                                                                                                                                                                      |     |                                                                                                                                                                             |
|                                         |   |     | E-mail address                                                                                                                                                            |     |                                                                                                                                                                             |
| Balance between University and Industry | V | 222 | Value of basic research of Indian universities is less than the value of basic research of universities in Japan.                                                         | 122 | Value of basic research of Japanese universities is less than the value of basic research of universities in India.                                                         |
|                                         | R | 223 | Researchers of Indian universities are not conducting unique research.                                                                                                    | 123 | Researchers of Japanese universities are not conducting unique research.                                                                                                    |
|                                         | I | 224 | Basic research of Indian universities is easy to imitate.                                                                                                                 | 124 | Basic research of Japanese universities is easy to imitate.                                                                                                                 |
|                                         | O | 225 | Organization of Indian universities is well organized for collaboration with universities in Japan.                                                                       | 125 | Organization of Japanese universities is well organized for collaboration with universities in India.                                                                       |
|                                         | P | 226 | Politics is preventing Indian universities from collaborating with universities in Japan.                                                                                 | 126 | Politics is preventing Japanese universities from collaborating with universities in India.                                                                                 |
|                                         | E | 227 | Difference of economic levels between India and Japan prevents global industry-academic collaboration between India and Japan.                                            | 127 | Difference of economic levels between Japan and India prevents global industry-academic collaboration between Japan and India.                                              |
|                                         | S | 228 | In India, there is no social environment (trend, value proposition, population structure, etc) that understands importance of basic research of universities in India.    | 128 | In Japan, there is no social environment (trend, value proposition, population structure, etc) that understands importance of basic research of universities in Japan.      |
|                                         | T | 229 | In India, technology level is not advanced enough for Indian universities to conduct basic research.                                                                      | 129 | In Japan, technology level is not advanced enough for Japanese universities to conduct basic research.                                                                      |
| Enhancement of Global Communication     | V | 230 | Level of global communication skill of researchers of Indian universities is higher than the level of global communication skill of researchers of universities in Japan. | 130 | Level of global communication skill of researchers of Japanese universities is higher than the level of global communication skill of researchers of universities in India. |
|                                         | R | 231 | Level of global communication skill of researchers of Indian universities is at the same level of global communication skill of researchers of universities in Japan.     | 131 | Level of global communication skill of researchers of Japanese universities is at the same level of global communication skill of researchers of universities in India.     |
|                                         | I | 232 | Researchers of Indian universities do not have unique and global communication skill that is difficult to imitate for researchers of other countries.                     | 132 | Researchers of Japanese universities do not have unique and global communication skill that is difficult to imitate for researchers of other countries.                     |
|                                         | O | 233 | Organization of Indian universities contributes to the improvement of global communication skill of researchers in Indian universities.                                   | 133 | Organization of Japanese universities contributes to the improvement of global communication skill of researchers in Japanese universities.                                 |
|                                         | P | 234 | Global communication of researchers of Indian universities is affected by politics.                                                                                       | 134 | Global communication of researchers of Japanese universities is affected by politics.                                                                                       |
|                                         | E | 235 | Researchers of Indian universities is provided with enough funding for global communication.                                                                              | 135 | Researchers of Japanese universities is provided with enough funding for global communication.                                                                              |
|                                         | S | 236 | In India, there is no social environment (trend, value proposition, population structure, etc) to exercise global communication from/to Indian universities.              | 136 | In Japan, there is no social environment (trend, value proposition, population structure, etc) to exercise global communication from/to Japanese universities.              |
|                                         | T | 237 | Technology level in India is advanced enough for global communication of researchers of Indian universities.                                                              | 137 | Technology level in Japan is advanced enough for global communication of researchers of Japanese universities.                                                              |

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|                                                    |   |     |                                                                                                                                                                            |     |                                                                                                                                                                              |
|----------------------------------------------------|---|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Commercialization                                  | V | 238 | Research outcome created by Indian universities have enough value to commercialize.                                                                                        | 138 | Research outcome created by Japanese universities have enough value to commercialize.                                                                                        |
|                                                    | R | 239 | Research outcome created by Indian universities are not unique enough to be commercialized.                                                                                | 139 | Research outcome created by Japanese universities are not unique enough to be commercialized.                                                                                |
|                                                    | I | 240 | Research outcome created by Indian universities will most likely be duplicated after its commercialization.                                                                | 140 | Research outcome created by Japanese universities will most likely be duplicated after its commercialization.                                                                |
|                                                    | O | 241 | In India, there is no organization which supports commercialization of research outcome created by Indian universities.                                                    | 141 | In Japan, there is no organization which supports commercialization of research outcome created by Japanese universities.                                                    |
|                                                    | P | 242 | In India, there is regulation or law that prevents commercialization of research outcome of Indian universities.                                                           | 142 | In Japan, there is regulation or law that prevents commercialization of research outcome of Japanese universities.                                                           |
|                                                    | E | 243 | In India, there is not enough funding for commercialization of research outcome created by Indian universities.                                                            | 143 | In Japan, there is not enough funding for commercialization of research outcome created by Japanese universities.                                                            |
|                                                    | S | 244 | In India, there is no social environment (trend, value proposition, population structure, etc) that supports commercialization of research outcome of Indian universities. | 144 | In Japan, there is no social environment (trend, value proposition, population structure, etc) that supports commercialization of research outcome of Japanese universities. |
|                                                    | T | 245 | In India, technology is not advanced enough to support commercialization of research outcome of Indian universities.                                                       | 145 | In Japan, technology is not advanced enough to support commercialization of research outcome of Japanese universities.                                                       |
| Prevention of Inappropriate Information Disclosure | V | 246 | In Indian universities, there is concern of inappropriate information disclosure of research outcome created by Indian universities.                                       | 146 | In Japanese universities, there is concern of inappropriate information disclosure of research outcome created by Japanese universities.                                     |
|                                                    | R | 247 | In Indian universities, in 2010, there was a case of inappropriate information disclosure of research outcome created by Indian universities.                              | 147 | In Japanese universities, in 2010, there was a case of inappropriate information disclosure of research outcome created by Japanese universities.                            |
|                                                    | I | 248 | In India universities, it is possible to obtain information of research outcome by inappropriate means.                                                                    | 148 | In Japanese universities, it is possible to obtain information of research outcome by inappropriate means.                                                                   |
|                                                    | O | 249 | In Indian universities, there are organizations that prevent inappropriate information disclosure.                                                                         | 149 | In Japanese universities, there are organizations that prevent inappropriate information disclosure.                                                                         |
|                                                    | P | 250 | In India, there is regulation or law that prevents inappropriate information disclosure in Indian universities.                                                            | 150 | In Japan, there is regulation or law that prevents inappropriate information disclosure in Japanese universities.                                                            |
|                                                    | E | 251 | In India, inappropriate information disclosure does not create enough economic value for the punishment of illegal act.                                                    | 151 | In Japan, inappropriate information disclosure does not create enough economic value for the punishment of illegal act.                                                      |
|                                                    | S | 252 | In India, there is no social environment (trend, value proposition, population structure, etc) that prevents inappropriate information disclosure.                         | 152 | In Japan, there is no social environment (trend, value proposition, population structure, etc) that prevents inappropriate information disclosure.                           |
|                                                    | T | 253 | In India, technology is not advanced enough to prevent inappropriate information disclosure.                                                                               | 153 | In Japan, technology is not advanced enough to prevent inappropriate information disclosure.                                                                                 |
| Intellectual Property Right in Asian Countries     | V | 254 | Research outcome of Indian universities are not valuable enough to obtain intellectual property right.                                                                     | 154 | Research outcome of Japanese universities are not valuable enough to obtain intellectual property right.                                                                     |
|                                                    | R | 255 | Research outcome of Indian universities are not advanced enough to obtain intellectual property right.                                                                     | 155 | Research outcome of Japanese universities are not advanced enough to obtain intellectual property right.                                                                     |
|                                                    | I | 256 | Research outcome of Indian universities are not unique enough to obtain intellectual property right.                                                                       | 156 | Research outcome of Japanese universities are not unique enough to obtain intellectual property right.                                                                       |
|                                                    | O | 257 | There are organizations in Indian universities                                                                                                                             | 157 | There are organizations in Japanese universities                                                                                                                             |

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|                                  |   |     |                                                                                                                                                                                                            |     |                                                                                                                                                                                                            |
|----------------------------------|---|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                  |   |     | that support the acquisition of intellectual property right of research outcome of Indian universities.                                                                                                    |     | that support the acquisition of intellectual property right of research outcome of Japanese universities.                                                                                                  |
|                                  | P | 258 | In India, there are regulations or laws that support the acquisition of intellectual property right of research outcome of Indian universities.                                                            | 158 | In Japan, there are regulations or laws that support the acquisition of intellectual property right of research outcome of Japanese universities.                                                          |
|                                  | E | 259 | Indian universities is provided with enough funding to acquire intellectual property right of research outcome.                                                                                            | 159 | Japanese universities is provided with enough funding to acquire intellectual property right of research outcome.                                                                                          |
|                                  | S | 260 | In India, social environment (trend, value proposition, population structure, etc) is not preventing the acquisition of intellectual property right of research outcome of Indian universities.            | 160 | In Japan, social environment (trend, value proposition, population structure, etc) is not preventing the acquisition of intellectual property right of research outcome of Japanese universities.          |
|                                  | T | 261 | In India, technology level is not preventing the acquisition of intellectual property right of research outcome of Indian universities.                                                                    | 161 | In Japan, technology level is not preventing the acquisition of intellectual property right of research outcome of Japanese universities.                                                                  |
| Enhancement of Global Management | V | 262 | In Indian universities, global management skill is not an issue in conducting joint projects with Japanese universities.                                                                                   | 162 | In Japanese universities, global management skill is not an issue in conducting joint projects with Indian universities.                                                                                   |
|                                  | R | 263 | Level of global management skill of Indian universities in conducting joint projects with Japanese universities is outstanding.                                                                            | 163 | Level of global management skill of Japanese universities in conducting joint projects with Indian universities is outstanding.                                                                            |
|                                  | I | 264 | Level of global management skill of Indian universities in conducting joint projects with Japanese universities can be imitated.                                                                           | 164 | Level of global management skill of Japanese universities in conducting joint projects with Indian universities can be imitated.                                                                           |
|                                  | O | 265 | In Indian universities, organizations are well developed to support joint projects with Japanese universities.                                                                                             | 165 | In Japanese universities, organizations are well developed to support joint project with Indian universities.                                                                                              |
|                                  | P | 266 | In India, there is no support from government to strengthen level of global management skill of Indian universities for joint projects with Japanese universities.                                         | 166 | In Japan, there is no support from government to strengthen level of global management skill of Japanese universities for joint projects with Indian universities.                                         |
|                                  | E | 267 | The economic level of India prevents global management of Indian universities in joint projects with Japanese universities.                                                                                | 167 | The economic level of Japan prevents global management of Japanese universities in joint projects with Indian universities.                                                                                |
|                                  | S | 268 | In India, there is no social environment (trend, value proposition, population structure, etc) that understands the importance of global management between Indian universities and Japanese universities. | 168 | In Japan, there is no social environment (trend, value proposition, population structure, etc) that understands the importance of global management between Japanese universities and Indian universities. |
|                                  | T | 269 | In India, technology is advanced enough for Indian universities to conduct joint projects with Japanese universities.                                                                                      | 169 | In Japan, technology is advanced enough for Japanese universities to conduct joint projects with Indian universities.                                                                                      |
| Expectation for Success          |   | 300 | Global industry-academic collaboration between India and Japan is difficult to achieve.                                                                                                                    | 300 | Global industry-academic collaboration between India and Japan is difficult to achieve.                                                                                                                    |