Uluslararası İleri Doğa Bilimleri ve Mühendislik Araştırmaları Dergisi
Sayı 9, S. 151-156, 2, 2025

Araştırma Makalesi

IJANSER
https://as-proceeding.com/index.php/ijanser
ISSN:2980-0811

International Journal of Advanced Natural Sciences and Engineering Researches
Volume 9, pp. 151-156, 2, 2025

Research Article

Conceptual modeling of agricultural information system

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(Received: 30 January 2025, Accepted: 03 February 2025)

(2nd International Conference on Pioneer and Innovative Studies ICPIS 2025, January 30-31, 2025)

ATIF/REFERENCE: Blagojce, N. (2025). Conceptual modeling of agricultural information system. *International Journal of Advanced Natural Sciences and Engineering Researches*, 9(2), 151-156.

Abstract – The trend of growth in developed countries around the world, combined with ICT technologies and the needs of the population deal with agriculture, is the incentive to start the process of creating a framework for the development of agricultural information system. Today we are witness of the continuous development and use of information systems in various areas of our lives. From that aspect, the use of agricultural information systems contributes to improve and accelerate the growth and development of agricultural production. The benefits of the proposed framework relate to and result from the determination of the stages of realization in the development and design of the conceptual model, through the ability to model adapt to the environment and each new situation, the possibility of migration or transfer of data from one agricultural information system to another, and collaborative implementation with the ability to upgrade the system from different user profiles. By monitoring the indicators related to system quality, information quality, service quality, system utilization and customer satisfaction, and by monitoring the internal consistency between the indicators in the system, a prototype developed according to the proposed framework is evaluated, for a one single purpose: the proposed framework for the development of an agricultural information system to generate a system that will be useful and easily accessible for widespread use.

Keywords – Information, Information System, Modeling, Data, ICT Technologies.

I. INTRODUCTION

Information systems are places where information is stored, processed and transmitted electronically. There are numerous information systems that differ in terms of the type and the work to be done. In the field of agriculture, the process of modeling, designing and creating an agricultural information system presents development and creation of e-farming tools that enable easy access to information, which is a need necessary for the growth and development of the agricultural sector. On the one hand, considering the process of modeling, creation and implementation of existing agricultural information systems across different countries in the world, and on the other hand, considering the rapid growth and development of information technologies, there is a need to make additional contribution to improving the process of creation, implementation and especially the modeling of individual parts of agricultural information systems. The aim of this title is to explore, and apply the best practices and capabilities of new technologies in the design and development of models for creation of agricultural information systems, including tools for their application, as well as creation of a prototype of an agricultural information

system, with the sole purpose: upgrading agricultural information systems for their efficient and effective operation.

II. MATERIALS AND METHOD

The creation and implementation of the information system is a larger process that takes place in several parts. It is necessary to conduct a case study for necessary information that is necessary to start with the modeling of the information system. Before proceeding to development the proposed framework for the development of agricultural information systems, a survey of already implemented information systems models was done (Table 1), and they were compared to the model proposed.

Table 1. Contribution to the proposed framework for development of an agricultural information system model

Development model of information system	Steps for developing of information system	TT model	AIS model	TITM model	Fleix Suominen model	MAGRIS model
	Search process	✓	✓	✓	✓	✓
	Analysis of the current situation	×	×	✓	✓	✓
	Develop a conceptual model	×	×	×	✓	✓
	Mathematical modelling	×	×	×	×	✓
	Develop a project model	✓	✓	✓	✓	✓
	Illustration of the working parts	×	×	×	×	✓

The current situation analysis is first phases for starting with modeling and creating an information system. This includes theoretical and practical literature, and support from the IT sector. Then follows the phase of a general plan that includes steps for creating the system. For get the quality of the whole process, two further phases are added, one of which concerns the modeling and development of the system, and the revision phase in which the proto-type system of his work before it is brought to the final version i.e. template. When creating the information system it is necessary to have a part where the information management will be carried out. The IT sector is responsible for all major categories that can be divided into individual parts. IT support when creating the information system can be local or remote support. Identity and identity management, storage solutions, ICT infrastructure and security is fully in the IT sector. The information management unit needs to be ready for efficient and highly optimized work, as well as ensuring the continuous operation of the electronic system.

III. RESULTS

Results The development of the information system model and life cycle can be divided into different stages and can be presented graphically or using a diagram. The most popular principle from which to start when creating and modeling the information system is the principle of waterfall where the phases in creating the model are: specification, planning and implementation. All phases include quality assurance measures such as checks and tests. The purpose of these phases is to detect system errors. At the end of each phase, has a review of a status-oriented session, and it is review whether the expected results are achieved. Each of the phases of activity consists of input, processing and realized output. The result of each stage of development has its own results, which are verified as input for the next phase. If the previous phases does not display the results is not successful, the next phase can not start. Accordingly, the next phase can only start if the previous phase is completed with success. In addition, in final project model was developed a construction of information system with all the validation improvements. The

model has been changed in its form, but it still provides the same basic functions with additional new features. The project model, proposed in the title, is developed according to the concept proposed by Felix Suominen[1], complemented by a fifth section that addresses the problems that arise from system implementation. The proposed model consists of five main parts: human resource management, technical support, testing, deployment and problem solving. Each section has steps that need to be followed up. In the diagram given in Figure 1, the steps of the different parts are connected to each other, by a full arrow in different colors, depending on which step it belongs to, including the part of troubleshooting which is made by the users.

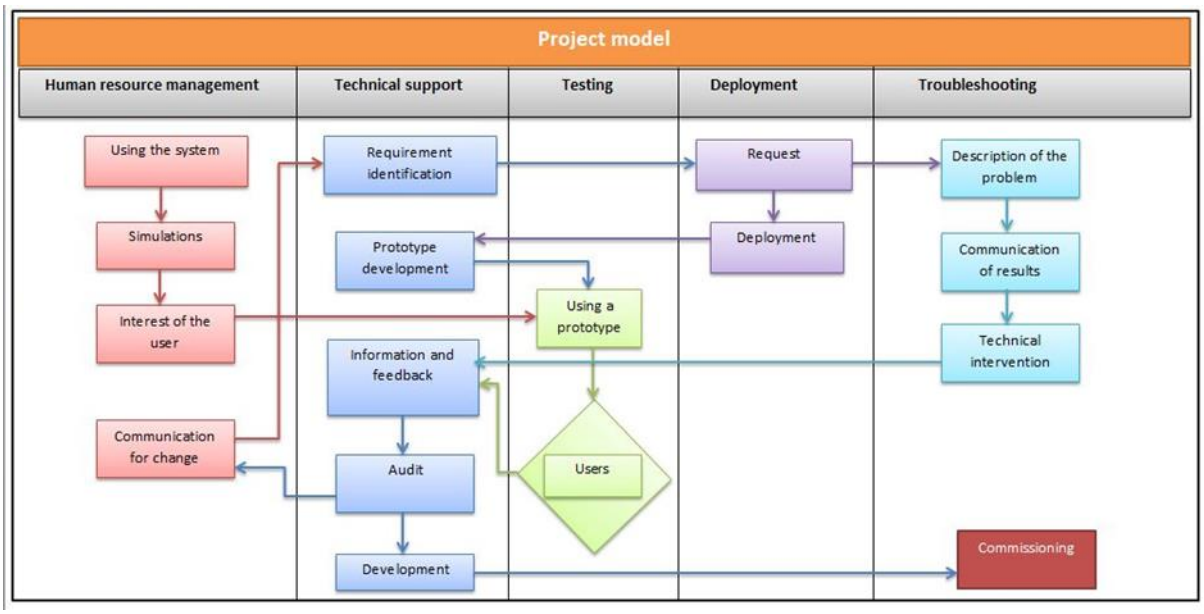

Fig.1 Project Model of the MAGRIS Agricultural Information System

In the context to the proposed framework for the development of agricultural information systems, in order to make his validation, the practical part of the information system entitled MAGRIS - Agricultural Information System according to MVC (Model, View, Controller) model has been developed. The methodology for validation of the agricultural information system proposed by DeLone and McLean observes the characteristics of information system grouped in five indicators according to which the following hypotheses are created:

- H1 - The use of the agricultural information system depends on the quality of the information.
- H2 - The use of the agricultural information system depends on the quality of the system.
- H3 - The use of the agricultural information system depends on the quality of service.
- H4 - Customers satisfaction of the use of the agricultural information system depends on the quality of the system.
- H5 - Customers satisfaction of the use of agricultural information depends on the quality of information.
- H6 - Customers satisfaction of the use of the agricultural information system depends on the quality of service.

For the projected agricultural information system, twelve features are observed and grouped into five indicators and obtained results are presented in Table 2.

[1] Fleix Suominen - "Creating a project model for Information system"

Table 2. Results of Validation of the MAGRIS Agricultural Information System.

Component	Question	Mean	Std. Deviation (SD)	AVE	CR
System quality	Is the system easy to use?	1.32	.471	0.50	0.70
	Does the system meet your requirements?	1.46	.503		
Quality of information	Is the information in the system correct?	1.38	.490	0.40	0.50
	Is the information in the system timely?	1.12	.328		
	Is the information in the system trusted?	1.16	.370		
Quality of service	Is the technical support of the system adequate?	1.14	.351	0.50	0.50
	Is technical support available?	1.08	.274		
Using the system	Does system work help you in your work?	1.18	.388	0.50	0.60
	Does using the system make your job easier?	1.20	.404		
	Does using the system increase your performance?	1.14	.351		
Customer satisfaction with using the system	Are you satisfied with the system performance?	1.16	.370	0.40	0.50
	Does the system meet your needs?	1.24	.431		
Total	12			0.50	0.84

The overall load of the CR (Composite Reliability) indicators between the system components is 0.84 which enables a stable connection and a well-designed connection between the system components and its successful validation. On Figure 2 are presents the indicators and their interaction with parameter CR in the system.

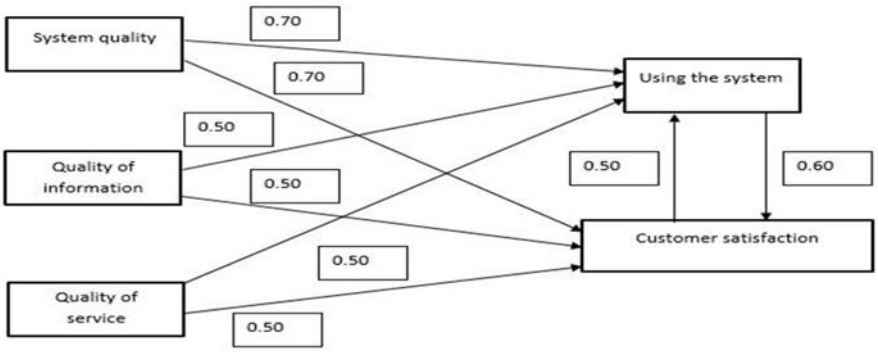

Fig.2. CR between the indicators in the system.

It is found that the indicators: system quality, information quality and service quality have direct influence on system utilization and customer's satisfaction, while the indicators of system utilization and customer's satisfaction also have an impact on each other. Also, the indicators load relative to the derived AVE (Average Variance Extracted) between the system components (Figure 3) is 0.5 which provides a stable linkage of the structure in terms of system functionality and confirmation of its validity between system components.

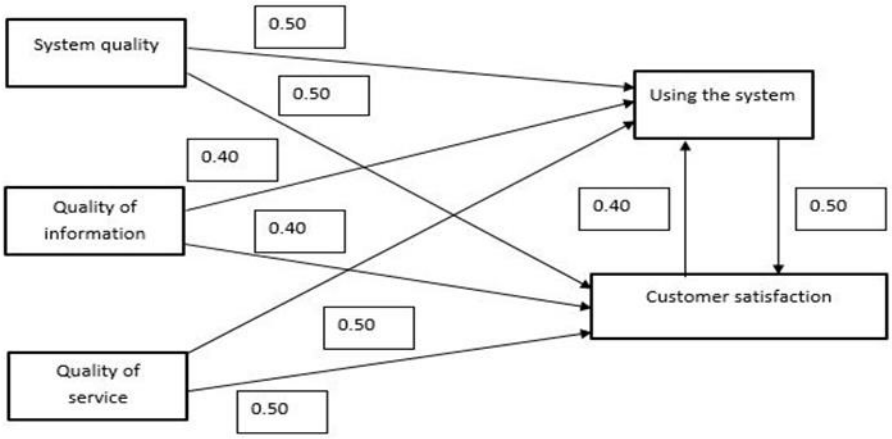

Fig.3. AVE of the system components.

The obtained results for the AVE and CR between the components of the system that provide a stable linkage of the structure with respect to functionality and a stable linkage and well-designed linkage between the system components confirm the hypotheses set and the following conclusions are drawn:

- The quality of the system represents the quality of the agricultural information system;
- The quality of information indicates the quality and relevance of the information held by the agricultural information system;
- The quality of service relates to the guidelines and supporting documents provided by the agricultural information system;
- Customer satisfaction refers to the fulfillment of the requirements and the continuous functioning of the agricultural information system;
- System visibility refers to the frequency of use of the agricultural information system.

IV. CONCLUSION

The In this paper, has been developed a framework for the development of a model of agricultural information system in the context of nature, the needs and conditions for its successful functioning. The existing models for creating agricultural information systems are shown and analyzed, and then on the basis of those models, a framework for development of a model of agricultural information system is proposed, which includes new additional opportunities, and thus advantages, which are refer to the way the frame is created, as well as the stages in creating the model. The main emphasis in improving the proposed model is the introduction of mathematical modeling and the illustration phase of the working parts. For effective and efficient use and use of agricultural information systems with which agriculture gets a new dimension in its operation, in the paper, in addition to the proposed framework for development of agricultural information system and applied information technologies, open questions and space remain in the future for develop and upgrade the proposed concept with new advanced design solutions.

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