System Evaluation and Mechanism of Research Management at the Innovative Research Unit for Society and Community, Rajamangala University of Technology Suvarnabhumi

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Abstract

The Innovative Research Unit for Society and Community was founded to administrate area-based collaborative research of Rajamangala University of Technology Suvarnabhumi, ranging from the upstream, midstream, to downstream of the research process. To gain the information regarding the results of the research works, this investigation was carried out to evaluate the system and mechanism of research management at the Innovative Research Unit for Society and Community (Phase II). This study aimed at 1) evaluate the system and mechanism of research proposal selection process, 2) evaluate the system and mechanism of research operation reinforcement, and 3) evaluate the output of the Innovative Research Unit for Society and Community (Phase II). A total of 90 informants from 7 target groups were recruited to be the participants of the investigation. There were 2 research instruments adopted in this study; 4 sets of assessment tests and the focus group between the researchers and stakeholders. The data were quantitatively analyzed by using frequency, percentage, average and standard deviation whereas the qualitative data were analyzed by the content analysis. The overall findings indicated that, the Innovative Research Unit for Society and Community clearly defined goals and operational processes. Also, there was a synthesis of lessons learned from the collaboration of the research community. Each progressive tracking and reporting system is a mechanism to drive research efforts to meet the goals by reinforcing the support and steering the direction of research by qualified experts. The Innovative Research Unit for Society and Community should then determine the shared goals of the research community with the overall vision and goals of each area to create a shared commitment and responsibility to drive research for further area-based development.

Keywords: Evaluation, System and mechanism, Research management, Innovative Research Unit for Society and Community

Introduction

Area-Based Collaborative research for development or ABC research program was initiated in 2007 by the Thailand Research Fund (TRF). The ABC principles include 1) the focus on area-based approach which emphasizes the development of research questions to respond to the problems and needs of the people in particular, and 2) the collaboration with different groups of stakeholders in order to bring potential groups to participate in the research program and work together. The aim of ABC is to create changes in the areas which consist of different levels, including provincial, community and household levels through Participatory Action Research process with network partners. Such process will bring about the mutual learning which leads to the changes in the way of thinking and practicing, and eventually to the sustainable changes in the areas (Teeramatvanich & Buasai, 2015).

Rajamangala University of Technology Suvarnabhumi is a higher education institution on vocational and technology, improves human resources on high vocation, professional teachers, research programs and academic services for the society through sciences and technology. The university realizes the importance of research as a mechanism to move the university forward to become a leader of the community and society. This research project, entitled "Development of research system to develop areas in Nonthaburi, Suphanburi and Phranakhon Si Ayutthaya" is one of the research studies which corresponds to the abovementioned mission. The study was funded by TRF and Rajamangala University of Technology Suvarnabhumi with the goal to integrate academic work of the university, so that the research studies will help solve the problems and serve the needs arising from the community development, especially in the province that the university is located. It is aimed to develop the area and to improve people's professions, using physical and biological resources and, local wisdom and culture by establishing the "Innovation Research Unit for Society and Community". The Unit coordinates the cooperation among all research units within the university in order to promote interdisciplinary work and initiate the participation of network partners outside the university by determining target areas and goals for working together with communities in the areas as well as by conducting research management, including research question development, research funding allocation, follow-up assistance, and researcher development. Participatory research ensures that the research findings will be useful to the network partners and will be disseminated to the public with the support from TRF (Suwannasorn et al., 2016).

The Innovation Research Unit for Society and Community was established under the abovementioned mission. Thus, it is an important mechanism to drive the operations from upstream to midstream and downstream. In 2015, on Phase II, the unit was allocated with the research fund of 4 million baht to support 17 area-based research projects which included 6 projects in Tabnam sub-district administration organization, Bang Pa-han district, Phranakhon Si Ayutthaya province; 5 projects in Samruan sub-district administration organization, Bang Pa-in district, Phranakhon Si Ayutthaya province; and 6 projects in Wangyang municipality, Sriprachan district, Suphanburi province. To be able to learn about the results of the above operations, the Innovation Research Unit for Society and Community designed a follow-up and assessment system to be a mechanism of information reflection to develop the projects to achieve the goals and truly benefit the communities, leading to the sustainable development. Therefore, the evaluation of mechanism and research management system of the Innovation Research Unit for Society and Community (Phase II) aimed 1) to assess system and mechanism of research proposal consideration; 2) to assess system and mechanism of the research support, and 3) to evaluate the performance of the Innovation Research Unit for Society and Community (Phase II).

Definitions of terms

The evaluation of system and mechanism of research management of the Innovation Research Unit for Society and Community refers to the process of gathering relevant

information about the implementation of the projects to achieve the goals by assessing indicators based on terms of reference between TRF and the university. This includes additional indicators according to the needs of the Unit to manage projects. The evaluation was conducted in 3 components.

1) The evaluation of system and mechanism in the consideration process of research proposals by the Innovation Research Unit for Society and Community refers to the accumulation of information to determine the effectiveness of such process under the Innovation Research Unit for Society and Community to find the target areas of the research, problem analysis, communities' needs, proposal submission procedure, and research grant allocation.

2) The evaluation of system and mechanism to support the operation of the Innovation Research Unit for Society and Community refers to the accumulation of relevant information to consider the effectiveness of work under the Innovation Research Unit for Society and Community pertaining to the research scholarship disbursement system, coordinating mechanism, research skill development, awareness building process, progress follow-up process, the support of network partners/stakeholders in the area and participation of the community/researchers in conducting research.

3) The evaluation of the performance of the Innovation Research Unit for Society and Community refers to the accumulation of information to consider the effectiveness of work under the Innovation Research for Society and Community Unit pertaining to;

- attitudes toward conducting social research
- the number of research project leaders who are aware of the goals in the middle phase for the development of the areas in Nonthaburi, Suphanburi and Phranakhon Si Ayutthaya Provinces
- the number of research project leaders who are aware of the main goals/objectives of the research projects in the areas
- the number of research problems that correspond to the real needs of the areas
- the number of new area-based researchers who take part in the research projects
- the number of research projects completed as planned
- the number of academic work being conducted and planned to be carried out
- the number of research projects that serve the people's needs in the areas and are being implemented in the communities or ready to be enhanced for further use, and
- the number of research projects integrated in teaching and learning, academic services or arts and culture preservation.

For the research management of the Innovation Research Unit for Society and Community, Rajamangala University of Technology Suvarnabhumi has been conducting area-based research by focusing on rural areas. The goal is to stabilize people's livelihood under the resources available in the communities by building up a body of knowledge through science and technology and with the participation of the communities in order to manage the physical and biological resources, local wisdom and culture, and the environment in the communities following the philosophy of Sufficiency Economy, as shown in Figure 1 (Suwannasorn et al., 2016).

In order to achieve the conceptual framework of area-based development in Nonthaburi, Suphanburi, and Phra Nakhon Si Ayutthaya, "the Innovation Research Unit for Society and Community" was established to explore effective system to achieve the mission of the university for the society. The unit's components include system and mechanisms to manage research work, researcher development, and research study development. The goal is to produce research studies which yield beneficial, concrete findings. Such operation needs cooperation among faculties within the university and the participation of network partners in the area as well as the development of instruments and a body of knowledge to push forward the area-based research. The Innovation Research Unit for Society and Community works together with different faculties and develop area-based research management for each faculty through the coordinators and researchers. Research work is integrated with academic services so that the research studies will be implemented productively, as shown in Figure 2 (Suwannasorn et al., 2016).

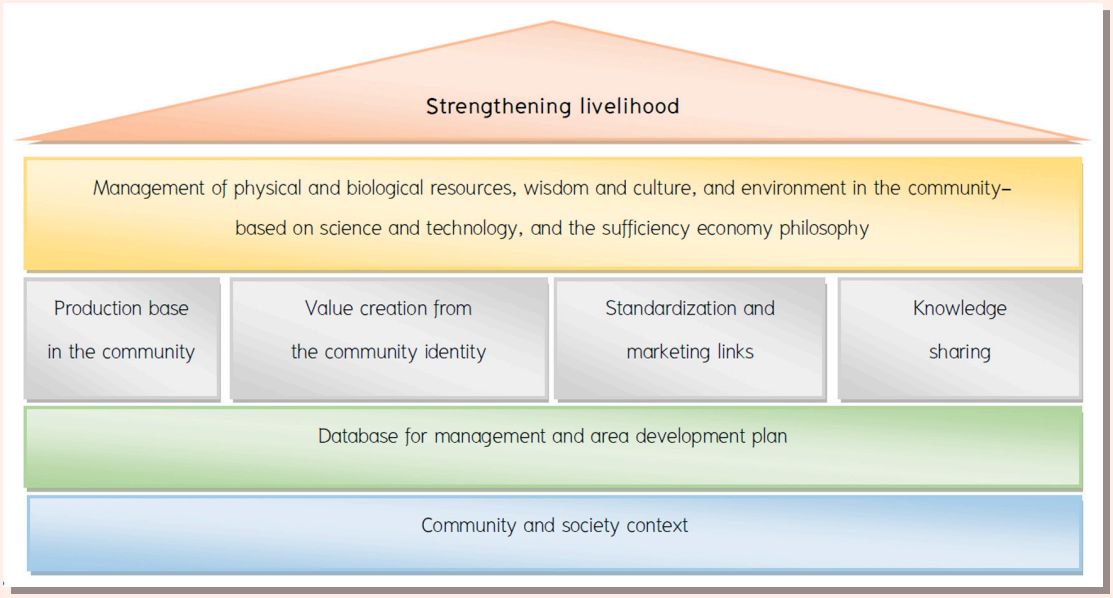

Figure 1 Area-based development framework in Nonthaburi, Suphanburi and Phra Nakhon Si Ayutthaya (Adapted from Suwannasorn et al., 2016)

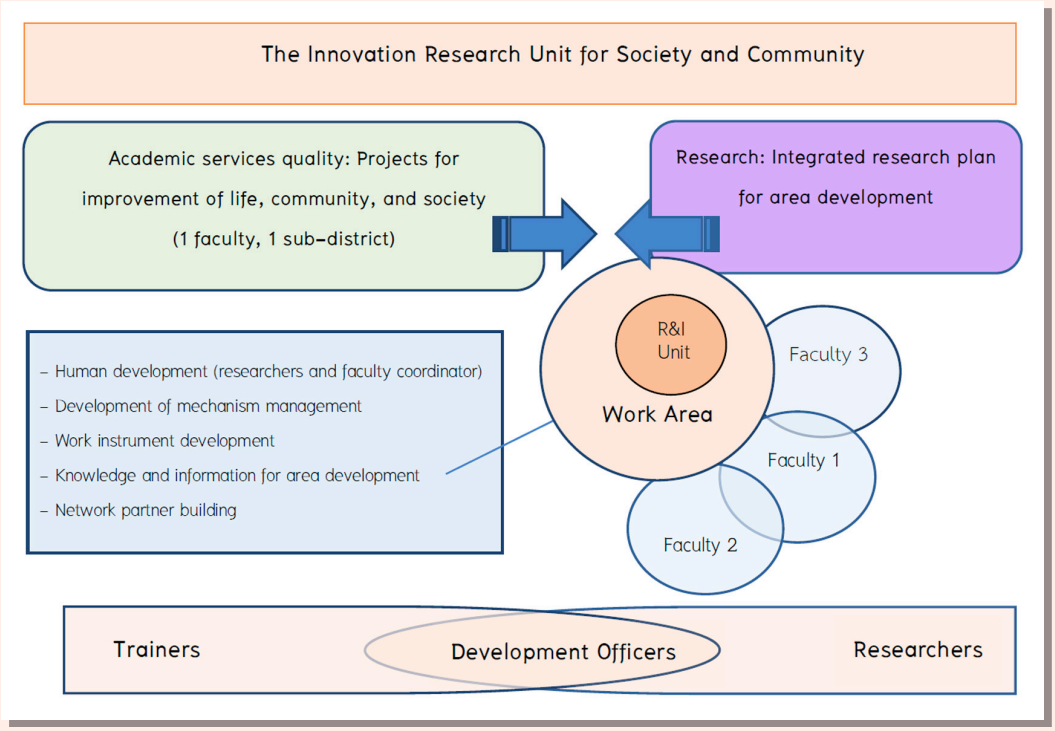

Figure 2 Roles and functions of the Innovation Research Unit for Society and Community (Adapted from Suwannasorn et al., 2016)

Evaluation framework

The evaluation of system and mechanisms of research management in the Innovation Research Unit for Society and Community (Phase II) is comprised of 3 principles which include: system evaluation, mixed-approach evaluation and amicable assessment, as detailed in Figure 3.

Research methodology

1) Target groups

The target groups are informants to evaluate system and mechanisms on research management of the Innovation Research Unit for Society and Community (Phase II), consisted of 1) 23 research project leaders who applied for research funding 2) 17 research project leaders who received research funding 3) 13 representatives of the stakeholders from the area ofTabnam Sub-district Administration Organization 4) 12 representatives of the stakeholders from the area of Samruan Sub-district Administration Organization 5) 7 representatives of the stakeholders from the area of Wangyang Sub-district Administration Organization 6) 17 researchers who have no experience in the area-based research, selected by simple random sampling and 7) an administrator from the Innovation Research Unit for Society and Community.

2) Instruments and methods to collect the data

Instruments and method to collect the data included 1) Evaluation of system and mechanisms of research proposal consideration form 2) Evaluation of system and mechanisms to support research operation form 3) evaluation of research

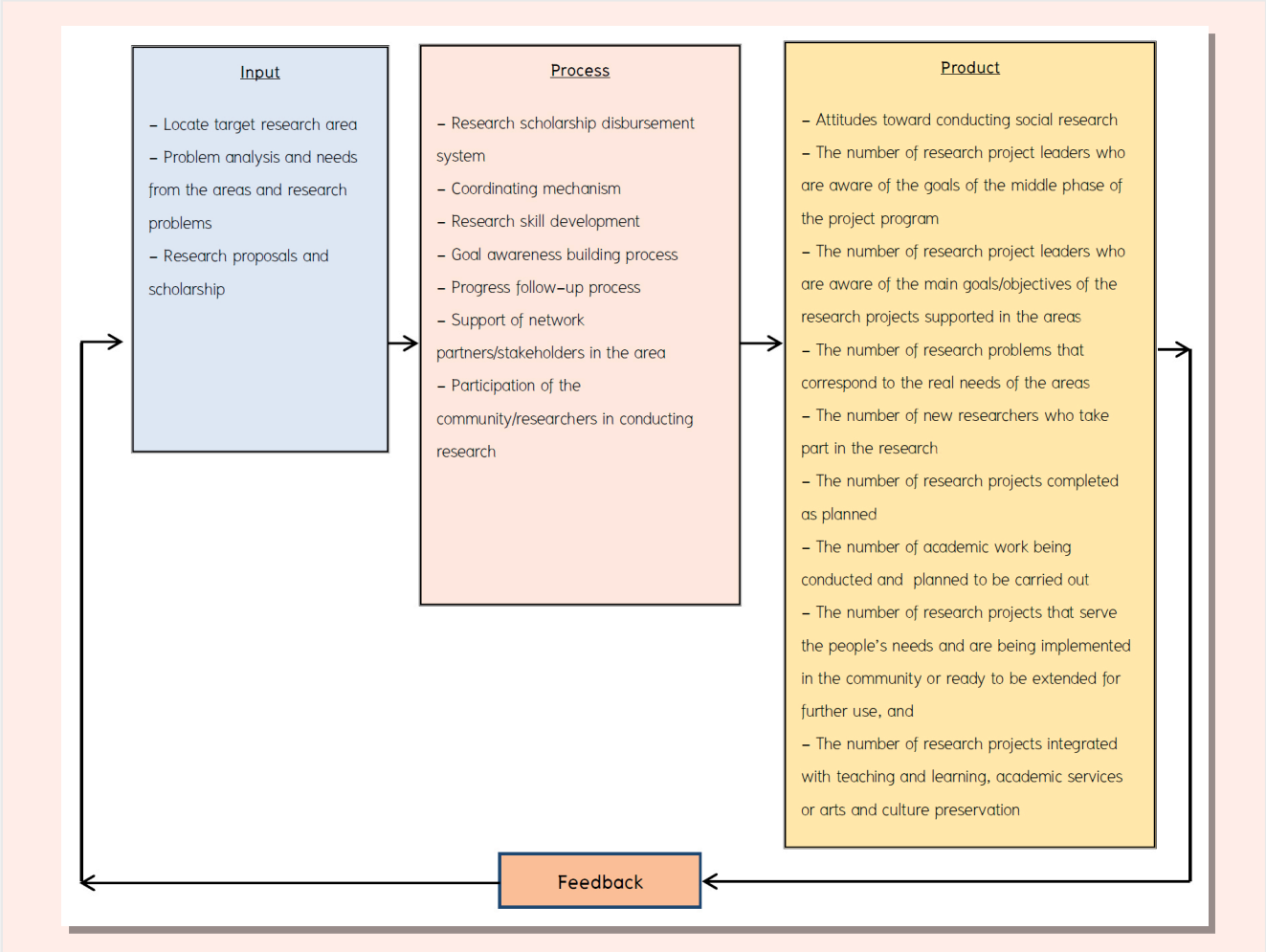

Figure 3 Conceptual framework of the evaluation

project form 4) evaluation of social research form to measure 3 components: cognitive, affective and conation (Henry, 1995; Schiffman & Kanuk, 2000). They were implemented with 30 people. It was found that the discrimination was between 0.2340–0.8521 and Conbrach's α–Coefficient=0.8822 5) group discussions with researchers who received research funds and 6) group discussions with representatives of stakeholders in conducting research projects.

3) Data collection

The data was collected by the evaluators using all 4 evaluation forms, group discussions with the researchers on 1st and 7th February 2017 and group discussions with research stakeholders on 24th and 27th February 2017 and 1st March 2017, as displayed in Figure 4.

4) Data analysis

Data were analyzed quantitatively through frequency, percentage, means, standard deviation and qualitative data analysis by employing content analysis technique with the qualitative data tested by the triangulation of Denzin (1970, cited in Chantavanit, 2005). It was conducted to analyze the consistency of the qualitative and quantitative data in each indicator from every target informant. If the data set is conflicted with each other, the evaluators would collect additional data until they reached the data saturation.

Findings and discussion

1) **Findings from the evaluation of system and mechanisms of research proposal management by the Innovation Research Unit for Society and Community (Phase II)** revealed that:

Indicator 1.1 Pertaining to locate research areas, the effectiveness was found at a high level. There was an additional suggestion that the researchers in the areas should be provided with more opportunities to take part in determining the research areas (in case, the research areas are extended).

Indicator 1.2 Concerning the analysis of problems and needs of area development and research question development, the effectiveness was found at a high level. An additional suggestion was that there should be collaborative analysis of research problems between the researchers of Rajamangala University of Technology Suvarnabhumi and the communities in order to discover the real and significant problems. For some important research problems in the areas that the researchers of Rajamangala University of Technology Suvarnabhumi do not specialize in, researchers from other units should be invited to join in so that the development or solution would cover the main points and there should be a research problem verification process.

Figure 4 Group discussions with the researchers and research stakeholders

Indicator 1.3 Pertaining to the research proposal and research fund allocation, the effectiveness was found at a high level. The suggestion was that the area–based research proposals should be reviewed by qualified experts as well so that the researchers would learn from them and this would create positive attitudes for the researchers toward the area–based research. In addition, complexity of research projects should be reconsidered in terms of the research process since some research projects might be integrated.

All 3 indicators passed the criteria of the evaluation. This may be due to the fact that the Innovation Research Unit for Society and Community has been working continuously for 2 years and thus learning the lessons in the system and mechanisms of the management, knowing how to appropriately adjust things to suit the contexts of the research in the areas as well as obtaining supports from the experts from the TRF. In addition, the operation is based fully on the PDCA which has been helping to improve and develop the system and mechanisms of management appropriately and efficiently. When considering the mean, even though it was found at a high level, a gap was also found. Each indicator should be developed to enhance public relation, coordination, funding as well as the participation process to help determining more research areas.

2) Findings from the evaluation of system and mechanisms to support research by the Innovation Research Unit for Society and Community (Phase II) revealed that:

Indicator 2.1 Regarding the research fund disbursement, the effectiveness was shown at a high level. An additional suggestion was that the training on the process of disbursement and the collection of financial evidence should be provided to the researchers as well as the disbursement manual should be clear and easy to understand.

Indicator 2.2 As for the mechanisms of coordination, the effectiveness was found at a high level. The suggestion was that there should be appropriate criteria to select the faculty coordinators and area coordinators to have the right coordinators who are ready to work. Duties of the coordinators should be clearly specified and they should be based on workload stated in the University declaration in order to build motivation for work. The coordinators should work closely and continuously with researchers and communities. One of the strategies is also to offer research funding to coordinators or select from those who already received the research fund. It will encourage the coordinators to have devotion and determination. In addition, it will create continuous relationship with the Innovation Research Unit for Society and Community and the local communities as well as the researcher community.

Indicator 2.3 Concerning research skill development, the effectiveness was found at a high level. The suggestion was that knowledge and PAR training workshop should be provided. Training on qualitative analysis techniques, e.g. content analysis, deductive summary, reflective thinking, and academic article writing should be provided.

Indicator 2.4 Pertaining to the building process of awareness of research goals, the effectiveness was found at a high level. A suggestion was that there should be meetings among researchers in the same area so that they would understand the goals in each area clearly. It will create mutual understanding and responsibility in order to achieve the research goals accordingly.

Indicator 2.5 As for the progress follow–up process, the effectiveness was found at a high level. A suggestion was that for the 6–month progress of the research in some areas, there should be an oral report apart from reporting by documents in order to review the research procedure and understand main points so as to encourage the researchers to find appropriate measures to conduct research.

Indicator 2.6 Regarding the support to the cooperation with network partners/stakeholders in the areas, the effectiveness was found at a high level. The suggestion was that there should be a meeting with different network partners before starting the research project in order to gain understanding and establish relationship with different network partners and after the research project, the data should also be given to the community.

Indicator 2.7 For the participation of the communities and local researchers in the research projects, the effectiveness was found at a high level. A suggestion was that there

should be a collaborative analysis between local researchers/community on the effectiveness of the participation levels based on the context of each research project as well as the clear goals of the Innovation Research Unit for Society and Community in supporting the learning process of local researchers/community.

Results of the evaluation of the 7 indicators revealed that they all passed the criteria. This may be due to the fact that the Innovation Research Unit for Society and Community has the follow–up and progress report system in each phase. It is the main mechanism to drive forward the research to achieve the goals or TOR by relying on the support program to pinpoint clear research directions from the experts from the TRF and the executives of the Innovation Research Unit for Society and Community as well as appropriate terms and conditions implemented in 2015. As a result, the researchers realized the importance of and were active in conducting area–based research studies to achieve the goals. Furthermore, research skill development process, knowledge exchange process and lesson learned are considered important factors to gear toward the success of the research project which was congruent to the study of Liangjindathaworn et al. (2016). Their study revealed that the local research community management of Ubon Ratchathani University should establish an organization to be responsible for local research management. The management system of research for local development should correspond to the concept of research for local development, measures and funding resource management process by relying on the participation of related people during the whole process. For the support of research for local development projects in the form of research community, it should consist of the support of research for local development, the support from Research Promotion and Administration Office, the support from mentors, and the fund to support local researchers.

3) **Findings from the evaluation of the performance of the Innovation Research Unit for Society and Community (Phase II)** based on the 9 indicators are shown in Table 1.

From the Table 1, findings from the performance of the Innovation Research Unit for Society and Community revealed are as follows:

Indicator 3.1 Attitudes toward social research. The mean was at 4.05, SD=0.40. It was found that the attitudes were positive toward the social research. They passed the criteria. The research project leaders were interested in continuing working on the area–based research in 16 projects or 94.1 percent.

Indicator 3.2 The number of research project leaders who are aware of the goals in the middle phase for the development of the areas in Nonthaburi, Suphanburi and Phranakhon Si Ayutthaya Provinces. It was found that only one research project leader was aware of the middle goal. It was "for career stability." Thus, this indicator did not pass the evaluation. The research project leaders understood the points differently.

Indicator 3.3 The number of research project leaders who are aware of the main goals/objectives of the supported research projects in the areas. It was found that 4 projects did not pass the evaluation criteria. The research project leaders understood the points differently.

Indicator 3.4 The number of research problems that correspond to the real needs of the areas. It was found that 14 projects could pass the evaluation criteria. However, 3 projects could not be verified since the research project leaders stated that "It is uncertain whether or not it was the real needs of the community." It corresponded to the representatives of the stakeholders who expressed that "The research problems were not clear and it was not known what the research study really wanted to accomplish." In addition, in some research projects, the stakeholder representatives requested to adjust the research problems to make it clearer since they might widely affect the farmers. For example, it was suggested that "There should be a research study concerning the development of disease–resistance water chestnuts. If it was successful, it could automatically decrease the use of pesticide."

Indicator 3.5 The number of new area–based researchers who take part in the research. It was found that 31 researchers passed the evaluation criteria. Fourteen of them or 45.16 percent were from the Faculty of Arts, 8 or 25.41 percent from the Faculty of Business Administration

Table 1 The evaluation of the performance of the Innovation Research Unit for Society and Community (Phase II), criteria comparison

Indicator	Criteria	Outcome	Results
Indicator 3.1 Attitudes toward social research.	$\overline{X} \geq 3.50$	4.05	Pass
Indicator 3.2 The number of research project leaders who are aware of the goals in the middle phase for the development of the areas in Nonthaburi, Suphanburi and Phranakhon Si Ayutthaya Provinces.	17 projects	1 project	Not pass
Indicator 3.3 The number of research project leaders who are aware of the main goals/objectives of the supported research projects in the areas.	17 projects	4 projects	Not pass
Indicator 3.4 The number of research problems that correspond to the real needs of the people in the areas.	12 or more projects	14 projects	Pass
Indicator 3.5 The number of new area-based researchers who take part in the research.	12 or more researchers	31 researchers	Pass
Indicator 3.6 The number of research projects completed as planned.	17 projects	17 projects	Pass
Indicator 3.7 The number of academic work being conducted and planned to be carried out.	12 or more pieces of work	32 pieces of work	Pass
Indicator 3.8 The number of research projects that serve the needs of the people in the area and are being implemented in the community or ready to be extended for further use.	12 or more projects	10 projects	Not pass
Indicator 3.9 The number of research projects integrated with teaching and learning, academic services or arts and culture preservation.	12 or more projects	14 projects	Pass

and Information Technology, 5 or 16.3 percent were from the Faculty of Science and Technology, and 3 or 9.68 percent were from Agricultural Technology and Industry and 1 or 3.23 percent was from the Faculty of Industrial Education. There were no new researchers from the Faculty of Engineering and Architecture joining any research projects.

Indicator 3.6 The number of research projects completed as planned. It was found that all 17 projects passed the evaluation criteria. Most of the research implementation followed the plan or the official timeframe. The Innovation Research Unit for Society and Community might extend some time for some research projects so that the findings would follow TOR. Some projects might be affected by uncontrollable external factors such as drought or delay in having the documents being audited by external organizations.

Indicator 3.7 The number of academic work being conducted and planned to be carried out. It was found that 32 pieces of research work passed the evaluation criteria. They included 30 research articles, a piece of petty patent, and a piece of geographical indication registration.

Indicator 3.8 The number of research projects that serve people's needs in the area and are being implemented in the community or ready to be extended for further use. It was found that from the total of 17 projects, 10 projects did not pass the evaluation criteria.

Indicator 3.9 The number of research projects integrated with teaching and learning, academic services or arts and culture preservation. It was found that 14 projects passed the evaluation criteria.

The indicators that passed the evaluation criteria may be due to the reason that the Innovation Research Unit for Society and Community has put the efficient system and mechanisms of research management by using PDCA through different groups of stakeholders under appropriate contexts, including upstream, midstream and downstream. The study was congruent to the study of Suwannasorn et al. (2016) which reports that "The development of research management system to develop the areas in Nonthaburi, Suphanburi and Phranakhon Si Ayutthaya" requires collaborative coordination among internal units to integrate interdisciplinary studies and building network partners outside the university by working together with units in the area to determine target areas and goals, allocate research fund, follow up the progress, provide assistance, improve researchers' capacity, conduct research process through Participatory Research, encourage the applications of research findings with network partners to the local areas, and reveal the implementations to the public and TRF. The system development brings about the integration of academic work within the university and creates interdisciplinary research in the area. The researchers share the same goals in conducting research by focusing on work achievement. Opportunities that the research studies will be academically accepted and will be able to benefit the people and help solve the problems in the areas. As a result, the 6 indicators could achieve the goals.

As for the 3 indicators revealing performance of the Innovation Research Unit for Society and Community (Phase II) that did not pass the evaluation criteria, they were indicators 3.2 and 3.3 – the awareness of the project goals and research goals in each area. The Innovation Research Unit for Society and Community employed the appropriate log frame analysis; however, the researchers lacked the shared understanding and awareness. Activities helping to enhance researchers' understanding and responsibility should be promoted. It can be done by implementing the feedback system to test the researchers' understanding including building continuous understanding with the researchers by integrating it in activities or meetings; for example, in a meeting of researchers in each area. Regarding the indicator 3.8, the number of research projects that serve the area needs and are being implemented in the community or ready to be extended for further use, which did not pass the evaluation criteria, some projects may need to adjust the research methodology to be more appropriate and clearer in order to achieve the research objectives. In addition, in some research projects, the participation of the stakeholders was still limited. It was also a lack of actual implementation which led to the lack of learning about the area's data. For some research projects, due to the research findings, the community understood and changed the way to solve the problems. For example, natural bleach was introduced to replace the bleach for water chestnuts or to reduce black spots in the water chestnuts. However, according to the research findings, black spots in the water chestnuts are useful substances, for example, Phenolic compounds and antioxidants. The community showed interests in the findings and chose to publicize and promote understanding with consumers regarding safe water chestnuts rather than reducing black spots or using the bleach.

Pertaining to the reflection of researchers after finishing the area–based research projects, they stated that "The research that integrates different sciences together by using community/stakeholders participation process to develop or solve the problems in the area, including identifying research problems, supporting the community/stakeholders to take part in the research projects, is beneficial to the local people. The research findings can be implemented to develop or solve the problems in the community or area in the long run.

Conclusion

The evaluation of the system and mechanisms of research management by the Innovation Research Unit for Society and Community (Phase II) can be summarized as follows;

1) Concerning the system and mechanisms in considering research proposals for the Innovation Research Unit for Society and Community (Phase II), which included Indicator 1.1 (determining research areas), Indicator 1.2 (analyse of problems and needs of the people in the area as well as development of research questions), and Indicator 1.3 (acceptance of research proposals and distribution of research fund), their effectiveness

was found at a high level. All of the indicators passed the evaluation criteria.

2) Regarding the system and mechanisms to support the research operation of the Innovation Research Unit for Society and Community (Phase II), which included Indicator 2.1 (research fund disbursement), Indicator 2.2 (coordination mechanism), Indicator 2.3 (development of research skills), Indicator 2.4 (goal awareness building process), Indicator 2.5 (progress follow–up process), Indicator 2.6 (support and cooperation of network partners/stakeholders in the areas), Indicator 2.7 (participation of communities/local researchers in the research project), it was also found that their effectiveness was found at a high level. All of the indicators passed the evaluation criteria.

3) Regarding the performance of the Innovation Research Unit for Society and Community (Phase II), 6 out of 9 indicators passed the evaluation criteria. The 6 indicators included Indicator 3.1 (attitudes toward social research with 4.05 mean), Indicator 3.4 (the number of research problems that correspond to the real needs from the areas, including 14 projects), Indicator 3.5 (the number of new area–based researchers who took part in the research, including 31 researchers), Indicator 3.6 (the number of research projects completed as planned, including 17 projects), Indicator 3.7 (the number of academic work being conducted and planned to be carried out, including 32 pieces), and Indicator 3.9 (the number of research projects integrated with teaching and learning, academic services or arts and culture preservation, including 14 projects). The other 3 indicators that did not pass the evaluation criteria included Indicator 3.2 (the number of research project leaders who are aware of the goals in the middle phase for the development of the areas in Nonthaburi, Suphanburi and Phranakhon Si Ayutthaya Provinces, including 1 project), Indicator 3.3 the number of research project leaders who were aware of the main goals/objectives of the supported research projects in the areas, including 4 projects, and Indicator 3.8 (the number of research projects that served the people's needs in the area and were being implemented in the community or ready to be extended for further use, including 10 projects).

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References

Chanthawanit, S. 2005. **Qualitative Research Method.** (13th Edition). Chulalongkorn University Press. Bangkok. 223 p. (in Thai).

Henry, A. 1995. **Consumer Behavior and Marketing Action.** 5th ed. South–Western College Pub. Ohio. 749 p.

Liangjindathaworn, O. et al. 2016. Research management pattern to support local research of Ubon Ratchathani University. *Area–based Research Magazine.* 8(4); 15–34. (in Thai).

Schiffman, L.G. & Kanuk, L.L. 2000. **Consumer Behavior.** 7th ed. Pearson Education. Reno.

Suwannasorn, R. et al. 2016. **Report on development of research system to develop areas in Nonthaburi, Suphanburi and Phranakhon Si Ayutthaya.** The Thailand Research Fund and Rajamangala University of Technology Suvarnabhumi. Phranakhon Si Ayutthaya. (in Thai).

Teeramasvanit, B. & BuaSai, S. 2015. **Development of capability and roles of a university to serve the area by research process on the road to the area–based university: 15 case study of a Thai university.** Collaborative Project to Develop Area–based Research between University and TRF, Nakhon Si Thammarat. 167 p. (in Thai).