Proposed Method for Problem-Solution Fit Phase at Start-up Incubator

Adhi Antyanto Naratama and Nila Armelia Windasari

Startup incubator has a major role in monitoring, evaluating, and managing startup progress. The most problem faced by startups is in the beginning phase, which cannot identify their product and market validation according to the specified time. This study uses the case of startup incubator owned by one of the biggest digital companies in Indonesia. From the total of 15 startups in 2018, nine startups are still in the customer validation phase and four startups are still stuck in the product validation phase. By using a qualitative approach through in depth-interview, the authors identify the factors that trigger the long period during customer validation and product validation. The findings suggest that the beginning process can combine customer validation and product validation phase using running lean methods by Ash Maurya. This research contributes theoretically to the more efficient beginning phase of the startup incubation process. Practically, the outcome of the research generates a self-assessment sheet and an online monitoring system to create a more effective and faster incubation process for startup incubators.

Index Terms—Customer Validation; Lean Startup; Indonesia; Institut Teknologi Bandung; Problem-Solution Fit; Product Validation; Startup

I. INTRODUCTION

Lately, digital business is one of the most interesting fields. To compete with other companies, companies start to create their own startup. According to the explanation from the Minister of Research, Technology and Higher Education (Menristekdikti) in the past four years, the growth of startups in Indonesia has increased rapidly. From 2014 to 2018, there is a significant change in the number of innovations and startups. This trend shows greater demand for creating an effective incubation program in a startup incubator. There is growing studies on how startup incubator serves as accelerator [24], accelerate the growth of new ventures and quicken the commercialization of technology [5]. Most of the startup incubator aims to enable the rapid growth of startups in usually 3-6 months through the provision of seed capital, extensive mentorship, and constant feedback, finally let them grow in real business environments [8].

Fig. 1 Number of Startups in Indonesia

Given the limited studies and clear guidance on how to effectively conduct the startup incubation process, a study to explore the critical phase and evaluation of startup development is imperative. This study explicates the case of a state-owned digital company which incubates, monitor, evaluate, and manage all their internal startup progress. In this incubator, each startup should go through a five-phase of a process called Innovation Journey to ease the incubator monitor the progress. Innovation journey consists of idea generation and validation, customer validation (CV), product validation (PV), business model validation (BMV), and market validation (MV). The five phases of the process are adopted from the customer development method [2] and Lean Startup [19]. Like other similar startup incubators, most of the startup cannot finish their innovations according to the specified time with no exact reasons. This creates a delay and low percentage of success of the startups in that incubator as seen in figure 2. A startup must look at opportunities and the right time to make products [13].

The first phase of startup development is critical to determine the success of the startup in the next phase. Thus, the beginning stage of startup development in the incubation needs higher attention. The incubation process is very important for startup survival and growth in the industry [13]. In our case, incubators' policy requires the customer validation process takes two weeks and will be given extra times of two weeks maximum extension. Meanwhile, the product validation process takes two months to develop the product. From the total of 15 startups in 2018, nine are still in the customer validation phase and four are still stuck in the product validation phase. The AMOEBA that still stuck in customer validation spent various time, from one and a half months until three months. It means the percentage of success rate from the customer validation phase is as low as 26,67%. While none of the AMOEBA is managing to pass

Adhi Antyanto Naratama is with the Master of Business Administration, Institut Teknologi Bandung, Ganesha st. No. 10, Bandung, Indonesia 40132 (email: adhi_naratama@sbm-itb.ac.id).

Nila Armelia Windasari is with the Master of Business Administration, Institut Teknologi Bandung, Ganesha st. No. 10, Bandung, Indonesia 40132 (email: nila.armelia@sbm-itb.ac.id).

the product validation phase until the end of 2018. It means the percentage of success rate from the product validation phase is 0 %. This problem is quite common in most startup incubators and to solve the bottleneck becomes critical.

Fig. 2 Percentage of Success from Startup in CV and PV Phase

This research explores the root cause analysis of identifies the factors that trigger a longer period during the first phases of startup incubation, which are customer validation and product validation. This research aims to propose an effective method to combine customer validation and product validation, which ultimately increases the effectiveness of the startup incubation process. We use the case study method with a qualitative approach to interview with both incubators and the startups. The interview aims to explore the root causes and find major factors in designing suitable methods in the first phase of the incubation process. This study is expected to fill the gap in the theoretical literature on startup incubation methods. For the practice, we expect this study to contribute to apply effective tools and methods for digital startup incubators.

II. LITERATURE REVIEW

A. The Lean Startup as the Foundation

A startup is a temporary organization designed to search for a repeatable and scalable business model [2]. Therefore, the lean startup is a set of practices to help people building a successful startup [19]. A lean startup is a principled approach to new product development that aims to create and manage startups and get the desired product to customers' hands faster [19]. Back in the day, the lean startup allows the software industry to get greater market satisfaction, deeper customer involvement, previously hidden market discovery opportunities [20]. It cannot be denied that a lean startup is hard to apply in the practice because it is quite difficult to understand [4]. But it is possible to implement lean startup methods by providing the processes and tools that made for the entrepreneur [3]. The Lean Startup approach relies on validated learning, scientific experimentation, and iterative product releases to shorten product development cycles, measure progress, and gain valuable customer feedback [19]. That way, the assumptions we use can be validated so that there is no time and money wasted because our products are not wanted by the public [13]. Lean startup is aiming to improve efficiency [14]. A startup should make a product that not only answers the pain problem but also how to make a product that fits the customer problem itself [19]. From their business model,

the startup can succeed if they can learn and rapidly using tests and experiments [3].

Lean startup is hypothesis-driven entrepreneurship [18]. Lean startup suggests that customer is the best source of information. They were experiencing their own problems. Customer is willing to solve it and willing to pay to solve it [15]. But, most startups lack a process for discovering their markets, locating their first customers, validating their assumptions, and growing their business [2]. It is very important to understand the initial problem which will then be developed into the idea of a product [13]. By using lean startup, customers had two roles: as a resource for new ideas and as a tester of new services [1].

B. Customer Development

Customer development is a framework consist of four steps, allowing us to explore and validate the market of the product, build a product that solves the customer need, acquire and converting customer using the suitable methods, and deployed the right resources to scale the business [2]. The customer discovery step is a process to understand what their customer problem and what they need. The customer validation step aims to make a sales model. In the customer creation step, we will create and control the demand. In the company building step, the startup is focused on the growth of the business [2].

C. Build Measure Learn Loop

Build measure learn loop is a continuous and iterative process, made to generate feedback and data [19]. In this loop, the startup will validate their assumptions as soon as possible to receive any feedback and data. This will help the startup to minimize their time through the loop, and also forced them to build fast, and learn faster [19]. The goals of every startup are to test the assumptions as quickly as possible [19]. Then, the startup will build a minimum viable product. According to [19], a minimum viable product is that version of a new product which allows a team to collect the maximum amount of validated learning about customers with the least effort. After setting a measurement indicator of success, the results are being measured and collected. Later, we made the data and made the conclusions.

D. Problem-Solution Fit

In this research, the author only concentrates on problem-solution fit. There is a simple method for validating the customer and the product, called a problem-solution fit phase [16]. There will be three stages that we need to do. First, we should write the business model and the hypotheses in the lean canvas. Lean canvas [16] is defined as the refinement of the business model canvas. Second, identifying the riskiest part of the plan so the startup can manage their time and their budget professionally. Third, the startup should systematically test their plan. The startup must understand well the problems to be resolved to be used as a basis for solutions. It is important to validate the problem with the customer. The biggest risk of a startup is not building something that does not work; it is building something that no one wants [16].

III. METHODOLOGY

To answer the research problems, this study consists of three steps. First, exploring factors on what makes the incubating period in the beginning phases were longer than expected. Second, the interview data were analyzed to find the root causes on the beginning phases, which are customer validation (CV) and product validation (PV) stages. At last, we propose the suitable methods to combine CV and PV as well as the tools for the monitoring process.

This research use interview as data collection methods and content analysis to do data analysis. There are six internal startups that are willing to do the interviews and the top management of the startup incubators. From six internal startups, each three of them was a representative of startups whose still in the customer validation phase and product validation phase. The respondents from the incubators are the CEO and CFO who are the key persons in managing strategies of the incubation process. There are five key questions that were being used to do an in-depth interview, which consists of questions about jobs to be done in CV and PV phase, startup incubators guidelines for the startups, startups key performance indicator, difficulties in CV and PV phase, and recommendation for startup incubators.

The interviews are conducted in a semi-structured form. Semi-structured interviews form allowing the author to do a discussion with the interviewee based on five key questions rather than a straightforward question and answer format. The data was collected in two steps. First, the author conducts an interview with incubators. Second, the author conducted an interview with startups. Every interview recorded and transcribed. Before the interview begins, the author had asked permission first to record the conversation. Every interview had a duration between 20 to 50 minutes. The data was analyzed using content analysis through manual and open coding to categorize the answers. The results are used as a basis to propose new tools for startup incubators.

IV. RESULTS AND DISCUSSIONS

A. Startup incubators – Interview with The Management

Startup incubators have a job to increase the number of innovation in Telkom. But innovating requires high passion. However, some STARTUPS agrees that they found it difficult when doing customer validation stage because they did not know the steps clearly. Startup incubators admit that there are no definite steps to do it, but they have already given the available option to do it. Time is a crucial problem in innovation because when the customer validation process is getting longer, it could be that the proposed hypothesis becomes invalid again because changes in problems over time can change. For the product validation stage, there is no serious issue at the moment, because some of the startups have not finished developing its products. The problem faced by some startups in the product validation phase is the difficulty of finding the right developer. Some startups felt that they are running out of time because their daily routines are taking their time. Startup incubators already have the solutions. startups will work with a 60/40 scheme (dual-mode), wherein three working days they do their existing jobs, and two days of work they do their innovations. At the

moment, startup incubators are considering a solution to overcome the time problem. Startup incubators will develop a website to monitor startups online. The notification will be sent via email, and the system can warn about their progress.

B. Startups – Interview with The Startups

The author has been conducted an in-depth interview with six startups which was incubated by startup incubators who represent the customer validation phase and product validation phase.

In customer validation, what should be done is to validate their own hypotheses in two weeks. Meanwhile, in the product validation phase, all startups agree that what should be done is simply to make a minimum viable product. Although Startup incubators already gave the explanation, startups admit that they did not have any clear steps to do customer validation. startups can choose whether they want to do a survey, in-depth interview, shadowing, or observation to validate the hypothesis. It is difficult to choose what methodology to validate the customer in the customer validation phase. In practice, every methodology that they choose has its own good and bad things. All startups understand that passing the KPI in the customer validation means customers agree that the problem exists and they need the solution that will be provided by the startups.

The steps in the product validation phase are clear because all of the startups using scrum methodology while going on in this product validation process. All startups understand that passing the KPI in the product validation phase means they achieve the number of a minimum user accessing their product, indicating that their product is being used by their customer. Dual mode policy or 60/40 scheme policy makes startups overwhelmed because of the load of work that they have been experiencing when doing the existing job. So, to do innovation, it means they work twice the load of their ordinary job. Every startup giving a suggestion to startup incubators for improvement. First, startup incubators should have an online monitoring tool. The online monitoring tools were useful to check the progress, to motivate, to have a structured target in every week, and to do a consultation with startup incubators. Startup incubators admit that they found it difficult to do a consultation with their startups due to their own agenda and routines. Startup incubators also should have a standardization about how to conduct a good interview or survey.

From the results, we can conclude that startups already understands what should be done at the stage of customer validation and product validation. However, the freedom to choose the method at the customer validation stage seems to be a problem for startups because they are confused to choose suitable methods. In addition, time is a major problem in innovating. Startups feel that their main work is already consuming their time. It is difficult for startups to manage their time. Startups also found it difficult to find the right time to be able to consult startup incubators.

Table I. Interview Summary with the Startups

Issues	Customer Validation Phase			Product Validation Phase		
	KEPOin	MyPride	Linmio	Integro	Tsabit	AMOR
What should be done in CV phase?	Validate the hypothesis Make golden Circle interview Online survey	Make a proposal :golden circle, lean canvas, list of questionnaire, and KPI. Interview Online survey	Make a proposal : golden circle, lean canvas, list of questionnaire, and KPI. Determine the user Making a question Interview online survey Budgetting	Gather the idea Make golden circle Interview Online survey	1. Make hypothesis 2. Determine the customer 3. Interview 4. Online survey	1. Make golden circle 2. Make value proposition canvas 3. Make the questionnaire 4. Online survey 5. List the answer in Microsoft Excel
What should be done in PV phase?	The Amoeba have not reached this phase.			Made feature map using SCRUM Made prototype of the product Validate the product	Make the product Customer try the product Validate the product to the customer	Meet programmers, make the model of the product Make a domain for the website
Is Ama Corpu giving clear guidelines about what to do in CV and PV phase?	Unclear, AMOEBA should decide their own methodology	Clear	Clear, Ama Corpu give a brief presentation	Clear, by following steps from Ama Corpu	Clear, Ama Corpu gives a training for giving instruction and clear guidelines	Unclear, AMOEBA should decide what methodology to use
What KPI that should be set in CV phase?	80% valid from total respondent	70% valid from total survey respondent	70% valid from total survey respondent	80% valid from total respondent	80% valid from total respondent	80% valid from total respondent
What KPI that should be set in PV phase?	The Amoeba have not reached this phase.			25% academies active using the application and each academy makes two programs for product validation	80% active users from total respondent for PV	80% active users from total respondent for PV
Is there any difficulties found in CV and PV phase?	1. Set up interview time 2. Make questionnaire	Dual mode	Set up interview time Educate their user Revising the questionnaire	1. Differentiate facts and problem 2. Determine interview and survey methodology	5. Set up interview time 6. Reminding respondent 7. Difficult to find matching developer	1. Make questionnaire 2. Dual mode 3. Teamwork

C. Proposed Effective Methods

The author combines customer validation and product validation processes into a process called the problem-solution fit. The study is limited only on the problem-solution fit phase because the author will propose tools only for the problem-solution fit phase. In the old methods of the innovation journey, it consisted of five phases, adapted from the customer development process made by Steve Blank. The new methods consisted of only three phases, adapted from running lean methods [16]. Idea generation and validation will be the initial phase before the clock starts running. The new problem-solution fit will have three months of duration.

Fig. 3 Old Methods Compare to New Methods of Innovation Journey

In the first step, startups must validate and verify the proposed hypotheses to their customers. Second, startups will make a demo product, then the demo product will be verified again to the customer. After the demo product has been verified to the customer and get some feedback, then startups can make the actual specifications from the Minimum Viable Product. Later, the finished Minimum Viable Product will be verified again to their customer, so the finished product can get a direct assessment from the customer. These repeatedly systematic steps of validation and verification are expected to help startups made a product that needed by their customers. The author contribution in this study is to help startup incubators by providing tools that can be used to bridge startup incubators with startups, in carrying out the problem-solution fit phase.

D. Proposed Startups Self-Assessment Sheets

Self-assessment sheets that were being proposed by the author consist of seven sheets containing how to assess progress from each startup. Every sheet has a different purpose and inside of it, there was a simple parameter, allowing startups to self-assess themselves to determine whether they were going in the right direction or not. After each sheet has been filled, startups should upload it to uploaded to startup incubators online mentoring and monitoring system, or startup incubators website. The figure below explains the objectives of each sheet of self-assessment sheets. The self-assessment sheets are created with the aim of overcoming the time problems experienced by both startup incubators and startups. Time problems often occur because both startups and startup incubators have busy schedules. That way, mentoring and monitoring activities can run anytime and anywhere without time constraints to meet in person. Startups can do self-assessment without having to ask directly to startup incubators. Self-assessment sheets also can overcome the

problem of standardization in the problem fit phase. The standardization means that the author tried to provide a reference indirectly on what startups should do when validating the customer and the products. Instead of giving startups the freedom to choose their methods, the author applied the method inspired by the running lean method [16]. The author uses interviews or surveys to validate problems and use surveys to verify the existence of the problem. Survey and interview seem to be more practical to be conducted rather than doing observation or shadowing.

Fig. 4 The Objective of Every Sheet in Self-Assessment Sheets

E. Proposed Online Mentoring and Monitoring System

Startup incubators online mentoring and monitoring system is created to overcome the difficulty of managing the time between startup incubators and startups. The product will be in the form of a website. The web-design of startup incubators Online mentoring and monitoring system will be divided into two interfaces. The interface will be different between the website for the startups and the website for startup incubators. Both of them have a similarity, which contains three main functions. The three main functions are, agenda, mentoring and progress. Agenda function is to inform both startup incubators and startups about their scheduling if they want to meet up or keeping up with the upcoming events from startup incubators. An online mentoring function has the same purpose with online chatting where startups can discuss directly with startup incubators anytime anywhere without worrying their chat does not read by startup incubators. For progress function, there will be a piece of information about the progress from each of the startups.

Fig. 5 Proposed Layout for The Website

V. CONCLUSIONS

Time is the main issue that must be faced when innovating. For this reason, startup incubators and startups

must work effectively with each other in order to make innovations in accordance with the specified time. Therefore, the proposed self-assessment sheets and proposed online mentoring and monitoring system are expected to provide benefits to overcome the time problems that have been experienced by startups and startup incubators. As a contribution to the theoretical, this study fills the gap from the study of how the incubation process in problem solution fit was refined to meet the purpose of startup incubators [16]. In the problem-solution fit [16] there are no self-assessment sheets. During an interview with startups, it was found that some startups are confused when conducting customer validation because there was no standardization in that phase. With the self-assessment sheets, the author can standardize so that all startups can do the same steps when undergoing the problem-solution fit phase.

The limitation of this study is that this research was conducted in the case of incubators in digital business. The results of incubator cases in digital business may be different in the case of other business fields according to their nature. Then this research is also limited only to discuss the phase of the solution fit phase. Therefore, this study cannot be generalized to the product-market fit phase and the scale-up phase because this research is a preliminary study. Thus, the proposed tools need to be further validated by using a larger incubator population. For future research directions, future research can benefit from extending the tools into the product-market fit phase. This will create integration between each of the phases so every startup will do the same methods and create standardization for every phase. Later, a future researcher can do more sophisticated methods to gather data such as field observation and experiment, or shadowing.

A. Practical Implication

It is expected that the presence of a solution in the form of self-assessment sheets and startup incubators online mentoring and monitoring systems can provide benefits. First, startup incubators have a structured procedure to evaluate startups. Therefore, with standardization, it is possible for startup incubators to have the same procedural structure for each startup so that it can help make it easier to evaluate the advantages and disadvantages of each startup because all startups use the same method. Second, startup incubators have a structured weekly target. Third, startup incubators can monitor the progress of every startup online. Now, with startup incubators online mentoring and monitoring systems, startup incubators know exactly the progress of every startup in real time because all progress is recorded online. Fourth, it is easier for startup incubators to make an appointment with startups. Because the scheduling process and the process of making appointments are carried out within the same online platform, making the scheduling process easier and organized. Last but not least, it is easier for startup incubators to conduct consultation and mentoring activities. Since this process can be done anytime and anywhere, it can solve the time mismatch problem between startups and startup incubators.

The benefits of the solutions offered in this study are not only felt by startup incubators. The following are the

benefits that will be obtained by startups. First, standardization of the problem-solution fit process. With the self-assessment sheets, there will be a standardization for the problem solution fit process and all startups will undergo the same set of processes. Second, startups can be more independent when making decisions. The presence of self-assessment sheets is expected to help the startups in determining the decision because it has made a similar process flow and will be carried out by all startups. Third, startups are easier to control by startup incubators. Startups do not need to worry that their progress is not monitored by startup incubators because startup incubators can monitor the progress of each startup online.

REFERENCES

- [1] Bieraguel M., Managing library innovation using the lean startup method. Bradford: Emerald Publishing, 2014.
- [2] Blank S., "The Four Steps to the Epiphany: Successful Strategies for Products that Win", Lulu Enterprises Incorporated, 2003
- [3] Bortolini, R. F., Cortimiglia, M. N., Danilevicz, A. D., & Ghezzi, A., *Lean Startup: a comprehensive historical review*, Management Decision, Porto Alegre: Emerald Publication, 2018.
- [4] Bosch, J., The Early Stage Software Startup Development Model: A Framework for Operationalizing Lean Principles in Software Startups, Gothenburg: Department of Computer Science and the Engineering Chalmers University of Technology, 2013.
- [5] Chengappa L., Geibel R. C., "What European Incubators Can Learn From Their American Counterparts: An Analysis of the Critical Success Factors for a Startup Incubator", Stanford: David Publishing, 2014.
- [6] Cooper R. G., "Winning at New Products Accelerating the Process from Idea to Launch", New York: Perseus Publishing, 2001.
- [7] Englis P., Wakkee I., & Sijde P. V., *Knowledge and networks in the global startup process*, Enschede: Inderscience Enterprises Ltd, 2007.
- [8] Fishback, Bo, Gulbranson C., Litan R., Mitchell L., and Porzig M., "Finding Business 'Idols': A New Model to Accelerate Startups." Ewing Marion Kauffman Foundation, Kansas City, 2007.
- [9] Gustafsson A., & Qvillberg J., Implementing Lean Startup Methodology - An Evaluation, 2012.
- [10] Haaverstad M. W., From Ambiguity to Problem/Solution Fit, Department of Product Design Norwegian University of Science and Technology, 2010.
- [11] Hadi U. (2018). *Indonesia Punya 956 Startup Dalam 4 Tahun*. [Online]. Available at: <https://finance.detik.com/berita-ekonomi-bisnis/d-4272928/indonesia-punya-956-startup-dalam-4-tahun>
- [12] Jaya M., Ferdiana R., & Fauziati S., Analisis Faktor Keberhasilan Startup Digital di Yogyakarta, Universitas Gadjah Mada, 2017.
- [13] Klaasa P., & Thawesaengskulthai, N., "Incubation framework for a new startup: A case study in Thailand", *IEOM Society International*, 2018.
- [14] Leoveanu V. M., The Advantages And Disadvantages Of Using The Lean Start-Up Method For Setting Up A Company In Romania, Bucharest: Emerald Publishing, 2018.
- [15] Manshoori Y., *Enacting the lean startup methodology*, Bradford: Emerald Publishing, 2017.
- [16] Maurya A., "Running Lean 2nd Edition. Iterate from Plan A to a Plan That Works", Sebastopol, United States: O'Reilly Media, 2012.
- [17] Policarpio N. (2018). How to Achieve Problem Solution Fit. [Online]. Available at: <https://medium.com/swlh/how-to-achieve-problem-solution-fit-3edfb83d59e>
- [18] Rasmussen E., & Tanev S., *The Emergence of the Lean Global Startup as a New Type of Firm*, Ottawa: Technology Innovation Management Review, 2015.
- [19] Ries E., "The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses", New York: Crown Publishing Group, 2011.
- [20] Rijssenbeek W., Applying Lean Startup Methods in Traditional Manufacturing Firms: A Theoretical Perspective, Enschede: University of Twente, 2015.
- [21] Still K., Accelerating Research Innovation by Adopting the Lean Startup Paradigm, Ottawa: Emerald Publishing, 2017.
- [22] Tatum R., Applying Lean Thinking Principles to Software Development. Portland: University of Oregon, 2005

- [23] Vlaskovitz B. C., “The Entrepreneurs Guide to Customer Development”, 2010.
- [24] van Huijgevoort, T. (2012). The business accelerator: Just a different name for a business incubator? (p. 68). Utrecht: Utrecht School of Economics.
- [25] Warberg N., & Thorup N., Preventing challenges in Lean Startup methodology - from a software engineering perspective, Copenhagen: Copenhagen Business School, Denmark, 2015

Adhi Antyanto Naratama. He was born in Jakarta on 26th September 1993. He is a bachelor degree of Civil Engineering from Parahyangan Catholic University, Bandung, Indonesia at 2017. Now, he is currently pursuing a Master degree in Master of Business Administration in Institut Teknologi Bandung, Bandung, Indonesia. The Author's major in the MBA program is marketing, concentrate on social entrepreneurship, consumer behavior, and market research.

He previously worked in PT. CIMB NIAGA, Tbk. for one year and have a role as a relationship manager from July 2016 until July 2017. And he has participated as an intern in PT. Telekomunikasi Indonesia, Tbk. for two months from December 2018 until January 2019 and have a role to manage innovation for an internal startup in the company. Now, he is still in college to pursue his Master degree.

Nila Armelia Windasari. She obtained PhD in Service Science from National Tsing Hua University on 2018. She also got her MBA major in Marketing from Asia University – Taiwan.

She is currently the junior faculty member at Business Strategy and Marketing research interest group, School of Business and Management, Institut Teknologi Bandung. She worked for an external audit firm before serve back in Academia.

Dr. Windasari has been awarded as HICSS Doctoral Fellow on 2017, and received Phi Tau Phi Scholastic Honor Society Award for her academic excellence upon graduation. Her dissertation was awarded as the Best PhD Dissertation by Service Science Society (s3tw) Academic Research Award on 2018. Her research interests lie in the broad areas of technology-enabled service, service marketing, and service design. She enjoyed doing research particularly in the digital business.