

The Modeling of a New Business Creation Process Based on the Case of the Development of a Road Sign Inspection Support System

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ABSTRACT There are problems in the fact that the inspections and the maintenances of the road signs owned and managed by the local governments nationwide, especially the inspections of the small-scale road signs, are often postponed due to the shortage of the human resources and the lack of the funds at each local government. In response, Furukawa Electric Group has developed and released a road sign inspection support system. Using this development as an example, we modeled the process of the new business creation activities starting from the market by defining them in six Phases. There are obstacles between each Phase, and the specific activities are required inside and outside a company in order to overcome the obstacles. It is difficult to carry out these activities alone, and the new human combination inside and outside the company that goes beyond the existing organization becomes important.

1. INTRODUCTION

In the inspection and the maintenance of the road signs owned and managed by local governments nationwide, the important large structures such as bridges and tunnels, etc. and the road signs such as sheds, pedestrian bridges, gate-shaped signs, etc. have been given the priority due to the aging acceleration and the shortage of the human resources for the maintenance and the management. On the other hand, the inspection and the maintenance of the small-scale road signs such as road signs and lighting facilities, etc. are often postponed since the number of them is enormous and due to the shortage of the local government human resources and its funds. In addition, the facility ledgers and the inspection records have not been organized well or are inadequate. Furukawa Electric Group has developed and released a road sign inspection support system (hereinafter referred to as an inspection support system) to address these social issues.

In this paper, we modeled, defined, and organized the process of the new business creation activities starting

from the market, taking the development of the inspection support system that is a new business creation for Furukawa Electric Group as an example.

2. THE OUTLINES OF THE ROAD SIGN INSPECTION SUPPORT SYSTEM

Figure 1 shows the work flow of the inspection support system. By combining a record file in which the latitude and the longitude information of the inspection target is input and a GPS system connected to the tablet terminal, a photograph of the inspection target near the current position is automatically displayed. This enables a more efficient inspection. At the same time, by utilizing the camera of the tablet terminal, it is possible to create a record at the inspection site. This system was created in collaboration with CHUDEN ENGINEERING CONSULTANTS CO., LTD.. (hereinafter referred to as Chuden Engineering Consulting).

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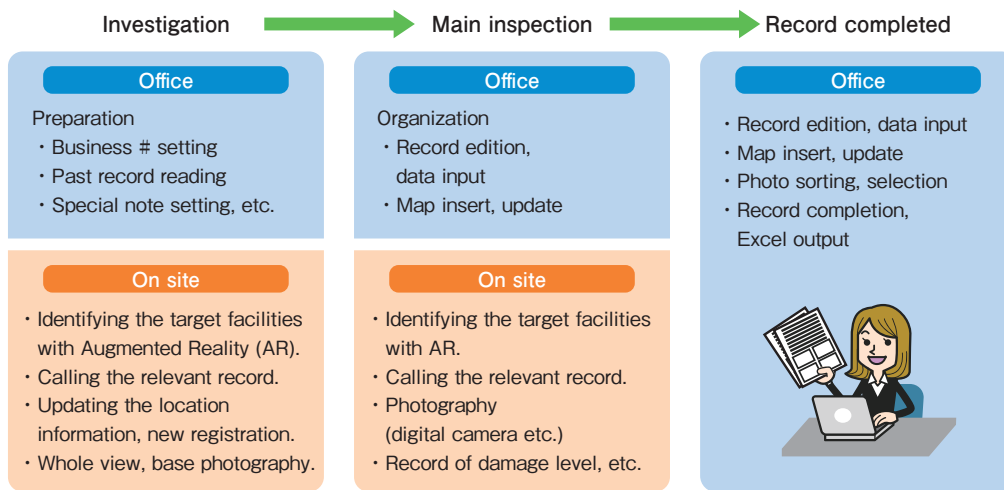


Figure 1 The work flow of the road sign inspection support system.

3. THE DEFINITION OF THE NEW BUSINESS CREATION PROCESS

Based on the example of the inspection support system, the new business creation process, especially the activity in the fuzzy front-end area from the creation of the idea to the development of the prototype, is defined as shown in Figure 2. Phases are set to a series of 6 from 0 to 5. Commercialization corresponds to Phase 5 onwards and this definition is the process up to just before the commercialization. The definition of Phases are shown below.

• Phase 0 “Knowledge learning”

If the target market already exists in the world, it is necessary to learn the knowledge of the market and the industry. In the market that does not exist in the world, it is necessary to learn the peripheral markets and industries. The peripheral markets and industries are the markets and the industries where the potential customers in the new market are present.

The knowledge to be learned includes “the issue of the industry”, “the industry key player who knows the issue”, “the existing solution to the issue”, “the industry features (value chain, 5F, the industry growth period, the life cycle of product service, etc.)”, “the degree of consistency with the social change and the direction of the industry change” and so on.

We participate in the industry community through the academic societies and the other organizations in order to obtain not only the secondary information, but also the primary information such as web and books, etc.

• Phase 1 “Job search”

Once the key people who know the issue in the community are identified (They can be an assumption.), it is necessary to sharpen the issue in the industry and continue searching for the planning of the specific job and its solution. The term “job” used here follows the definition of job theory¹⁾ by Clayton M. Christensen.

In many cases, one visit and one dialogue do not reach the job, so the visit and the dialogue should be made repeatedly. We reach the true job while pivoting the key

people and the proposal hypotheses keeping in mind the information that will lead to the next Phase.

• Phase 2 “Concept prototyping (including the draft business model)”

At this stage, the job obtained and its solution are simplified as much as possible and the appeal level is increased. The basic provision functions are defined, the provision values of our company are reviewed and the positioning is clarified. The quantitative targets associated with the jobs are set in order to quantify the functions.

• Phase 3 “Creation of the verification set up”

This is the stage of the demonstration in the verification set up in order to evolve from the concept to the product and the service. A testbed that allows the quick verification of the concept prototype is designed. It is better to select the candidates for the verification set up at the same time as planning the concept of Phase 2.

The verification set up is either prepared by ourselves or utilizes the opportunity prepared by other parties.

• Phase 4 “Product prototyping”

This is the stage where the prototypes incorporating the functions required for the verification are put into the verification set up, and the feedback and the correction are quickly performed. The technologies and the resources that are necessary for prototyping but not owned by our company will be procured from external.

• Phase 5 “Sharpening business scenarios”

Through the verification, we will add not only the basic provision functions but also the secondary functions required for the social implementation. At that time, we design the scaling towards the commercialization, taking into account of the value chain around the basic provision function and the nodes of the ecosystem.

There are obstacles between the Phases, and it is necessary to continue to invest the appropriate activity resources in order to overcome the obstacles. They are the resources of finance, human (activity and channel), technology and time. The commitments by the top management of the new business creation department are required.

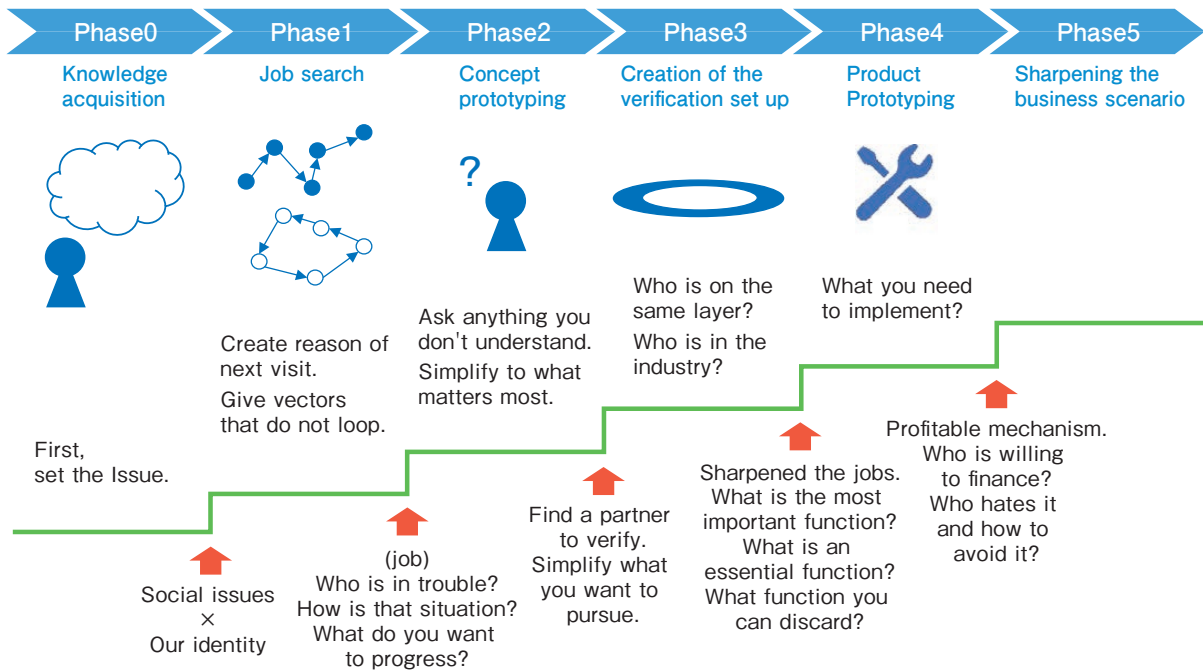


Figure 2 The definition of the new business creation process (at the fuzzy front end).

4. EXAMPLE: THE PROCESS FOR THE ROAD SIGN INSPECTION SUPPORT SYSTEM

Figure 3 shows the activities of each Phase for the inspection support system developed.

• Phase 0 “Knowledge learning”

Based on our company's identity and the social issues, “Maintaining the social infrastructure” was set as the tar-

get area. At this time, the possibility of applying our company's optical fiber sensing technology to the visualization of the maintenance and the management of the social infrastructure has been invented based on our technical experience. Through the information such as the market research, the lectures, etc., we participated in the community suitable for this job search.

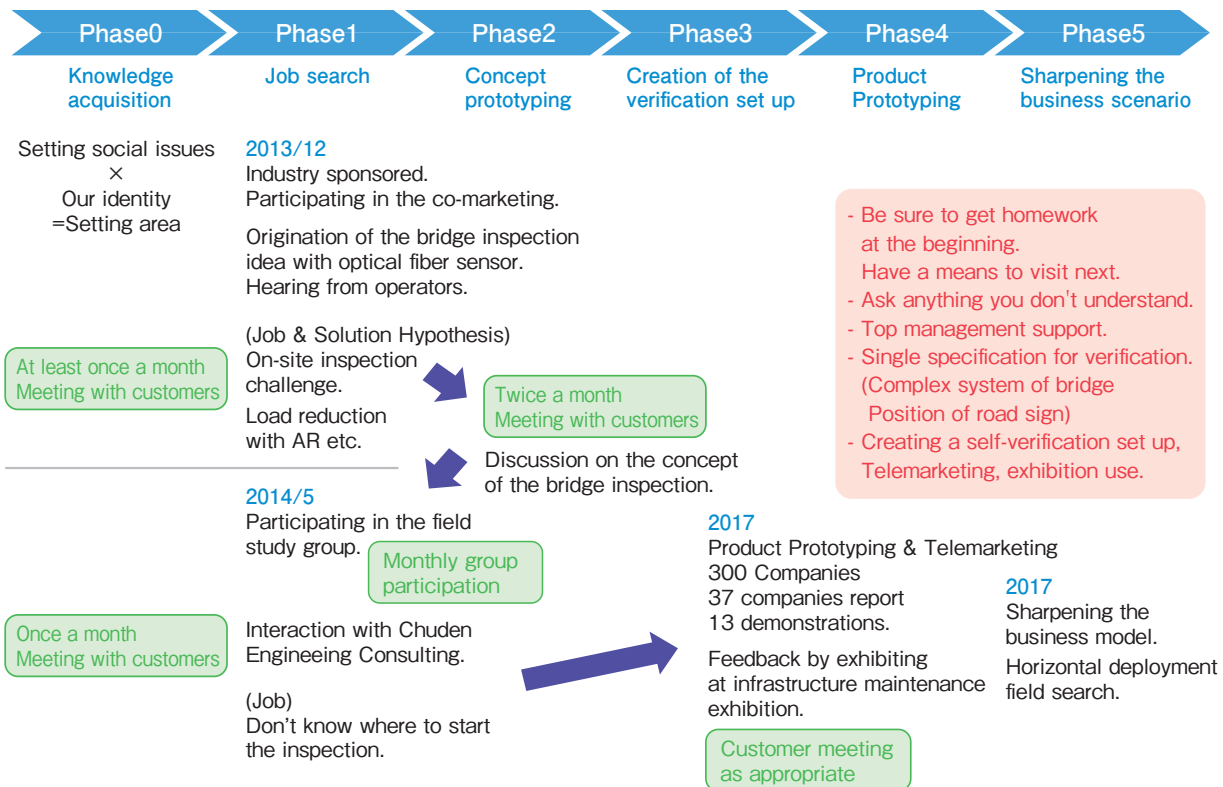


Figure 3 The example of the development of the road sign inspection support system.

• Phase 1 “Job search”

By participating in the co-marketing sponsored by the industry, we found the players and the key players in the industry. We had a dialogue with the people in the industry, having the hypothesis that the optical fiber sensors, which is a technology owned by our group, can contribute to the maintenance management by visualizing the vibration of the structures and monitoring. Through the interviews with the company that was conducting the bridge inspection, it was found that there was an issue that the load at the time of inspection at the bridge site was high. Also, the core idea of the inspection support system to reduce that issue with an AR came up. During this time, we had a meeting with the company at least once a month.

• Phase 2 “Concept prototyping”

The detailed version of the concept of the bridge inspection was discussed more in detail with the company and the simplified version of the bridge inspection using AR was created and verified. At that time, the important issues such as location information (GPS), etc. could be captured, but the initial prototype did not lead to a complete solution. In addition, it was understood through the prototype that it was difficult because the bridge structure is complex and the GPS information must be accurately provided for each inspection point. We decided to pivot to the inspection target that could be simplified more.

• Phase 1 “Job Search” 2nd time

By participating in a study group in this field once a month, we searched for the key players in the inspection industry. Then, we met with Chuden Engineering Consulting and recognized that the road signs would be the target. In addition, at the time of the inspection of the road signs, the laying position may change from the initial position, and there may be no initial ledger. As a result, we arrived at the job of the operator who did not know where to start.

• Phase 2 “Concept Prototyping” 2nd time

After the meeting with Chuden Engineering Consulting once a month, a prototype of the road sign inspection support tool using an AR was created. The verification with Chuden Engineering Consulting provided the prospect of solving the technical issues, but the concern was that only Chuden Engineering Consulting was the Voice of Customer (VOC). Therefore, we decided to create the verification set up and ask for the opinions on the prototype.

• Phase 3 “Creation of a verification set up”

Phase 4 “Product prototype”

This Phase is performed simultaneously in this example. The telemarketing was conducted to create the verification set up. We conducted the telemarketing for 300 companies and obtained the opinions from 13 companies on the demonstration of the product prototype. In addition, as another method of creating the verification set up, we identified the interested potential customers and acquired the VOCs by participating in the related exhibitions.

• Phase 5 “Sharpening the business model”

By collecting the VOCs, we identified the high-value processes in the value chain for the road sign inspection. We examined the business models that could appeal to them.

In addition, we were able to find out the horizontal spread of the inspection targets through the interviews with the stakeholders who inspected the road signs.

From Phase 5 onwards, it will enter into the Phase of the commercialization. The challenge now is to develop the customers so that the potential customers make purchasing decisions.

Figure 4 shows a typical six-layer sales funnel. In this example, “Lead” has been cultivated through the telemarketing and the exhibitions, the potential customers who are likely to be willing to purchase have been extracted

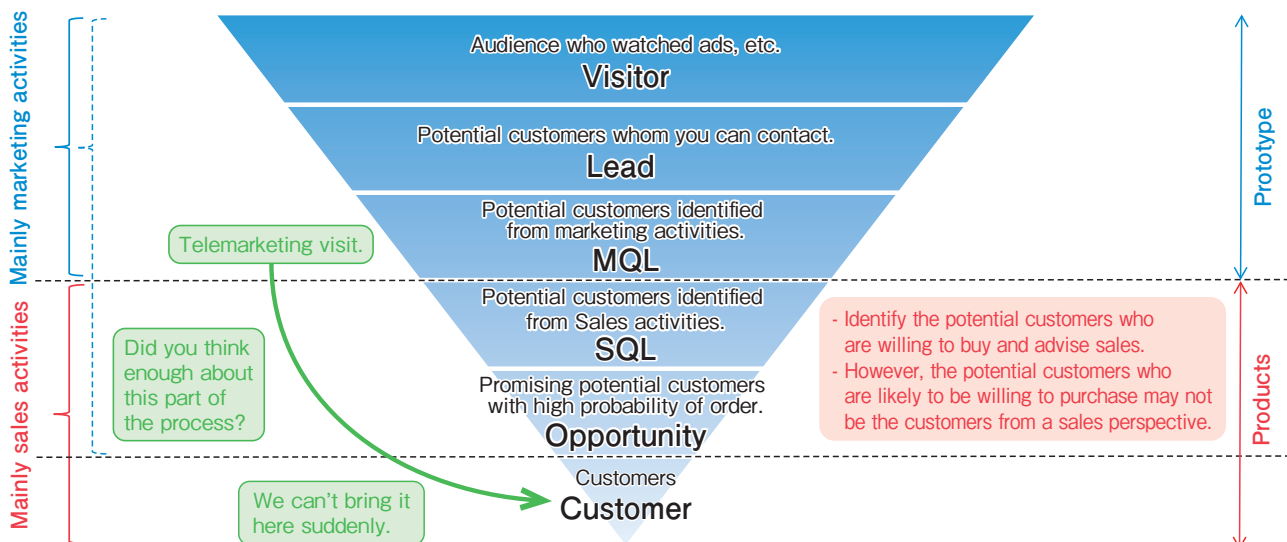


Figure 4 Sales funnel.

and the sales has been promoted. However, there are still several steps before the actual decision is made, and the gap has not been filled. From Phase 5 onward, designing of the marketing and the selling process that takes into account of the customer journey from the beginning of marketing will be an issue.

Note that the issues of the mass production after Phase 5 (quality assurance, securing the resources necessary for the stable mass production, etc.) will not be described in this paper.

5. ORGANIZING THE POINTS

There are obstacles between the Phases. In order to overcome these obstacles, "the specific activities" are required inside and outside the company. Also, in order to secure the activities, we cannot sustain the activities without the commitment and the support of the top organization.

It is difficult to carry out the activities in creating the new value alone and the new human combination inside and outside the company that goes beyond the existing organization becomes important.

Those who create a new business need to be aware of which Phase they are in and it is necessary to overcome the obstacles one by one while creating the nodes with other people. The top of the organization needs to flexibly invest the resources (people, goods, money, technology, etc.) necessary to overcome the obstacles.

6. THE COMPARISON WITH THE INNOVATION-RELATED RESEARCH

Yashiro organizes the process of the innovation as an "Innovation Process Meta (IPM) model" in his book, Innovation and Management²⁾. In addition, by using the concept of "value creation network", the state of the subject group involvement and interconnection to the process is organized as "In each stage of the innovation process, various subjects (people and organization) are involved, the information provision, the information

exchange, the knowledge fusion and the collaboration are made, some values are created and they are expanded in the society". Figure 5 shows the expression of the IPM model based on the knowledge creation and the application cycle. Yashiro says that the starting point of the innovation, "the starting point of the change", can occur from any process in Figure 5 and leads to the innovation through a cycle of processes. In this example, it can be considered as an example that we start from "review and reconsideration" with the industry experts in Figure 5, perform the current "definition of the issues and needs", perform "concept and solution creation", and lead to "development of products, mechanisms, and services" incorporating "technology development". In comparison to the linear Phase defined in this report, Yashiro's IPM model is considered as a higher-level concept. In the example of this paper, since "the starting point of the change" defined by Yashiro et al. is either "review and reconsider" or "definition of issues and needs" based on the VOC at the operation site, it can be said that the definition of the linear process model is also applicable.

Yashiro also states that "being involved in the same action and the activity node is a necessary but not sufficient condition for the collaboration and interconnection relationship to occur" and he values the conscious involvement of the subject. It is important to create a node point with other people while considering the Phase, which is the point of this report.

7. THE FUTURE DEVELOPMENTS

The road sign maintenance support system (hereinafter referred to as a maintenance support system), which is an extension of the inspection support system, has been developed and the verification tests are now undergoing. Figure 6 shows the work flow of the maintenance support system. It is a solution that easily creates and maintains the facility ledger of the road signs from scratch, combining the technology for the recognizing of the road signs from drive recorder images using Artificial Intelligence (AI) that belongs to ZENRIN DataCom Co., Ltd. with the

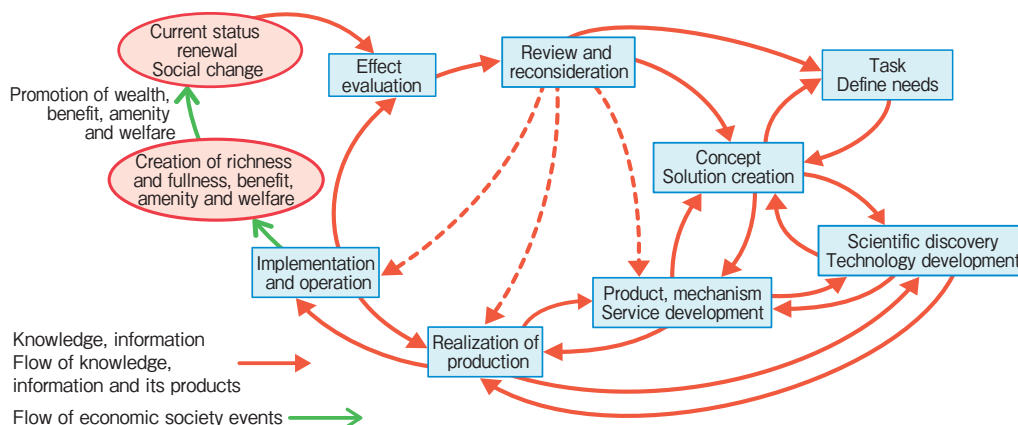


Figure 5 Schematic diagram of innovation process Meta model.

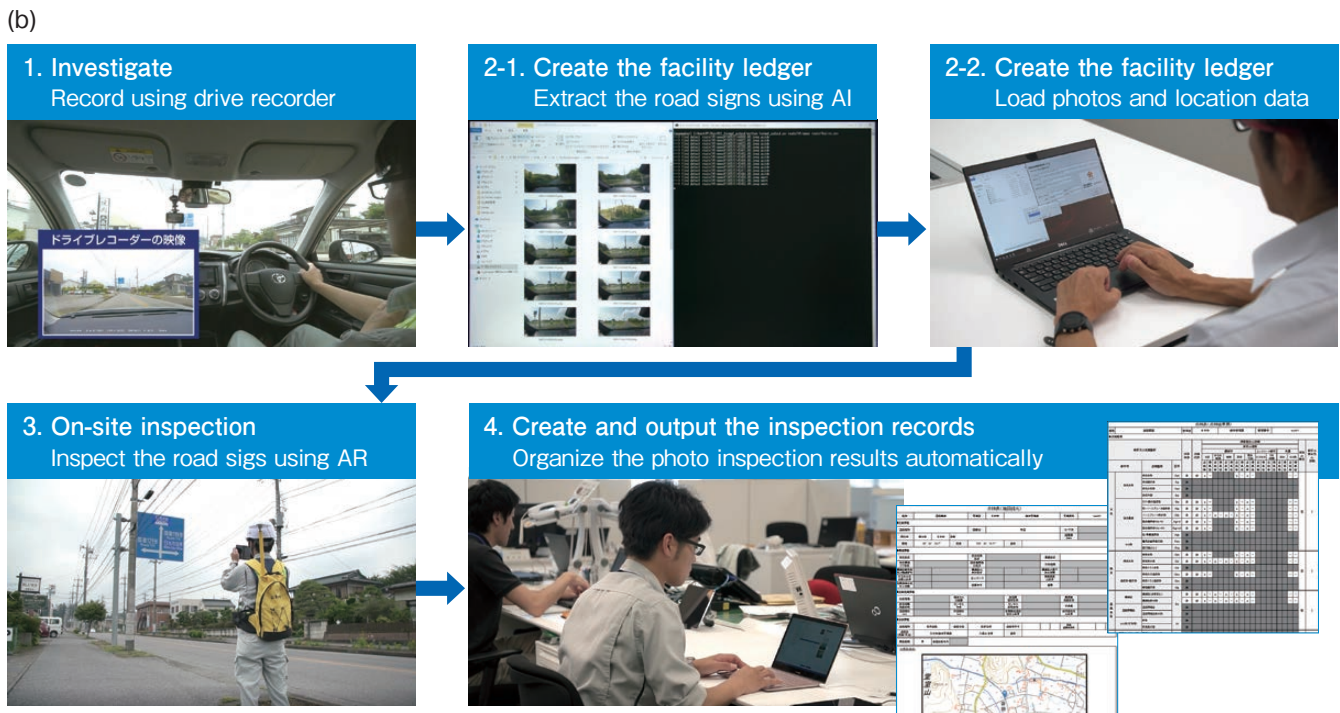
inspection support system. Demonstration tests of this system were conducted with the cooperation of Nikko City, Tochigi Prefecture, and it was confirmed that the system could be completed in about one-tenth the time compared to the conventional manual inspection.

In the IPM model shown in Figure 5, after the inspection support system was “implemented and applied”,

“review and reconsider” were carried out and reached “definition of issues and needs”. As a result, the maintenance support system was developed. In the future, we plan to conduct an analysis based on the model presented in this paper for the example of maintenance support system development.

(a)

	Conventional	Implementer	This system	Implementer
1. Investigate	Inspectors manually inspect and record the road signs in the area one by one visually.	Local government	Automatic recording of the video of road driving in the area with a commercially available drive recorder.	Local government
2. Create facility ledger	Manually create the facility ledger based on the location information of the road signs, whole view photos, and the map of the location.	Local government	Automatically create the facility ledger by identifying the road signs using AI from the drive recorder images.	Zenrin DataCom & FEC
3. Inspect the site	On-site inspection of the road signs while comparing the records using the facility ledgers (often paper).	Local government	Read the facility ledger into the inspection support system (tablet terminal) and inspect the road signs on site using AR.	Local government
4. Create and output the inspection record	Organize the photos of the road signs and manually copy the inspection results, and create and output the inspection records.	Local government	Photos of the road signs and the inspection work are automatically organized, and the inspection reports are created and output.	Local government



Example of the inspection record outputs.

Figure 6 Work flow of road sign maintenance support system. (a) Comparison table (b) Work flow image

8. CONCLUSION

Based on the development example of the road sign inspection support system, six phases 0 to 5 were defined as a new business creation process and modeled, and the following suggestions were obtained.

1. There are obstacles between the Phases, and “the specific activities” are necessary to overcome the obstacles inside and outside the company.
2. In order to secure the specific activities, the commitment and the support from the top of the organization are essential.
3. It is difficult to create activities that create new value alone, and the new human combination inside and outside the company that goes beyond the existing organization becomes important.

These Phases were compared with Yashiro’s IPM model, and it was determined that the specified linear process was valid in this example.

Those who create a new business need to be aware of which Phase they are in and it is necessary to overcome the obstacles one by one while creating the nodes with other people.

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