Business Model Analysis for Social Challenges: Integration of MOT and PPP

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Abstract--**Many governments are facing lack of resources and expecting some forms of Public Private Partnership (PPP) in service provision and infrastructure development. Meanwhile, many public entities have put solving social challenges as a priority in their science and innovation policies. However, both public and private sectors lack knowledge of how the other partners develop policies/businesses thus often cause failures or mismatches. Abe, Mitsuoka, Nakamura and Kojima introduced and applied MOT frameworks—business modeling and innovation architecture—to explore the possibility of using robot suits in elderly care at PICMET 2013. The article aimed to bridge the gap of understanding among public, private and other stakeholders. In this article, we emphasize the importance of matching regional characteristics and technologies in tackling social issues, thus aimed to incorporate regional assessment tools with MOT tools. Cases analyzed are development of a smart community in a tsunami-devastated area and regional medical care in rural Japan. These frameworks will help both public and private sectors to share thoughts/values, analyze their regional resources and develop PPP business models suitable for the region. Consequently this article finds effectiveness of these tools as well as several issues in applying such analyses to actual policy developments.**

I. INTRODUCTION

Solution for the social challenges have predominantly born by public sectors, however, with many government sectors have been facing lack of resources (monetary or nonmonetary) and seeking alternative means for financing and providing such services. In addition, innovations have changed ways of providing services rapidly, and they could be applied to public services. The aim of this paper is to identify the importance of public sectors and private sectors working together to tackle social challenges and the application of innovative solutions. However, even if a public sector recognizes the importance of using innovation in public services, it is often incapable of developing an efficient model. [1]

On one hand, there are many tools and framework for analysis and business model development recognized and used in MOT and business management while these tools are often too difficult for policy makers, public servants and the general public.

This paper succeeds the discussion raised by Abe, Mitsuoka, Nakamura and Kojima [2], in which MOT tools—e.g. innovation support technologies (IST)such as business modeling (BM) and innovation architecture (IA)—were effectively applied to the social challenges. Thereby this study aimed to further develop tools to assess regional characteristics, which strongly affect on the appropriateness of technologies and innovations to be applied. Authors focused on identifying resources or "infrastructures" of the region and analyze what are the desired services, technologies or innovations in that region.

Section I overviews recent topics in innovation policy and PPP to explain background of integrating MOT and Public Private Partnership (PPP). Section II briefly explains the tools developed and deployed. In Section III, these tools are used to examine two cases in rural Japan, their problems, and evaluate their counter plans. Section IV discusses and proposes some adjustment we came up to make the actual project more attractive. Section V provides issues to be further discussed and studied in using these tools.

Some of the tools developed and used in this article may not be refined as much as MOT tools, which have decades-long discussions and refinements by various contributors, however authors believe this article would be a guidepost of a discussion on effective application of innovations to social challenges.

A. Business management and society

Even though an economist Friedman [8] argued the social responsibility of business is to increase its profit, Drucker [6] wrote that business enterprises exist "to fulfill a specific social purpose and to satisfy a specific need of society, community, or individual." However, as Porter and Kramer [18] pointed out, activities as a member of society (e.g. CSR) have stuck at the periphery, never been the core of a business. In consequence, organizations operate for social purposes are often called a "social sector," and often differentiated from a for-profit business sector. According to Phills, Deiglmeier and Miller [16], social entrepreneurship, social enterprise, social capital, and social innovation, and similar words are gaining more attention. Porter and Kramer [18] also argued the importance of creating shared value (CSV), which provides value to society created from core of their business[2]. Thus,

[1] Nemoto [14] pointed out causes of failures of PPP are: failure of goal-setting by public, failure of roles-shared between public and private, inadequate/misleading messages etc. The main cause of such failures is lack of understanding of private sector's capacity, activities and technologies by public sector.

[2] Porter argued CSR has been recognized as philanthropy or charity and sparsely tied to strategic business activities. On the other hand, CSV should be recognized as a part of business strategy and activities for social issues

innovations discussed in this paper are defined as parts of a business's core activities.

B. Institutional supports for PPP in social challenges

In response, institutional frameworks to support such activities of businesses are rapidly put into place in many countries. The European Commission launched Horizon2020, the framework program for research and innovation. In this program, one of three major targets is to tackle societal challenges. In order to achieve the goals, importance of PPP is highlighted [7].

In the United States, Edward M. Kennedy Serve America Act was passed in Congress in2009, and Office of Social Innovation and Civil Participation was established to support innovative solutions for social challenges. In addition, 50 million dollar Social Innovation Funds Pilot Program has been implemented. These are mainly intended to increase number of people participate in NPO/NGO or community activities. However, as Bromberger [3] reported in 2010, Benefit-corporation legislations are passed in some states to support for-profit companies to pursuit social purposes following the legislation in Maryland.

In Japanese Fourth Basic Plan for Science and Technology [4], recovering from the Great East Japan Earthquake and achieving sustainable economic and social development is embraced as the most important issue. Promotion of environmental and energy issues and life innovations (i.e. medical, nursing, and health) are listed as pillars for innovation.

C. Challenges and opportunities of PPP

PPP is a method used in public service provision (including infrastructure developments). Various entities (public, private and citizens/communities) share risks and rewards in some public services, and the performance is ensured by a contract [12-13] [3]. Meanwhile, many stakeholders—private companies, governments, NPOs, charity organizations, and residents—involve in innovations for social challenges. These different entities possess different recognitions of issues, purposes, intentions, and approaches. Thus if these entities try to work together to tackle an issue, some tools are necessary for them to communicate and coordinate smoothly. These will help clarify and share a common purpose, target and solution on a subject matter.

PPP has changed the process of project development and contracting to a performance-based, long-term and holistic approach. Thus, different segments of service providers (e.g. finance, engineering, hospital operators, doctors, librarians and etc.) started working together to achieve the common project goal. These efforts have widened opportunities for private sectors to provide new values in the society.

II. ANALYZING BUSINESS MODELS FOR SOCIAL ISSUES

A. Methodology and Process of analysis

Fig. 1 is a modified schematic diagram of IST used in Abe, Mitsuoka, Nakamura and Kojima [2]. IA and BM were used to analyze effectiveness of such tools for promoting communications among people from different backgrounds. This article inherits the underlying idea, while there was a clear recognition that assessments of regional resources are necessary to develop solutions to social challenges. Thus, concepts and tools bordered in red are used in this article. These tools are aimed to be used by policy makers, private companies which are looking for their potential markets, and citizens to evaluate and involve activities in their region. Therefore, authors tried to avoid technical terms in developing regional assessment tools. These can be used by an individual or small group of people for discussions.

Fig. 1 depicts that while an IST process essentially reflects a technology or a company's background, the modified process starts from social issues. At the beginning, modified process adds a process to grasp regional outlook by using Porter's diamond model in the beginning. This establishes a hypothesis of what makes the issue challenging and how it can be tackled. In the next step, authors developed two sheets to assess regional resources and issues in detail. These analyses can illustrate the conditions of the region and validate the hypothesis. Finally, these analyses are integrated into business modeling and innovation architecture.

B. Porter's Diamond model

There are several tools used in business management to assess regional environments. One of them is Porter's Diamond model [17]. Porter emphasized that competitive advantage of a nation is created from its locations. There are six components in the diamond model; factor conditions, demand conditions, related/supporting industries, and firm strategy, structure, and rivalry. Two external components are government (government interventions, regulations and etc.) and chance. This process helps participants to develop a hypothesis of how and why a social challenge has become an issue in that region. However, the authors were aware that Diamond model cannot analyze small region's economy in detail. Similar criticism was raised by Rugman and D'Cruz [19], and they developed the "Double Diamond" model.

should be tackled in line with the core business activities.

[3] National Council for PPP defines PPP as contractual arrangement between public and private sector in which both parties share resources, risks and rewards in achieving greater efficiency, better access to capital and improved compliance. Nemoto[13] of Toyo University argues NCPPP's definition only describes formal and narrow partnerships in the society, and there are broader and various forms of partnerships between public, private and community.

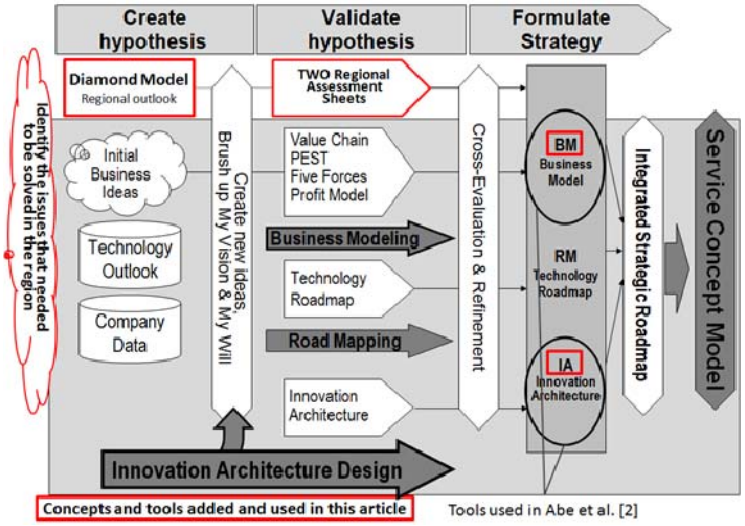

Figure 1 Schematic diagram of IST modified to apply to social challenges in a specific region

C. Regional assessment sheets

Namba, Goto, Tashiro, Hara, and Abe [11] examined the relationship of infrastructure and services in public service provision. Even though one of primary roles of a public sector is provision of physical infrastructures (e.g. roads, water/sewer and etc.), intangible infrastructures (e.g. politics, knowledge, law and etc.) are also necessary to sustain the benefits for the society. In that article, the authors defined major components of infrastructure as natural environment, hard infrastructures, human resources and institutional infrastructures. Infrastructures and services provided are strongly affected by the regional characteristics, history, and culture. Therefore, authors developed two sheets to assess regional conditions and resources.

The first sheet, "resources radar chart," is to analyze distribution of resources within a region (or specific industry). Each infrastructure component has four sub items, and participants use this sheet to see the condition of each item whether it is plenty or insufficient (or in good/bad condition). Initially, the authors tried to plot only the current state of an issue in the region, however, because each axis does not have quantitative measurement, they found out this sheet was suitable to plot two (or more) different things for comparison of conditions. Authors are still in discussion whether it should have a quantitative indicator to ensure objectivity and reproducibility. However, because of the simplicity and intuitiveness of the sheet, this sheet encourages and promotes discussions amongst people from different backgrounds. One way to use this chart is to compare internal resources and external resources. One industry can be compared to another as well.

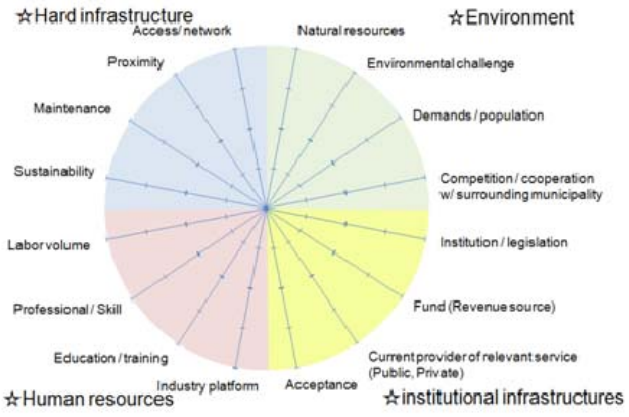

Figure 2 "Resources radar chart"

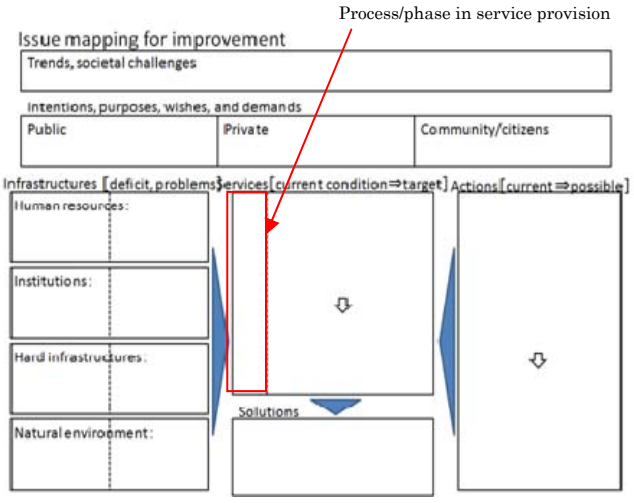

Figure 3 "Issue mapping"

The second sheet, "issue mapping," is to list and write down all the elements regarding the subject matter. With using this sheet in small groups, people from different backgrounds can share the value and recognition of the current status of the issue. This sheet also helps to identify where in the process of public services provision do they have an issue. This function is somewhat similar to value-chain analysis. Through this process, participants become more aware of regional characteristics, history, and political/social acceptance.

D. IA

IA is a methodology for innovation strategy formulation. Sato, Fukunaga, and Kamagata [20] argued IA is designed to develop an innovation of products, but not services. Sato proposed several modifications to Tschirky's IA in order to apply to service industries by amalgamating the soft systems methodology in the emergent phases of IA (SSM-IA) to analyze urban planning and regional policies of a city. In this process, Sato emphasized the importance of cultural and historical context, and argued SSM helps to incorporate such dimensions in IA. Nakamura, Tschirky and Ikawa [10] also developed service innovation structure. In the process of developing service (product) innovation, they applied a "service roadmapping," which consists of five layers; market/customer, service/business, service infrastructure/ network, elementary technology/product, and regulation /standardization.

The authors compared the layers of the IA in proposed by Tschirky, Sato, or Nakamura to identify if there is any elements to be added in our analysis. Of the four components of infrastructure, institutional framework was not included in none of the aforementioned IAs. In public services, institutional infrastructures can be both obstacles and enhancers, therefore need to be included.

E. Business modeling

BM process is useful to develop an implementable business. As Zott, Amit, and Massa [21] reviewed, definition of business model is broad and components vary. This article used a BM developed by Japan's Techno-Economics Society (JATES), which was presented at PICMET 2008 by Abe et al. [1]. This method enables to clarify revenue stream/cost, customer and domain of the business.

III. CASE ANALYSIS

A. Smart Community Development in Miyako City

(1) Background

Struck by the tsunami in 2011, Miyako City, Iwate is now implementing a "smart community" plan for its reconstruction. The tsunami led to 517 casualty and 2.4billion dollar damage within the city. However, even before the tsunami, Miyako had faced typical rural issues such as high elderly rate, declining population (57,000 in 2014 is estimated to be 36,000 in 2040), stagnant economy and shrinking tax base. Miyako was selected as one of eight Tohoku municipalities to develop a master plan for a smart community in 2012. NTT Data [15] and other companies formed a consortium to develop the plan and implement it in the city. The plan is now in feasibility study and basic planning phase, and some financial arrangements have been concluded. Detail planning and some installations will begin in 2014.

The biggest question is whether the smart community can solve these rural problems and sustain its economy. One of the major purposes to develop a smart community in Miyako is to install independent power sources because the city suffered from power outage after the earthquake and tsunami. The project consists of nine sub projects executed by four special purpose companies (SPC)[4].

- SPC #1 (Power generation): This SPC will install renewable energy generation facilities (solar, mini-hydro and biomass), especially in inundated area. All energy generated will be sold to SPC #2. Revenue sources for SPC#1 is the sale of electricity and feed-in tariff (FIT).
- SPC #2 (PPS, ESCO, CEMS, BEMS, HEMS): As a PPS[5], this SPC stores and sells electricity to the community. It also promotes efficient use of energy in public and private facilities through ESCO and other activities, monitors energy consumption using CEMS/BEMS/HEMS. It envisages implementing real-time pricing and automatic supply control to balance out the demand for power.
- SPC #3 (Car sharing): This SPC will install power supply stations and promote car sharing of energy efficient vehicles (plug-in hybrid and ultra lightweight vehicles) among residents and visitors. These vehicles are also used as movable power storages and outlets in emergency occasions.
- SPC #4 (Plant factory): This SPC develops a plant factory to use inundated land within the city. The factory uses solar power and cogeneration systems for producing high-value vegetables. It also acts as a large energy consumer of the generated renewable energy. It also creates employments within the city.

For the purpose of coordination and sharing philosophy of the entire project, City government and eight companies launched Miyako Smart Community Promotion Council. All

[4] SPC#1: power generation; SPC#2: power producer and supplier (PPS), energy service company (ESCO), community energy management system (CEMS), building energy management system (BEMS), home energy management system (HEMS), and storage of electricity; SPC#3: car sharing; and SPC#4: plant factory

[5] In Japanese definitions, PPS generate and sell electricity to contracted private large business complexes, companies and factories, while independent power producer (IPP) generate and sell only to power companies.

these activities combined, the project targets more than 5% of internal rate of return (IRR), and also to reduce energy consumption and tariff by 5%.

(2) Diamond model

The tsunami worsened the economic conditions of Miyako by accelerating population decline of younger generations and thus aging. These conditions are displayed well in the diamond model.

When observing the four major components of the diamond, a question rose whether the smart community plan provides the best solution for the challenges that this city is facing. The smart community plan does not take advantage of the geographical advantages of Miyako, in other words, marine resources or its core industry, fishery. Many felt incongruity between the advantages and resources they have and what they are trying to implement.

(3) Regional Assessment

Two major issues in Miyako were decline of local economy and reconstruction from tsunami. There are two possibilities to prosper the local economy; by strengthening existing local industry (fishery), or by creating different solutions with newly prospected smart community project. For the first step, both fishery and smart community are put in the same radar chart.

While 20% of workforce in Miyako worked fishery or related industry before the tsunami, there was no industry in the city that relates to power generation/monitoring/supply. The biggest "gap" shown in the chart was "human resources." Within Miyako, there are rich labor, skills, and experience in fishery but smart community is new to the region. In order to implement nine sub projects in smart community, the region need to "import" human resources from outside.

Both fishery and smart community projects are blessed with natural resources. There are good fishing grounds for fishery and plenty of sources for renewable energy (rich solar radiation, forest, and river).

(4) IA

Up to this point of analysis, authors could not identify the connection between the problems and the proposed smart community project. This implies that the smart community project does not necessarily correspond to the current condition of the city.

Authors then drew IAs for the smart community projects and fishery, but these IAs have the same problem; missing a link. Thus, authors elaborated to integrate two IAs, and attempted to find a connection and possibility for innovation.

There are several factors/characteristics that can connect these two. First, fishery (including processing and other related industry) is a large consumer of energy. A large and stable energy consumer can reduce the demand risks that will be borne by the power generator. Without such an off-taker, the power generator excessively depends on the feed-in tariff. Success of the smart community projects will also benefit existing fishery industries in Miyako by reducing energy price by 5%.

In the future, there are possibilities to integrate smart community projects with fishery: remote auction using ICTs and eco-friendly logistics using EVs. This analysis implies that the gap identified in the regional assessment can be bridged with a use of IA. IA makes it easier for the participants to recognize different elements of services and technologies concerned, and helps them devise and come up with new ideas for combining these elements.

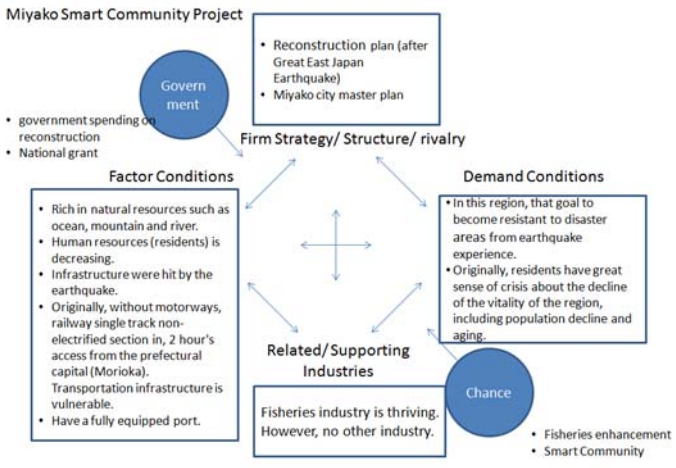

Figure 4 Diamond model after tsunami in Miyako

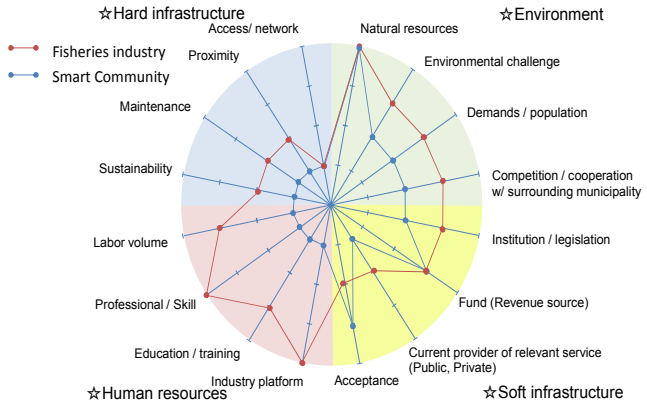

Figure 5 Radar chart of resources in smart community and fishery

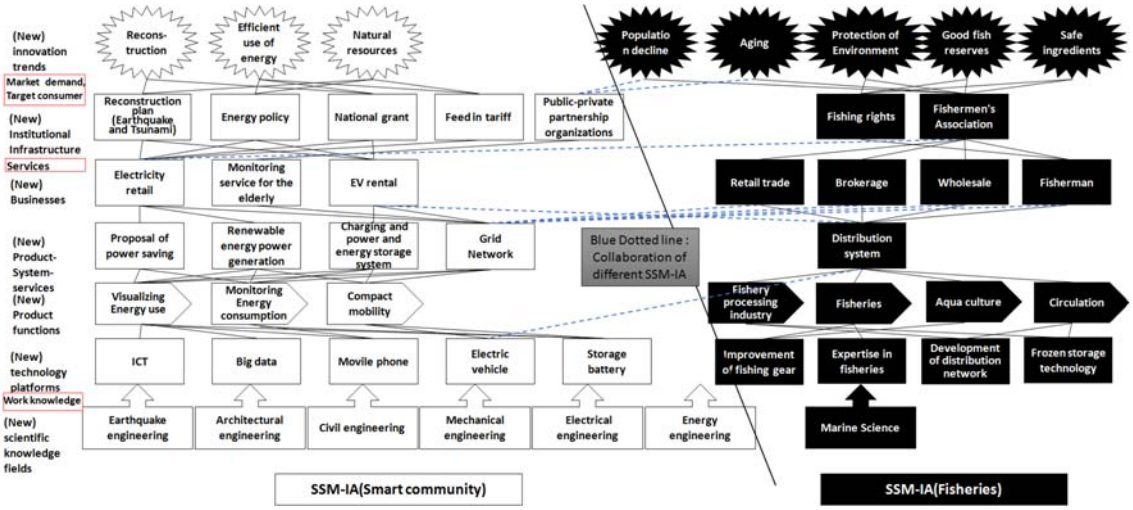

Figure 6 Integrated IA

(5) Business model

Miyako's smart community plan consists of nine subprojects implemented by four SPCs. This means several different responsible parties (providers) of different specialties have to work in unison to create a smart community. There are two governing bodies in the project; one to coordinate all SPC activities among private sectors, and the other to build up philosophy of entire smart community projects and maneuver as an organizer. The latter consists of both public (Miyako City) and private (companies involved).

B. Remote obstetric monitoring in rural area

(1) Background

Tono City in rural Iwate is now known as an advanced city for telemedicine.

Tono is a small city with 30,000 populations, and surrounded by very steep mountains. Tono flourished as a transportation hub connecting the inland and coastal areas and has been famous for horse bleeding. However, rapid aging and population decline has progressed in recent years. Aging rate in the 2010 Census reached 33.5%. Therefore, attracting young family is an urgent need for the city. Meanwhile, the influence of the decrease in obstetrician-pediatrician in Japan struck Tono and obstetrician/pediatrician became zero in the city in 2002.

The city vigorously tried to attract new physicians (especially obstetricians) to the city, by giving out many incentives. However, as reported in a regional newspaper Kahokushimpo [9], the city did not succeed to attract an obstetrician for many years, and had to come up with some outrageous incentives, such as grant aid for open a new clinic, a free house with garden, and a horse.

This case study analyzes the condition of the city at that time and evaluates the effectiveness of the counterplan. The counterplan of the city [5], *Net Yurikago* (meaning online cradle in Japanese), is a fetus monitoring through telemedicine devices. At the same time, Iwate Prefecture is also trying to build collaboration among obstetric hospitals/clinics within the prefecture, connecting hospitals and clinics with the internet, standardizing medical records, and promoting electric medical record keeping. Meanwhile, the national government loosened the regulation (Medical Act) that prohibited telemedicine. With these came together, the city established a council with 10 hospitals/clinics within and outside the city and contracted with hospitals across the prefecture to provide medical services.

The plan to install telemedicine was selected as a model project for using ICT for revitalization of rural cities by Ministry of Economics, Technology and Industry (METI). METI provided grants to install mobile cardiotocograph (CTG) devices, broadband network, video conference software, and so on. The City renovated an underutilized space in a public building to a maternity clinic so that the capital investment can be centralized to this clinic. Maternity and infant record book was also digitalized. The clinic provides health checkup, periodic fetus monitoring, counseling for expectants and new mothers, and health examination of newborns, but not deliveries. Only midwives and nurses are working in the clinic. At the clinic, expectants were connected with doctors in nearby cities through the internet, and doctors can monitor fetus development using a PC or a cell phone, which displays images sent from a mobile CTG.

(2) Diamond model

At first, participants of discussion could not list up many factors because they stuck with the idea that they have to write down items relate to obstetric care, telemedicine, and etc. Thus, participants had to do it all again after realizing they can list other elements in the city.

Service/ Product / Business model		Smart community				Fisheries	
		Business model 1	Business model 2	Business model 3	Business model 4	Business model 1	Business model 2
		Power generation	PPS,ESCO CEMS,BEMS,HEMS Storage facilities	Car sharing	Plant factory	Participation in the auction from a remote location	Plant factory
Target consumer		• residents	• residents	• residents • Tourists	• residents • Consumers in the distant city	• Brokers who live in remote areas	• residents
Value		To supply the renewable energy in the region	• To supply a stable electric power energy • Energy saving effect	• Moving around the city with small EV(electric vehicle) • In case of emergency power supply	• Vegetable production • Human resource development through partnerships with universities and companies • Employment creation	People who live in remote areas can participate in the fish auction market	• To order fish from the network • Delivery of fresh fish with compact mobility
	Provider	SPC 1	SPC 2	SPC 3	SPC 4	For example, Fishermen's Association	For example, Fishermen's Association
	Means	Supply through the electric power system	Stable supply of electricity by regional energy management system	Rentals in EV stations and charging	Retail high-added-value agricultural products(ex Paprika)	ICT auction of fish	EV fish Peddler
	Infrastructure (hard)	• Power generation facilities • *ICT(Information and Communication Technology)*	• Electric power system • Building • Storage facilities • Power supply facilities • *ICT*	• *EV* • EV station • *ICT*	• Plant factory • *ICT*	• *ICT*	• *EV* • *ICT*
	Infrastructure (soft)	• Prediction of the demand and supply of electric power • Monitoring	• Grids • Visualization of the utilization of energy • Monitoring	• Traffic rules • Deregulation	• Production expertise • Human resources	• E-payment	• E-payment
Revenue stream		• Usage fees • Feed in tariff • National grant	• Usage fees • Feed in tariff • National grant	• Usage fees	• Sales fee	• Sales fee	• Sales fee

Figure 7 Business modeling integrating Smart community projects and fishery

One of unique elements listed in the factor conditions was "Mayor has strong relationship with prefectural and national government. (Good at gaining grants from national government)." Cities surrounding Tono have geographical advantages. Since Tono does not have any big factory or company to work for, younger generations are sucked up by neighboring cities. Infrastructures (roads, networks, and hospital buildings) are well developed, though residents have to drive in the mountain to go to nearby cities for fetus checkup and delivery. It is very tough and dangerous during wintertime and many women expressed anxiety of being pregnant in the city. National government's policy to permit telemedicine is a big chance for the City.

(3) Regional Assessment

The radar chart was used to grasp conditions of obstetric care in Tono and surrounding cities. The result reinforces that Tono has shortage in human resources. The City had been trying to attract doctors, but not been successful. On the other hand, hard infrastructures or institutional infrastructures are by no means inferior. Even though hard infrastructures or institutions are well developed, hospitals or medical care could not function without professional human resources. In addition, access to hospitals in neighboring cities is not easy. Therefore, the City concluded that there are two choices; to continue trying to attract doctors or to find other way to fill the needs.

When listing current conditions of services, participants realized that periodic checkup of fetus development is one of the biggest troubles for pregnant women. While it is very difficult to attract doctors or improve access to nearby cities, periodic checkup can be provided through ICT. This alternative can achieve the same goal (to monitor health of a fetus and a mother periodically), while drastically reduces the physical burden of expectants. Many private sectors have strong intention to install such facilities and devices.

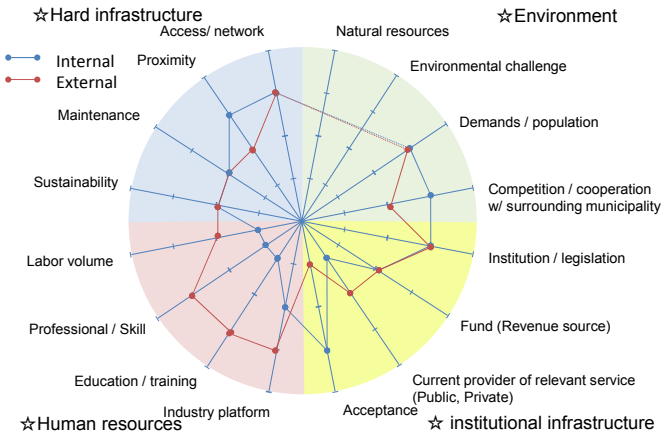

Figure 8 Rader chart for internal and external medical resources in Tono

(4) IA

This IA presents the technology and other elements to find out necessary function of the obstetric care through ICT. As shown in this IA, related institutional infrastructures have been put into place in a timely manner to enable the tele-maternity checkup and electrical medical record keeping. Meanwhile, national government started to promote preventive care for elderly, which can use IT devices, medical record keeping, knowledge, networks, relation to doctors, and human resources developed in the remote obstetric care. Tono has more than 33% of elderly rate, thus this seems to be promising.

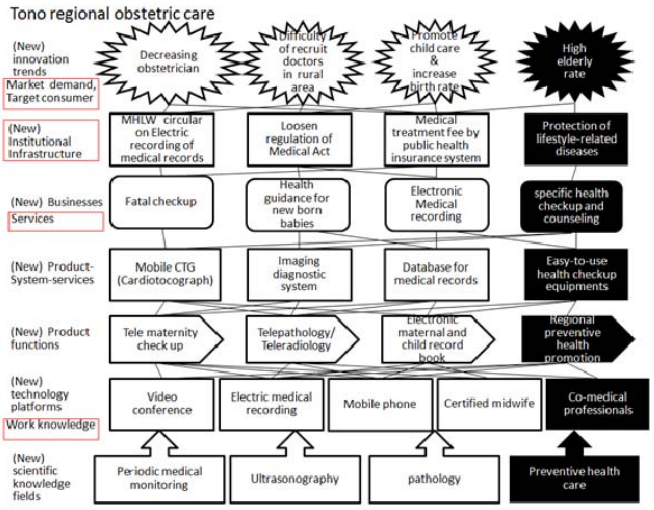

Figure 9 Innovation architecture for remote obstetric care

(5) Business model

At the end, we analyzed the business model for obstetric care and preventive care for elderly. The revenue stream for these projects are public health insurance, user fees, and some taxes. Since the city needed to renovate a public building to make it as a maternity clinic, and install ICT devices, the city used national grant. This clinic helps the city to reduce the total cost of operation because it improves efficiency.

In this business model, since the city intends to use grants for the initial investment, city is in charge of securing the fund (national grant), renovation, and purchasing equipments. The city also initiated public and private hospitals and clinics within and in nearby cities to join alliance and contract with the city. Private sectors supported this activity by investing in broadband, databases and so on.

IV. IMPLICATIONS AND PROPOSALS FOR IMPROVEMENT

By employing these tools, we could identify problems in policies in practice. From the results of the analyses, authors can propose the following to the cities.

A. Case of Miyako

This analysis showed the lack connection between the strength shown in the Porter's diamond model and regional analyses and the solution (smart community plan). The brain storming using the IA helped to point out some common elements (technologies, factors, and characteristics) to connect the proposed project with current status. It helped to invent a business models using a technologies/elements that can utilize existing strength to newly proposed projects. This implies that policies can be brushed up through this process. Continuous effort to repeat such process will help improve the appropriation of the policy to tackle the social challenges.

The smart community projects brought many stakeholders together and discuss about community development. This was a by-product of efforts to solve social challenges. In addition, this case study suggests that devising a scheme or business to utilize the existing strengths/resources in the new business scheme would induce invention of new business that fits local conditions. This also improves the feasibility/possibility of the smart community projects implemented in rural area.

B. Case of Tono

Preventive care for elderly can be developed and installed easily to Tono after successful operation of the obstetric monitoring system. In this case, Tono City identified the largest issue in the City was shortage of obstetricians within the City. By the same token, it was the hardest issue to tackle. Thus, the City decided to tackle easier problems to make the conditions better. Tools presented this article helps to such maldistribution of resources or malfunctions of policies.

V. DISCUSSIONS FOR FUTURE RESEARCH

As demonstrated in these two case analyses, these tools helped to identify current local conditions, enabling institutions, human resources, and help choose an option to achieve services and technologies desired. They also helped to develop a new idea for implementable business. Porter's diamond model and regional assessment tools are especially effective to help multi stakeholders from different background to collaborate and communicate intuitively. Recognizing conditions of infrastructures in the region helps to judge whether the policy respond to the current social challenges in the region.

(1) Objective (i.e. quantitative) measurement in regional assessment

While the radar chart tries to depicts the quantitative sufficiency of resources in a region (or subject matter), it does not have objective indicators for what is sufficient/ insufficient. The authors believe that this sheet is useful as an ice-breaker of discussion in regional analysis, and it well reflects the real feelings of the issue in the region. On the other hand, the results can be very subjective and is not reproducible. Thus, this can be used as a qualitative analysis of how sufficient participants feel about the status of certain resources versus their desired condition.

(2) Improvement of usability

Even though diamond model and regional assessment tools were relatively easier to use, participants could not reach expected result in the beginning because they started an analysis in a very narrow-sighted fashion. The regional assessment tools can be subjective and intuitive, therefore these may not be appropriate to be compared with sheets filled by other people or groups without a clear guidance. Meanwhile, many people need assistance or facilitation on drawing IA and BM.

(3) Different understanding of vocabulary

This paper aimed to develop some tools to bridge people from public and private sectors to share purpose and promote communication so that technologies and innovations can be effectively applied to social challenges. It is certainly helpful to have some tools to discuss about very complex social issues with people from different background. However, it is very important to keep in mind that everyone has different understanding of tools and vocabularies (e.g. what is infrastructure or service). Achieving common understanding of these tools and vocabularies is elaborating.

(4) Coordinating or comparing different/conflicting approaches

In addition, there was no process in this article to compare different solutions on the same issue. Some goals can be met with different approaches. There are many combinations of counterplans, infrastructure and services to obtain the same result. However, as we saw in Miyako's case, a policy target is often set without recognizing current situation, existing resources and status of infrastructure/service provision. Policy makers have amalgamated evaluation criteria for infrastructures and services to evaluate different options. In PPP, value for money (VFM) testing is used to compare different approaches to the same target. In applying MOT tools to social issues, it is necessary to develop objective method to compare different approaches.

Authors expect more analyses will be done to elaborate and refine effective tools so that technologies and innovations will be better utilized to tackle social challenges.

REFERENCES

[1] Abe H. A. Suzuki, M. Etoh, S. Sibagaki & S. Koike; "Towards systematic innovation methods: Innovation Support Technology that integrates business modeling, roadmapping and innovation architecture," *Proceedings of PICMET 2008,* pp. 2141-2149. 2008.

[2] Abe, H., M. Mitsuoka, M. Nakamura & K. Kojima; "A challenge for PPP (Public Private Partnership) concept modeling by the IST (Innovation Support Technology)," *Proceedings of PICMET 2013.* pp. 2219-2227. San Jose: PICMET 2013

[3] Bromberger, A., "Is the benefit corporation really such a big deal?" Retrieved 12/18/13 World Wide Web, http://www.lawforchange.org/NewsBot.asp?MODE=VIEW&ID=3631

[4] Bureau of Science, "The 4th Science and Technology Basic Plan" (In Japanese). Retrieved 12/21/13 World Wide Web, http://www8.cao.go.jp/cstp/kihonkeikaku/4honbun.pdf

[5] City of Tono, "Telemedicine using ICT in Tono," (In Japanese) Retrived 9/15/13 World Wide Web, http://www.city.tono.iwate.jp/index.cfm/31,13217,145,html 2010, January 5.

[6] Drucker F.P., "Management;Tasks, Responsibilities, Practices." Oxford: Butterworth-Heinneman. 1974.

[7] European Commission, "Public-private partnerships in Horizon 2020: a powerful tool to deliver on innovation and growth in Europe," Retrieved 12/21/13 World Wide Web, http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:52013DC0494:EN:NOT

[8] Freidman, M. "The Social Responsibility of Business is to Increase its Profits," T*he New York Times Magazine.* 1970.

[9] *Kahokushimpo*. "A Horse for a new doctor--Outlandish incentive to secure doctors in Tono," (in Japanese). 1/11/2007.

[10] Nakamura, K., H. Tschirky & Y. Ikawa, "Dynamic service framework approach to sustainable service value shift applied to traditional Japanese tea ceremony," *Proceedings of PICMET 2008*. pp. 2433-2444. Cape Town: PICMET. 2008.

[11] Namba, Y., N. Goto, K. Tashiro, K. Hara and H. Abe, "Integration of Infrastructures and Services," *Proceedings of The Japan Society for Science Policy and Research Management*. 2013

[12] National Council for Public Private Partnership "Top ten facts about PPPs," Retrieved 12/19/13 World Wide Web, http://www.ncppp.org/ppp-basics/top-ten-facts-about-ppps/

[13] Nemoto, Y. "Consideration of frame of PPP studies," in *Collected Papers of the Research Center for PPP in Toyo University*. No.1.pp19-28.2011.

[14] Nemoto, Y. "Consideration of frame of PPP studies (2)," in *Collected Papers of the Research Center for PPP in Toyo University*. No.2. pp4-20. 2012.

[15] NTT Data, Ennet, JDC Corporation, and City of Miyako. "Promotion of Miyako smart community installation" (in Japanese). Retrived 12/22/2013 World Wide Web, http://www.meti.go.jp/committee/summary/0004633/pdf/015_03_00.pdf

[16] Phills, J. A. Jr., K. Deiglmeier and D. Miller, "Rediscovering social innovation," in *Stanford Social Innovation Review* , pp.34-43. 11/4/2008.

[17] Porter, M.E., "Competitive advantage of nations," in *Harvard Business Review*. pp. 73-93, March-April 1990

[18] Porter, M.E. and M.R. Kramer, "Creating Shared Value," in *Harvard Business Review*. pp.2-17, January-February 2011.

[19] Rugman, A. M, and J. R. D'Cruz, "Double Diamond"model of international competitiveness : The Canadian experience," in *Management International Review* Vol.33. 17-39. 1993.

[20] Sato, R., Y. Fukunaga and T. Kamagata, "Consideration of Innovation Architecture Strategy and Management" (in Japanese). *Proceedings of Japan Society for Information and Management*. 2006.

[21] Zott, C., R. Amit and L. Massa, "The business model: Theoretical roots, recent developments and future research," Barcelona: IESE Business School University of Navarra. 2010.