Model of Artificial Intelligence System to Promote Learning About Rice Farming According to Philosophy of the Sufficiency Economy for Farmers in the Upper Northeast

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Abstract: This research has the purpose of research to study and develop model of artificial intelligence system to promote learning about rice farming according to philosophy of the sufficiency economy for farmers in the Upper Northeast with 4 research steps as follows: analysis of artificial intelligence systems to promote learning about rice farming according to philosophy of the sufficiency economy for farmers in the Upper Northeast, synthesis of artificial intelligence systems to promote learning about rice farming according to philosophy of the sufficiency economy for farmers in the Upper Northeast, modeling artificial intelligence systems to promote learning about rice farming according to philosophy of the sufficiency economy for farmers in the Upper Northeast and testing of artificial intelligence systems to promote learning about rice farming according to philosophy of the sufficiency economy for farmers in the Upper Northeast. The sample used in the research was 512 people classified by research phase was the group used to study the needs, forms and content of the lesson program of artificial intelligence system to promote learning about rice farming according to philosophy of the sufficiency economy for farmers in the Upper Northeast include, farmers studying in office of the non-formal and informal education in the Upper Northeast area and farmers in the Upper Northeast success in rice according to philosophy of the sufficiency economy amount 5 people and expert group to inquire about opinions on the comprehensive system composition of 15 people, farmers participated in the project to transfer knowledge to 97 people. The tools used in the research consisted of, questionnaires for opinions on the needs of lesson programs, interview with successful farmers, rice farming in Thailand about the content of the lesson program, questionnaire of expert opinion on the composition of the system, models, learning plan, lesson

program, learning achievement test and satisfaction assessment form. Statistics used in data analysis, the analysis uses the average and standard deviation. The results showed that artificial intelligence system to promote learning about rice farming according to philosophy of the sufficiency economy for farmers in the Upper Northeast consisting of inputs, processes, results and feedback. Which each part has elements and relationships as follows: context is informal education, there are 3 input factors: surveying problems and needs, exploring resources determining objectives. There are 4

processes in the process: production planning program lessons, creating a learning plan for the lesson program, production of lesson programs, finding effective programs, lessons and results is the transfer of knowledge and feedback to improve 1 system. The results of knowledge transfer revealed that farmers who participated in the project to transfer knowledge on rice farming according to philosophy of the sufficiency economy with a learning progress of 64.69%. And satisfaction with learning with the lesson program were at the highest level.

INTRODUCTION

Thailand is an agricultural country. Rice is considered an important economic crop for the country. One in five areas of Thailand or about 70 million rai are a rice field. Most of the area is spread across the country. And outside the irrigation area. But the most common problem is the low price of agricultural products. Especially, in the Northeastern region, the price has decreased significantly. The royal guidance of his Majesty the King Rama 9 bestowed upon the farmer in the year 1993 that one "Rice must be planted because for another 20 years, the population may be 80 million people. Rice will not be enough. If reducing rice cultivation, rice will not be enough. We will have to buy rice from abroad about what people in Thailand are not. Thai person must have rice. This Thai person must have rice. Even rice grown in Thailand will not be able to fight rice grown in Foreign countries. We have to plant" and "The new theory as to how to make people eat conventionally. May not be very rich but enough to eat and notstarve. The principle is to divide the soil into four parts. Part is for planting rice, another part for growing field crops, horticulture and there is a place for digging ponds" (Peetathawatchai, 2010). Encouraging farmers to realize the importance of rice for consumption. Giving Thailand food security, therefore is important. The focus of Thailand 4.0 is to change the economic structure to innovation-driven economy, changing commodity production into innovative products, change driven by the industrial countries to technology-driven creativity and innovation (Charoensethasil, 2017). Using local wisdom, local trainer, educational resources, training and local knowledge to benefit. Non-formal education must be organized. Supporting and promoting the use of these resources in human resource development (Promwong, 2012). The problem of using technology and educational communication in Thailand is still lacking in learning materials.Users don't have the ability to use the media. And lack of agencies to develop media and teaching

media systems (Kumut and Thaweekulsap, 2012). Bring knowledge about rice farming according to philosophy of the sufficiency economy for farmers in the Northeast of Thailand. From the development of innovations in the form of artificial intelligence systems are another science that many researchers around the world are interested. Because it is the science of creating intelligence for machines.

Especially, with computer systems. At present, artificial intelligence has been introduced. Applied to develop multimedia media such as computer games. Developing an artificial intelligence system to promote learning about rice farming according to philosophy of the sufficiency economy. Which students can use technology and educational communication as a tool to seek knowledge by themselves in a variety and appropriate. And these learning tools are what help to promote and support lifelong learning.

For this reason, the research was interested in conducting research about the development of artificial intelligence to promote learning about rice farming according to philosophy of the sufficiency economy for farmers in the Upper Northeastern region according to the principles of the human resource development system according to the Thai way. To develop a learning system to transfer knowledge to farmers to have knowledge and understanding in rice farming according to philosophy of the sufficiency economy. In order to be able to use in the way of life and continue the peasant career to stay with Thailand.

Objective: To study the needs, forms and content of artificial intelligence systems to promote learning about rice farming according to philosophy of the sufficiency economy for farmers in the Upper Northeast.

To study the components of artificial intelligence systems to promote learning about rice farming according to philosophy of the sufficiency economy for farmers in the Upper Northeast.

To create a model of artificial intelligence systems to promote learning about rice farming according to philosophy of the sufficiency economy for farmers in the Upper Northeast.

To study the results of using the artificial intelligence systems to promote learning about rice farming according to philosophy of the sufficiency economy for farmers in the Upper Northeast.

MATERIALS AND METHODS

The develop model of artificial intelligence system to promote learning about rice farming according to philosophy of the sufficiency economy for farmers in the Upper Northeast. This research is a research and development by adhering to the SASMES Model in organizing the human resource development system according to the Thai way (Promwong, 2012). The research phase is divided into 4 phases as follows:

Phase 1: Analysis of artificial intelligence system to promote learning about rice farming according to philosophy of the sufficiency economy for farmers in the Upper Northeast is a study of relevant documents and research, then coordinated the request for cooperation with the office of the non-formal and informal education in the Upper Northeastern by handing out questionnaires to the needs of the program format for artificial intelligence systems to promote learning about rice farming according to philosophy of the sufficiency economy suitable for farmers in the Upper Northeast. And the research team in the area to interview farmers in the Upper Northeast successful in rice farming according to philosophy of the sufficiency economy about the content of the program of artificial intelligence system to promote learning about rice farming according to philosophy of the sufficiency economy suitable for farmers in the Upper Northeast. The details are as follows:

- Population include farmers in the Upper Northeast
- Samples used in this research phase classified by the research process, divided into 2 groups

Farmers who study in the office of the non-formal and informal education in the Upper Northeast. The research team has determined the size of the sample group by using 400 people Taroya Mane tables and multi-stage sampling.

Farmer in the Upper Northeast which has succeeded in making rice paddy according to the philosophy of sufficiency economy, 5 people use the snowball sampling chain method.

The tools used in the research are divided into 2 types; questionnaire for opinions on program requirements, lessons of artificial intelligence system to promote learning about rice farming according to philosophy of the sufficiency economy for farmers in the Upper Northeast.

Interview with farmers in the Upper Northeastern region about the program content of artificial intelligence systems to promote learning about rice farming according to philosophy of the sufficiency economy for farmers in the Upper Northeast.

Phase 2: Synthesis of artificial intelligence systems to promote learning about rice farming according to philosophy of the sufficiency economy for farmers in the Upper Northeast. The research in this phase is to use the data from the system analysis in phase 1 research to consider the selection as an element of the artificial intelligence system to promote learning about rice farming according to philosophy of the sufficiency economy for farmers in the Upper Northeast. According to the composition of the system consisting of inputs, processes, results and feedback. The synthesis system components sent to 15 experts to inquire about the opinions of the elements of the artificial intelligence system to promote learning about rice farming according to philosophy of the sufficiency economy for farmers in the Upper Northeast.

The samples include an expert of the artificial intelligence system to promote learning about rice farming according to philosophy of the sufficiency economy for farmers in the Upper Northeast the 5 aspects: including technology and educational communication, electronic learning, artificial intelligence systems, informal education and the promotion of agriculture in the amount of 3 people per side, totaling 15 people use the purposive sampling method.

Phase 3: Modeling of artificial intelligence system to promote learning about rice farming according to philosophy of the sufficiency economy for farmers in the Upper Northeast. Research at this stage is the use of synthetic system components and then write as a structure showing the direction and the ongoing relationship of the system by doing the following:

Improve the composition as suggested by experts: Determine the systemic path of the artificial intelligence system to promote learning about rice farming according to philosophy of the sufficiency economy for farmers in the Upper Northeast including the direction and the ongoing relationship of various elements of the system; arrange the elements of the big system, subsystems in order of precedin; set the symbol to show the steps of the system, both large systems and subsystems.

Phase 4: Testing of artificial intelligence system to promote learning about rice farming according to philosophy of the sufficiency economy for farmers in the Upper Northeast.

This phase of research is a system test the research team coordinated with the office of the non-formal and informal education Maha Sarakham province in organizing a project to transfer knowledge on rice farming according to philosophy of the sufficiency economy into the agricultural community in the Northeast by following the steps of the artificial intelligence system to promote learning about rice farming according to philosophy of the sufficiency economy for farmers in the Upper Northeast. The details are as follows:

Step 1; explore problems and needs: The research team has signed the office of external education. Informal system and education Maha Sarakham province in organizing a project to transfer knowledge on rice farming according to philosophy of the sufficiency economy into the agricultural community in the Northeast found that there was a need for online lesson programs for use in non-formal education systems and informal education.

Step 2; explore resources: From the survey of the office of non-formal and informal education Maha Sarakham province found that there is readiness in computer equipment and the internet network system according to the Pracharat internet project. But lacking an online lesson program to transfer knowledge in various fields to be used in non-formal education systems and informal education.

Step 3; define objectives:
- To allow farmers to understand the value of farmers
- To allow farmers to understand rice farming in accordance with philosophy of the sufficiency economy

Step 4; production program lesson plan: Studying and analyzing farmers courses of the office of the non-formal And informal education promotion Maha Sarakham province. Analyze the relationship of content and learning objectives by organizing the learning process evaluation, that is suitable for farmers according to the form of informal education.

Create a learning management plan for the lesson program of artificial intelligence system to promote learning about rice farming according to philosophy of the sufficiency economy for farmers in the Upper Northeast.

Bring the learning management plan to content 3 experts, assess the learning management plan and then take the assessment score come to analyze the mean with an average of 4.80 with the right quality at the highest level can be used in teaching and learning. Bring a learning plan that has been evaluated by experts to experiment with farmers who study in the office of non-formal and informal education Maha Sarakham province, 30 people who are not samples by learning through the developed lesson program.

Apply the problem from the experiment using the learning management plan to improve the details of the content, media, more appropriate learning activities. Complete the learning plan to use in the development of the next lesson program.

Step 5; production of lesson programs: Artificial intelligence system lesson program to promote learning about rice farming according to philosophy of the sufficiency economy for farmers in the Upper Northeast. The researchers have determined the performance criteria of the program, lessons; E1/E2 = 80/80 and proceed as follows:

Analyze: Conducting analysis of the characteristics of farmers, network learning environment, learning management plan, indicators, learning objectives and content for the lesson program.

Design: The data from the analysis in step 1 is used as a guideline for determining the content and learning activities of the lesson program in accordance with the learning management plan by dividing the content into 5 episodes as follows: value of farmers and benefits of rice; rice farming; caring for rice; application of sufficiency economy philosophy to rice farming and applying the new agricultural theory to rice farming then create a flowchart and create a storyboard of the lesson program.

Development: Create a lesson program based on storyboards bring the created lesson program offer 3 experts consists of content in education, technology and communication, research and measurement to evaluate the quality of the lesson program with an average of 4.80 with the right quality at the highest level can be used in teaching and learning.

Step 6; assessment of the lesson program: At this stage, a lesson program is introduced as follows; one-to-one experiment by using the program created to experiment with farmers who study in the office of non-formal and informal education Maha Sarakham province, 3 people who are not samples by experimenting with the created lesson program to find a flaw in the work of the lesson program.

Small group testing after one-to-one experiment and then modify the lesson program. Then take a lesson program to experiment with farmers who study in the office of non-formal and informal education Maha Sarakham province, 30 people who are not samples by conducting learning management like real situations in order to fix the defect again before actual use.

Evaluate and revise take the data from the test score at the end of the chapter. Achievement score from small group trial to analyze the effectiveness of the lesson program. Found that the lesson program was effective; E1/E2 = 78.84/79.86 according to the criteria.

Step 7; transferring knowledge: In this step, bring the lesson program of artificial intelligence system to promote learning about rice farming according to philosophy of the sufficiency economy for farmers in the Upper Northeast to transfer knowledge to farmers in the Upper Northeastern region use the purposive selection method by selecting from farmers in the Upper Northeastern region who are interested in short-term training on rice farming according to philosophy of the sufficiency economy down to 97 agricultural communities in the Northeastern region.

Step 8; system update: At this stage, the researchers used the results of the experiment using of artificial intelligence system to promote learning about rice farming according to philosophy of the sufficiency economy for farmers in the Upper Northeast to analyze for defects, then improve the model to make the system more complete and can be used to transfer knowledge about rice making according to philosophy of the sufficiency economy into appropriate agricultural communities in the Northeast.

RESULTS AND DISCUSSION

The results of the study of the needs, forms and content of the lesson program of artificial intelligence system to promote learning about rice farming according to philosophy of the sufficiency economy for farmers in the Upper Northeast.

Sample there is a need for content presentation styles using the most video media, 85.47%, followed by graphics 83.36% and animation 83.26%, respectively.

Sample there is a need for a form of communication through social media channels, the most 84.84%, followed by chat 82.84% and electronic mail 79.15%, respectively.

Sample 85.84% of the demand for learning activities in virtual classrooms followed by 84.47% of the students with occasional group encounters and study in the classroom 84.10%, respectively.

Sample there is a need to use the language in the online rice farming learning center for the young farmers in the Northeastern region, the most local language, 85.68% and the combination between the official language and local language 85.63% and the next hundred official languages 84.10%, respectively.

The sample group needs the content of the lesson program of artificial intelligence system to promote learning about rice farming according to philosophy of the sufficiency economy for farmers in the Upper Northeast. Sort priority as follows; value of farmers and benefits of rice, rice farming, caring for rice, applying philosophy of the sufficiency economy to rice farming and applying the new agricultural theory to rice farming.

Elements of artificial intelligence: System to promote learning about rice farming according to philosophy of the sufficiency economy for farmers in the Upper Northeast. The details are as follows: There are 3 input factors: surveying problems and needs; exploring resources; determining objectives.

There are 4 processes in the process, namely; production planning, lesson program; developing a learning plan for the lesson program; production of lesson programs; assessment of lesson programs. The result is the transfer of knowledge and feedback system to improve 1 system as shown in Fig. 1.

The results of expert opinions on the composition of artificial intelligence system to promote learning about rice farming according to philosophy of the sufficiency economy for farmers in the Upper Northeast.

Experts have opinions on the coverage of large system components overall at a high level (X = 4.27, SD = 0.21). When considered on an individual basis, it was found that there were 4 most comprehensive levels by sorting average from descending to production lesson program (X = 4.80, SD = 0.41). Finding effective lesson programs. (X = 4.73, SD = 0.46). Explore problems and needs (X = 4.60, SD = 0.51). And create a learning management plan for the lesson program (X = 4.60, SD = 0.51).

Experts have opinions on the coverage of the components of the subsystem overall at a high level (X = 3.91, SD = 0.16). When considering each item, it was found that the coverage was at the highest level, 4 elements were arranged in order of average from highest to lowest as follows (X = 4.80, SD = 0.41). And to find the effectiveness of small group experimental program (X = 4.80, SD = 0.41). Followed by evaluating the needs of the stakeholders (X = 4.67, SD = 0.49). And creating a lesson program (X = 4.53, SD = 0.64).

The result of the production of the lesson program of artificial intelligence system to promote learning about rice farming according to philosophy of the sufficiency economy for farmers in the Upper Northeast found:

The content of the lesson program is chapter 1 value of farmer and benefits of rice, chapter 2 rice farming, chapter 3 rice care, chapter 4 application of sufficiency economy philosophy to rice farming and chapter 5 application of the new agricultural theory in rice farming.
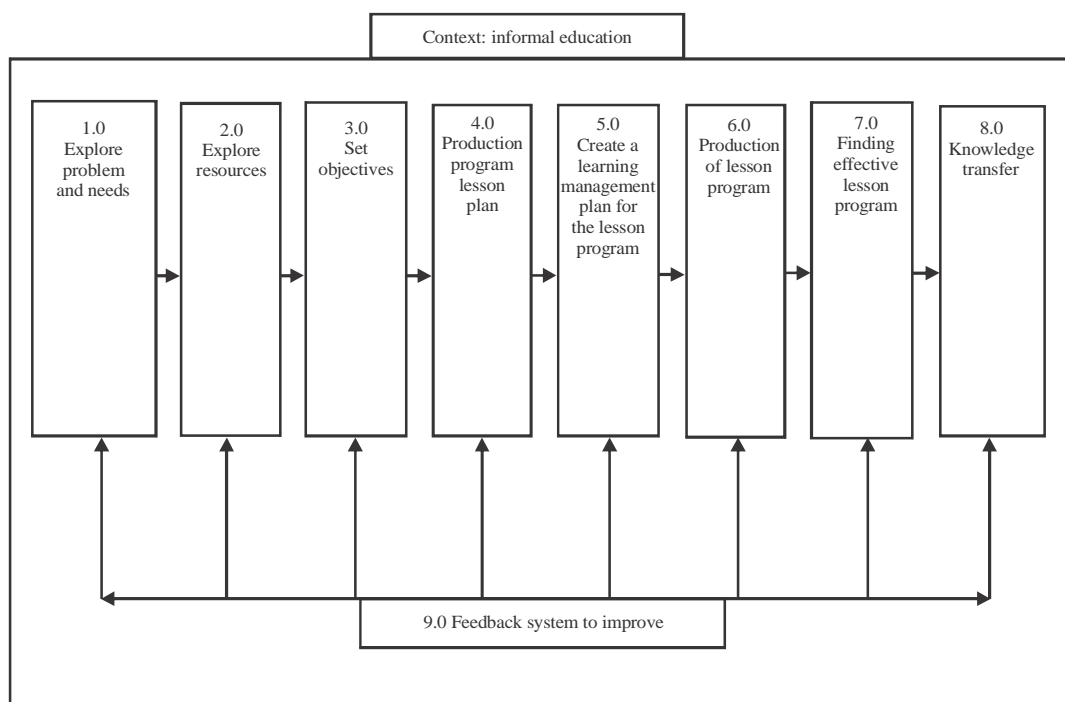
Fig. 1: Artificial intelligence system to promote learning about rice farming according to philosophy of the sufficiency economy for farmers in the Upper Northeast

The composition of the lesson program consists of, registration and identity verification system, manual system for learners and instructors, lesson management system (CMS), support source management system, messenger system via. facebook, virtual classroom system via. facebook live, online social networking system on facebook page, intelligent test inventory system and monitoring and evaluation system as shown in Fig. 2.

The lesson program of artificial intelligence system to promote learning about rice farming according to philosophy of the sufficiency economy for farmers in the Upper Northeast with efficiency equal to 78.20/79.33, which is in accordance with the specified criteria 75/75.

The result of transferring knowledge of artificial intelligence system to promote learning about rice farming according to philosophy of the sufficiency economy for farmers in the Upper Northeast into the agricultural community in the Northeast, the results are shown below:

The effectiveness index of artificial intelligence system to promote learning about rice farming according to philosophy of the sufficiency economy for farmers in the Upper Northeast equal to 0.7935 which indicates that the farmer studying by using the lesson program with progress of learning 79.35%.

Satisfaction of the experimental group with the artificial intelligence system to promote learning about rice farming according to philosophy of the sufficiency economy for farmers in the Upper Northeast overall at a high level ($X = 4.14$, SD = 0.24). When considering each item, it was found that there were 3 levels of satisfaction. Sort the average value from descending as follows content can be used ($X = 4.80$, SD = 0.37). Next is that students can use social networking systems on the facebook page. ($X = 4.69$, SD = 0.46). And the video in the lesson is appropriate ($X = 4.66$, SD = 0.48).

The evaluation results of the opinion on the coverage of the large system components of experts overall, at a high level, there are 3 inputs: surveying problems and needs; exploring resources; determining objectives. There are 4 processes in the process, namely: production planning, lesson program, creating a learning plan for the lesson program, production of lesson programs, finding effective programs, lessons and results is the transfer of knowledge and feedback to improve 1 system. In accordance with Fischer *et al*. (2015); Parisi *et al*. (2018). Continual lifelong learning with neural networks: a review developmental approaches and autonomous agent, towards autonomous agents, developmental and curriculum learning, transfer learning, curiosity and intrinsic motivation and crossmodal learning. Show that artificial intelligence system to
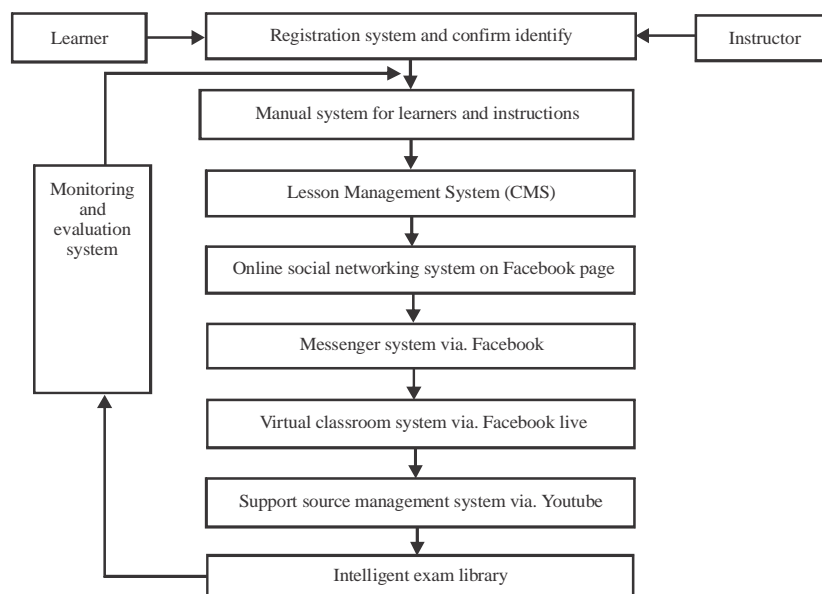
Fig. 2: The lesson program of artificial intelligence system to promote learning about rice farming according to philosophy of the sufficiency economy for farmers in the Upper Northeast

promote learning about rice farming according to philosophy of the sufficiency economy for farmers in the Upper Northeast. Into the agricultural community in the northeast is a lifelong online learning media development system by using an online lesson program to transfer knowledge to develop human resources according to the Thai way to the community that truly meets the needs of learners.

Farmer's satisfaction with the artificial intelligence system to promote learning about rice farming according to philosophy of the sufficiency economy for farmers in the Upper Northeast overall at a high level When onsidering each item, it was found that there were 3 levels of satisfaction as follows: content can be used, students can use the social networking system on the facebook page and the video in the lesson is appropriate. Consistent with the research of Lydia Fischer *et al*. (2015). Combining offline and online classifiers for life-long learning. The proposed OOL extended architecture is well suited for life-long learning tasks or streaming data. The general architecture consists of three parts: a static, pre-trained offline model, a flexible online model and a dynamic classifier selection part. Combining an offline and an online model has the advantage of learning new knowledge with the online model while preserving the ground (offline) information with the offline model. We have investigated the performance of the OOL using the example of learning vector quantization: LGMLVQ in batch mode serves as the offline model of the architecture, the LGMLVQ in incremental mode offers a flexible online model of the architecture and a dynamic classifier selection can be based on a certainty measure that is well suited for LVQ approaches. We analysed the properties

and performances of the OOL in comparison to several other incremental experiments on artificial and real life data have shown that the OOL is more robust against the CFE compared to other state of the art approaches and that it is able to gather new knowledge during application like other incremental learning approaches. Additionally, it turned out that none of the analysed approaches surpasses the others with respect to performance and model complexity. We discussed the properties of the approaches in order to give hints which one to choose for a desired task. The analyses give an overview of some existing life-long learning approaches highlighting the the robustness of the OOL against the CFE. This makes it attractive for safety related application where performance guarantees for known data are required.

CONCLUSION

From the results of the research shows that the artificial intelligence system to promote learning about rice farming according to philosophy of the sufficiency economy for farmers in the Upper Northeast by developing a plan to learn about rice farming multimedia creation, creating a network through social networks, virtual classroom system and communication via. social media in order to suit the characteristics and interests of the new generation of farmers. Allowing learners to learn lifelong anywhere anytime.

RECOMMENDATIONS

The project should be coordinated with educational agencies, Agricultural Extension Agency, Office of the

Non-formal and Informal Education in the Upper Northeastern area. Open for training or training in rice farming courses for farmers in order to jointly use models developed to transfer knowledge about rice farming according to philosophy of the sufficiency economy.

Information from research used as information in planning for the use of electronic learning systems in promoting wisdom to young farmers to raise awareness among young farmers to be aware of the importance of the peasant career. The state should develop an artificial intelligence system to promote learning about rice farming according to philosophy of the sufficiency economy for farmers in Thailand that are linked to a network that can use resources together to create a new generation of farmers effectively.

REFERENCES

Charoensethasil, T., 2017. Thai education 4.0 in the context of educational management for sustainable development. Information and Communication Technology Center Office, USA.

Fischer, L., B. Hammer and H. Wersing, 2015. Combining offline and online classifiers for life-long learning. Proceedings of the 2015 International Joint Conference on Neural Networks (IJCNN), July 12-17, 2015, IEEE, Killarney, Ireland, ISBN: 978-1-4799-1960-4, pp: 1-8.

Kumut, P. and W. Thaweekulsap, 2012. Document set, educational technology and human resource development. Master Thesis, Sukhothai Thammathirat Open University, Pak Kret, Thailand.

Parisi, G.I., R. Kemker, J.L. Part, C. Kanan and S. Wermter, 2018. Continual lifelong learning with neural networks: A review. J. Mach. Learn., 1: 1-29.

Peetathawatchai, W., 2010. Fathers Rice. Ministry of Culture/Huai Khwang District, Bangkok, Thailand, ISBN: 978-616-543-043-2, Pages: 154.

Promwong, C., 2012. Document set, educational technology and human resource development. Master Thesis, Sukhothai Thammathirat Open University, Pak Kret, Thailand.