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Doctoral Dissertation

A Model of Value Co-creation between Professors and Students Based on Service Viewpoint for Enhancing Research Activities: A Case Study of Japanese Research-Oriented Laboratories

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Table of Contents

List of Figure

List of Table

List of Abbreviation

S-D logic	Service-Dominant logic
G-D logic	Goods Dominant logic
GDP	Gross Domestic Product
SSME	Service Science, Management, and Engineering
VIF	Variance Inflation Factors
FP	Foundation Premise
VCC	Value co-creation
iMOST	Innovation Management of Service and Technology
MOT	Management of Technology
MOS	Management of Service
HE	Higher education

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For my beloved family

Abstract

Keywords: Value co-creation, service-dominant logic, higher education, student goal, professor gold, student satisfaction, professor satisfaction

Service science as an independent discipline includes researching as well as academic education for both unemployed students and employed ones. Therefore, nowadays, universities around the world are speeding up their efforts to understand service systems, one of the importance parts of the service science. Service is being viewed as the process of doing something for another person (or entity) that is beneficial. Services (plural) often refer to intangible units of output that a firm produces". In Service-dominant logic (S-D logic), Lusch & Vargo indicated that service is the transferring and exchanging of application of knowledge and skills (R. F. Lusch & Vargo 2006), so higher education could be reformed to avoid directly considering it as service with applying the concept of service to this sector. Before it was argued because of the educated moral rule and regulation in traditional education (Dewey 1938).

Colleges, universities, and institutions are facing many challenges and the competitions due to globalization. Toward the S-D logic, customers become active co-creators and they create competitive advantages for the firms. So, applying the concept of value co-creation to both institutions and customers plays a key role. The co-creation with students as customers leads to satisfying students and helping them get their objectives. Besides, students with their skills and knowledge nowadays become operant resources for universities to create advantage competition.

With the ambition of opening and developing the viewpoint of service science to any activities such as higher education, this research aims to propose a system of co-creation between professors and students in higher education. We desire to point out distinctive values, being suitable for the context of professors and students and find out factors influencing to value co-creation process.

The proposed model has been verified by two different cases, which are iMOST course and research-oriented laboratories. The former one is a business professional education course with rich working experience students and the later one is research laboratory with regular graduate students. We proposed several hypotheses in each case and verified them based on both quantitative and qualitative data analysis. In iMOST case, the value of co-creation process is the satisfaction of gaining knowledge and satisfaction of gaining publication of both professors and students. The most important impact factors are achievement goals and objective characteristics. Achievement goals are goals for a gain of academic knowledge, summary of experience in an academic way, and solving specific problems. Objective characteristics are students' attitude, the difference in experience, and the difference in age. In the research laboratory case, the mutual value of professors and students is building a good *Ba* for value co-creation with the center as a human resource. The quality of the *Ba* and students' motivation and attitude have a strong influence on value co-creation between professors and students. Finally, we suggested 4 spheres have an effective co-creation between professors and students. Consequently, we concluded that improving the strongest impact factors is the best way to obtain objectives and provide satisfaction for both professors and students in value co-creation.

Chapter 1. Introduction

1.1 Backgrounds

1.1.1. Service science

Service sector currently dominates and plays a key role in the economy of any countries all over the world, which its percentage account for more than 70% of gross domestic product (GDP) (Figure 1.1). In countries with the strong economy, it is also slightly increased or balanced in a high percentage of GDP, but in developing countries such as Viet Nam or China, the service sector is increasing in comparison with GDP each year. It leads many companies in the industrial sector to customer-orientated solutions with a predominant portion of services. Moreover, there has been an increased interest by industry, government, and academia in understanding the determinants of productivity in service industries as well as service innovation.

Focusing on service research and education is one of aspect to understand and contribute to the service sector development. Not only the universities but also powerful companies establish researches on service. For example in 1998, Roland Rust, the distinguished University Professor David Bruce Smith chair in marketing at the University of Maryland, launched the *Journal of Service Research*, which today is the leading scholarly journals in the world in service research.[1] IBM Corp. has been popular in many efforts to advance the research and teaching of service, which was identified as service science, management, and engineering, or SSME. IBM Deutschland, Roland Berger Strategy Consultants, Siemens Business Services and the Chair of Services Management at Ingolstadt School of.(Stauss et al. 2008).

[1] Robert Lusch and Christopher Wu August (2012), Center for American Progress: https://www.americanprogress.org/

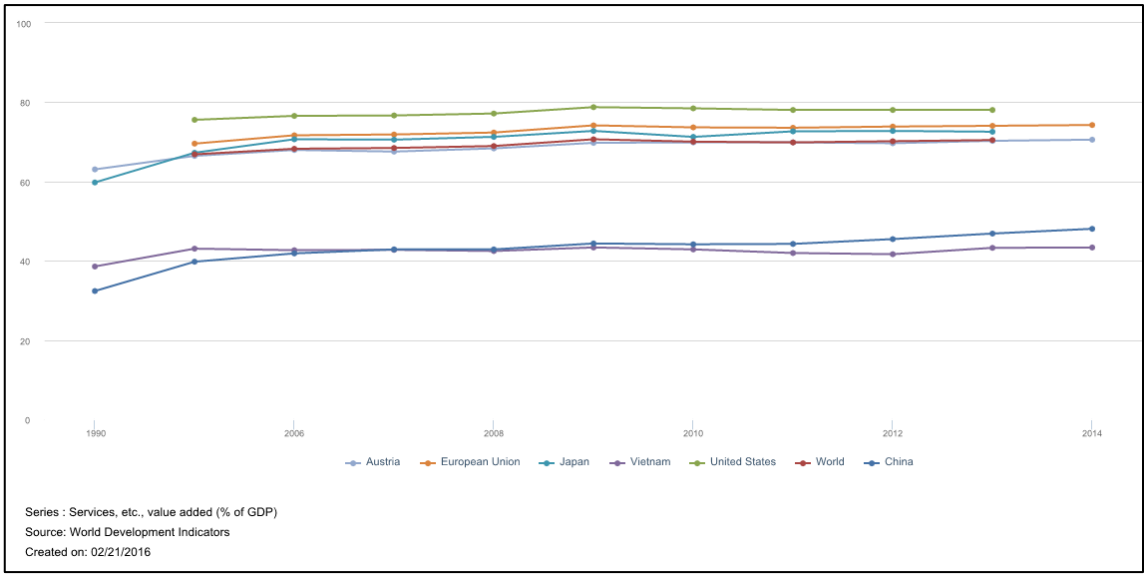

Figure 1.1 Percentage of service sector (% of GDP)
Source: World Development Indicators

Service science is defined as a new scientific concept that aims at solving the complex problems of a service economy by applying a transdisciplinary approach in intensive collaboration between academia and service organizations(Stauss et al. 2008). Service science as an independent discipline includes research as well as academic education for both students and employed persons. Therefore, nowadays, universities and countries around the world are speeding up their efforts to understand service and service systems.

By awareness of service concepts and mindset, an organization of all sectors are changing to adapt and increase their competitive advantages. And the changing of the education organizations is not an exception case.

1.1.2. Linking service science and higher education reform

According to Lush & Wu, 2012: "An interesting development arising out of service science, management, and engineering is a broadened and more sophisticated view of service, one that moves beyond merely viewing services as a residual to the extractive and manufacturing industries. More broadly and abstractly, service is being viewed as the process of doing something for another person (or entity) that is beneficial. Think of it as

the act of helping another. Services (plural) often refer to intangible units of output that a firm produces." In Service-dominant logic (S-D logic), Lusch & Vargo indicated that service is the transferring and exchanging of application of knowledge and skills (R. F. Lusch & Vargo 2006), so higher education (HE) could be reformed from avoiding to directly consider it as service with applying the concept of service to this sector. Before it was argued because of the educated moral rule and regulation in traditional education (Dewey 1938).

In education institution, the students' degree, marks and credit hours has been concentrated and noticed rather than other service round students. For example, the consultancy, sports activities, food services, etc., which supports students from their daily life to their mental life. There is the fact that the students must have an interested and comfortable environment, then they could have a high-quality study result. Thus, their degree' quality is higher and more qualified. All services which support students in both daily life and study research life create a *bundle of offerings that make up the service of education*[2]. From the service perspective, focusing on students' need is more important than only providing the lectures for them without caring their needs, feeling and contribution. The students should put in a complex ecosystem of education, which include many entities and students with other entities join the co-creation process to create benefits for all. In education institution, the value of lectures, or research projects is not created by professors only, it relies on students' contribution and co-creation so much.

Universities, colleges, and institutions are facing many challenges and the competition is increasing by globalization. Institutions are also meet the influence of the global financial crisis impacting both enrolment numbers and research funds, and students have increasing demands and expectations of their educational experience. In the context of globalization, without barriers students could choose easily their wanted universities and supervisors. If

[2] Robert Lusch and Christopher Wu August (2012), Center for American Progress: https://www.americanprogress.org/

the institutions have less competitive advantages, they could not attract talents students. Therefore, on one hand, the income from tuition fee is less. On the other hand, their achievement hardly is obtained much. Consequently, the reputation could not be high and invested fund is decreased as a result. Toward the S-D logic, the customer becomes active co-creators and they create competitive advantages for the firms. So, applying the concept of value co-creation for both institutions and customers plays a key role in universities. The co-creation with students as customers leads to satisfying students and help them get their objectives. Besides, students with their skill and knowledge nowadays become operant resources for universities to create advantage competition.

In a larger society sense, to the way education organization creates a benefit to society is the knowledge and skill of students. To build up and develop a well-being society and growth economy, the graduate students are the main factors and the responsible human resource. In addition, nowadays within the knowledge society where both internationalization and computerization continue to move forward, the role of education organization within society as centers for fostering human resources, preserving and developing science and culture, and contributing to local communities and industries is growing more and more significant. Therefore, education organization should recognize and provide the resource to society. Through awareness and developing service mindset, all the actors of the education organization could easier interact to each other. They could share the vision and co-create benefit and value together and to society.

1.2 Objectives and research questions

With the ambition of opening and developing the viewpoint of service science to any activities such as higher education, this research aims to propose a model of co-creation between professors and students in graduate education. This dyad was selected because it reflects the essence of higher education, and it is based on value co-creation viewpoint. We desire to point out distinctive values, being suitable for the context of professors and students and find out factors influencing to value co-creation process.

We assume the research result could suggest the viewpoints for faculties and the higher education managers to the dyadic relationship with students enhance the research activities in the graduate education. Then, they could consider suitable management or marketing strategies to satisfy students as important customers.

To reach the purpose, the research will be designed to answer the main research question (MRQ) and three subsidiary research questions (SRQ) as follow:

MRQ: How have professors and students co-created to enhance value for both sides?

SRQ1: How have professors and students determined their value in co-creation process?

SRQ2: What and how do factors impact on co-creation process based on students' viewpoint?

SRQ3: What and how do factors impact on value co-creation process based on professors' viewpoint?

1.3 Significance of the study

Hofstede's cultural dimensions theory is a framework for cross-cultural communication, developed by Geert Hofstede. It describes the effects of a society's culture on the values of its members, and how these values relate to behavior, using a structure derived from factor analysis. Accordingly, Hofstede explored the Japanese culture and showed that Japan is a borderline hierarchical society. Accordingly, hierarchical positions in any social settings and activities are recognized and accepted (Hofstede, 2001). Therefore, in higher education, the relationship between teachers and students normally are conscious as hierarchical one. However, student's voice plays a key role because their knowledge, skills, and experience are important for institutes for example in teaching approaches, courses, and curricula (Bovill et al. 2011). Student's voice reflects that their position on teaching and learning is unique, so sharing their insights perspective on teaching and learning is valuable (Fielding 2001). According to service-dominant logic (S-D logic) (R. F. Lusch & Vargo 2006), providers and customers also were discussed to engage in the dialog of co-creation, and they can change the role together to create values. This notion adopted the consideration a student as a customer of the institution. The student and the institute as being in a dynamic and mutual process of co-production and value exchange (R. F. Lusch & Vargo 2006).

Research in higher education of students as co-creators are increasing recently for example, students' co-creation role supports to teaching approaches, course design, and curricula (Bovill et al. 2011), teaching quality based on the evaluation of student to enhance quality of teaching and education service of the institute (Maria et al. 2014), influence of technology, facilitated learning to students' perceptions of value, satisfaction and, therefore, loyalty to the institute (Bovill et al. 2011), social networks become place to interact with students and do marketing for the institute, for example, student recruitment (Fagerstrøm & Ghinea 2013), university branding based on co-creation process involving experience of university stakeholders (Nguyen et al. 2012), the students

experience of schooling (Fielding 2001), constitutes students' satisfaction with university experience and examines the influence of overall satisfaction with the university experience on students' co-creation behavior (Elsharnouby 2015).

In service marketing, customer satisfaction is very important, because customer only satisfied when the services or products match their expectation (Kotler 2007). Customer satisfaction was based on customer's experience of both contacts with the organization and personal outcomes (Cengiz 2010). Goals were discussed to be an object or outcome to judge satisfaction.

Based on our investigation, the limitation of previous research is that they only focus on one side value in education such as teaching or curriculum quality for the university side, or facilitates students to satisfy the students on the student side. In addition, almost research was conducted in America and Europe, where the service logic and concepts were easier accepted in higher education and students was considered as customers. In the context of Japan, the country is a newcomer in the global arena and the notions of service are still controversial argument in higher education sector. There is no research considering the value co-creation between professors and students in graduate education in Japan, especially focusing on the research activities from the lens of service dominant logic. In addition, less research tried to find out the specific value, impact factors to co-creation process in higher education. However, this research cultivates in all of the problems to propose a theoretical model for co-creation between professors and students in higher educations. Especially, testing the model in Japan, which is a stranger in accepting dyadic notion in higher education, promises interesting and novelty results to discuss.

1.4 Methodology of the study

1.4.1. Case study methodology

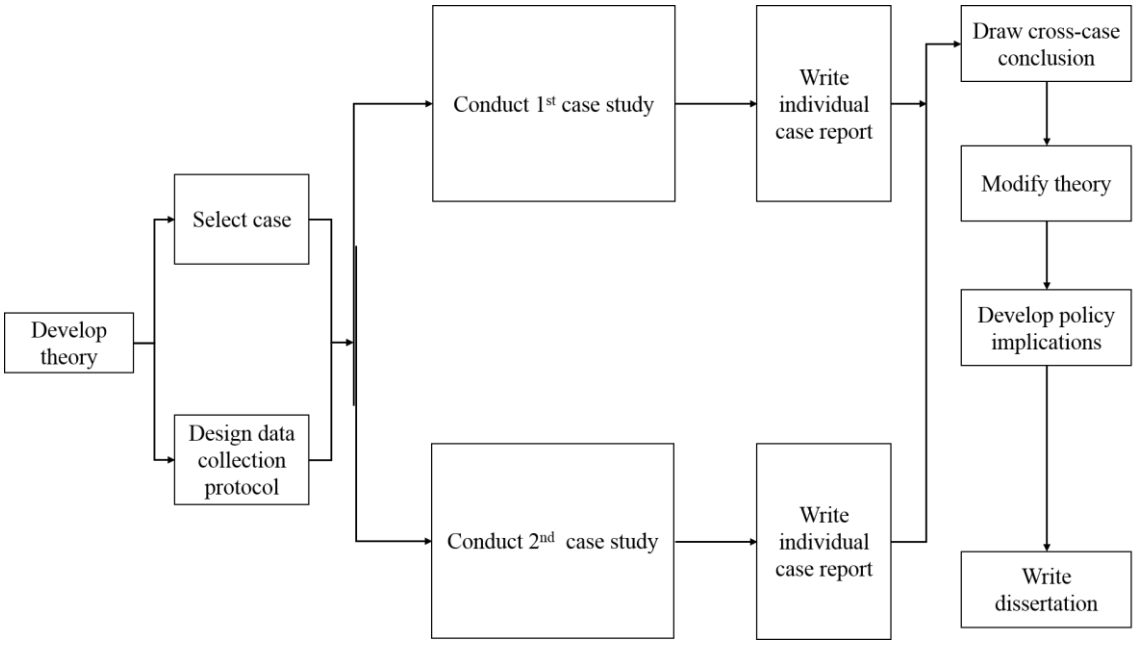

Figure 1.2 Multiple case study method (Source: Yin, 2003)

There are many methods for social research, each one has advantages and disadvantages, and the case study was selected and designed as a research method for this research. Because according to the case study definition of Yin 2003: *A case study is an empirical inquiry that: investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident.* Moreover, "why" and "how" research question normally lead to case study method and case study is usually applied to test contemporary events, in which we cannot touch to the relevant behaviors (Yin, 2003). Our main research question is a "how" one, and the SRQ2 and SRQ3 are also "how" questions because we desired to investigate and explain the real co-creation mechanism inside the cases.

Firstly, we propose some hypotheses based on the problem background and literature review. To verify the hypotheses, we choose two cases: one case of research laboratories, and one case of Innovation Management of Service and Technology course, higher

education for business professionals. These cases were chosen because of the successfulness of co-creation between professors and students characteristics. In these case studies, both professors and students aware the co-creation relationship and try to co-create value each other. Therefore, the hypotheses were verified based on the case studies. Finally, a theoretical model could be generalized based on the verified hypotheses and real case operation. Figure 1.2 illustrates the methodology of this research.

1.4.2. Case study design

a) Objective

We emphasized graduate education because, in this sector, the students' skill and knowledge became a huge resource to institutes in general and to professors in particular. Moreover, we chose the research institutes because the students in research environment have the intention of self-research, self-learning, i.e. they became active co-creators in co-creation process with professors.

We chose two cases to analyze to reveal the relationship and operation of elements of the proposed model. Because the proposed model was general, it could encompass and illustrate many cases. Therefore, each case could reflect and manifest one part of the model. The case studies were considered as S-D logic following and successful co-creation between professors and students.

b) Study design

In some Asia countries, the hierarchy is accepted easily based on the traditional social manner. One of a case is Japan, Hofstede explored the Japanese culture and showed that Japan is a borderline hierarchical society. Accordingly, hierarchical positions in any social settings and activities are recognized and accepted in this country (Hofstede & Hofstede 2001). Therefore, in higher education, the co-creation notion could not be accepted easily. Majority's professors still think it is not necessary to have co-creation with students, they just give a lecture and teach students from the higher viewpoints. And, the students also

accepted the notion of passive studying, and their professors are the higher position, so they shouldn't co-create or they cannot determine any value for the professors.

1.4.3. Data collection techniques

Firstly, this research continues my research from the master course, which is named value co-creation model in university branding: a case study of Japanese research laboratories, so some of the factors were collected from the master course. This step put a foundation to the main data collection in two cases in the next step. Because in my master course, we verified and justified some factors in co-creation between professors and students.

Secondly, we carried out this research in two case studies with both quantitative and qualitative data. In the scale of students' side, the sample scale was big enough to collect and analyze quantitative data, but in the professors' side, the number of professors was not suitable to analyze with a quantitative one.

In research laboratory case study, we chose three laboratories assumed that their operation is based on S-D logic. One of them has a long history of the foundation of the university; two of them belong to the young and new university and institute in Japan. Multiple methods were used to collect primary data such as interview, documents, and website survey. Interview data was collected from following resources: face-to-face interviews with professors and students. Besides, survey websites and annual books of the laboratories supported for a rich description of the operation of the cases.

In the case of Innovation Management of Service and Technology course (iMOST), the first phase, we joined a seminar to observe and interview both professors and students. Then in the second phase, we sent a questionnaire to collect data. After that, in the final phase, we conducted an e-mail deep interview to explain and discuss more the result of quantitative data analysis. The questionnaire included three parts: the first one is the questions of expectation of goals to co-create between professors and students, the second one is about the satisfaction of those goals after co-creation process, and the last one is

about the supported factors to co-creation process. All the questions are used 5-point Likert scale: The Likert 1 scale for not strongly agree on answer, Likert 2 scale for not agree, Likert 3 scale for not sure answer, Likert 4 scale for agree, and Likert 5 scale for strongly agree on answer.

1.4.4. Data analysis strategy

Firstly, in the pilot study, we interviewed professors and students in J graduate institute and in the iMOST course to identify some specific goals and characteristics to co-create and the mutual ones among them. Then, we summarized and made the report to generate the suitable factors belonging to goals and characteristics parts.

Secondly, in the first semi-interview of iMOST professors and students, collected data was summarized to compare with the pilot research conclusion and develop it to the questionnaire and interview in the next steps.

After that, we designed a questionnaire using 5-point Likert scale to collect data. The majority is qualitative data, but there is a part of quantitative data. The qualitative data was collected, summarized and described to compare with the proposed hypotheses and model, which called pattern-matching logic (Yin 2009). There are some steps of the qualitative data analysis in this research such as reading and listening to the interviews; identifying words, phrases or issues frequently mentioned and discussed; selecting and organizing the summary data. When summarizing and reporting the result, extract method was often used to reflect the interviewees' opinion especially the professors' answers. Qualitative data analysis is supported to answer the SRQ1, SRQ3 in particular, and MRQ in general.

The quantitative data was analyzed using descriptive statistics, reliability test, correlation and multiple linear regressions by IBM SPSS statistics version 22 software. Both simple and advanced statistical tools and methods are used for analyzing the relationship between variables in the model to test the hypothesis. The quantitative data analysis is supported

to answer the SRQ2.

Reliability analysis allows studying the properties of measurement scales and the items that compose the scales. The reliability analysis procedure calculates a number of commonly used measures of scale reliability and also provides information about the relationships between individual items in the scale. Interclass correlation coefficients can be used to compute inter-rater reliability estimates. Alpha Cronbach model is used to test the internal consistency of variables, based on the average inter-item correlation.

Collinearity diagnostics: Collinearity (or multicollinearity) is the undesirable situation when one independent variable is a linear function of other independent variables. Eigenvalues of the scaled and un-centered cross-products matrix, condition indices, and variance-decomposition proportions are displayed along with variance inflation factors (VIF) and tolerances for individual variables. Normally the value of VIF reaches 10 the multi-collinearity regarded as a serious one, so to reduce the collinearity eliminating one or more variables is the chosen way.

Linear regression estimates the coefficients of the linear equation, involving one or more independent variables, which best predicts the value of the dependent variable. For example, we could try to predict a satisfaction of gaining knowledge (the dependent variable) from independent variables such as the goal to have a chance to engage in other research.

1.5 Organization of the study

This dissertation includes 6 chapters. The first chapter introduces research based on the background of service science and higher education sector; identify problem and research purpose, the novelty of this research. Then, introducing the research method and explain why we chose that method.

Chapter 2 is concepts and related works mention. All the related and applied concepts will be introduced and reviewed in this chapter to build a foundation of the research. By literature review part, we could see the research flow of the sector and confirm or argue the significance of the research. Choosing foundation concepts, supporting the research, is also based on this chapter.

Based on the literature review in chapter 2 and background in chapter 1, chapter 3 was written to propose a general theoretical model. The proposed model used the foundation concepts of S-D logic, co-creation, and service system to apply in higher education which reflects the originality of the research. We will introduce the mechanism and architecture of the model based on the important concepts in this chapter.

Because the proposed is general, so we assumed that it could be applied to many types of cases. Therefore, chapter 4 and 5 are different cases, and we analyzed them based on comparison with the proposed model. There are different hypotheses, depending on each case. We will analyze the cases to verify the hypotheses to show the effectiveness of the proposed model in each case.

Finally, we conclude and discuss the results to answer the research questions, then give out the verified model after that. We also discuss the research implications and future research direction in this chapter.

Chapter 2. Literature review

2.1 Introduction

This chapter will review concepts and related works in the same research field. The literature review is a general viewpoint and supports the theoretical part to the research. Based on the literature review, we could find out the evidence, foundation, and trend to our research. Moreover, the originality of the research is warranted by this research step.

Normally higher education was seen through the different lens with service sectors. However, education was considered as service from the viewpoint of many service researchers, which was intangible actions and had mental stimulus processing. From this viewpoint, education is as directed services at people's mind. With the notion of service dominant logic, education as any economics should be considered as service, and the concept of co-creation leads education to the new issue to discuss besides the traditional hierarchical relationship in this sector.

The motivation is the center of educational institute discussion. Because education is a special service with the high role of human resources, motivation as goals became one of the most interesting considered topics to research. Goals lead people to change behavior and archive goals lead them to the satisfaction. The concept of customer satisfaction was reviewed to consider in this research as a significant indicator for evaluating value co-creation.

2.2 Value co-creation and Service-dominant logic

2.2.1. Service-dominant logic

Vargo and Lusch posited that marketing is evolving toward a new logic as Service Dominant logic (S-D logic) (Lusch & Vargo, 2006, 2014). This logic considered service

as a process orientation, focused on common exchange and engages customer into value creation process. “From this perspective, goods remain important but are identified as vehicles for service provision”(R. F. Lusch & Vargo 2006).

S-D logic became a mindset for a unified understanding of the purpose and nature of organizations, markets, and society. The foundational proposition of S-D logic was that organizations, markets and society are fundamentally concerned with the exchange of service - the applications of competencies (knowledge and skills) for the benefit of a party (Vargo and Lusch, 2004). Thus, service is exchanged for service; all firms are service firms; all markets are centered on the exchange of service, and all economies and societies are service based.

The 10 premises, shown in Table 2.1, generalize the foundations which S-D logic would like to implicate and justify. Being influent to my research, the most important point of S-D logic is the value co-creation theoretical concepts. As mentioned in G-D logic, the value is created at the moment of exchange. After that, customers use the goods, or the value-added inside on their own. In the new mindset, value co-creation happens after value exchange. Values for customers mean that, after customers have been offered a service process, they feel better than before using it. The service really helps them to solve their issues. The satisfaction here is determined by customers themselves, not by the service suppliers. We can say that value is co-created when customers’ needs and requirements are fully met.

The evolving of S-D logic makes the customer endogenous to value creation by arguing that value is always co-created with customers (and others), rather than unilaterally created by the firm and then distributed. The logics of marketing are paralleled and reflected in the branding literature and reinforce and inform each other. Marketing is shifted from “marketing to” (output-oriented models) to “marketing with” (process-oriented logic) to emphasize value-in-use.

Table 2.1 Foundational premises of S-D logic
(Source: Adapted from R. Lusch & Vargo, 2006)

	Foundation Premises	Explanations
FP1	Service is the fundamental basis of exchange.	The application of operant resources (knowledge and skills), "service," as defined in S-D logic, is the basis for all exchange. Service is exchanged for service.
FP2	Indirect exchange masks the fundamental basis of exchange.	Because service is provided through complex combinations of goods, money, and institutions, the service basis of exchange is not always apparent.
FP3	Goods are a distribution mechanism for service provision.	Goods (both durable and non-durable) derive their value through use – the service they provide.
FP4	Operant resources are the fundamental source of competitive advantage.	The comparative ability to cause desired change drives competition.
FP5	All economies are service economies.	Service (singular) is only now becoming more apparent with increased specialization and outsourcing.
FP6	The customer is always a co-creator of value.	Implies value creation is interactional.
FP7	The enterprise cannot deliver value but only offer value propositions.	Enterprises can offer their applied resources for value creation and collaboratively (interactively) create value following acceptance of value propositions, but cannot create and/or deliver value independently.
FP8	A service-centered view is inherently customer oriented and relational	Because service is defined in terms of customer-determined benefit and co-created it is inherently customer oriented and relational.
FP9	All social and economic actors are resource integrators.	Implies the context of value creation is networks of networks (resource integrators).
FP10	Value is always uniquely and phenomenologically determined by the beneficiary	Value is idiosyncratic, experiential, contextual, and meaning-laden.

2.2.2. Experience and co-creation

Because concepts of experience and co-creation are fundamental of service. First, we surveyed the concept of co-creation, shown by Prahalad (Prahalad 2004) to see the role of customers in service co-creation.

The key point of co-creation process is that customers involve and create value with the suppliers through their true experience. According to Lusch and Vargo, customers are co-creators with suppliers (R. Lusch & Vargo 2006). Prahalad and Ramaswamy argued that co-creation experiences become the basis of value co-creation(Prahalad & Ramaswamy 2004) (Table 2.2) . It is not a time to be product-centric, service-centric, or firm-centric anymore, but a time for co-creation with customers and other stakeholders through human experience. Only by experience, can customer and firm realize and perceive the real value of service or products?

Ramaswamy also stated the premises of an alternate logic of value and its creation as follows (Ramaswamy 2011):

- *"Value is a function of human experiences*
- *Experiences come from interactions*
- *A firm is any entity that facilities this creation of experience-based value through interactions. Engagement platforms are the means to creating value together*
- *Co-creation is the process by which mutual value is expanded together, where value to participating individuals is a function of their experiences, both their engagement experiences on the platform and productive and meaningful human experiences that result"*

Table 2.2 The concept of co-creation (Prahalad & Ramaswamy 2004)

WHAT CO-CREATION IS NOT	WHAT CO-CREATION IS
• Customer focus • Customer is king or customer is always right	• Co-creation is about joint creation of value by the company and the customer. It is not the firm trying to please the customer
• Delivering good customer service or pampering the customer with lavish customer service	• Allowing the customer to co-construct the service experience to suit her context
• Mass customization of offerings that suit the industry's supply chain	• Joint problem definition and problem solving
• Transfer of activities from the firm to the customer as in self-service • Customer as product manager or co-designing products and services	• Creating an experience environment in which consumers can have active dialogue and co-construct personalized experiences; product may be the same (e.g., Lego Mindstorms) but customers can construct different experiences
• Product variety	• Experience variety
• Segment of one	• Experience of one
• Meticulous Market research	• Experiencing the business as consumers do in real time • Continuous dialogue
• Staging experiences	• Co-constructing personalized experiences
• Demand-side innovation for new products and services	• Innovating experience environments for new co-creation experiences

2.3 Customer satisfaction

Customer satisfaction is an important concept in service marketing and has the attention of researchers. In marketing theory, customer satisfaction locates in a major position because it is based on the premise that the profit is made through the process of satisfaction of consumers' demands (Dubrovski 2001). Since customer satisfaction has been considered as an important element, how to satisfy customers is very important, all innovative activities of service businesses aim to gain the better and highest level of customer satisfaction.

There are several definitions of customer satisfaction summarized in the Table 2.3. In the former definitions, customer satisfaction was determined through a cognitive procedure by comparing what customers give up to get a service (cost) and what they receive in response (reward), however, the later concepts take satisfaction as an emotional feeling that results during the process of evaluation. In the simple understanding, the word "satisfaction" is a most appropriate label for the range of attitudes and feelings that customers hold about their experiences with an organization. Therefore, customer satisfaction or dissatisfaction is the feeling a customer has about the extent to which their experiences with an organization have met their needs (Hill et al. 2007). It is a concept that involves the feeling of well-being and pleasure that results from obtaining what one hopes for and expects from an appealing product and service (WTO, 1985). For more detail, we could examine the explanation of Philip Kotler, satisfaction is a person's feeling of pleasure or disappointment resulting from comparing a product's performance (outcome) in relation to his or her expectation. If the product matches expectations, the consumer is satisfied, if it exceeds them, the consumer is highly satisfied if it falls short, and the consumer is dissatisfied (Kotler 2007). Focusing on the service experiences, customer satisfaction was defined as an experience-based assessment made by the customer of how far his own expectations about the individual characteristics or the overall functionality of the services obtained from the provider have been fulfilled (Bruhn

& Homburg 1999).

There are many ways to define customer satisfaction; however the definitions have the same points when both focus on: the emotion, feeling and attitude of customers to service providers; the customer expectation about the responsibility of service providers; the value perceived by customers; and the intending to reuse services in the future.

Table 2.3 Summary of Customer satisfaction definition

Author	Year	Definition
Hunt	1991	Satisfaction is a function of customer's belief that he or she was treated fairly.
Yi	1990	Customer satisfaction is a collective outcome of perception, evaluation and psychological reactions to the consumption experience with a product/service.
Philip Kotler	1986	If the product matches expectations, the consumer is satisfied, if it exceeds them, the consumer is highly satisfied if it falls short, and the consumer is dissatisfied.
Philip Kotler	2000	Satisfaction is a person's feeling of pleasure or disappointment resulting from comparing a product's perceived performance (or outcome) in relation to his or her expectation.
Oliver	1997	Customer satisfaction is a judgment that a product or service feature, or the product or service itself, provided (or is providing) a pleasurable level of consumption-related fulfillment, including levels of under-or over-fulfillment.
Nigel Hill et al	2007	Customer satisfaction, or dissatisfaction, is the feeling a customer has about the extent to which their experiences with an organization have met their needs

2.4 Value co-creation in higher education

According to Phillip Kotler (1986), if *the product matches expectations, the consumer is satisfied, if it exceeds them, the consumer is highly satisfied if it falls short, and the consumer is dissatisfied*. However, in higher education, there is a gap between students' expectation and institution service offerings. Normally teachers usually put themselves on a higher level than their students'. That's the reason why they think students need their help in some certain things, which might be different from students' want. Therefore, when higher education institutions try to offer and satisfy their customers, they must balance to meet the students' need and want (Maria et al. 2014; Schwartzman 1995). In addition, by understanding students' need and expectation institutions can provide to students high-quality education offerings. When approaching marketing concepts within the higher education sector, higher education institution connects closely to a service exchange. Because it is the exchange of knowledge and skill, the service produces and consume at the same time, and the actors experience and perceive value directly at exchange activities (Clewes 2003; Bowden & D'Alessandro 2011).

Because students join the exchange of knowledge and skill, they become active actors in the dialogue with institutions. According to Prahalad and Ramaswamy, dialogue involves 'interactivity, deep engagement, and the ability and willingness to act on both sides'(Prahalad & Ramaswamy 2004). Therefore, overcoming the notion of hierarchy in traditional, human in higher education can join to solve the problem together and perceive their value. "Dialogue thus includes the conversations between consumers, and the institution of higher education to jointly define and solve the consumer's problems, while the institution at the same time acquires knowledge about the consumer. Hence, to achieve an active dialogue, the universities/colleges, and the customer must become equal and joint problem solvers" (Bowden & D'Alessandro 2011).

Research in higher education considering students as co-creators are increasing recently, for example, students' co-creation role supports to teaching approaches, course design

and curricula (Bovill et al. 2011), teaching quality based on the evaluation of student to enhance quality of teaching and education service of the institution (Maria et al. 2014), influence of technology-facilitated learning to students' perceptions of value, satisfaction and therefore loyalty to the institution (Bowden & D'Alessandro 2011), social networks become place to interact with students and do marketing for the institution for example student recruitment (Fagerstrøm & Ghinea 2013), University branding based on co-creation process involving experience of university stakeholders (Nguyen et al. 2012), the students experience of schooling (Fielding 2001), constitutes students' satisfaction with university experience and examines the influence of overall satisfaction with the university experience on students' co-creation behavior (Elsharnouby 2015). Those all reflect the significant role of value co-creation in higher education and variety approach in this research flow (Table 2.4).

Table 2.4 Summary of surveyed researches of value co-creation in HE

Author	Research
Elsharnouby 2015	Constitutes students' satisfaction with university experience and examines the influence of overall satisfaction with the university experience on students' co-creation behavior.
Maria et al. 2014	Teaching quality based on the evaluation of student to enhance quality of teaching and education service of the institution.
Fagerstrøm & Ghinea 2013	Social networks become place to interact with students and do marketing for the institution for example student recruitment.
Bovill et al. 2011	Students' co-creation role supports to teaching approaches, course design and curricula.
Bowden & D'Alessandro 2011	Influence of technology-facilitated learning to students' perceptions of value, satisfaction and therefore loyalty to the institution.
Fielding 2001	The students experience of schooling.

2.5 Conclusion

In this chapter, we introduced Service-Dominant (S-D) Logic as a mindset for a unified

understanding of the purpose and nature of organizations, markets and society. In addition, we surveyed the concept of value co-creation defined as a process, in which customers involve and create value with the suppliers through their true experience. From the viewpoint of service, higher education topic have been opened, in which students involve and co-create in teaching quality, course & curriculum design, & institution recruitment. We also discussed the concepts of human resource & customer satisfaction because they are very important in service system, then HE. Another significant concept which mentioned in this research was goal, which is an object or outcome to judge satisfaction.

Through reviewing previous researches, we found that there was no research which considered enhancing the research achievement in graduate education and value co-creation for both side: students and the co-creators, as well as connecting goals and satisfaction to consider the effectiveness of co-creation process. Therefore, this is the clue for us to develop and conduct this research.

Chapter 3. Proposed model of value co-creation between professors and students based on goals and service *Ba*

3.1 Introduction

Based on the literature review and the background, we chose some foundation concepts to support our research. And then, we proposed our model of value co-creation in higher education. In this chapter, before proposing the model, we focused on the viewpoint of S-D logic versus G-D logic in higher education. Then, once again we emphasized that value co-creation is a process in higher education with the professors' and students' joining and identify the concept of value in the process. In this process, the goals and satisfaction are important because the goals play the input role and satisfaction is the output role of the co-creation process. The more goal successes one has, the higher his total satisfaction. Service system was also described in this chapter as a foundation concept because we adopted the similarity of service system to develop our model in higher education. Finally, we proposed a value co-creation model between professors and students based on goals and supported *Ba* characteristics.

3.2 Higher education from viewpoint of S-D logic and G-D logic

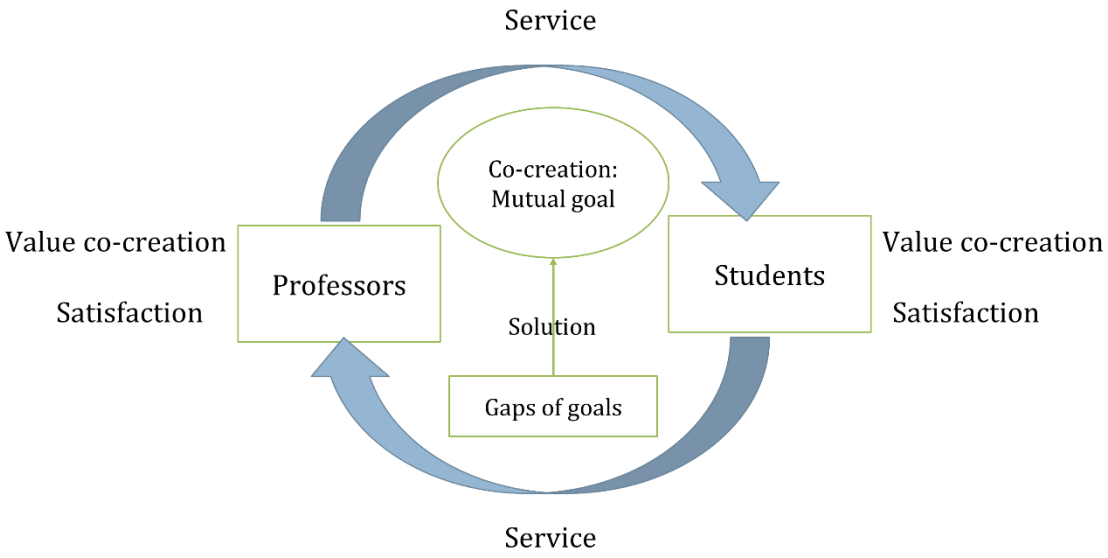

Figure 3.1. Co-creation from S-D logic viewpoint

From the perspective of S-D logic, "*service is defined as the application of specialized knowledge and skills (competencies) for the benefit of another party*" (R. F. Lusch & Vargo 2006), so providers and receivers can change the role together to provide service and co-create value together. In our discussion of education (Figure 3.1), professors and students co-create together based on experiencing and sharing the mutual and different goals, in other words, their goals are knowledge and skill for their benefit. With the mutual goals, they will share opinion and ideas to gain the value. With the different goals or gaps, by co-creating, they will find out the solution and fulfill the gaps to create their value. Professors not only teach but also receive new ideas or experiences from students. The students both learn from and give the ideas, benefits and other value for the professors in co-creation process. They interact with each other and then obtain their value co-creation. The value co-creation reflects their satisfaction in the co-creation process. The more value they get, the more they feel satisfied with this education service and co-creation process.

To demonstrate more clearly about the co-creation between professors and students, we can discuss an example of "individual seminar" between professors and students in a

master course for professionals. A student could register individual seminar with three professors one time, then they could present their proposal, research idea, research progress, and so on with three different professors chosen by himself. Thus, he could gain many academic theories and concepts, which he still lack in his works, through discussion with many professors. Regarding of professors' side, they could receive and update new issues and ideas from industries which the student presents in individual seminars. Students come from many new and different fields with professors, sometimes knowledge from industries is various and strange with professors. Each student provides fresh or up-to-date knowledge to professors. Consequently, the individual seminar is an effective *Ba* for both students and professors gaining knowledge, which is one of their mutual goals.

This perspective is different from the viewpoint of G-D logic which considered professors and students' relationship were hierarchy totally. Professors taught and gave knowledge and skill to students and the students received, learned and even obeyed in any cases. In the normal notion of professors, it is difficult to accept listening to the students and learning from them because they were teachers who taught but not learned from the learners. Therefore, it was difficult for them to co-create with students and reverse.

3.3 Foundation from value co-creation concept

3.3.1. Value co-creation is a process

Co-creation was defined as the process by which mutual value is expanded together (Ramaswamy 2011). So, co-creation is the interaction between both sides based on the same goal to increase and develop their mutual value. Interaction is a mutual or reciprocal action where two or more parties have an effect upon one another. The involved parties are in some contact with each other (Gronroos 2011). According to Prahalad, value co-creation was defined as creating an experience environment in which consumers can have active dialogue and co-construct personalized experiences. Thus, besides joint activity characteristic, the experience orientation is one of the important points of value co-creation to discuss. We can see that the value co-creation is a process, different with value

creation. Value co-creation requires that both actors join the process together and they have influenced each other. They experience and perceive the value of themselves depending on their own context. While the value creation is one side activity, in business the producer normally sets up the value for the customer and the customer has no influence on the value creation process (Prahalad & Ramaswamy 2004).

In higher education, professors and students have to co-create together by many activities in a long term. They experience each activity and perceive their value by themselves in the dialog with their partners. Both professors and students have to involve in the co-creation together continuously and actively to create value and gain value, giving and taking value are a process that they join and contribute to it. Through experiencing and sharing together actively, their mutual goal and value are exposed.

3.3.2. What is value in co-creation process?

Value is a very difficult concept to identify and define. Value seems to be the perceive notion depending on each person, each context. For example: with G-D logic standpoint, the value is easily monetary, and the producer always tries to maximize their value as money, minimize the cost and expense. Money was reflected through firms' revenue, profit, stakeholder share and stock, and so on. From the viewpoint of S-D logic, value changes its pattern, and value is not only monetary but also other benefit and senses. Customers use, experience, perceive and demonstrate their value by themselves. So, the value is not fixed, it is uniquely and phenomenologically, and it is determined by the beneficiary on the basis of value-in-use (Lusch & Vargo 2014). *Value-in-use the best way to understanding value for customers, value creation cannot mean anything else than the customer's, or any other user's, experiential perception of the value-in-use that emerges from usage or possession of resources, or even from mental states* (Gronroos 2011). Thus, value for customers and value for suppliers in dyadic co-creation process may be different or same.

In the relationship professors and students in higher education, certainly, the value should

not define as monetary based on G-D logic. However, it seems still to be G-D logic in the notion of hierarchical relationship, so the value for students was not defined clearly and there is less attempting to satisfy the students. Thus, it is necessary to apply S-D logic and co-creation concept into higher education to enhance the value for students and other partners.

The co-creation between professors and students is very important because the target of higher education is to gain research abilities, closely related to their interaction. According to S-D logic, learning is not passive one-way process anymore, and students become active learners and co-creators. Besides learning, students in graduate education with their skill and knowledge become a resource to provide value for professors.

3.4 Foundation from goal theory and customer satisfaction concept

In service marketing, customer satisfaction is very important because customers only satisfied if the services or products match their expectation (Kotler 2007). Customer satisfaction is based on customer's experience of both contacts with the organization and personal outcomes (Cengiz 2010). Goals are discussed to be an object or outcome to judge satisfaction. In case, one is trying to achieve a goal means that one will only be satisfied when he achieves and gains that goal (Locke & Latham 2002). Goals and satisfaction have a significant relationship as input and outcome of a progress. The more goals successes one has, the higher his total satisfaction (Locke & Latham 2002).

To co-create value, both professors, and business professional students have their own goals based on their context and depend on each situation, priority goals are different. There is two type of goals as achievement goals (task orientation) and performance goal (ego orientation) (Nicholls, 1984; Ames & Archer, 1988; Jagacinski & Strickland, 2000). Achievement goal related to our intrinsically interested in the activity, and performance goal related to demonstrating to ourselves or others our superior competence (Jagacinski & Strickland 2000). If someone seeks to develop or improve competence, his goals will

be the achievement one. In case, alternatively, an individual prefers to demonstrate competence to others, his goals intends to be a performance goal (DeShon & Gillespie 2005).

That's the reason why we use the goal as an important factor lead to the co-creation between professors and students. Then, the satisfaction of the mutual goals become an evaluating tool of the co-creation process. In this research, we identified the co-creation between professors and students based on their goals. As the context of graduate students, the majority of students' goals when co-creating with professors is achievement goals because they understand the real and core value in a research environment. With the high motivation to develop and improve their knowledge and skill, they determine the achievement goals to co-create to professors. In the dyadic relationship between professors and students, goals as their value proposition and they involve the interaction process, co-creation process to try to perceive their goals or their value. Finally, if they are successful in co-creation together, they could obtain some of their goals, which become their value co-creation.

3.5 Foundation from service system concept

According to Kameoka (Kameoka 2007), *service is the activity of supporting human beings or organizations to enable them to achieve their objectives or desires*. Through a case of a famous Japanese spa hotel and a famous services-oriented company, another definition of service was regarded as *an activity that provides professional techniques, satisfies the customer, and results in compensation for the service provider* (Figure 3.2). By this viewpoint, service reflects a fruitful characteristic of human activities, and it contains different business activities (Kosaka 2012).

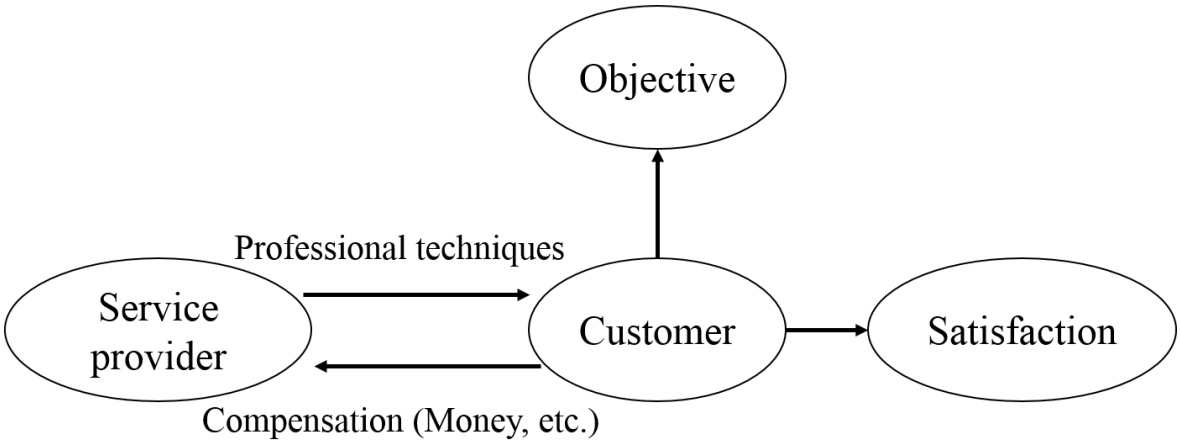

Figure 3.2. Definition of service (Kosaka, 2012)

From the viewpoint of this definition of service, the main points of the service system are ① satisfaction of customers from provided service, ② service providers perform professional techniques, and ③customers award compensation (money or another benefit) for service providers.

Developing this notion of service and S-D logic, in Figure 3.3 Kosaka defined service system as service comprises customers, service providers, and service co-creation activities. In other words, a service system includes human beings, and its objective is to maximize the service value for customers in a consideration of their objectives in order to assure their satisfaction. Various technologies related to human beings or system sciences are used to maximize the level of satisfaction.

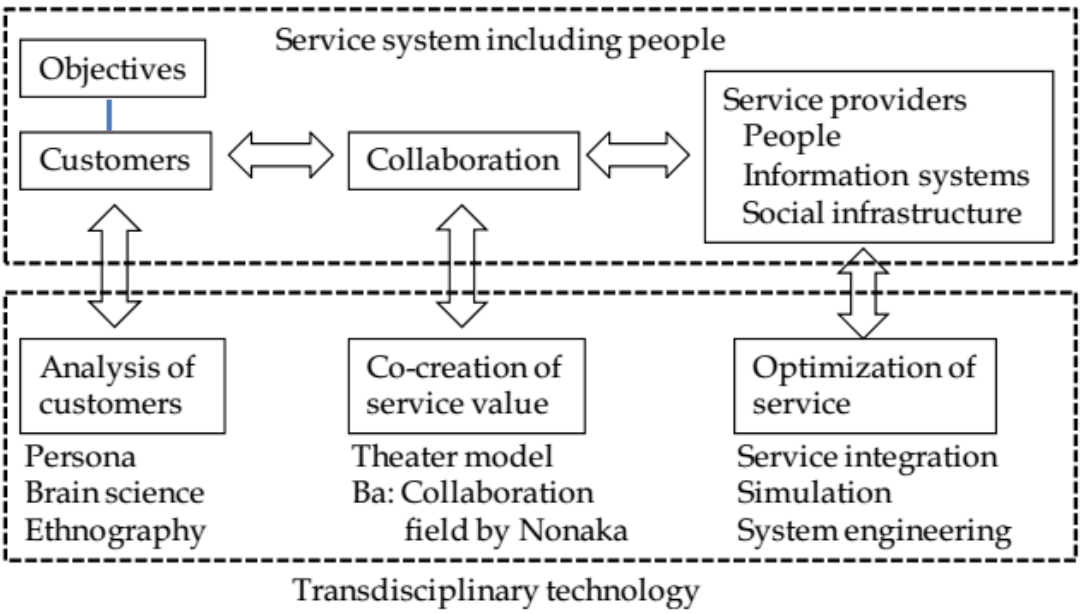

Figure 3.3. Service system (Kosaka, 2012)

Considering education as service, professors provide their knowledge and academic experience for students to satisfy and help them gain their goals or objectives. In turn, students response by providing their idea and their knowledge for professors.

Furthermore, the service system creates a foundation for us to consider the co-creation between professors and students in a service viewpoint. In the service system, human beings factors play a key role to create value and satisfaction for the actors. Service *Ba* is a place to support the co-creation process to gain the most effectiveness results. The co-creation of professors and students should have this kind of service *Ba* to overcome the notion of hierarchy notion and then give and take in a parallel position. Then, they are willing to join the value co-creation process.

3.6 Proposing a value co-creation system in higher education

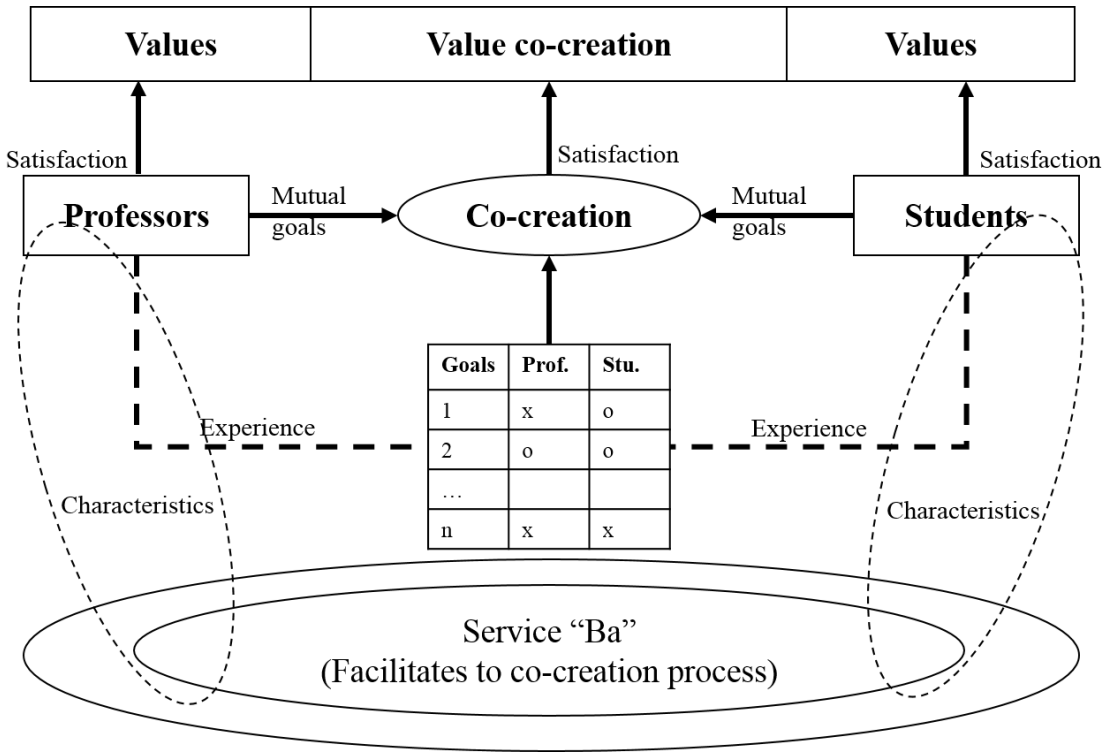

Figure 3.4. Service system of co-creation in higher education

3.6.1. Mechanism of the proposed model and how have the foundation concepts supported it

Based on the supported and foundation concepts above, we proposed a value co-creation system in higher education (Figure 3.4). The value co-creation system consists of students as customers, professors as service providers, and value co-creation activities. In other words, the system includes human beings, and its objective is to maximize the service value for customers as regards their objectives in order to assure their satisfaction. In the relationship between students and professors, goals are very important because they lead to motivation and behavior of the co-creation process. Goals are the reason to co-create between professors and students. They are also the expectation of professors and students before the co-create value to each other. Because of having goals, they will co-create value together and their satisfaction of the value will reflect whether the co-creation

process is effective or not. If receivers and givers satisfy with the mutual value receiving in the co-creation process, it means the co-creation process is effectively and versus. Both professors and students experience the co-creation each other based on their goals based on their context. Only by their own experience, they perceive the value from the co-creation by their satisfaction. There are same and different goals of professors and students, they co-create together based on not only mutual goals but also the different. Once they have a goal to co-create, they will co-create to the partners. However, only when they satisfy they acquire their value.

Nonaka and Konno (1998) stated that *Ba* can be thought of as a shared place for emerging relationships, this place can be physical (e.g., offices, and dispersed business spaces), viral (e.g., e-mails, and teleconference), mental (e.g., shared experiences, ideas, and ideals) or any combinations of them (Nonaka & Konno 1998) (Figure 3.5). *Ba* was considered as to be a shared place that serves as a foundation for knowledge creation. Within an organization, knowledge-creating teams or projects play key roles in value creation (Nonaka et al. 2000). In the discussion of service system model, Kosaka (2012) mentioned to *Ba* in knowledge management as a methodology for maximizing the value in co-creation process. In this proposed model, we consider some characteristics belonging to *Ba* as the supporting system to co-creation process to obtain the values.

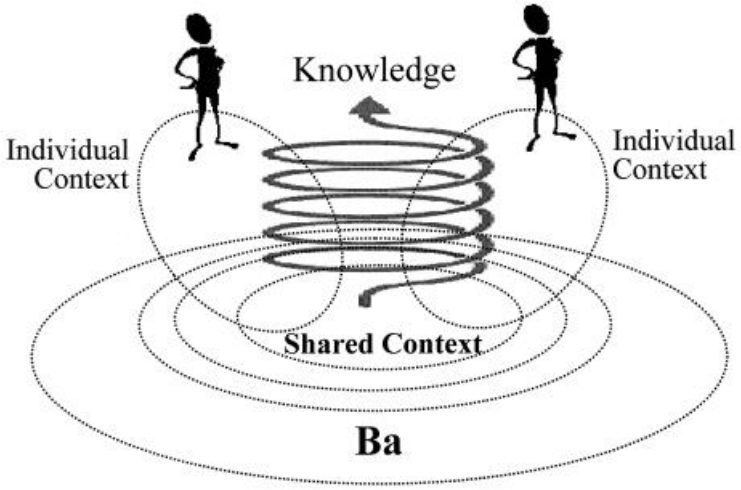

Figure 3.5. *Ba* as shared context in motion (adopted from Nonaka et. al., 2000)

3.6.2. Value in the proposed model

Based on the foundation concepts discussed above, in this research, we consider:

> *The value of the co-creation process between professors and students is the satisfaction of mutual goals of both sides.*

Value co-creation process was considered that it includes three elements that lead to the outcome: customer sphere, provider sphere and joint sphere, and the real value are created only by co-creation interaction of the joint sphere (Grönroos & Voima 2013; Payne et al. 2008). Because the value in co-creation process is value-in-use, the real experience of co-creator who join the co-creation process, so the value is not fixed in any context and v*alue is always uniquely and phenomenologically determined by the beneficiary* (Gronroos 2011).

In business, the service providers and customers are distinctive, and the service system's purpose is to maximize the value and the satisfaction of customers. However, from the point of S-D logic view, the customers become co-creator and the customers and suppliers change the role together to co-create value. Moreover, t*he service is the application of specialized competences (knowledge and skills) through deeds, processes, and performances for the benefit of another entity or the entity itself (self-service)*(R. F. Lusch & Vargo 2006). That's the reason why we propose that in higher education, professors are service providers and they are also the customers to receive specific skill and knowledge from students, and in that case, students become service providers besides the role of customers. Therefore, the value is regarded as the satisfaction of only the mutual goals of both sides to reflect the notion of an equal role in co-creations based on the S-D logic.

3.6.3. Hypotheses based on the proposed model

The core nature of this proposed model is the factors having the influence to co-creation process to enhance value for both professors and students. Co-creation between professors and students is a process and the input materials, which are goals and

characteristics of professors and students. The output of the process is the satisfaction of the mutual goals of both sides. In addition, the co-creation process occurred in service *Ba,* where professors and students could share goals together.

Therefore, we propose 3 hypotheses to verify the proposed model as followings:

Hypothesis 1: Goals have positive influence to value co-creation.

Hypothesis 2: Characteristics have positive influence to value co-creation.

Hypothesis 3: Service Ba facilitates positively to co-creation between professors and students.

These hypotheses are general to describe the relationship and influence of factors to co-creation process and value co-creation. Depend on each case, we could identify the concrete and detail factors belonging to goals, characteristics or service *Ba* group.

Chapter 4. Innovation Management of Service and Technology (iMOST) case study

4.1 Introduction

To verify our proposed model, first of all, we chose a case study of Innovation Management of Service and Technology (iMOST) in a J institute, a Japan graduate institute, to analyze. This case was assumed as a successful one of value co-creation between professors and business professional students. In this case, we propose several hypotheses to analyze the correlation between goals and other characteristics to the value of co-creation process. There are two phases of collecting data in this case. The first one is an interview to identify specific goals and characteristics, which impacted into the value of co-creation process. From the students' perspective, we collected quantitative data and used multiple linear regression methods to verify the proposed hypotheses. From the professors' perspective, we analyzed the factors having the influence on the value of co-creation process between professors and students.

4.2 Methodology and data analysis

4.2.1. Linear regression model

The co-creation between professors and students are supported by goals and characteristics (containing objective and subjective ones). These factors relate and facilitate directly and frequently to the co-creation. For instance, depending on what type of students such as master or doctoral students, the satisfaction with gaining publication will be different, and the doctoral one considers publication rather than the master students. Therefore, estimating the relationships between factors and value co-creation are very significant, for example, relationship between goals and the satisfaction of the mutual goals and relationship between characteristics and the satisfaction of the mutual goals. Because, through the estimating works, we could identify which parameters and factors have or not influence on value co-creation and the level of the influence. Then, we could have suitable and adaptive plans and strategies to improve the influenced factor, co-creation process, and value co-creation.

As we know, the regression analysis is very well-known as a statistical process for estimating the relationships among variables. It contains many techniques for modeling and analyzing several variables when the focus is on the relationship between a dependent variable and one or more independent variables (or 'predictors'). Therefore, it is the most suitable analysis method for this research to estimate the relationship between goals and satisfaction of the mutual goals, between characteristics and satisfaction of the mutual goals.

In this case, we defined the mutual goals as gaining knowledge and gaining publication. Then, we desire to test the relationship between several goals and satisfaction of gaining knowledge and relationship between several characteristics and satisfaction of gaining publication. To illustrate the regression relationship, we considered two dependent variables as following: Y_1 is the satisfaction of gaining knowledge, and Y_2 is the satisfaction of gaining publication. The independent variables are goals and

characteristics which codes as variables $G_i = \{G_1, G_2... G_7\}$ and variables $CH_j = \{CH_1, CH_2... CH_7\}$. In general, we have the regression equations to express the relationship between dependent and independent variables as follow:

$$Y_1 = f(G_1, G_2...G_7)$$

$$Y_2 = f(CH_1, CH_2...CH_7)$$

4.2.2. Data analysis

There are many ways to exam whether the co-creation process is successful or not, and in this research, we proposed that the values would reflect the quality of co-creation process. Because the values are the satisfaction of mutual goals of professors and students, the higher satisfaction gains the more values they perceived and experienced. With the purpose of increasing values of co-creation process, we want to find out the factors having the influence on values, and we can improve those factors.

In iMOST course case, the mutual goals to co-create between professors and students are publication and knowledge. Because in the academic field, publication including conference paper, journal paper, etc. are the way researchers reflect their results. Therefore, the publication is very important. In terms of gaining knowledge, the students' goal to co-creation with their professors is to gain academic and methodology knowledge to support their works, their research life. The professors' goal is to gain knowledge to change and upgrade their research and their teaching progress.

We proposed four hypotheses for this cases as follows:

H1a: Goals positively influence satisfaction of gaining knowledge in co-creation between professors and students.

H1b: Goals positively influence satisfaction of gaining publication in co-creation between professors and students.

H2a: Characteristics positively influence satisfaction of gaining knowledge in co-

creation between professors and students.

H2b: Characteristics positively influence satisfaction of gaining publication in co-creation between professors and students.

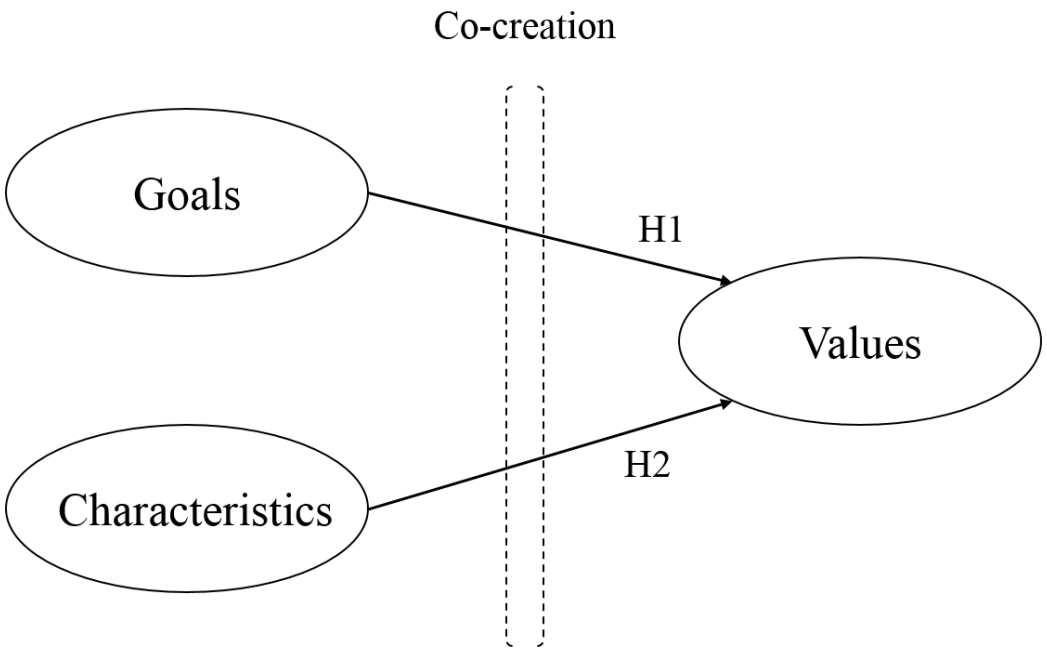

Figure 4.1. Illustration of hypotheses in iMOST course

4.2.3. Data collection

We designed and sent a questionnaire to the iMOST students and professors. There were 50 responses from iMOST students and 7 professors of the institution. From the professors' side, beside questionnaire, we conducted a face-to-face interview and use narrative description method to analyze the interview data. From student side, the data was analyzed using descriptive statistics, reliability test and linear regression by "IBM SPSS statistics version 22" program. The contents of the questionnaire were described in chapter 1 (methodology section), and detail in the appendix section too.

We designed the questionnaire by "Google form" which is distributed via e-mail to the professors and the students in the iMOST course. In the questionnaire, we gave a short

introduction and explanation of the included questions and research purpose to help to understand of the respondents and to ensure their reliable answers.

The questionnaire was designed to ask the evaluation of parameters belonging to goals, characteristics, then we coded them into Table 4.1, Table 4.2, and Table 4.3 for regression data analysis.

Table 4.1. Students' goals for co-creation (iMOST)

Coded Parameters	**Students' achievement goals**	**Coded parameters**	**Students' performance goals**
G_1	Goal to solve problems from current works	G_6	Goal to increase the number of publication
G_2	Goal to summary experience in an academic way	G_7	Goal to increase quality of publication
G_3	Goal to have chance to engage in other research		
G_4	Goal to gain academic knowledge		
G_5	Goal to gain method knowledge		

Table 4.2. Professors' goals for co-creation (iMOST)

Coded Parameters	**Professors' achievement goals**	**Coded Parameters**	**Professors' performance goals**
P1	Goal to complete the mission	P6	Goal to increase the number of publication
P2	Goal to gain insights in research		
P3	Goal to approach up-to-date issues in industries		
P4	Goal to gain knowledge for teaching		
P5	Goal to complete university's outreach mission		

Table 4.3. Characteristics impact for co-creation

Coded Parameters	**Objective characteristics**	**Coded Parameters**	**Subjective characteristics**
CH_1	Facilities (physical materials, …)	CH_6	Student motivation
CH_2	Type of students	CH_7	Student attitude
CH_3	Culture		
CH_4	Difference in experience		
CH_5	Difference in age		

4.3 iMOST course outline

Our society is on the movement of changing to become a knowledge-based one. Then, this awareness has the influence to market segmentation of Japanese universities in order to provide higher quality and adaptive employees for industries and societies. As a special institution with only graduate programs to educate professionals, J institute has been expected to become a pioneer of knowledge society. In addition, understanding the reality of industries' demand, Japan realizes the most important factors for them to restore its world competitiveness, which is "Management of Technology", "Management of Service" and "Corporate Strategy" (M Kosaka, 2010, Kameoka, Kondou, & Ikawa, 2007). In 2009, J institute launched the education course Management of Service, related to MOT before. Then, they merged MOT and MOS into the iMOST education of J institute (Yasuo Ikawa 2014).

iMOST education program launched the concept theory-practice evolution illustrated in Figure 4.2. The special point in this course is that qualified applicants must have work experience of at least three years, which is different from the education provided by other universities and institutes with no specified applicants, so there are only about 20-25 students in each course per year. Therefore, it is easier to discussion with each student, in order to refine the problem consciousness and awareness, which become a tacit knowledge. This is the co-evolution between theory and practice, which are the proposed as one of the iMOST concepts

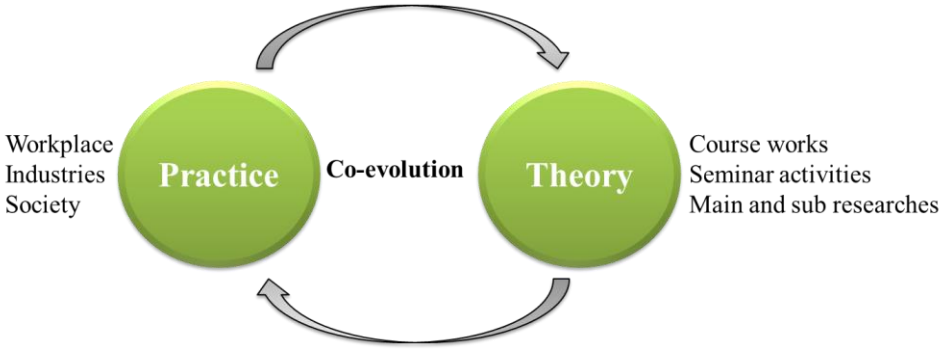

Figure 4.2 Theory-practice evolution in iMOST[3]

In iMOST, adult students learn the various things to cultivate "problem consciousness and awareness" in their professional life. Then, by applying studied things to practice, they could brush up their practical knowledge and find out a solution to their real problem. Practice mutually affects the theory the theory to support the cycle of evolution.

In addition, being designed as lecture type education, iMOST seminar system as "individual seminar”,"the entire seminar," and "voluntary seminar" is the core of the education to support learning and research activities of the students. "Individual seminar" is a chance for a single student to co-create with three or four professors to obtain advice for their master's thesis. It starts with the submission of the "research plan proposal", and twice a year. It is necessary for Innovation Management to cover a wide range of fields, so these seminars give chances for students to receive multiple pieces of advice from professors with various perspectives.

Based on both professors’ and students’, the systematic discussion will be done for solving the problems. In other words, professors and working students co-create their values through this academic way.

[3] http://www.jaist.ac.jp/ks/imost/

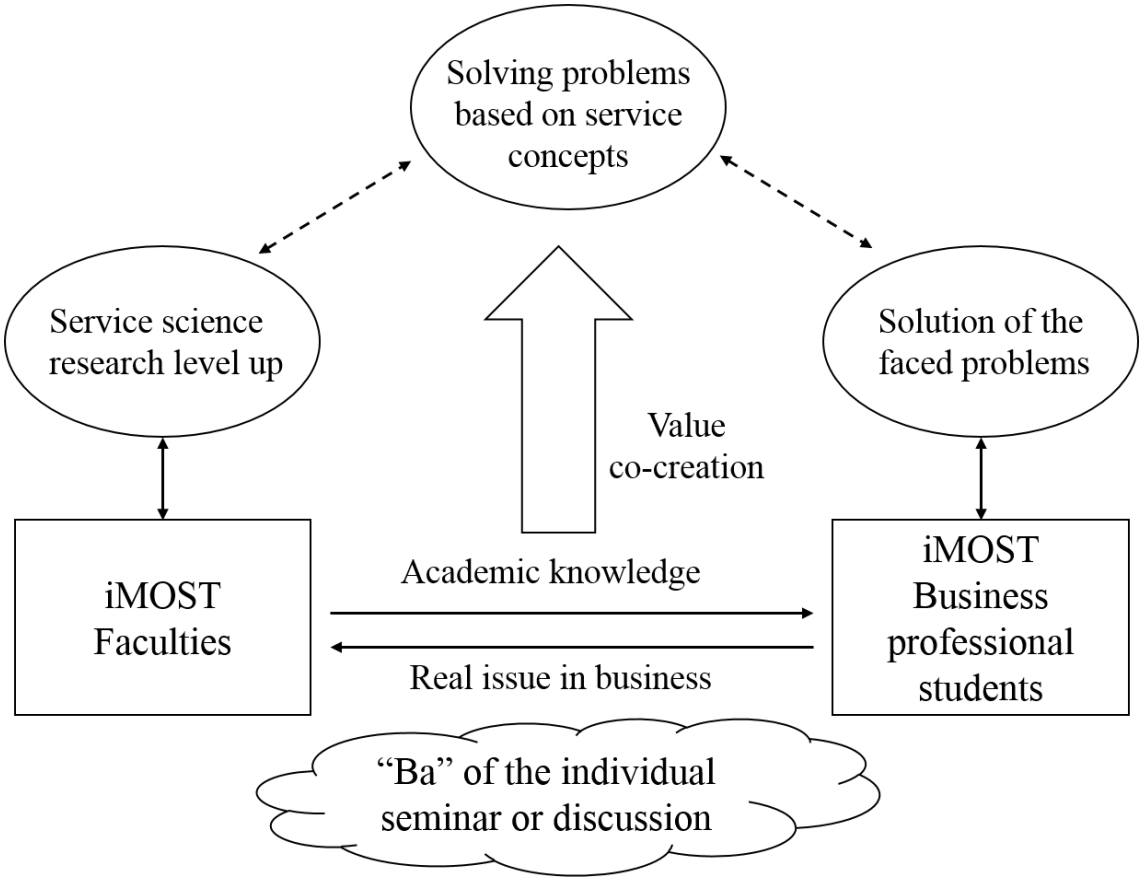

Figure 4.3. Value co-creation in iMOST (Kosaka 2010)

iMOST course was designed based on value co-creation between faculties and the business professional students. As the business professional, students bring their real working issues to iMOST to be discussed and solved with supporting from academic faculties. During trying to solve the problems with business professionals in the iMOST course, professors could level up their service science research. Because of desire to apply service science concepts to solve the problems in an academic way, adult students join the iMOST course and co-create with the professors. Adult students have to work besides learning, so almost time for researching is a direct discussion with their professors. Therefore, there are several special types of the seminar which is *Ba* to support both sides to co-create value together such as an individual seminar.

To co-create value, both professors, and business professional students have their own goals based on their own context, in which, priority goals are different. In the viewpoint

of the goal orientation and based on the conceptual model of value co-creation in iMOST, the goals of professors and students in the iMOST course should be divided into two types: achievement goals and performance goals to co-create. Through the interview of the preliminary study, we discussed with students and professors and we found out that: besides goals to co-create, there are other factors impacting on and supporting to co-creation process between professors and students such as objective and subjective characteristics. These factors are related to directly and frequently to co-creation between professors and students. Subjective characteristics are factors which could be controlled by co-creators in certain contexts while objective one exists without the influence of others in the context of co-creation process. Table 4.3 illustrates two types of characteristics factor discussed by iMOST students and professors.

4.4 Case study analysis results

4.4.1. Students' side: regression analysis results

Table 4.4. Correlations between dependent variables {G_i} and independent variable Y_1 & Y_2

Correlations										
		G_4	G_5	G_1	G_6	G_7	G_2	G_3	Y_1	Y_2
G_4	Pearson Correlation	1	.633**	.347*	.255	.332*	.534**	.227	**.559****	.238
	Sig. (2-tailed)		.000	.023	.098	.030	.000	.143	**.000**	.124
	N	43	43	43	43	43	43	43	43	43
G_5	Pearson Correlation	.633**	1	.159	.275	.250	.572**	.044	.431**	.245
	Sig. (2-tailed)	.000		.309	.074	.107	.000	.778	.004	.113
	N	43	43	43	43	43	43	43	43	43
G_1	Pearson Correlation	.347*	.159	1	.243	.073	.284	.475**	**.552****	.371*
	Sig. (2-tailed)	.023	.309		.116	.644	.065	.001	**.000**	.014
	N	43	43	43	43	43	43	43	43	43
G_6	Pearson Correlation	.255	.275	.243	1	.737**	.361*	.420**	.223	**.634****
	Sig. (2-tailed)	.098	.074	.116		.000	.018	.005	.151	**.000**
	N	43	43	43	43	43	43	43	43	43
G_7	Pearson Correlation	.332*	.250	.073	.737**	1	.485**	.416**	.252	**.601****
	Sig. (2-tailed)	.030	.107	.644	.000		.001	.005	.103	**.000**
	N	43	43	43	43	43	43	43	43	43
G_2	Pearson Correlation	.534**	.572**	.284	.361*	.485**	1	.365*	**.499****	**.487****
	Sig. (2-tailed)	.000	.000	.065	.018	.001		.016	**.001**	**.001**
	N	43	43	43	43	43	43	43	43	43
G_3	Pearson Correlation	.227	.044	.475**	.420**	.416**	.365*	1	.416**	**.593****
	Sig. (2-tailed)	.143	.778	.001	.005	.005	.016		.005	**.000**
	N	43	43	43	43	43	43	43	43	43

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

Table 4.5. Correlations between dependent variables {CH_j} and independent variable Y_1 & Y_2

Correlations

		CH_1	CH_2	CH_3	CH_6	CH_7	CH_4	CH_5	Y_1	Y_2
CH_1	Pearson Correlation	1	.289	.328*	.327*	.221	.428**	.203	.299	.155
	Sig. (2-tailed)		.064	.034	.034	.154	.004	.191	.052	.320
	N	43	42	42	42	43	43	43	43	43
CH_2	Pearson Correlation	.289	1	.443**	.501**	.452**	.454**	.308*	.309*	.131
	Sig. (2-tailed)	.064		.003	.001	.002	.002	.044	.044	.402
	N	42	43	42	42	43	43	43	43	43
CH_3	Pearson Correlation	.328*	.443**	1	.268	.329*	.428**	.412**	.376*	.168
	Sig. (2-tailed)	.034	.003		.086	.031	.004	.006	.013	.282
	N	42	42	43	42	43	43	43	43	43
CH_6	Pearson Correlation	.327*	.501**	.268	1	.814**	.394**	.132	**.604****	**.375***
	Sig. (2-tailed)	.034	.001	.086		.000	.009	.398	**.000**	**.013**
	N	42	42	42	43	43	43	43	43	43
CH_7	Pearson Correlation	.221	.452**	.329*	.814**	1	.273	.127	**.652****	**.360***
	Sig. (2-tailed)	.154	.002	.031	.000		.073	.410	**.000**	**.016**
	N	43	43	43	43	44	44	44	44	44
CH_4	Pearson Correlation	.428**	.454**	.428**	.394**	.273	1	.529**	**.437****	**.464****
	Sig. (2-tailed)	.004	.002	.004	.009	.073		.000	**.003**	**.002**
	N	43	43	43	43	44	44	44	44	44
CH_5	Pearson Correlation	.203	.308*	.412**	.132	.127	.529**	1	.198	**.485****
	Sig. (2-tailed)	.191	.044	.006	.398	.410	.000		.197	**.001**
	N	43	43	43	43	44	44	44	44	44

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

During calculating and analyzing the real data from the questionnaire, not all the parameters as independent variables G_i and CH_j was selected to do the regression. Based on the correlation analysis, we chose independent variables which had the highest correlation with the dependent variable Y_1 and Y_2 to do the multiple regression analysis (Table 4.4 & Table 4.5).

a) Evaluation of H1a: Goals positively influence to satisfaction of gaining knowledge in co-creation between professors and students.

Table 4.6. Results of multiple regression analysis 1

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.703[a]	.495	.456	.52517

a. Predictors: (Constant), G_1,G_2,G_4
b. Dependent Variable: FKnowledge

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	1.517	.430		3.532	.001		
	G4	.242	.110	.306	2.203	.034	.674	1.485
	G1	.237	.076	.382	3.121	.003	.866	1.154
	G2	.156	.093	.227	1.674	.102	.704	1.421

a. Predictors: (Constant), G_1,G_2,G_4
b. Dependent Variable: FKnowledge

ANOVA[a]

Model		Sum of squares	df	Mean Square	F	Sig.
1	Regression	10.535	3	3.512	12.732	.000b
	Residual	10.756	39	.276		
	Total	21.291	42			

a. Predictors: (Constant), G_1,G_2,G_4
b. Dependent Variable: FKnowledge

The "R" column represents the value of the multiple correlation coefficient R. R can be considered as one measure of the quality prediction of the dependent variable; in this case, Fknowledge. A value of 0.703 indicates a good level of prediction. The "R Square" column represents the R^2 value (also called the coefficient of determination), which is a number indicating how well data fit a proposed model. The value of 0.495 shows that independent variables explain 50% of the variability of our dependent variable, Fknowledge.

Based on the ANOVA table for the linear regression ($F(3, 39) = 12.732$, $p<0.001$), there is a relationship between the dependent variable Fknowledge and the independent variables G_4, G_1, G_2. Since the probability of the F statistic ($p<0.001$) was less than or equal to the level of significance (0.05), the null hypothesis that correlation coefficient (R) equal to 0 is rejected.

The research hypothesis is supported.

G_1, G_2, and G_4 was chosen to do the multiple regression because they have higher correlation score with Y_1, which was highlighted in Table 4.4.

Using the “Enter” method, it was found that at the significant level of 0.05, G_4 “goal to gain academic knowledge” and G_1 “goal to solve problems from current works” have positively significant influence on satisfaction of knowledge with $\beta G_4 = 0.242$, $\beta G_1 = 0.237$ & $R^2 = 0.495$. At the significant level of 0.1, G_2 “goal to summarize experience in an academic way” has positively significant influence on satisfaction of knowledge with $\beta G_2 = 0.156$ & $R^2 = 0.495$ .Thus, the hypothesis 1a is supported.

b) Evaluation of H1b: Goals positively influence to satisfaction of gaining publication in co-creation between professors and students.

Table 4.7. Result of multiple regression analysis 2

Model Summary[b]				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.754[a]	.569	.536	.66321

a. Predictors: (Constant), G_2, G_3, G_6
b. Dependent Variable: FPublication

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	22.625	3	7.542	17.146	.000[b]
	Residual	17.154	39	.440		
	Total	39.779	42			

a. Predictors: (Constant), G_2, G_3, G_6
b. Dependent Variable: FPublication

Coefficients[a]								
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	.211	.486		.434	.667		
	G_6	.325	.094	.414	3.465	.001	.774	1.292
	G_2	.201	.110	.213	1.832	.075	.815	1.227
	G_3	.324	.114	.341	2.850	.007	.772	1.296

a. Predictors: (Constant), G_2, G_3, G_6
b. Dependent Variable: FPublication

Both G_6 and G_7 have high correlation score with Y_2, but they also have a high correlation to each other (Table 4.5), so to avoid the collinear, we eliminated G_7, which has a lower correlation with Y_2 in comparison with G_6. Then, G_2, G_3, and G_6 were selected to do the regression in this test.

The "R" column represents the value of R, the multiple correlation coefficient. R can be considered as one measure of the quality prediction of the dependent variable; in this case, Fpublication. A value of 0.754 indicates a good level of prediction. The "R Square" column represents the R^2 value (also called the coefficient of determination). You can see from our value of 0.569 that our independent variables explain 57% of the variability of our dependent variable, Fpublication.

Based on the ANOVA table for the linear regression ($F(3, 39) = 17.146$, $p<0.001$), there was a relationship between the dependent variable Fpublication and the independent variables G6, G3, G2. Since the probability of the F statistic ($p<0.001$) was less than or equal to the level of significance (0.05), the null hypothesis that correlation coefficient (R) equal to 0 is rejected.

The research hypothesis that there exist a relationship between the variables is supported.

Using the Enter method, it was found that at the significant level of 0.05, G6 “goal for increasing the number of publication” and G3 “goal to have a chance to engage in other research” have positively significant influence on the satisfaction of publication with $\beta G6 = 0.325$, $\beta G3 = 0.324$ & $R2 = 0.569$. At the significant level of 0.1, G2 “goal to summarize the experience in an academic way” has positively significant influence on the satisfaction of publication with $\beta G2 = 0.201$, $R2 = 0.569$ (Table 4.7)

Therefore, hypothesis 1b is supported in the case of iMOST course.

c) Evaluation of H2a: Characteristics positively influence to satisfaction of gaining publication in co-creation between professors and students.

Table 4.8. Results of multiple regression analysis 3

Model Summary[b]				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.706[a]	.498	.474	.51043

a. Predictors: (Constant), CH_7, CH_4
b. Dependent Variable: FKnowledge

ANOVA[a]						
Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	10.613	2	5.307	20.368	.000[b]
	Residual	10.682	41	.261		
	Total	21.295	43			

a. Predictors: (Constant), CH_7, CH_4
b. Dependent Variable: FKnowledge

Coefficients[a]								
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	.873	.509		1.715	.094		
	CH_7	.554	.111	.576	5.009	.000	.926	1.080
	CH_4	.170	.070	.280	2.438	.019	.926	1.080

a. Predictors: (Constant), CH_7, CH_4
b. Dependent Variable: FKnowledge

The "R" column represents the value of R, the multiple correlation coefficient. R can be considered to be one measure of the quality of the prediction of the dependent variable; in this case, Fknowledge. A value of 0.706 indicates a good level of prediction. The "R Square" column represents the R^2 value (also called the coefficient of determination), which is the proportion of variance in the dependent variable that can be explained by the independent variables (technically, it is the proportion of variation accounted for by the regression model above and beyond the mean model). You can see from our value of 0.498 that our independent variables explain 50% of the variability of our dependent variable, Fknowledge.

Based on the ANOVA table for the linear regression ($F(2, 41) = 20.368$, $p<0.001$), there was a relationship between the dependent variable Fknowlege and the independent variables CH7 and CH4. Since the probability of the F statistic ($p<0.001$) was less than or equal to the level of significance (0.05), the null hypothesis that correlation coefficient (R) was equal to 0 was rejected.

The research hypothesis that there was a relationship between the variables was supported.

Both CH_6 and CH_7 have high correlation scores with Y_1, but they also have a high correlation to each other (Table 4.4), so to avoid the collinear, we eliminated CH_6, which has a lower correlation with Y_1 in comparison with CH_7. Then, CH_7, CH_4 was selected to do the regression in this test.

Using the “Enter” method, it was found that at the significant level of 0.05, CH_7 “Student attitude” and CH_4 “Difference in experience” have positively significant influence on value co-creation as the satisfaction of knowledge with $\beta CH_7 = 0.554$, $\beta CH_4 = 0.170$ & $R_2 = 0.498$ (Table 4.8). Therefore, hypothesis 2a is supported in the case of iMOST course.

d) Evaluation of H2b: Characteristics positively influence to satisfaction of gaining publication in co-creation between professors and students.

Table 4.9. Results of multiple regression analysis 4

Model Summary[b]				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.597[a]	.357	.308	.81873

a. Predictors: (Constant), CH_4, CH_5, CH_7
b. Dependent Variable: FPublication

ANOVA[a]						
Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	14.869	3	4.956	7.394	.000[b]
	Residual	26.813	40	.670		
	Total	41.682	43			

a. Predictors: (Constant), CH_4, CH_5, CH_7
b. Dependent Variable: FPublication

Coefficients[a]								
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	.386	.817		.472	.640		
	CH_7	.348	.178	.258	1.960	.057	.925	1.081
	CH_4	.181	.131	.213	1.384	.174	.677	1.477
	CH_5	.237	.104	.340	2.272	.029	.720	1.390

a. Predictors: (Constant), CH_4, CH_5, CH_7
b. Dependent Variable: FPublication

The "R" column represents the value of R, the multiple correlation coefficient. R can be considered to be one measure of the prediction quality of the dependent variable; in this case, Fpublication. A value of 0.597 indicates a good level of prediction. You can see from our value of 0.357 that our independent variables explain 36% of the variability of our dependent variable, Fpublication.

Based on the ANOVA table for the linear regression (F (3, 40) = 7.394, p=0.001), there was a relationship between the dependent variable Fpublication and the independent variables CH_4, CH_5, and CH_7. Since the probability of the F statistic (p=0.001) was less than or equal to the level of significance (0.05), the null hypothesis that correlation coefficient (R) equal to 0 is rejected.

The research hypothesis that there was a relationship between the variables was supported.

CH_6, CH_7, CH_4, and CH_5 are variables having a high correlation with Y_2 . However the correlation score between CH_6 and CH_7 is high (0.814>0.375 of correlation between CH_6 and Y_2), it means that the collinearity easily happens, so we had to eliminate CH_7 or CH_6 in the regression analysis. After consideration, we chose CH_7 because there is no missing value in CH_7, so it is better to choose CH_7 in this detail context. Therefore, CH_4, CH_5, CH_7 was chosen to be used for the regression.

By using the "Enter" method it was found that at the significant level of 0.05, CH_7 "Student attitude" and CH_4 "Difference in experience", and CH_5 "Difference in age" have positively significant influence on value co-creation as publication with βCH_7=0.398, βCH_4=0.181, βCH_5=0.237 & R^2 = 0.357 (Table 4.9). So hypothesis 2b is supported.

e) Discussion from students' side analysis

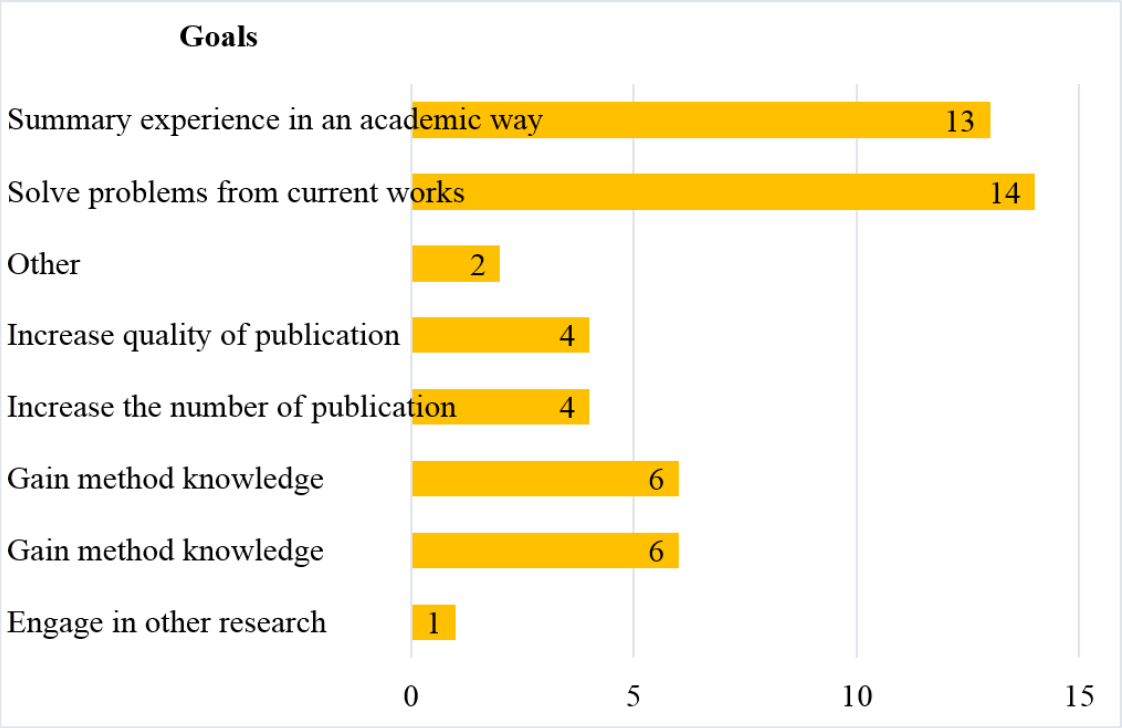

Figure 4.4. Important goals for co-creation

In the survey, we asked the students for the most important goals among 7 given goals (Which is your most important reason?) and the results are illustrated in Figure 4.4. We found that G_1 (Goal to solve problems from current works), and G_2 (goal to summarize the experience in an academic way) are the most important goals, followed by G_4 (Goal to gain academic knowledge) and G_5 (goal to gain method knowledge).

Regarding the value such as knowledge, G_4 (goal to gain academic knowledge) has the strongest effectiveness with the coefficient $\beta = 0.242$, and the next one is G_2 (goal to summarize the experience in an academic way) with the coefficient $\beta = 0.156$ and G_2 (goal to solve problems from current works) with the coefficient$\beta = 0.237$. These results show that the G_4 (goal to gain of academic knowledge) is very important for iMOST students.

Because iMOST students working in the industries have strong motivation to join this course for studying from and sharing knowledge with professors who are experts in the academic sector. The goal to summarize the experience in an academic way is one of the special characteristics of the iMOST students, even old students (Who already retired, or have much working experience. They join this course without the goal of getting a degree, and they hope that they could discuss and share knowledge with the academic professors, and learn how to summarize their working experience in an academic way. The last factor is G_2 (goal to solve problems from current works), which is suitable for the characteristics of the working students, not young ones without or much fewer experience students. Because working in the industries, they have to face too many real problems, they need to gain their knowledge for finding out the solution for these problems or similar things. In addition, all the goals in this relationship are the achievement goals. This means that the intrinsic motivation and individual interest of improvement in their knowledge, skills, and abilities effect on value in co-creation process with their partners.

In terms of publication, G_6 (goal to increase the number of publication) has the most influence on the satisfaction of publication. The goal is the motivation for the students to co-create with their professors, so they themselves become more active to publish their researches. Therefore, it creates more chance to increase the number of publication. Next factor, significantly influencing satisfaction of publication, is G_3 (goal to engage in other research), especially when taking part in a conference. Consequently, they will be more satisfied with publication. Among 3 influencing factors, the strongest one is a performance goal because the publication is competitive and reflect abilities and the researchers' competence.

In the correlation between satisfaction of knowledge and their characteristics, the CH_7 (students' attitude) plays an important role revealed by the large value of the correlation coefficient 0.554, then the difference in experience. This shows that the subjective

characteristics are very important. When students have a high positive attitude in learning, they will join the co-creation process actively and create value co-creation more effectively.

Regarding publication and characteristics relationship, CH_7 (students' attitude) still has a strong positive influence on the satisfaction of publication, then CH_4 (difference in experience) and CH_5 (difference in age). Because of various experience students in iMOST course, they may satisfy with gaining publication in different levels, for example several senior older iMOST students prefer to write journal papers to summary their achievements after a long time working in the industries, however, some younger ones with less experience are not so interested in writing journal papers, but only co-creation with professors to solve their real problems.

4.4.2. Professors' side: interview data analysis

Through the first observation and interview after an individual seminar of the iMOST course, we summarized and drew out the goals to co-creation value shown in Figure 4.5. After that based on the questionnaire we once again confirm the opinion of professors about goals, satisfaction and other impact factors to co-creation value. The summary data was illustrated in Figure 4.5, Figure 4.6, and Figure 4.7.

As the results in the questionnaire, 50% respondent professors agreed that "to complete your mission" and "to gain insights in the area of your own research" are important goals to co-create value with their students. The "goal for completion of the mission" is the nature of education, and "goal to gain insights in research" was referred to be the same as the goal for a gain of knowledge of the professors. Therefore, we should consider this goal as a significant point. The next important goal is "to approach the up-to-date issue in industry", which is also set as the main purpose of the theoretical concept of iMOST course. This goal was regarded as a goal for a gain of knowledge, the practical knowledge in the industry to professors. Directly asking the professors for the goal for a gain of knowledge related to practical problems, we found most professors agree that it is considerably important. Regarding the satisfaction related to gaining knowledge, the majority of professors answered at the level 3 (neutral), 4(satisfaction) and 5(very satisfaction) of the satisfaction (Figure 4.6).

The discussion with professors shows clearly their opinions about the values in co-creation with the students. We could see the professors' opinion after an individual seminar as follows:

- ✧ Students here are all adults, iMOST students have been doing research on their own works, so they have a lot of knowledge about their own works, and sometimes they know better than us. We tried to provide more objectives of academic perspectives to them. …… We, professors, can learn a lot from their experiences and knowledge,

several students work on a field which is totally unknown to us, the unknown business areas for us….. I think the relationship between the professors and students in iMOST is mutual learning, we can learn from them…… Sometimes students gave me many hints to my research insight, useful information for my research. … especially in my case I have never work for Business Companies, but students have their field, the field for our research project, I can't define my own theoretical model through the students by the research project, and the students could have their own model that could be very useful for our research. It is co-learning, co-evolution between professors and the business students in iMOST[4]

- ✧ Every topic in iMOST is related to my research.[5]
- ✧ I would like to know other professors' opinion not only students'. Other comments of participants including professors and students.[6]

Regarding the satisfaction related to gaining publication shown in Figure 4.6, there is a fluctuation of the answers, so it is not clear to give a conclusion for professors' satisfaction in this part. Hence, with the characteristics of iMOST course, professors seemed to prefer considering co-creation to create new knowledge through solving real problems in the industry.

Figure 4.7 summarized the result of professors' opinion about characteristics influencing to value co-creation. The most important factors are "students' motivation", with 85.7% and "students' attitude" with 71.4% agreement of very important. In the face-to-face discussion, all three interviewed professors also mentioned to students' motivation and students' attitude several times as an important point for having a good co-creation in the seminars:

[4] Interview with Professor Katsuhiro Umemoto in March 2015 in Tokyo Japan

[5] Interview with Professor Naoshi Uchihida in March 2015 in Tokyo Japan

[6] Interview with Professor Yoji Koda in March 2015 in Tokyo Japan

- ✧ There is no special facilitator in this seminar, so I think that the most important thing is good materials prepared by the students…..[7]
- ✧ Depend on the materials, if their content is very interesting, we will be interested in discussion. In case the content is not so interesting, we have to come up with new idea and the facilitation is very difficult [8]
- ✧ Students should prepare handout materials for discussion...If the students do not prepare the materials for the seminar, I think it will waste much time of both professors and students[9]

According to the professors' answers, their motivation is also significant in co-creation process (50% at "very satisfaction" level, 35.7% at "satisfaction" level). Because co-creation is a dyadic relationship which needs to be built up from both sides. Especially, in professors and students relationship, the professors easily put themselves in a higher level, leading to a gap obstructing co-creation with students. In iMOST, the students are adults, so professors cooperated with them as partners. In the discussion, when the professors mentioned their motivation, they also led to values of co-creation to show that the co-creation in iMOST is an effective example, and the professors have a strong motivation to join the co-creation process with students because they believed that they could obtain the values. The following discussion gave us more detail in this matter:

- ✧ Faculty members don't have a specific field, especially in my case, I have never worked in a Business Company, but students have their specific field. Sometimes, in the field of our research project, I could not define my own theoretical model, but the students could have their own model which could be very useful for our research. This is co-learning, co-evolution between professors and business students in iMOST.

[7] Interview with Professor Naoshi Uchihida in March 2015 in Tokyo Japan
[8] Interview with Professor Yoji Koda in March 2015 in Tokyo Japan
[9] Interview with Professor Katsuhiro Umemoto in March 2015 in Tokyo Japan

In the iMOST course, the students are encouraged to conduct the action research. Action research focuses on their problem solving in their works, so it is good for both our research and their practice.[10]

- ✧ Sometimes the students and I joined the research projects, for example, the projects related M2M communication, and we applied our proposal to funding agencies so we got money. We have regular meeting with the students from companies (Hitachi and Toshiba). It is one of an example of co-creation between students and professors.[11]
- ✧ In my voluntary seminar, we read a book about S-D logic, reading is very interesting because the interpretation of somethings is difficult so we mainly discussed on unclear points in the seminar. Through discussing with the students, sometimes I found out that my interpretation was limited and narrow, and I feel I could extend my vision to wider and some students make very good questions such as " Why is it?", which was very interesting. It is not the theory but discussing with the students especially the adult ones is very interesting, sometimes helpful to deepen my understanding.[12]

The difference in age seems not to be an important factor but difference in experience was a factor having the influence to co-creation between professors and students in iMOST. Regarding iMOST students and regular students in the same institute, professors mentioned that there is some difference between two types of the students because of experience gap as follows:

- ✧ In Ishikawa campus, sometimes we are not critical, but students think that we are critical, I think because they have no social experience. The gap comes from the social experiences. …… in the iMOST course, we are enjoining the discussion. We can concentrate on discussion.[13]

[10] Interview with Professor Katsuhiro Umemoto in March 2015 in Tokyo Japan
[11] Interview with Professor Naoshi Uchihida in March 2015 in Tokyo Japan
[12] Interview with Professor Yoji Koda in March 2015 in Tokyo Japan
[13] Interview with Professor Yoji Koda in March 2015 in Tokyo Japan

- ✧ … Because of age and experience differences, the Ishikawa campus students are nervous in the discussion. … I think that the relationship between the professors and students in iMOST is mutual learning, we can learn from each other.[14]
- ✧ Compare with MOT, the ability of young students is low because of fewer experiences. (Of course, some young students are very excellent).[15]

Facilities, culture, and the type of the students was not discussed in detail. Facilities and culture did not seem to be important factors to co-creation process between professors and students in the iMOST course.

Physical environment as facilities was not considered as important factors, however, *Ba* played a key role in supporting the process. The ideas of three types of seminars were the *Ba* in this course and they create for both students and professors values:

- ✧ Individual seminar is the most interesting[16]
- ✧ Each seminar has each meaning. Volunteer seminar, we invite speaker so many students to come to hear and discuss the topic with a speaker. … Today we have four students, for me each student's topic is new so I feel very interesting.[17]
- ✧ I think volunteer seminar is the most interesting to me because I can choose any topic.[18]

[14] Interview with Professor Katsuhiro Umemoto in March 2015 in Tokyo Japan

[15] Interview with Professor Naoshi Uchihida in March 2015 in Tokyo Japan

[16] Interview with Professor Yoji Koda in March 2015 in Tokyo Japan

[17] Interview with Professor Naoshi Uchihida in March 2015 in Tokyo Japan

[18] Interview with Professor Katsuhiro Umemoto in March 2015 in Tokyo Japan

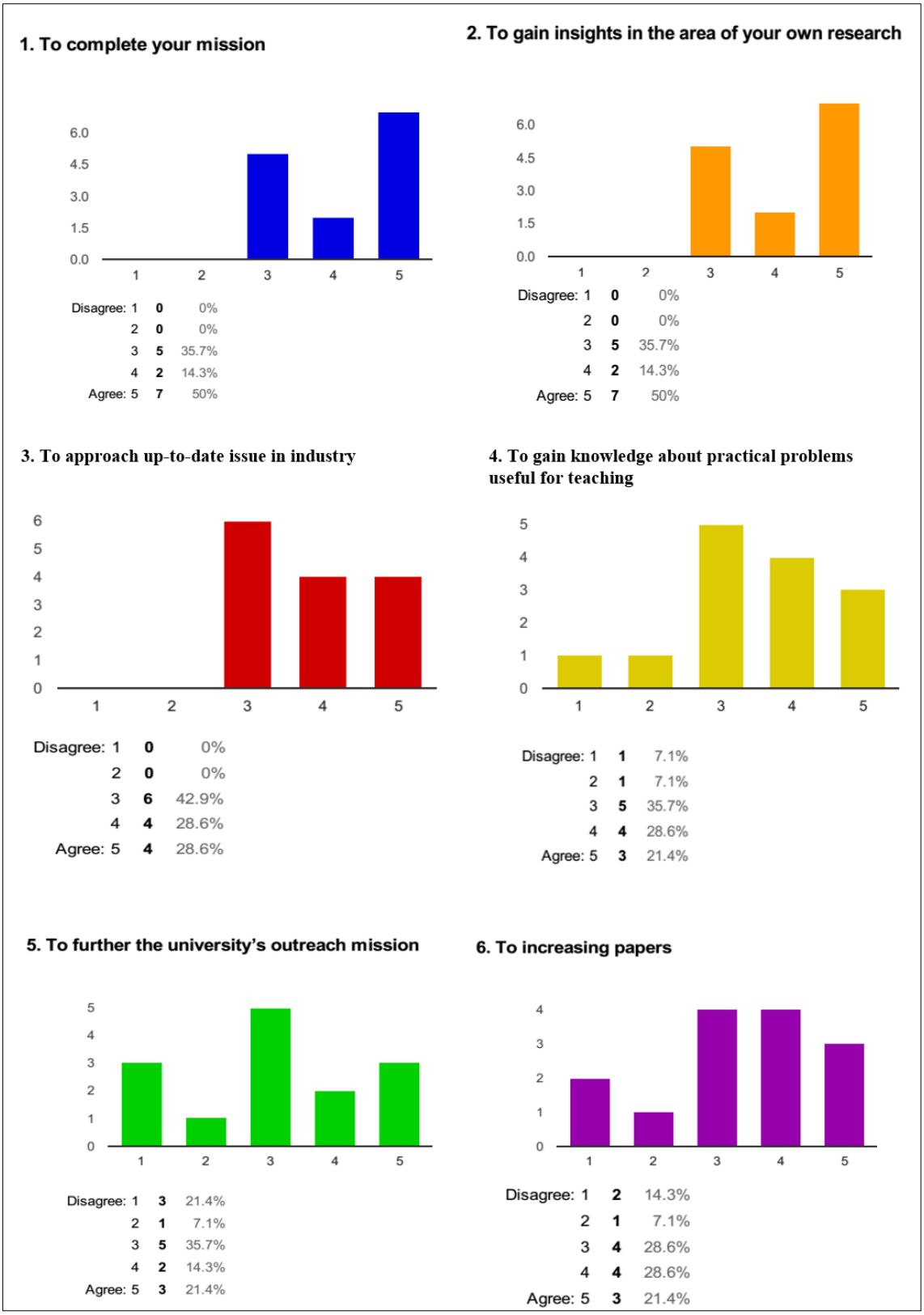

Figure 4.5 Professors' goals to co-create value

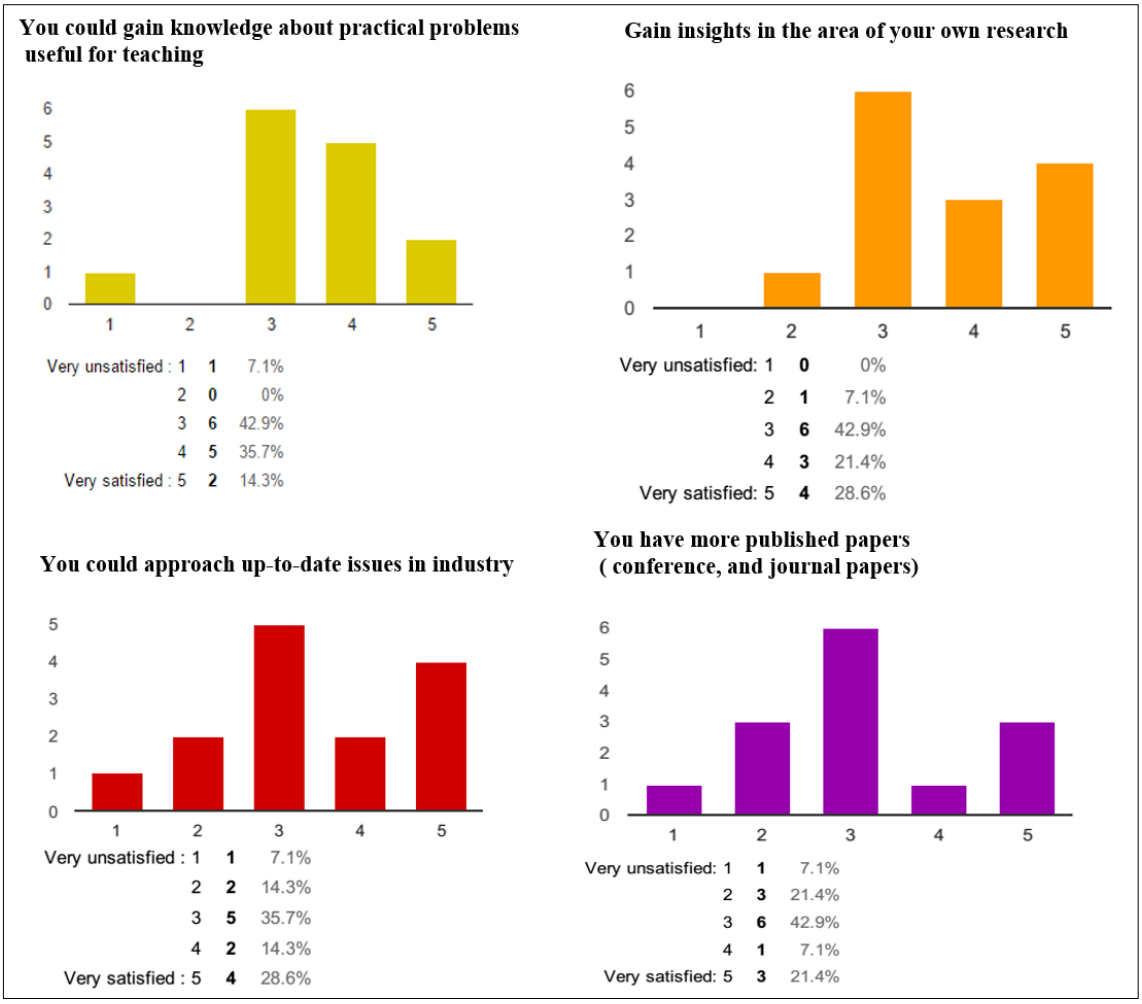

Figure 4.6 Professors' satisfaction related to gaining knowledge & gaining publication

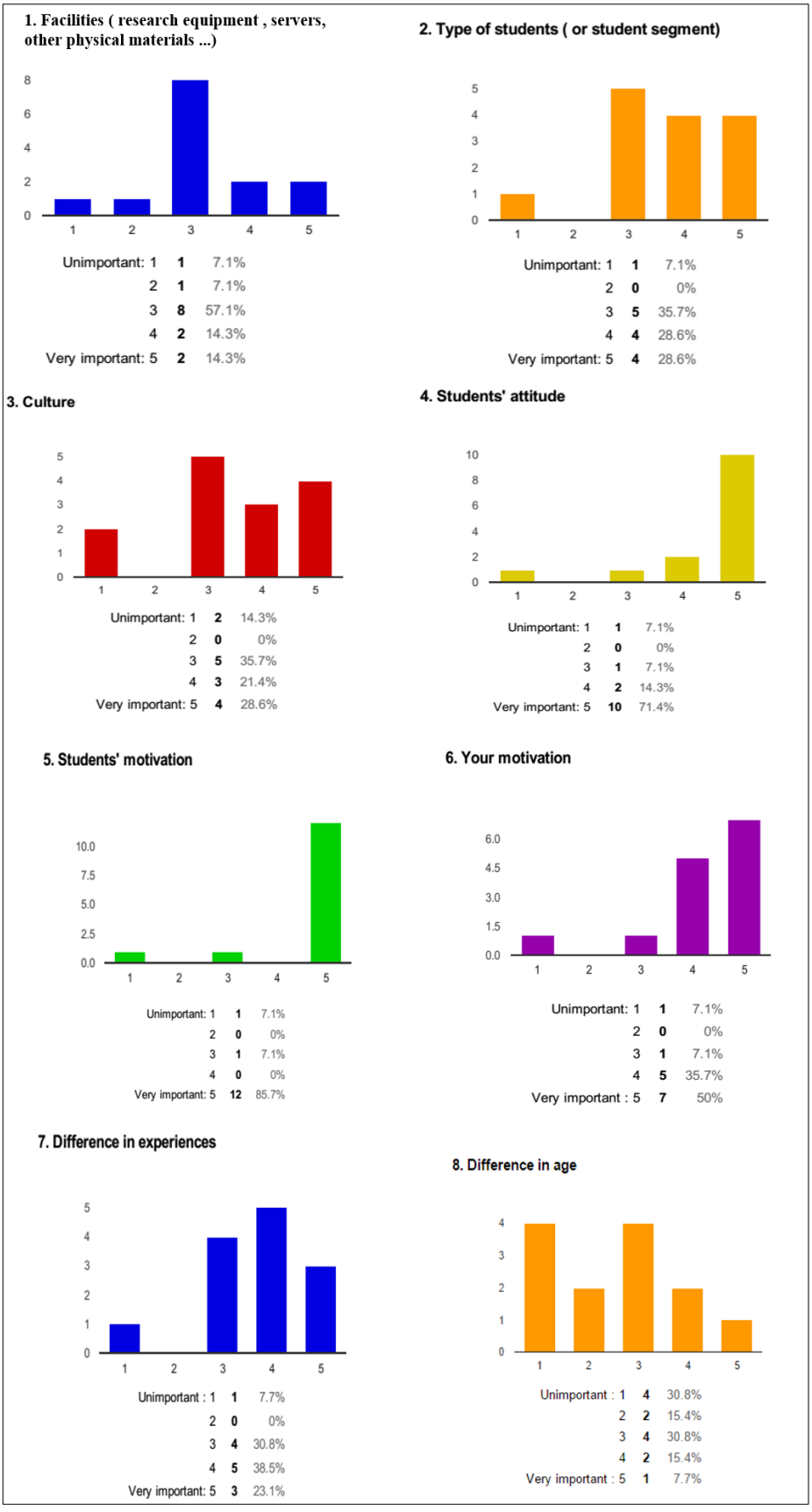

Figure 4.7 Professors' opinion about characteristics influenced to value co-creation

4.5 Conclusion

$$Y_1 = 1.517 + 0.242G_4 + 0.237G_1 + 0.156G_2$$

$$Y_2 = 0.211 + 0.325G_6 + 0.324G_3 + 0.201G_2$$

$$Y_1 = 0.873 + 0.554CH_7 + 0.170CH_4$$

$$Y_2 = 0.386 + 0.348CH_7 + 0.235CH_5 + 0.181CH_4$$

Figure 4.8. Summary regression model of students' side

From the viewpoint of professors and students in the iMOST course, we could conclude that the iMOST is an effective case for our proposed model. In this case, dominant values of co-creation between both professors and students are gaining knowledge and gaining publication.

From students' opinion, the factors having an influence on co-creation process are both achievement and performance goals, but most of them were achievement goals. The students themselves should desire to join the co-creation relationship actively. In addition, subjective characteristics such as student motivation, student attitude were found to be the most important factors influencing to co-creation process. This is the evidence to say that co-creation is a human experience process as an experience environment in which consumers can have active dialogue and co-construct personalized experiences (Prahalad & Ramaswamy 2004). The summary regression result is illustrated in Figure 4.8.

From the professors' opinion, completing the mission, gaining insight in the area of their own research and approach up-to-date issues in the industries are the main goals to co-create with students in the iMOST course. And students' attitude, motivation, professors'

motivation, and the difference in experience are influencing to co-creation process. In sum, both professors and students in iMOST course satisfy with the course and their co-creation because they could gain the mutual values which are gaining knowledge and gaining publication to their research and careers.

In sum, Table 4.10 illustrates our comparison of the case and hypotheses. From both sides analysis, the hypothesis 1 and 2 were verified because the results reflect the hypotheses. In hypothesis 3, there is a limitation that we could not verify from the students' side, but professors' side. From the professors' side, the hypothesis was supported.

Table 4.10 Comparison between hypotheses and iMOST case through Professors' and students' side

Hypothesis	**iMOST case**	
	Professors' side	**Students' side**
Hypothesis 1: Goals have positive influence to value co-creation.	In iMOST, following goals is important and have positive influence to value co-creation with students: 1. Goal to complete your mission. 2. Goal to gain insights in the area of your own research. 3. Goal to gain knowledge. 4. Goal to approach the up-to-date issue in the industry.	Fig. 4.8 is the summary of goals have the influence to value co-creation with professors. The higher weight is, the more that goal has the influence to value co-creation. Value co-creation in this case including gaining knowledge and gaining publication. 1. Goal to gain academic knowledge 2. Goal to solve problems from current works 3. Goal to summary experience in an academic way 4. Goal to increase the

		number of publication 5. Goal to have chance to engage in other research Especially, goal to summary experience in an academic way
Hypothesis 2: Characteristics have positive influence to value co-creation.	In iMOST, the students are adults, so professors cooperated with them as partners, and the professors have a strong motivation to join the co-creation process with students because they believed that they could obtain the values. These following factors strong impact to co-creation process: 1. Students' motivation 2. Students' attitude 3. Professors' motivation	Fig. 4.8 is the summary of goals have the influence to value co-creation with professors. The higher weight is, the more that goal has the influence to value co-creation. Value co-creation in this case including gaining knowledge and gaining publication: 1. Student attitude 2. Difference in experience 3. Difference in age
Hypothesis 3: Service Ba facilitates positively to co-creation between professors and students.	Service *Ba* played a key role in supporting to co-creation process. The ideas of three types of seminars were the *Ba* in this course and they create for both students and professors values: 1. the individual seminar, 2. volunteer seminar, and 3. the entire seminar	N/A

Chapter 5. Case studies of research laboratories in Japanese universities

5.1 Introduction

In this chapter, we investigate totally 3 cases, which are 3 Japanese research laboratories. We named them A, B, and C Lab. under the management and supervision of *A, B, and C* professors. In the context of this research, we focus on research-oriented laboratories in Japanese graduate education, so we determine the following rules to choose the cases: first of all, it must be a research-oriented laboratory. Secondly, it must be an international laboratory, which means students come from various countries besides Japan. Thirdly, the majority of students are graduate students, which are master and doctoral students. Finally, the laboratory management must have notion and organization adapted co-creation value with students, the achievement of the Lab. sticks to the skill, knowledge, and development of the students. We believed that with three specific characteristics, the cases we chose could represent to the research-oriented laboratories in Japan graduate education based on value co-creation viewpoint.

5.2 Methodology and data analysis

Multiple methods were used for primary data collection methods such as interview, documents, and website survey. Interview data was collected from following resources: face-to-face interviews with professors, assistant professors, and students. Besides, survey websites and annual books of the laboratories supported for a rich description of the operation of the cases. In order to ensure the objectiveness of the data, we conducted the interview privately and keep confidential information. Professors and students could not know the other sides' questions and answers, so they could feel freely to answer the interview. Because the questions and the research theme are a focus on their real experience, so the interviewees were contributed and shared their opinions

enthusiastically and honestly.

5.3 Service science research laboratory

5.3.1. Outline of the service science research laboratory

J institute is the first Independent National Graduate University without Undergraduate Division in Japan. The admission criterion for students with diverse backgrounds is the special and unique characteristic of J institute. Founded in October 1990, J aims to carry out graduate education based on research at the highest level in advanced science and technology and establishes an ideal model of graduate education for Japan. J was incorporated as a National University Corporation in April 2004. They clearify the goals for J to develop leaders in society or industry who hold credible expertise in the frontier science and technology, broad perspectives, high level of autonomy and communication ability, through its systematic advanced graduate education. To contribute to societies with research outcomes, and create a center of excellence for the advancement of researches for solving problems of our world and society and develops new fields through a variety of basic research. In addition, to foster active global human resources by promoting faculty and student exchanges with leading institutes overseas and globalizing its education and research.

A Lab. is a laboratory of Service science the J institute. The knowledge creation and its applications for a service innovation are a central research subject of the Lab. It is said that the 21st century will be important because of the industrial competitiveness acquisition with the international creation of the innovation by service. In service innovation creation, invention and just discovery of the technology used as an element are not enough, but it is required by connecting this to a citizen's needs or social problem solving to produce economic value. For the purpose, new knowledge creation required for a service innovation is indispensable by the purpose intention approach. At a laboratory, by fusion of system engineering and knowledge science, the new methodology

of innovation creation is built and the deployment to a concrete example is aimed at.

With this aims and vision, this new and potential Lab. is growing fast and attracting more and more both domestic and international students. In 2013, there were the most international students in this Lab. with 13 students, including six doctoral students and seven master students with two Japanese, three Vietnamese, one Taiwanese, one Korean, one Bangladesh, and five Chinese students. Therefore, it is very global and friendly environment in this Lab.

Operation concept of the Laboratory

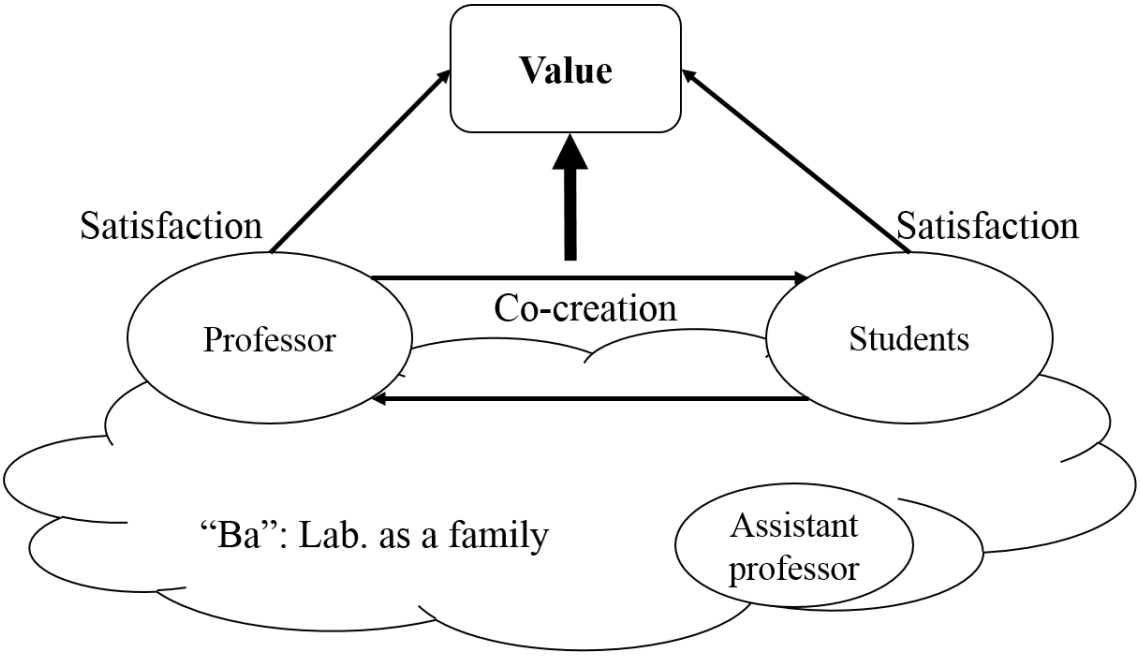

Figure 5.1. Operation concept of A Laboratory

In this case study, all the members share the mutual vision to become the No.1 of service laboratory in Asia in service science. The professors and assistant professors create a *Ba* as a family atmosphere for the student to research in a comfortable way. Based on a good *Ba*, students became more active to co-create and contribute to the Lab. and the professors. Even though students considered professors as their "Big father", there is not a hierarchical relationship but dyadic one because the professor receives value from the co-

creation process and satisfied with this (Figure 5.1).

5.3.2. Case Study Analysis

a) Professor's side: interview data analysis

In the viewpoint of professor A, his laboratory's atmosphere is "family atmosphere". He considers students as his children and often shares the vision with students. Their dream is to become a No.1 Lab. of Service Science in Asia. He usually shares the dream with students and creates for them motivation to research in service science. He said that he, the assistant professor and students should co-create based on trust to each other. In research seminars, he often makes the good suggestions for students. It is his way to make a good atmosphere in the research meetings.

"Understanding students for education management works" and "multidimensional co-creation in educating and culture experiences" are two important values for professor *A*. He introduced that his Lab. includes many international students such as Korea, Viet Nam, Taiwan, China, and Bangladesh, so he can experience knowledge of the international cultures and apply it into his both management works and education such as laboratory management or school management. When mentioning about alumni, he said that: "After graduation, students' research and presentation ability is growing up, so they can have good activities in companies". In other words, communication skill & ability is obtained a value for students in A Lab.

b) Students' side: interview data analysis

In the viewpoint of students, there are several ways which they are doing to make a good atmosphere in communication in A Lab. First, they suggested that careful preparation for the presentation or for the meeting is a formal way. Second, as an informal way, a female student mentioned that she often provides service for her professor such as making coffee in the morning, designing parties in Lab. She also said that providing the service based

on the attitude of considering professor *A* as her father. Another opinion of this matter is trying to express the thankful attitude after receiving knowledge from professor's comment, and making a fun environment like telling jokes. According to most of all opinions, their professor is gentle, friendly, very open-mind and enthusiastic in discussing with students. It is the way they see *A* sensei's[19] method of making the good atmosphere in communication. However, there is one person said that: "I don't think professors have to make a good atmosphere for communication. It depends on the relationship between students and professors. If the relationship is bad, so the communication cannot be comfortable". Therefore, we assumed that making a good relationship in her opinion is the same with making a good atmosphere.

4/5 interviewed students agreed that solving problem is the most important value co-creation they get. 3/5 thought that it is communication skill & ability. 2/5 thought that publication works and the same number of students chose education service quality are their value after co-creating with their professors. There are two people, respectively mentioned to multidimensional co-creation in educating and culture experiences and understanding students for education and management works are their value.

The opinion about the assistant professor's role is a little different. Two of them said that he is a mediator/ bridge between them and professor *A*. One said that he is a supporter for the academic comments. One also supposed the same idea of receiving good comments from him because his ideas are younger and more international than the professor's ideas.

Table 5.1 shows the summarization of the interview data.

[19] ("sensei" is the Japanese word means teacher, master, and doctor. This is a suffix with names of teachers as an honorific (http://jisho.org/))

Table 5.1. Service Lab. – Summarized data

	Co-creation process	Value of co-creation process
Professor	**Usually sharing the vision with students** • Family atmosphere • Value-in-trust between professor and students, assistant professor and students • Making good suggestion for students **Four phases orders: BACD**	**VCC for professors** • g: understanding students • for education and management • works • f- Multidimensional co-creation in educating and culture experiences **VCC for students:** *"After graduation, students' research and presentation ability are growing up, so they can have good activities in companies"*
Students (n = 5)	**Creating positive atmosphere:** • Formal: good performance preparation • Informal: Offer many services (making coffee, tea for professor) , making parties in Lab., professor as father • Express the thank-you attitude with professor • Making fun environment, tell jokes **Professor creating positive atmosphere** • Depend on relationship between professor and students • Gentle and friendly talking, no push students but encourage students. • Open-mind, enthusiastic and happy discussion **Four phase orders:** 1/5 people: BDCA; 2/5 : BACD 1/5: ABDC; 1/5: ADBC (process)	**VCC for students** • 4/5 people: b- Solving problem • 3/5: a- Communication skill & ability • 2/5: c- Publication works • 2/5: e- Education service quality • 1/5: f- Multidimensional co-creation in educating and culture experiences • 1/5: g- Understanding students for education and management works

5.4 System science research laboratory

5.4.1. Outline of the system science research laboratory

O university is located in Osaka prefecture of the Kansai area of Japan, where our history has shown that the tradition of creative and innovative ideas has long existed. In 2005, O university has been merged as one great engine for Osaka and it has restarted its endeavors into newer and greater academic pursuits. With around 8,000 students and 900 faculty and staff members, its campuses try to make an ideal academic setting for new students to gain essential knowledge while exploring new frontiers. Collaborative work among the various departments and schools is also encouraged here.

B Lab. belongs to Management Information System group in the graduate school of engineering of O university. B Lab. with other 8 groups belongs to the department of Computer Science and Intelligent Systems. They are strong research groups in O university with many achievements contributing for O. Since 2002, B Lab. was established with the vision is to contribute to developing new Industrial Engineering Technology for the advanced broadband society, the aged society, and the global cooperative society. The mission of B Lab. is to develop the new idea on management information system. It means research computer systems on managing information for decision and knowledge to increasing working style in companies.

B Lab. has been building up based on a good relationship between professors and students. The environment has been designed conveniently for students' research and daily life.

5.4.2. Case study analysis results

a) Professor's side: interview data analysis

In the viewpoint of professor B, he always tries to make a good atmosphere for the Lab. in general and for every discussion with students in particular. In terms of daily life, there are many events such as making Udon, soba together which are kinds of Japanese

traditional noodle; playing HyakuninIsshu, a Japanese old game; designing an annual 2-day trip for members in the Lab.; and having the bowling contest for Lab. entertainment activities, etc. He said that it is like “family atmosphere” in his Lab. to provide a good education service for students. In terms of research activities, he encourages and gives a chance for students to study abroad to polish their knowledge and skills. Making clear schedules for students in different periods based on their common goals is also useful for both he and students to discuss and get targets. With this characteristic, it is easier for both he and students to share information and feeling together in both research and daily life activities. He said that he not only provides for students as teaching activities but also receives and learns new knowledge and experiences such as understanding international cultures from students.

He introduced the assistant professor, Dr. *W* in his Lab. in the mention of taking a small meeting with students. Normally, before and after B Lab. seminars, students can meet and discuss with *W* sensei to discuss. *W* sensei assists *B* sensei to discuss regularly with students. In other words, *W* sensei helps both *B* sensei and students in co-creation of this Lab.

Students assumed that they could get much values from co-creation with their professor. 4/7 people identify the value is communication skill & ability, 3/7 chose education service quality, 2/7 chose solving the problem and the same number with publication works value, and one person suggested that knowledge and research method is his gained value. They mentioned that their knowledge, skill, and goals could be upgraded and modified after the discussions with their professor and assistant professors.

In the viewpoint of the assistant professor, he usually shares the vision and goals with students in their Lab and discuss with them anytime he can such as a coffee time, or coming to students place to talk, etc. He supported to students in presentations techniques before discussing with *B* sensei because he knows that they are a lack of the techniques.

He agreed that his role is as a support mediator between *B* sensei and students. He also mentioned some important value for both students and students in co-creation of the professor and him with students such as communication skill & ability, solving the problem for students, and solving the problem for the professor.

Table 5.2. System research Lab. - Summarized data

	Co-creation process	Value of co-creation process
Professor	**Sharing with students:** • Meeting in every Friday morning • Survey paper meeting **Creating positive atmosphere:** • Making clear schedule annual two-day trip • Making Udon together • Playing bowling, • Making the bowling contest • Making and using SNS (Facebook, alumni pages, etc.) • Having New York and Tokyo parties for all members and alumni **Four phase orders: ABCD**	**VCC for professors:** • g: understanding students for education and management works
Students (n=7)	**Creating positive atmosphere:** • Prepare carefully for presentations • Smile, have the best joke, act friendly • 1 person: " I don't care" **Professor making good atmosphere:** • Professor's characteristic: friendly, nice, both gentle and strict • Same goals • Suggesting for student by asking questions **Four phase orders:** • 4/7 people: BACD for goals • 1/7: ABCD, BADC, BCDA	**VCC for students** • 4/7 people: a- Communication skill & ability • 3/7: d- Education service quality • 2/7: b- Solving problem • 2/7: c- Publication works • 1/7: Other- Knowledge and research method

5.5 Computer communication laboratory

5.5.1. Outline of the computer communication laboratory

U university is located in Fukushima Prefecture of Japan. Their main mission is to develop students into productive members of knowledge-based society through its education and research. The U university is a young university, however, it provides international education and research environment, and they focus on the core value of the human resource, who contributes to their development. In order to establish the graduate school open to the world, English is used here as the common language, faculty members from almost twenty countries around the world (international faculty ratio: Around 40%), and 44% students come from oversea. In terms of human resource development, students here is encouraged to experience in many different aspects, to be creative and to recognize innovation, but the most important thing is that they must be happy.

Belonging to the U university, C Lab. is a computer communication laboratory with 2 outstanding Vietnamese professors and both Vietnamese and Japanese students. Currently, there are 10 graduate research students including 7 Vietnamese and 3 Japanese ones. Following the institute goals, the C Lab. also an international Lab. and there is a close relationship between professors and students to encourage students to experience the research worlds in many aspects. Both professors and students in this Lab. are very active researchers, they joined many domestic and international conferences with noticeable awards. They also obtain many research funds, which play a significant role to support their research activities.

5.5.2. Case study analysis

a) Professor's side: interview data analysis

In the viewpoint of professor C, the students are his colleges in research and he always encourages students to experience both in daily life and in research activities in various

aspects. He keeps a good atmosphere in his Lab. by understanding students' abilities and research level. He considers the feeling of students in discussion to avoid them from boring:

- ✧ The most important are the balance of students' abilities. If some students run very fast while some runs very slowly, they could not catch to each other and it makes the discussion boring. Both advanced students and others could be sleepy..... I will separate students into 2 groups: 1 for advanced research and the others. ....

The professor *C* creates chances to students to sharing and working more effectively by tutorial group discussion. In which, each student will have to teach other members some topics by tutorial group discussion. That's the way he created a good atmosphere for the discussion with students and among students together. In his Lab. human resource is the most important thing, so he kept in his mind the students' feeling and healthy in the laboratory management.

- ✧ Just have everything easy because we should focus on efficiency and productivity. .... I think no good body, no good brain.

In terms of factors important level in co-creation with students, he considered many important factors (level 5: very important) such as, laboratory atmosphere, goal to increasing number of his academic publications, goal to increase quality of his academic publications, goal to have a chance to engage to other research (e.g. via seminars and workshop), type of students, his motivation, his attitude, students' motivation, and students' attitude. While the physical environment was selected at important level (level 4). Culture and difference in age of students are two factors which he thought they are not important. The most important factor which has influence on co-creation with students is students' attitude. This is the reason why he identifies his value after co-creating with students is "success of student". He emphasized:

- ✧ I hope that my Ph.D. student could become independent researchers and professors, and my master students could contribute to the industry. The academic research is different with industrial research... the product of academic research is manpower, it is a human resource to contribute to industry and society.

According to professor *C*, the mutual goal between him and students is creating potential research achievement together. This is the core of co-creation between him and students. First, they specify the goal and then they reciprocal discuss and work to catch the goal together. The achievement of students is also the value for the professor because it means that he could finish his education role and mission.

Discussing on the 4 phases model to have an effective co-creation with students, he suggested that first phase is "sharing the goal", then "updating the goal" should a dyadic relation based on "making a good atmosphere", so they could "obtaining value together".

Evaluate the value co-creation between professor and students in C Lab, professor *C* very satisfy. He satisfied with all the value such as creating good research achievement together, increasing a number of publication, gaining knowledge (methodology and academic knowledge), and developing his laboratory (for supporting students' life and research). On his opinion, professor *C* totally agree with concept co-creation value with students and very satisfied with the co-creation process in his lab.

b) Students' side: questionnaire data analysis

In the viewpoint of students: The important goals which students consider most are: Laboratory atmosphere, a goal to gain academic knowledge, goal to learn academic methodology, goal to increase the number of publication, goal to increase the quality of the publication, culture, students' motivation, students' attitude, and professors' motivation. In which, the most important goal is students' motivation (4/5 students choose this factor). Majority assume that the final value they receive after co-creation is

communication skill and ability. However, the mutual value with their professor is the same as professors' chosen value, which is creating potential research achievement together. In this Lab. students in general satisfied with the co-creation with their professors, 4/5 of them always sets the satisfaction level at 4 and 5 means satisfied and very satisfied (Table 5.3). In detail, all the one who chooses neutral when deciding their satisfaction is master students, who have less time to co-create with professors.

Table 5.3. Computer communication laboratory – summary data

	Co-creation process	**Value of co-creation process**
Professors	**Usually discussing and sharing the idea, opinion with students**: 1 whole seminar/week, and 40'-1,5^{h} for individual every week **Making a good atmosphere for the discussion:** separate students into suitable groups based on their abilities→ Supervise based on understanding students. Encourage students to keep health by practice: no good body → no good brain	**The most important goal to co-create value**: Students' attitude **VCC for both professors and students**: Success of students **Mutual goals with students**: Creating potential research achievement together
Students (n=5)	**Usually discussing and sharing the idea, opinion with professors:** • Whenever I have some ideas or problems • (2/5) Every day: in the morning and after finishing the office hour of the Lab. • Lab meeting (1/week, general discussion, all members) & individual meeting (1/week, detailed discussion) • Have a new idea **Making a good atmosphere for the**	**The most important goal to co-create value:** Students' motivation **VCC for students:** • 3/5: Communication skill & ability • 1/5: Solving problem ability • 1/5: Potential research achievement **Mutual goals with professors:** • 3/5: Creating potential research achievement

	discussion: • (1/5) : Directly express my ideas as clear as possible • (3/5): Well prepare - All support documents (ex: report) and the frame of discussion. - Send report before I meeting with my professor • 1/5: I try to remember his advice and do not interrupt him without deeply thinking about his advice. **Professor makes a good atmosphere for the discussion:** • He always listens carefully and tries to explain clearly and patiently • He always thinks about the problem to find out the solution. • Read the report and shared documents in advance; listen carefully before making questions and comments • He encourages us even if our ideas are not good.	together • 1/5: Increasing number of publication • 1/5: Gaining knowledge (methodology and academic knowledge)

5.6 Conclusion

5.6.1. Discussion based 3 cases combination

In summary, from the case of A Lab. and B Lab. research laboratory cases, we could find out that the value for professors is understanding students for education and working management. While value for students is gaining solving problem knowledge, gaining publications, and perceiving high education service quality. The *Ba* is very important in research laboratory cases for professors and students to co-create together. Both sides considered and contributed to the *Ba* where they could co-create comfortable. The *Ba* of both cases included the physical environment, mental environment and their attitude and motivation to co-create value. Although the perceived value of professors and students are different, they have the same goal to create a good *Ba*, which is their laboratory. In their *Ba*, they could co-create and share their vision and goal in research. Versus, they co-create to contribute a better *Ba* in their laboratory. In the case of C Lab., *Ba* is an important factor but it is not the most one. The most important factor to co-create is students: motivation of students and attitude of students. In addition, the mutual goal of professors and students are creating potential research achievement together and they all satisfied with their mutual goal.

In comparison with the hypotheses,

Table 5.4. Comparison between hypotheses and 3 case studies of research-oriented Lab.

Hypothesis	The case of A Lab.	The case of B Lab.	The case of C Lab.
Hypothesis 1: Goals have positive influence to value co-creation.	N/A	N/A	• Goal to increasing number of his academic publications, • Goal to increase quality of his academic

			publications, • Goal to have a chance to engage to other research • Professor's motivation, • Professor's attitude, • Students' motivation, • Students' attitude
Hypothesis 2: Characteristics have positive influence to value co-creation.	N/A	N/A	• Laboratory atmosphere, • Type of students • Culture
Hypothesis 3: Service Ba facilitates positively to co-creation between professors and students.	Professor and students have the same goal to create a good *Ba*, which is their laboratory. In their *Ba*, they could co-create and share their vision and goal in research. Versus, they co-create to contribute a better *Ba* in their laboratory.	Professor and students have the same goal to create a good *Ba*, which is their laboratory. In their *Ba*, they could co-create and share their vision and goal in research. Versus, they co-create to contribute a better *Ba* in their laboratory.	Both professor and students have their own way to contribute to their laboratory which is their service *Ba* to co-create value. They satisfied with their *Ba* at a high level.

5.6.2. Findings

The data of A Lab. and B Lab. is not enough to support the hypothesis 1 and hypothesis 2. However, there is a question emerged in the case study of laboratories that "how to have effective communication and discussion, which is the nature of co-creation in the laboratories?" Based on the goals and service *Ba*, we discussed and find out the process

to have effective communication and discussion in laboratories. There are 4 phases: sharing goals, upgrading goals, making a good atmosphere and obtaining value together. There are scenario 1, 2 and 3 based on the context (Figure 5.2). The scenario 1 could be applied for long time communication, for example, the whole Doctoral course. Versus, the Scenario 2 could be applied in a short time such as a weekly seminar. And the last one, the scenario 3, in which the making a good atmosphere is a general sphere to support for the cycle of sharing goals, updating goals and obtaining value together. The first sphere is different based on context, but the last sphere of one cycle is obtaining value together, after that they start the new communication with the same sphere. The consequence of the cycle is mind-set's changing and behavior's changing in a better way of students. Students could improve their motivation and change the attitude in research. As a result, the value they perceived is better.

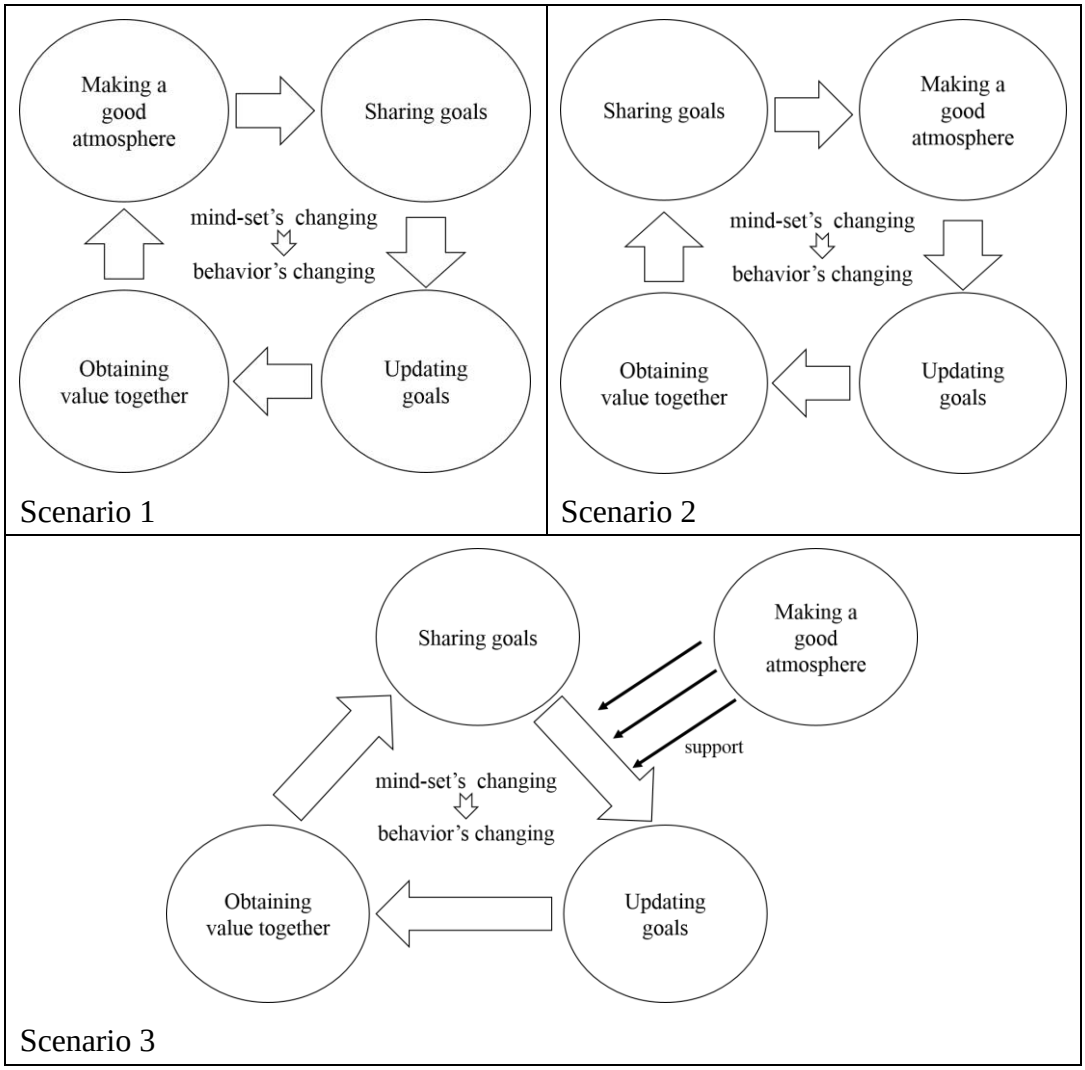

Figure 5.2. Process to an effective communication and discussion in research laboratories

Chapter 6. Conclusion

6.1 Introduction

This chapter presents overall of our research. First, the research questions were answered by analysis of two cases which are iMOST course and research laboratory. Then, theoretical implication and practical implication of the study were discussed. Finally, we suggest a potentially future research.

6.2 Answers to research questions

After study from the related researches and analyzing two real cases in higher education, we could be able to answer the subsidiary research questions, then the main one as followings:

SRQ1: How have professors and students determined their value in co-creation process?

Based on the foundation concepts discussed above, in this research, we consider:

The value of the co-creation process between professors and students is the satisfaction of mutual goals of both sides.

The value is value-in-use and it is perceived by the beneficial based on each context. In the case of iMOST course, the mutual goals to co-create between professors and students are publication and knowledge. Because in the academic field, the publication includes conference papers, journal papers, etc. which are the way researchers reflect their own results. Therefore, the publication is a very important factor. In terms of gaining knowledge, the students' goals of co-creation with their professors are to gain academic and methodology knowledge to again support their works, and research life. The professors' goal is to gain knowledge for upgrading upgrade their research and teaching progress.

In the case of research laboratories, the mutual goal is creating a good *Ba* with the center is human, students' and professors' attitude and motivation, for both professors and students to co-create their values. Their *Ba* here is their laboratory with an atmosphere and physical environment, in which they could co-create value and share knowledge together. They could reach their own different values based on the mutual goals of creating a good *Ba*. For them, *Ba* is very important to co-create value.

SRQ2: What and how do factors impact on co-creation process based on students' viewpoint?

From iMOST students' opinion, the factors having an influence on co-creation process are both achievement and performance goals, but most of them were achievement goals. The students themselves should desire to join the co-creation relationship actively. In addition, subjective characteristics such as student motivation, student attitude were found to be the most important factors influencing to co-creation process (Table 6.1). This is the evidence to say that co-creation is a human experience process as an experience environment in which consumers can have active dialogue and co-construct personalized experiences (Prahalad & Ramaswamy 2004).

In the case of research laboratories, the most important factor have an influence on co-creation process is *Ba*. The good service *Ba* supports them to co-create value with professors. The mutual goal of professors and students is to create a good *Ba*, besides they have other value. Then, in this *Ba*, they co-create and perceive other value together. The satisfaction of *Ba* leads them to other satisfaction of gaining values. Other factors were listed in Table 6.2.

Table 6.1. Factors impact on co-creation process based on students' viewpoint – iMOST case

Goal to solve problems from current works (0.237)
Goal to summarize experience in an academic way (0.156 & 0.201)
Goal to have chance to engage to other research (0.324)
Goal to gain academic knowledge (0.242)
Goal to increase the number of publication (0.325)
Difference in age (0.237)
Students' attitude (0.348)
Difference in experience (0.17 & 0.81)

Table 6.2 Factor influence on co-creation process based on students' viewpoint – research laboratories case

Students' motivation
Students' attitude
Professor's motivation
Goal to increase quality of academic publications
Goal to increase the number of academic publications
Goal to learn academic methodology
Laboratory atmosphere
Goal to increase the number of academic publications

SRQ3: What and how do factors impact in co-creation process based on professors' viewpoint?

From the professors' opinion, completing the mission, gaining insight in the area of their own research and approach up-to-date issues in the industries are the main goals to co-create with students in the iMOST course. And students' attitude, motivation, professors' motivation, and the difference in experience are influencing to co-creation process. The students' attitude and motivation reflect that the students are willing to join the co-creation process actively or not. Once they have enough motivation and a good attitude, they become active in the dialogue to co-create value with professors. The difference in experience is a subjective characteristic, which is important in value co-creation between professors and students because they are the source of skill and knowledge in the service exchange in this case. There more experience they have, the more skill and knowledge they have, and then the service exchange process will be supported by a rich resource. It issues a warranty to a successful exchange.

Table 6.3. Factors impact in co-creation process based on professors' viewpoint – iMOST case

Completing the mission
Gaining insight in the area of their own research
Approach up-to-date issues in the industries
Students' attitude
Students' motivation
Professors' motivation
Difference in experience

In the research laboratory cases, the most important factor influencing to value co-creation process is *Ba* and students' attitude. Because they emphasize into a good environment to a co-create value between professors and students. Besides, other detail factors are listed as

Table 6.4. Factors impact in co-creation process based on professors' viewpoint – research laboratories case

Goal to increasing number of academic publications
Goal to increase quality of academic publications
Goal to have a chance to engage in other research
Professor's motivation
Professor's attitude
Students' motivation
Students' attitude

6.3 Theoretical implications – answering the MRQ

MRQ: How have professors and students co-created to enhance value for both sides?

Through answering the three subsidiary research questions, we find out that: Depending on each context, the co-creation process exhibits a different way to achieve objectives and provide satisfaction professors and students. With each case, the impact factor is different but the 3 main group factor have an influence on co-creation process and provide satisfaction for professors and students are goals, characteristics (of individual and context), and service *Ba*.

The goals have a strong influence on students' achievement of the objectives. Especially the achievement goals, or the intrinsic goals play a key role in their co-creation behavior in co-creation with their professors. Based on the strong goals, they joined the co-creation with their professors more actively and effectively. The higher goals they specify the more satisfaction they obtain. Their goals impact in not only their objectives and satisfaction but also the professors' satisfaction.

The professors co-create more actively with students depend on the students' attitude and motivation. Versus, the students also are willing to share with professors who have more motivation to co-create openly with students.

The service *Ba* is significant in value co-creation between professors and students. Both professors and students want to create a good service *Ba* for their effective co-creation. Then, they can obtain their individual objectives and gain their satisfactions. In generally, having a good service *Ba* is their mutual goal. Consequently, *Ba* is their mutual goal and it also has the influence to their satisfaction.

Finally, to answer the MRQ, we verified the proposed model into theoretical model as follows:

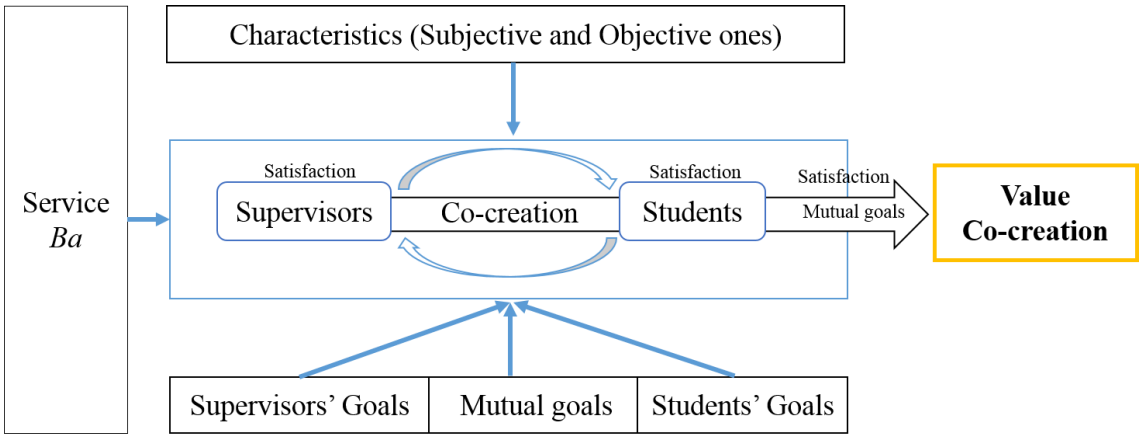

Figure 6.1. Value co-creation model based on goals, characteristics and service *Ba*

There is three group important factors having influence on value co-creation:

- ✓ *Characteristics*
- ✓ *Goals*
- ✓ *Service Ba*

There is four significant spheres to have an effective co-creation between professors and students:

- ✓ *Sharing goals*
- ✓ *Updating goals*
- ✓ *Obtaining value together*
- ✓ *Making a good atmosphere*

6.4 Practical implications

Summarily, the proposed model of co-creation in higher education is verified in the iMOST course and research laboratory cases. We demonstrated the important factors have positive influence to value co-creation between students and professors in two cases. By understanding the impact factor to value co-creation, the professors, and students could find out the way to enhance the value co-creation by changing behavior or activities such as the goal to gain method knowledge, increase the quality of the publication, culture, and students' motivation.

In the case of students have rich operant resources, the intrinsic achievement goals and subjective characteristics of students and professors are most important to them. Therefore, professors in the relationship with students can consider the way to understand this type of students to enhance the co-creation with them. Human resource management method could be considered in this situation. In general, the institutes could consider the strategy to create more chance to students satisfy their goals for example emphasizing on the facilities is not necessary, but an innovating course or more seminar of increasing publication for students are potential in this case.

Versus to the case of regular young students, this research provides to professors and institutes the important impact factor to co-create value with them as a good *Ba*. Therefore, the education managers could consider a suitable strategy to encourage students and enhance the co-creation process. For example: installing some facilities which is taking care of the students' life in research laboratories besides research life: creating events with open atmosphere, in which students can easily and comfortably share knowledge and idea with professors, and so on.

6.5 Suggestions for future research

In the future, this model could be verified in other cases of higher education to investigate

more influencing factors, and deeply understanding the impact of goals, characteristics, and service *Ba* in co-creation process. Moreover, researching in the human resource management or methods to develop the next phase of this research is one of potential research. Our ambitiousness is after understanding the impact factors influencing to value co-creation, we could explore and propose a general process or guideline to have an effective value co-creation in higher education.

6.6 Limitation of the research

In the regression linear, the sample size is still small and it could lead to the week representation to the whole population.

In research-oriented laboratories case, we did not conduct in various research theme, it could be different between nature science, social science and informatics science.

In Japan, there is still a huge gap between graduate schools, we had no chance to collect data in very top of the world and nation graduate schools to investigate value co-creation process between professors and students here.

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APPENDIX

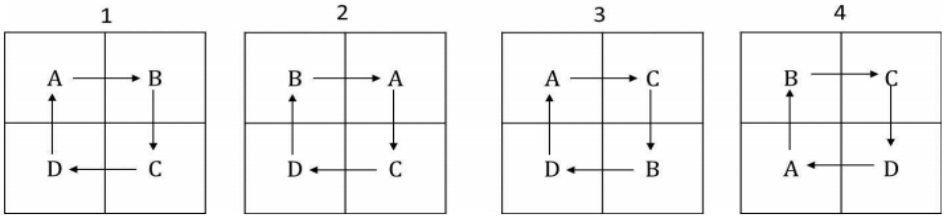
APPENDIX 1: THE FIRST QUESTIONNAIRE FOR RESEARCH LABORATORIES – STUDENT

1. How did you know about your Lab. before you entered?
2. Which factors you and your friends and family concerned when choosing a Lab. or a university?
   a. Reputation of the Lab. and university
   b. Student rate of getting job
   c. Number of publications
   d. Number of students (also international student with an international university)
   e. Strong laboratory with high quality and special "culture laboratory"
   f. Other:...
3. When do you often discuss and share the idea, opinion with your professor?
4. How do you make a good atmosphere for the discussion?
5. How does your professor make a good atmosphere for the discussion?
6. Which are final values after co-creating with your professors?
   a. Communication skill & ability
   b. Solving problem ability
   c. Publication works
   d. Globalization environment &culture
   e. Education service quality
   f. Multidimensional co-creation in educating and culture experiences
   g. Understanding students for education and management works
   h. Other:...
7. Do you think the visions will be changed after each discussion because of both agreement and conflict? better or worse?

If these 4 phases can be applied for your Lab. or WERE applied for your Lab. what is the order of them?

A: "Sharing the vision" B: "Making a good atmosphere"

C. "Co-creation" D. "Obtaining &upgrading the vision"



5. Other:...

8. Do your thinking and attitude (E.g.: about your professor, your Lab. theme, your research, your Lab. and your school) change day by day since you entered this Lab.?
9. When will you discuss with your assistant professor?

a. You cannot meet and discuss with Professor
b. You cannot have the same vision sharing with Professor
c. You joined with the same project with him
d. Other

10. Is it effective to discuss with your assistant professor? If yes, how effective? (Could you describe more about the effectiveness?)
11. Does the assistant professor help you easier to discuss or share the opinion with your professor? In other words, what is the role of your assistant professor in your co-creation with the professor?
12. If you satisfy or get your value from your Lab. , will you share the information of your Lab. and your university to others?
13. Do you often share the information of your Lab. and your school to others? by what way (for example: talking with your friends, Facebook or other social networks, etc.?)

APPENDIX 2: THE FIRST QUESTIONNAIRE FOR RESEARCH LABORATORIES – PROFESSORS

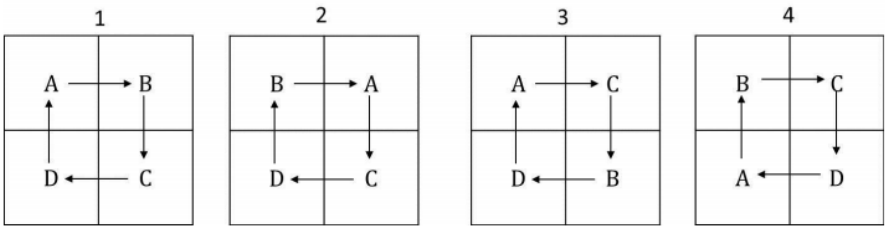
1. What is research theme of your Laboratory (Lab.)? Could you introduce briefly for me?
2. Is there any an objective or target to attract potential students to your Lab.? If yes, what is that?
3. Do you usually share the vision (for example: the vision of the main target of the Lab. research theme, or the vision in each period of each student: write conference papers, journal papers, etc.) with your student by discussing?
4. How do you make a good atmosphere for the discussion?
5. Which are final values after co-creating with your students?

(Choose the answer as following)

a. Communication skill & ability
b. Solving problem ability
c. Publication works
d. Globalization environment &culture
e. Education service quality
f. Multidimensional co-creation in educating and culture experiences
g. Understanding students for education and management works
h. Other:

6. Do you think the visions will be changed after each discussion because of both agreement and conflict? Better or worse in your opinion?
7. If these 4 phases can be applied for your Lab. or WERE applied for your Lab. what is the order of them?

A: "Sharing the vision" B: "Making a good atmosphere"
C. "Co-creation" D. "Obtaining &upgrading the vision"



5. Other:...

8. Do you think that: your students become interested in the Lab. target and have good relationship with the Lab. little by little from entering your Lab. to graduate and after that? Can you describe more about their changing?
9. Is the relationship with alumni of your Lab. helpful for expose the Lab. brand?
10. Do you think your Lab. brand strongly related to your university brand?
11. Do you think when students' satisfaction of your Lab. will push their satisfaction of the university?
12. Do you think when some factors like number of publication, rate of getting job of your students increase, people will know about your Lab. and your school much more? Could you suggest me more factor you think that they will have impact everyone to know about your Lab. and your university?

APPENDIX 3: THE SECOND QUESTIONNAIRE FOR RESEARCH LABORATORIES – STUDENTS

1. **1. When do you often discuss and share the idea, opinion with your professor?** *

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2. **2. How do you make a good atmosphere for the discussion?** *

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3. **3. How does your professor make a good atmosphere for the discussion?** *

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4. **4. How important of the following factors in the co-creation between you and your professor? a. Laboratory atmosphere** *

Mark only one oval.

	1	2	3	4	5	
Unimportant	◯	◯	◯	◯	◯	Very important

5. **b. Physical environment (Facilities in your lab., etc)** *
Mark only one oval.

	1	2	3	4	5	
Unimportant	◯	◯	◯	◯	◯	Very important

6. **c. Goal to gain your academic knowledge** *
Mark only one oval.

	1	2	3	4	5	
Unimportant	◯	◯	◯	◯	◯	Very important

7. **d. Goal to learn academic methodology** *
Mark only one oval.

	1	2	3	4	5	
Unimportant	◯	◯	◯	◯	◯	Very important

8. **e. Goal to solve specific problems related to your works** *
Mark only one oval.

	1	2	3	4	5	
Unimportant	◯	◯	◯	◯	◯	Very important

9. **f. Goal to increase number of your academic publications** *
Mark only one oval.

	1	2	3	4	5	
Unimportant	◯	◯	◯	◯	◯	Very important

10. **g. Goal to increase quality of your academic publications** *
Mark only one oval.

	1	2	3	4	5	
Unimportant	◯	◯	◯	◯	◯	Very important

11. **h. Goal to summarize your own experience in an academic way** *
Mark only one oval.

	1	2	3	4	5	
Unimportant	◯	◯	◯	◯	◯	Very important

12. **i. Goal to have a chance to engage to other researches (e.g. via seminars a workshop)** *
Mark only one oval.

	1	2	3	4	5	
Unimportant	◯	◯	◯	◯	◯	Very important

13. **j. Type of students (Bachelor,Master, Doctor, etc.)** *
Mark only one oval.

	1	2	3	4	5	
Unimportant	◯	◯	◯	◯	◯	Very important

14. **k. Culture** *
Mark only one oval.

	1	2	3	4	5	
Unimportant	◯	◯	◯	◯	◯	Very important

15. **l. Your motivation** *
Mark only one oval.

	1	2	3	4	5	
Unimportant	◯	◯	◯	◯	◯	Very important

16. **m. Your attitude** *
Mark only one oval.

	1	2	3	4	5	
Unimportant	◯	◯	◯	◯	◯	Very important

17. **n. Professors' motivation** *

Mark only one oval.

	1	2	3	4	5	
Unimportant	◯	◯	◯	◯	◯	Very important

18. **o. Professors' attitude** *

Mark only one oval.

	1	2	3	4	5	
Unimportant	◯	◯	◯	◯	◯	Very important

19. **p. Difference in experience of students** *

Mark only one oval.

	1	2	3	4	5	
Unimportant	◯	◯	◯	◯	◯	Very important

20. **q. Difference in age of students** *

Mark only one oval.

	1	2	3	4	5	
Unimportant	◯	◯	◯	◯	◯	Very important

21. **r. Your other opinions (If there is no more opinion, please answer "0")** *

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22. **5. Which is the most important factor in above factors?** *

Mark only one oval.

- ◯ Laboratory atmosphere
- ◯ Physical environment (Facilities in your lab., etc)
- ◯ Goal to gain your academic knowledge
- ◯ Goal to learn academic methodology
- ◯ Goal to solve specific problems related to your works
- ◯ Goal to increase number of your academic publications
- ◯ Goal to increase quality of your academic publications
- ◯ Goal to summarize your own experience in an academic way
- ◯ Goal to have a chance to engage to other researches (e.g. via seminars and workshop)
- ◯ Type of students
- ◯ Culture
- ◯ Your motivation
- ◯ Your attitude
- ◯ Professors' motivation
- ◯ Professors' attitude
- ◯ Difference in experience
- ◯ Difference in age
- ◯ Your other opinion

23. **6. Which are final values after co-creating with your professors?** *

Mark only one oval.

- ◯ a. Communication skill & ability
- ◯ b. Solving problem ability
- ◯ c. Gaining publication
- ◯ d. Globalization environment &culture
- ◯ e. Potential research achievement
- ◯ f. Multidimensional co-creation in educating and culture experiences
- ◯ g. Understanding students for education and management works
- ◯ Other: .....

24. **7. Do you think the goals will be changed after each discussion because of both agreement and conflict? Better or worse?** *

Mark only one oval.

- ◯ Better
- ◯ Worse

25. **8. If these 4 phases can be applied for your Lab. or WERE applied for your Lab. wh is the order of them?A: "Sharing the goal". B: "Making a good atmosphere". C: "Obtaining value together". D: "Updating the goal"** *

Mark only one oval.

- ◯ ABCD(A) -Spiral starting from A
- ◯ BACD(B)- Spiral starting from B
- ◯ ACBD(A) - Spiral starting from A
- ◯ BCDA(B) - Spiral starting from A
- ◯ Other: .....

26. **9. Have your thinking and attitude (E.g.: about your professor, your Lab. theme, you research, your Lab. etc.) changed since you entered this Lab.?** *

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27. **10. What are your common/mutual goals with your professor?** *

Mark only one oval.

- ◯ a. Creating potential research achievement together
- ◯ b. Increasing number of publication
- ◯ c. Increasing quality of publication
- ◯ d. Gaining knowledge (methodology and academic knowledge)
- ◯ e. Developing your laboratory (for supporting students' life and research)
- ◯ Other: .....

28. **11. How is your satisfaction? a. Creating good research achievement together** *

Mark only one oval.

	1	2	3	4	5	
Unsatisfied	◯	◯	◯	◯	◯	Very satisfied

29. **b. Increasing number of publication** *

Mark only one oval.

	1	2	3	4	5	
Unsatisfied	◯	◯	◯	◯	◯	Very satisfied

30. **c. Gaining knowledge (methodology and academic knowledge)** *
Mark only one oval.

	1	2	3	4	5	
Unsatisfied	◯	◯	◯	◯	◯	Very satisfied

31. **d. Developing your laboratory (for supporting students' life and researcl**
Mark only one oval.

	1	2	3	4	5	
Unsatisfied	◯	◯	◯	◯	◯	Very satisfied

32. **12. How is your total satisfaction of co-creation with you professor?** *
Mark only one oval.

	1	2	3	4	5	
Unsatisfied	◯	◯	◯	◯	◯	Very satisfied

33. **13. Your student status (Please write your undergraduate/Bachelor, Master or Doctor and which year? E.g: B3, M2, D3.)** *

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34. **14. Your nationality** *

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35. **15. What is your age?** *
Mark only one oval.

- ◯ 18-23
- ◯ 24-29
- ◯ 30-35
- ◯ 36-41
- ◯ over 41

APPENDIX 4: THE SECOND QUESTIONNAIRE FOR RESEARCH LABORATORIES – PROFESSORS

1. **1. When do you often discuss and share the idea, opinion with your students?** *

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2. **2. How do you make a good atmosphere for the discussion?** *

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3. **3. How does your professor make a good atmosphere for the discussion?** *

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4. **4. How important of the following factors in the co-creation between you and your students? a. Laboratory atmosphere** *

Mark only one oval.

	1	2	3	4	5	
Unimportant	◯	◯	◯	◯	◯	Very important

5. **b. Physical environment (Facilities in your lab., etc)** *
Mark only one oval.

	1	2	3	4	5	
Unimportant	◯	◯	◯	◯	◯	Very important

6. **c. Goal to gain your academic knowledge** *
Mark only one oval.

	1	2	3	4	5	
Unimportant	◯	◯	◯	◯	◯	Very important

7. **d. Goal to increase number of your academic publications** *
Mark only one oval.

	1	2	3	4	5	
Unimportant	◯	◯	◯	◯	◯	Very important

8. **e. Goal to increase quality of your academic publications** *
Mark only one oval.

	1	2	3	4	5	
Unimportant	◯	◯	◯	◯	◯	Very important

9. **f. Goal to have a chance to engage to other researches (e.g. via seminars and workshop)** *
Mark only one oval.

	1	2	3	4	5	
Unimportant	◯	◯	◯	◯	◯	Very important

10. **g. Type of students** *
Mark only one oval.

	1	2	3	4	5	
Unimportant	◯	◯	◯	◯	◯	Very important

11. **h. Culture** *
Mark only one oval.

	1	2	3	4	5	
Unimportant	◯	◯	◯	◯	◯	Very important

12. **i. Your motivation** *
Mark only one oval.

	1	2	3	4	5	
Unimportant	◯	◯	◯	◯	◯	Very important

13. **k. Your attitude**
Mark only one oval.

	1	2	3	4	5	
Unimportant	◯	◯	◯	◯	◯	Very important

14. **l. Students' attitude** *
Mark only one oval.

	1	2	3	4	5	
Unimportant	◯	◯	◯	◯	◯	Very important

15. **m. Students' motivation** *
Mark only one oval.

	1	2	3	4	5	
Unimportant	◯	◯	◯	◯	◯	Very important

16. **n. Difference in experience of students** *
Mark only one oval.

	1	2	3	4	5	
Unimportant	◯	◯	◯	◯	◯	Very important

17. **o. Difference in age of students** *
Mark only one oval.

	1	2	3	4	5	
Unimportant	◯	◯	◯	◯	◯	Very important

18. **p. Your other opinions (If there is no more opinion, please answer "0")** *

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19. **5. Which is the most important factor in above factors?** *
Mark only one oval.

- ◯ Laboratory atmosphere
- ◯ Physical environment (Facilities in your lab., etc)
- ◯ Goal to gain your academic knowledge
- ◯ Goal to increase number of your academic publications
- ◯ Goal to increase quality of your academic publications
- ◯ Goal to summarize your own experience in an academic way
- ◯ Goal to have a chance to engage to other researches (e.g. via seminars and workshop)
- ◯ Type of students
- ◯ Culture
- ◯ Your motivation
- ◯ Your attitude
- ◯ Students' motivation
- ◯ Students' attitude
- ◯ Difference in experience of students
- ◯ Difference in age of students
- ◯ Your other opinions

20. **6. Which are final values after co-creating with your students?** *
Mark only one oval.

- ◯ a. Communication skill & ability
- ◯ b. Solving problem ability
- ◯ c. Gaining publication
- ◯ d. Globalization environment &culture
- ◯ e. Potential research achievement
- ◯ f. Multidimensional co-creation in educating and culture experiences
- ◯ g. Understanding students for education and management works
- ◯ Other: .....

21. **7. Do you think the goals will be changed after each discussion because of both agreement and conflict? Better or worse?** *
Mark only one oval.

- ◯ Better
- ◯ Worse

22. **8. If these 4 phases can be applied for your Lab. or WERE applied for your Lab. what is the order of them?A: "Sharing the goal". B: "Making a good atmosphere". C: "Obtaining value together". D: "Updating the goal"** *
Mark only one oval.

- ◯ ABCD(A) - Spiral starting from A
- ◯ BACD(B)- Spiral starting from B
- ◯ ACBD(A)- Spiral starting from A
- ◯ BCDA(B)-Spiral starting from A

23. **9. Have students' thinking and attitude (E.g.: about your professor, your Lab. theme, your research, your Lab. etc.) changed since they entered this Lab.?** *

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APPENDIX 5: THE QUESTIONNAIRE FOR IMOST CASE – STUDENTS (MAIN PART)

Reason for students to co-create value with faculty members (i.e supervisors)

In short: Value co-creation means you and your supervisors create value together . Value is not money, Value is your benefit which you can receive from your supervisors

6. **1. Co-creation in order to gain your academic knowledge**
   Mark only one oval.

	1	2	3	4	5	
Disagree	◯	◯	◯	◯	◯	Agree

7. **2. Co-creation in order to learn academic methodology**
   Mark only one oval.

	1	2	3	4	5	
Disagree	◯	◯	◯	◯	◯	Agree

8. **3. Co-creation in order to solve specific problems related to your works**
   Mark only one oval.

	1	2	3	4	5	
Disagree	◯	◯	◯	◯	◯	Agree

9. **4. Co-creation in order to increase number of your academic publications**
   Mark only one oval.

	1	2	3	4	5	
Disagree	◯	◯	◯	◯	◯	Agree

10. **5. Co-creation in order to increase quality of your academic publications**
Mark only one oval.

	1	2	3	4	5	
Disagree	◯	◯	◯	◯	◯	Agree

11. **6. Co-creation in order to summarize your own experience in an academic way**
Mark only one oval.

	1	2	3	4	5	
Disagree	◯	◯	◯	◯	◯	Agree

12. **7. Co-creation in order to have a chance to engage to other researches (e.g via seminars and workshop)**
Mark only one oval.

	1	2	3	4	5	
Disagree	◯	◯	◯	◯	◯	Agree

13. **8. Other reasons**
Please contribute to us other reasons which are important in your opinion

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14. **9. Which is your most important reason?**
Mark only one oval.

- ◯ Gain your academic knowledge
- ◯ Learn academic methodology
- ◯ Solve specific problems related to your works
- ◯ Increase number of your academic publications
- ◯ Increase quality of your academic publications
- ◯ Summarize your own experience in an academic way
- ◯ Have a chance to engage to other researches (e.g via seminars and workshop)
- ◯ Your other opinion

15. **10. (Addition) In case you have many other opinion, please write down here your most important reason you think**

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Students' satisfaction of value co-creation

Please evaluate your satisfaction of the value which you could obtain after the time you co-created with your superviors

16. **1. You could enhance academic knowledge**

Mark only one oval.

	1	2	3	4	5	
Very unsatisfied	◯	◯	◯	◯	◯	Very satisfied

17. **2. You could enhance methodology knowledge**

Mark only one oval.

	1	2	3	4	5	
Very unsatisfied	◯	◯	◯	◯	◯	Very satisfied

18. **3. You could learn and access new research by joining workshops and conferences**

Mark only one oval.

	1	2	3	4	5	
Very unsatisfied	◯	◯	◯	◯	◯	Very satisfied

19. **4. You could increase your number of publications**

Mark only one oval.

	1	2	3	4	5	
Very unsatisfied	◯	◯	◯	◯	◯	Very satisfied

20. **5. You have good quality publications (E.g: famous, high quality journal paper or conferences)**

Mark only one oval.

	1	2	3	4	5	
Very unsatisfied	◯	◯	◯	◯	◯	Very satisfied

21. **6. You could summarize your own experience in an academic way**
(Please skip this one if it is not your case)
Mark only one oval.

	1	2	3	4	5	
Very unsatisfied	◯	◯	◯	◯	◯	Very satisfied

22. **7. You could solve specific design problems or technical in your real work and company**
(Please give us more information of your solution in your work related to the co-creation value with faculty member if possible)
Mark only one oval.

	1	2	3	4	5	
Very unsatisfied	◯	◯	◯	◯	◯	Very satisfied

23. **7.(Addition) You could solve specific design problems or technical in your real work and company**
(Please give us more information of your solution in your work related to the co-creation value with faculty member if possible)

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24. **8. Which is your most satisfaction?**
Mark only one oval.

- ◯ Enhance academic knowledge
- ◯ Enhance methodology knowledge and could use it
- ◯ Learn and access new research by joining workshops and conferences
- ◯ Increase your number of publication
- ◯ Have good quality publication (E.g: famous, high quality journal paper or conferences)
- ◯ Summarize your own experience in an academic way
- ◯ Solve specific design problems or technical in your real work and company

Impact factors of value co-creation between supervisors and students

25. **1. Facilities (research equipment, servers, other physical materials ...)**
Mark only one oval.

	1	2	3	4	5	
Unimportant	◯	◯	◯	◯	◯	Very important

26. **2. Type of students (or students segment)**
(For example: working students, young students, aged students)
Mark only one oval.

	1	2	3	4	5	
Unimportant	◯	◯	◯	◯	◯	Very important

27. **3. Culture**
(For example: international student, domestic student)
Mark only one oval.

	1	2	3	4	5	
Unimportant	◯	◯	◯	◯	◯	Very important

28. **4. Your motivation**
Mark only one oval.

	1	2	3	4	5	
Unimportant	◯	◯	◯	◯	◯	Very important

29. **5. Your attitude**
Mark only one oval.

	1	2	3	4	5	
Unimportant	◯	◯	◯	◯	◯	Very important

30. **6. Difference in experience**
(For example: you feel easier to co-create with your supervisors because you have experience. Or you feel difficult to discuss because you have no working and living experience)
Mark only one oval.

	1	2	3	4	5	
Unimportant	◯	◯	◯	◯	◯	Very important

31. **7. Difference in age (or generation)**

(For example: You are so young and you scare to talk with your supervisors. Or you are not young anymore, so you don't have any trouble to communicate with your supervisors)
Mark only one oval.

	1	2	3	4	5	
Unimportant	◯	◯	◯	◯	◯	Very important

32. **8. Others**

Please share us other important impact factors in your opinion

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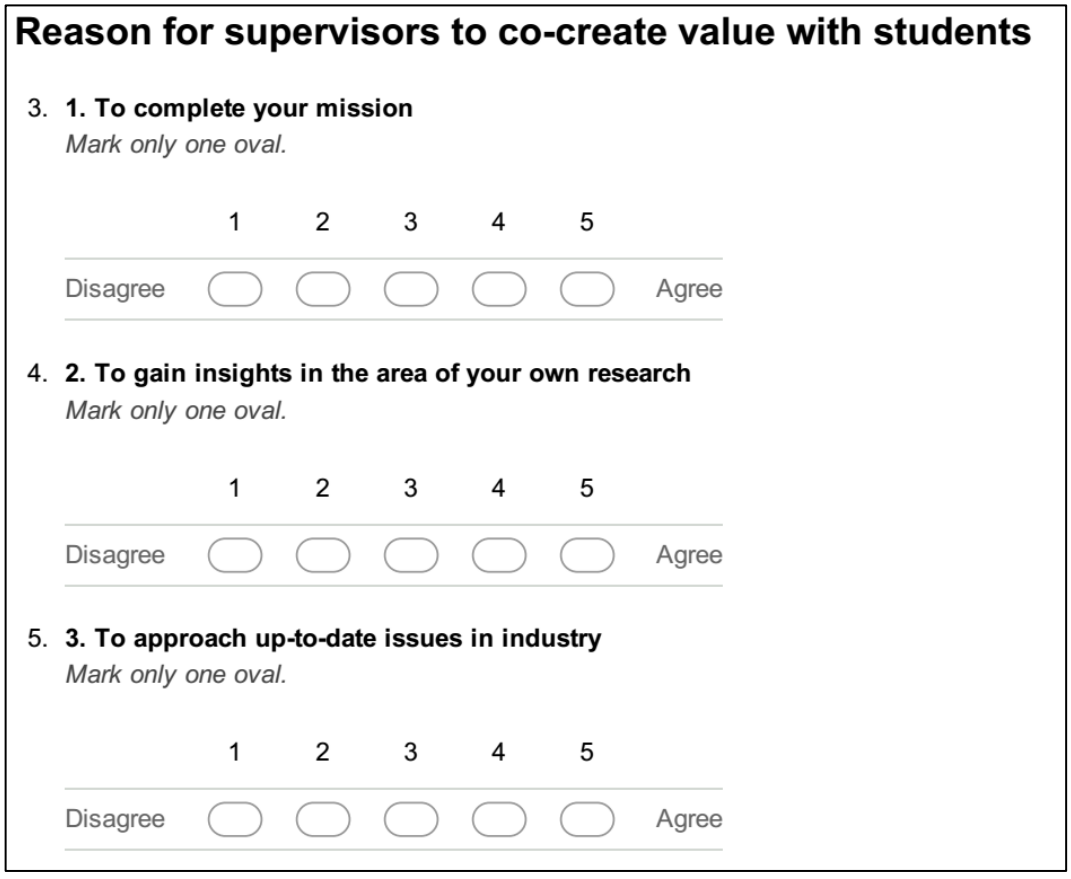
APPENDIX 6: THE QUESTION LIST FOR FACE-TO-FACE INTERVIEW IN IMOST CASE – PROFESSORS (MAIN PART)

We observed the individual seminar between 3 professors and each student. After that, we conducted the face-to-face interview with professors.

1. What are important to facilitate and support to a seminar?
2. Do you think your attitude have influence to students in a seminar? Before and after a seminar? How have you encouraged students?
3. Do the physical tools support effectively(効果的な)to the seminars? (Could you give examples?)
4. Do you suggest any things to more conveniently discuss?
5. What do you want to gain in today seminar?
6. What do you expect to gain from iMOST students?
7. What is the different between main campus students and iMOST students?
8. Are the experiences and idea of students in today seminar useful for you? Why?

9. In three type of seminar, is there any one not effective? : 個別ゼミ(Individual seminar) , 全体ゼミ(The entire seminar) 自主ゼミ(Voluntary seminar) . Why ? Which is the most interesting one and why?
10. Are the comments of students from other fields useful for your research? Why?
11. What are the important things to make a good discussion or seminar?
12. How many times have you joined this Individual seminar like today (個別ゼミ)? Compare to main campus seminar?
13. The concept of MOT is co-evolution of theory and practice. Could you explain for us your opinion by real examples?

APPENDIX 6: THE QUESTIONNAIRE FOR IMOST CASE – PROFESSORS (MAIN PART)



Reason for supervisors to co-create value with students

3. **1. To complete your mission**
Mark only one oval.

	1	2	3	4	5	
Disagree	◯	◯	◯	◯	◯	Agree

4. **2. To gain insights in the area of your own research**
Mark only one oval.

	1	2	3	4	5	
Disagree	◯	◯	◯	◯	◯	Agree

5. **3. To approach up-to-date issues in industry**
Mark only one oval.

	1	2	3	4	5	
Disagree	◯	◯	◯	◯	◯	Agree

6. **4. To gain knowledge about practical problems useful for teaching**
Mark only one oval.

	1	2	3	4	5	
Disagree	◯	◯	◯	◯	◯	Agree

7. **5. To further the university's outreach mission**
Mark only one oval.

	1	2	3	4	5	
Disagree	◯	◯	◯	◯	◯	Agree

8. **6. To increasing papers**
Mark only one oval.

	1	2	3	4	5	
Disagree	◯	◯	◯	◯	◯	Agree

9. **7. Other reasons**
Please contribute to us other reasons which are important in your opinion

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10. **8. Which is your most important reason from the above?**
Mark only one oval.

- ◯ 1. To complete your mission
- ◯ 2. To gain insights in the area of your own research
- ◯ 3. To approach up-to-date issues in industry
- ◯ 4. To gain knowledge about practical problems useful for teaching
- ◯ 5. To further the university's outreach mission
- ◯ 6. To increasing papers
- ◯ 7. Your other opinion

Supervisors' satisfaction of value co-creation

Please evaluate your satisfaction of the value you could gain after each whole course of one student.

12. **1. Complete the mission**
Mark only one oval.

	1	2	3	4	5	
Very unsatisfied	◯	◯	◯	◯	◯	Very satisfied

13. **2. Gain insights in the area of your own research**
Mark only one oval.

	1	2	3	4	5	
Very unsatisfied	◯	◯	◯	◯	◯	Very satisfied

14. **3. You could approach up-to-date issues in industry**
Mark only one oval.

	1	2	3	4	5	
Very unsatisfied	◯	◯	◯	◯	◯	Very satisfied

15. **4. You could gain knowledge about practical problems useful for teaching**
Mark only one oval.

	1	2	3	4	5	
Very unsatisfied	◯	◯	◯	◯	◯	Very satisfied

16. **5. It helps for further the university's outreach mission**
Mark only one oval.

	1	2	3	4	5	
Very unsatisfied	◯	◯	◯	◯	◯	Very satisfied

17. **6. You have more published papers (conference, and journal papers)**
Mark only one oval.

	1	2	3	4	5	
Very unsatisfied	◯	◯	◯	◯	◯	Very satisfied

18. **7. Which is your most satisfaction?**
Mark only one oval.

- ◯ Complete the mission
- ◯ Gain insights in the area of your own research
- ◯ Approach up-to-date issues in industry
- ◯ Gain knowledge about practical problems useful for teaching
- ◯ Further the university's outreach mission
- ◯ Have more published papers (conference, and journal papers)

Impact factor of value co-creation between superviors and students

19. **1. Facilities (research equipment , servers, other physical materials ...)**
Mark only one oval.

	1	2	3	4	5	
Unimportant	◯	◯	◯	◯	◯	Very important

20. **2. Type of students (or student segment)**
(E.g: working student, young student, aged student)
Mark only one oval.

	1	2	3	4	5	
Unimportant	◯	◯	◯	◯	◯	Very important

21. **3. Culture**
(E.g: international student, domestic student)
Mark only one oval.

	1	2	3	4	5	
Unimportant	◯	◯	◯	◯	◯	Very important

22. **4. Students' attitude**
Mark only one oval.

	1	2	3	4	5	
Unimportant	◯	◯	◯	◯	◯	Very important

23. **5. Students' motivation**
Mark only one oval.

	1	2	3	4	5	
Unimportant	◯	◯	◯	◯	◯	Very important

24. **6. Your motivation**
Mark only one oval.

	1	2	3	4	5	
Unimportant	◯	◯	◯	◯	◯	Very important

25. **7. Difference in experiences**
(E.g: you feel easier to co-create with students who have more working experience)
Mark only one oval.

	1	2	3	4	5	
Unimportant	◯	◯	◯	◯	◯	Very important

26. **8. Difference in age**
(E.g: you feel easier to co-create with young student or aged student)
Mark only one oval.

	1	2	3	4	5	
Unimportant	◯	◯	◯	◯	◯	Very important

27. **9. Others**
Please share us your opinion about other impact factors

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LIST OF PUBLICATION AND PRESENTATIONS:

- Paper published in journal:

1. Dung Thuy Nguyen., Kunio Shirahada., and Michitaka Kosaka. "A Consideration of Value Co-Creation in Branding of University Research-Laboratories," International Journal of Knowledge and Systems Science (IJKSS), Vol. 7, No. 2, pp. 40-57, 2016.
2. Dung Thuy Nguyen, Chinh Thi Kieu Nguyen, Cong Thanh Nguyen, Michitaka Kosaka, "Factors Influencing Co-creation between Professors and Students in Higher Education for Business Professionals", IEEJ Transactions on Electronics, Information and Systems (C), Vol. 136, No. 12, pp. 1726-1733, August 2016.

- International conference proceedings:

1. Nguyen, T. D., Kosaka, M., Value Co-creation in Higher Education from the Viewpoint of Service Marketing: case study of JAIST iMOST course, The Fourth Asian Conference on Information Systems ACIS 2015: verbal, 2015 October 15th, Penang.
2. Nguyen, T. D., Shirahada, K., Kosaka, M., A consideration on University Branding based on SDL (Service Dominant Logic): the Lens of Stakeholders' Value Co-creation , Service Systems and Service Management (ICSSSM), 2012 9th International Conference: in p, pp.779 – 784, 2012 July 2-4, Shanghai.

- Domestic conference proceedings:

1. Nguyen, T. D., Shirahada, K., Kosaka, M., Value-in-trust for university branding management: experience and co-creation in universities' stakeholders, The Paper of Technical Meeting on Information Systems, pp. 67-71, 2012, IEE Japan, Kaga. *(Best presentation award)*
2. Nguyen, T. D., Branded service encounter based on co-creation in higher education: a case of academia-industry relationship in Japan, サービス学会 2015: Poster, 2015 April 8th, Kanazawa.