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Understanding why the public agricultural information services would meet troubles?: based on systems thinking approach

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Abstract This study aims to understand why public information systems in agricultural fields have shown lower performances than other industrialized fields and industries and how these problems would be fixed and overcame. To accomplish this research purpose, this study would overview the previous studies on developing agricultural information systems in public sectors and would find out meaningful and considerable factors. This study would accept the methodologies of literature review and systems thinking approaches to understand the relationships among the found factors and to suggest the conceptual research model.
Agricultural information system should take care to reduce implement and maintenance costs to reduce the negative relationships between costs and expected service value and between expected service value to perceived service value. Also, it should be understood that impersonal response would reduce the eager to use the services, so the government sectors should consider positively to adopt the concept of CRM even though the government sectors traditionally have ignored its necessity.
The failure of public information systems/services may be caused not only by lack of the contents but also by the failure of the persistent post management.

Keywords Systems Thinking Approach, Agricultural Information Services, Public Information Services

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1 Introduction

Generally, agricultural information systems – especially in public purposes – have been designed to serve practical, expensive, and/or rare information such as weather, climate, yearly growth, soil, water, and other information. In Korea, the Ministry of Agriculture, Food and Rural Affairs have invested lots of money and resources to develop more trustable and usable information systems. Nonetheless, still the MAFRA(Ministry of Agriculture, Food, and Rural Affairs) seem to meet problems to follow the information requirement of general people and rural people(Kim et al., 2014; Hong and Kim, 2015). For instance, still there are distributed and scattered data and information rather to be integrated because the systems and the services have been developed and managed by individual sectors, public branches, and organizations. Diverse researches and academic papers have tried to understand why and how public information systems and/or services have failed to persuade the general IT service users to use their services. Interestingly, there have been general expectations including the research of Fong et al.(1997) to investigate the reasons. Font et al. suggested that there are several factors to inter the agricultural information systems – Over-developed Systems, Lack of Sufficient and Active Market Participants, Dual marketing, Free-riders and Impersonal nature of an electronic market system. According to their research, it is important to understand that IT and IS(Information Systems/Services) should be controlled and managed by personal consideration. This would mean

that the expected performance of IT/IS should be managed manually by human's hands far from the common expectation and should be improved continuously.

This study aims to understand why public information systems in agricultural fields have shown lower performances than other industrialized fields and industries and how these problems would be fixed and overcame. To accomplish this research purpose, this study would overview the previous studies on developing agricultural information systems in public sectors and would find out meaningful and considerable factors. This study would accept the methodologies of literature review and systems thinking approaches to understand the relationships among the found factors and to suggest the conceptual research model.

2 Literature Review

2.1. Critical Factors of Information Services in Agricultural Fields

Jin et al.(2016) investigated the reasons why information systems fail to be accepted in agricultural an organization. Based on the study result, they suggest that the known adoption rates of the public information systems, perceived work improvement, satisfaction, and perceived efficiency should be treated as important and positive factors affecting the adoption of these new information technologies and services. This research result may illustrate that the system users in agricultural fields would prefer to position themselves as an early majority or late rather as an early adopter. Also the users would expect and decide the value of newer information systems/services based on not only the perceived work performance but the expected personal value. For instance, even though a newer information system could reduce the work times and minor activities, information system users would deny to use the newer system because the adoption of the system would affect their private benefits negatively such as their possible overtime wages, stability of their position in organizations, and others.

Second, they suggest that tutoring the system users should be considered meaningfully to reduce the user's negative expectation and emotional limitation. In fact, Korean and other countries' governments have concentrated on providing specific and restricted information, services, and learning services. For instance, Korea Agency of Education, Promotion and Information Service in Food, Agriculture, Forestry and Fisheries(EPIS), MAFRA, National Agricultural Cooperative Federation, and other public and private organizations have provided diverse agricultural information systems, but it can be found that those services mainly support the required information professionally but partially and separatedly. This means, it is hard to find out comprehensive information services like Yahoo.com, Google.com, and Naver.com in agricultural fields. So the agricultural information service users should find the needed information one by one and site by site even though the required task would be one especially in public area.

As mentioned before, Fong et al. suggest several success and failure factors of agricultural information services. According to their study, there five failure factors and eight success factors for agricultural information systems (by public sectors).

First factor, over-developed systems, may mean technically the over-invested information systems. As pointed, public agricultural information systems would be used not much as other well-developed industries such as manufacturing industries now. Fong et al. suggest this issue as related to maintenance cost issue. So we understand that the government-side or public organizations should expect rightly how much they should pay costs not only for systems development but also for systems maintenance. So, it can be re-defined as a maintenance cost issue.

Second factor, lack of sufficient and active participants, may mean how many users would use the systems/services consistently and steadily. Interestingly, MAFRA and other public organizations have tried to develop new services and to redesign/reorganize current services persistently, but still their information services seem to fail to maintain high-loyalty users as they had expected. Along with this factor, Kim and Lee(2014) suggest that three factors should be considered to maintain the public information services efficiently. So, the service users already have enough user experiences to find useful information channels/services, so the service providers cannot be free to encounter the fundamental problem – technological advantages would not be enough to satisfy users without active contents and updated information. In agricultural fields, it may not be easy to create newer and updated information in a short time relative to other industries, such as IT(information technology) industries. It should be understood that this problem is quite fundamental for the agricultural information systems(Kim and Lee, 2014), So this second factor can be re-defined as an issue of the attractiveness of the provided information and contents and as an issue of steadiness.

Third factor, dual marketing, seems to be related with

private e-commerce sectors rather with public information services, but it should be considered carefully because sometimes information and/or contents would be delivered via electronic environments with small portions relative to offline methods. In agricultural fields, enormous knowledge and experience would be interchanged in offline fields such as farms, offices, forums, and others. In this regard, it may not be easy to persuade the potential users to use the information systems rather to use the offline relationships and networks. In other words, the users would not understand why they should use the online services positively and consistently without any attractive online contents. Also more meaningful information can be delivered via diverse private services such as DAUM, NAVER, and GOOGLE. This third factor can be redefined as the differentiation factor.

Forth, impersonal nature of the service should be considered carefully. This factor should be understood in the scope of social contact, so we can consider this as a communication issue. Although the public information is hard to deliver the users hedonic or emotional advantages, social networking and inter-communication should be considered in the public agricultural information services. It also may mean the uploaded contents should be enough to be delivered with the user's social networks and/or their colleagues. So this factor can be understood as an intercommunication issues.

Fifth, Font et al. suggest that effective ownership and control of the system should be considered. Along with this factor, they also suggest that national government style should be considered. Because this research now concentrates on public information systems in agricultural fields, this two factor can be understood as one. It should be considered that public information services should be managed in a long term view – it also may mean the services should be managed by permanent and independent organization, even though the policy of national government would be changed and statutory government support is important. So the government should understand why it should care the information services in a long-term view to enhance the value of the services. This factor can be redefined as an issue of permanent support by the government sectors.

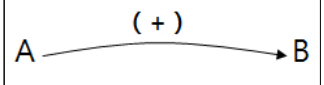
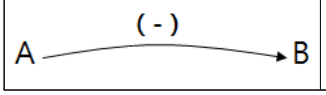
The last factor is accurate and objective product description. public information services should let the users understand clearly which information can be supported and how to use the information. Interestingly, very diverse users of public information systems seem to fail to expect whether the needed information and contents can be found efficiently. It may mean, public information services would not be well-designed with good UI(user interface)/UX(user experience). So we defined this factor as an issue of UX/UI design.

3 Results and Implications

3.1. Systems Thinking Approach Results

Systems thinking approach which is the fundamental base of systems dynamics methodology has been preferred by academic and practical researches focusing on modeling the causal relationships among diverse factors with intuitive and exploratory understanding and expectation(Jin et al., 2016; Chung and Lee, 2012). After the first suggestion of Forrester(1961), systems thinking approach has been used to analyze and to model diverse and complicated social events easily and intuitively. This methodology starts from visualizing a simple CLD(Casual-Loop-Diagram) and enhances this simple CLD with additional causal loops(Kwak, 1995; Lee et al., 2012; Jin et al., 2016). Systems thinking approaches focus on completing concrete and simple causal loops which can illustrate stereoscopic feedback frameworks with quantitative and qualitative backgrounds simultaneously. Even though this research method seems to be lack of theoretical backgrounds, this can demonstrate a large, complex systems map of practical issues and the effects of each factors with ease(Lane et al., 2016). According to Chung and Lee, the completed CLD should comprise both R-loop(Reinforcing/Positive Loop) which increase the values of each factors consistently and B-loop(Balancing/Negative Loop) which decrease the values of each factors consistently. With the balance between these two loop types, the entire relationships can be in a stable status.

Table 1 Causal types of systems thinking approaches

Causal types of systems thinking approaches	Detail
	A would affect B positively
	A would affect B negatively

3.2. Modeling Results

Systems thinking approach which is the fundamental base of systems dynamics methodology has been preferred

by academic and practical researches focusing on modeling the causal relationships. The result of systems thinking approach is illustrated on figure 1.

According to figure 1, negative relationships are six – costs to expected service value, expected service value to perceived service value, impersonal response to personal network, impersonal response to negative opinion, negative opinion to service implement, and service implement to negative opinion. These may mean, agricultural information system should take care to reduce implement and maintenance costs to reduce the negative relationships between costs and expected service value and between expected service value to perceived service value. In other words, it is important to persuade the users to understand that they can use valuable information without or with less costs. Also consistent supplying of new contents and information via the online services can reduce the negative opinion of the users on the information services. It may mean that persistent educating and notifying the advantages of the information services in agricultural fields should be followed after the launching of the information system/services. In this regards, we can understand that diverse Korean information systems in agricultural fields may have failed not because of the contents but because of the problem of persistent maintenance and advertisement.

Also, it should be understood that impersonal response would reduce the eager to use the services, so the government sectors should consider positively to adopt the concept of CRM even though the government sectors traditionally have ignored its necessity.

The failure of public information systems/services may be caused not only by lack of the contents but also by the failure of the persistent post management.

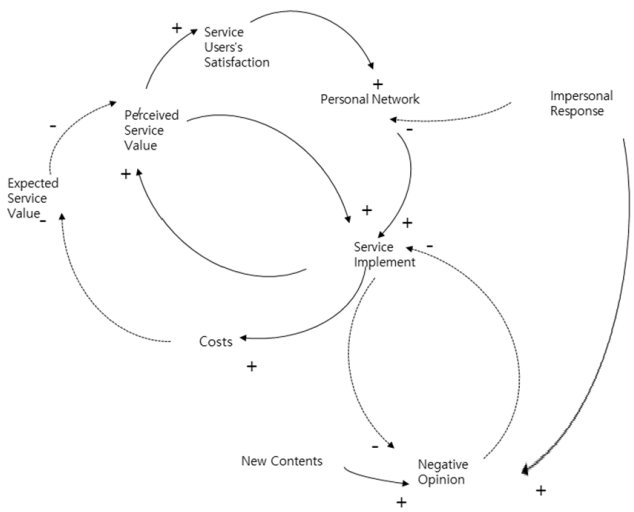


Figure 1 Result of Systems Thinking Approaches

3.3. Limitations

This research is an conceptual modeling research to understand why well-designed and well-developed public information systems have failed with systems thinking approach methodology. But still this research has limitations to be solved in future studies.

First, systems thinking approach has fundamental vulnerability. Systems thinking approach models diverse causal relationships in a closed loop frameworks but it cannot include every possible relationship because it is based on personal and subjective scheme.

Second, this research focuses on modeling the CLD with previous researches not on proving the CLD as significant by statistic methodologies. So quantitative and statistic analysis should be followed to ensure the feasibility of the suggested research model. Iwelunmor et al.(2014) explain that the implementation of systems thinking approaches should be understood that this research methodology could be affected by diverse factors far from the theoretical expectations.

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