STATISTICS AND ANALYTICS OF ONLINE INFORMATION SYSTEM FOR AGRICULTURAL CROPS

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Abstract

An online agricultural information system provides crop-related statistics. Crop data are collected and transformed into statistics, analytics and reports for the use of agricultural producers. The study focuses on determining the production level as compared to previous years. Production problems and its effects were identified and can be manipulated by controlling the decision-making function. This research developed an online digital repository of crop-related statistics which may serve as a practical tool for an efficient management of the agricultural resources of Silang, Cavite. A descriptive-developmental approach was employed in this study. Likert scale was used to interpret the result. The Agile model was applied in the project development phase. The system was evaluated using Web Quality Assessment criteria such as content, navigation, structure and design, appearance and multimedia, and uniqueness. As a whole, the evaluation result of the web-based agricultural system was found excellent in most of its features. The features and functionality of the system is highly recommended by local government and farmers. This will provide timely solution to the current state of agricultural profile of crops and the industry, hence, could serve as basis for a sound judgment in determining crops to be planted on the right time.

Keywords: Agriculture, Decision-making, Farmers' Needs, Web-based System.

I. Introduction

Agricultural information system generates, transforms, transfers, consolidates, receives and feeds back information to be utilized by agricultural producers [1]. Studies [2],[3] indicated that access to agricultural information of farmers could improve their production level. In rural areas, people must be required to appropriate information. Farmer's participation in the agriculture information system contributes to make sound decision. The availability to information of farmers couple with access and full participation in the national development process [4].

The Philippines uses about 33% of the country's area for agriculture. This makes agriculture as one of the major sources of income of the country accounting to 9 percent of the GDP [5].

Silang, Cavite depends mainly on agricultural economy. It grows coconut, coffee, corn, banana and pineapple [6]. According to the municipal agriculturist of Silang, the local government has experienced setbacks in data collection in enabling them to undertake efficient production management and conduct relevant research. Moreover, because of these setbacks, the Municipal Office for Agriculture fails to manage the subsidies given to farmers. Hence, a well-managed online Agricultural Information System can play a vital role to address those issues.

Agricultural content management systems can manage the data given by farmers to provide the users up-to-date and relevant information and in the utilization of production economics and crop management research. The content management systems will help the local government to monitor the crop production yearly, facilitates the

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management of potential farm risks through analysis of problems encountered by farmers, practice multi-cropping, and help them make better decisions in the future.

This study designed and developed a system which will help the local government unit collect necessary data from farmers to be used in undertaking production economics and crop management research, and to test the performance acceptability of the developed system, the system was assessed in terms of content, navigation, structure and design, appearance and multimedia, and uniqueness.

II. Methodology

The researchers employed a descriptive-developmental research design. In the development of the online agricultural information system, we followed the Agile Model that includes planning, requirement analysis, design, implementation, testing and deployment [7].

As for the performance acceptability testing, survey questionnaires were distributed to 150 respondents employing purposive sampling technique. One hundred thirteen (113) of which are farmers and personnel of the Municipal Agriculture Office of Silang and 37 are information technology experts. The system's performance acceptability was tested using the Website Quality Assessment Criteria. These are Content, Navigation, Structure and Design, Appearance and Multimedia, and Uniqueness [7]. Each criterion was rated using a five point Likert scale, where 5 is the highest and 1 is the lowest (See Table 1). We tabulated the scores and had the mean and standard deviation computed and analyzed.

Table 1. Numerical Rating and its Equivalent Remarks

NUMERICAL RATING	REMARKS
5	Excellent
4	Very Good
3	Good
2	Fair
1	Poor

Development Process

The methodology used in this project was Agile as shown in Figure 1. Agile is a process that promotes continuous iteration of development and testing throughout the software development lifecycle of the project. It is an approach under which requirements and solutions evolve through the collaborative effort of self-organizing and cross-

functional teams and their costumer(s)/end user(s). It advocates adaptive planning, evolutionary development, early delivery, and continual improvement, and it encourages rapid and flexible response to change [8]. On the first step of the software development lifecycle of the project, the requirements for the project are defined such as its required features and basic characteristics. In the designing phase, the overall architectural design of the project was drafted along with its security design. The researchers documented the business needs and the processing requirements of the new system. All the necessary information was collected as requirements in fulfilling the system's creation process. The actual building of the project was in the development phase where the project was built through coding. After finishing the project, the finished product underwent testing and debugging to find errors on the project. The project was deployed on its release phase and on the last phase, the project underwent constant maintenance and improvement through user feedbacks.

Figure 1. The Agile Model

III. Results

The Developed System

The developed online agricultural information system records, analyzes and generates crop-related statistics, analytics and reports. Figure 2 shows how the system works. It has three users: guests, farmers, and the administrator. The farmer needs to be a registered user before logging into the system. They can view the statistics and analytics provided by the system in table and graph forms, together with other information from the Municipal Agriculture Office. They are also allowed to input data about their crop production. The guests are only allowed to view the information provided by the system. The administrator has the overall control of the website and can modify the contents, add or delete accounts, and configure the settings.

Figure 2. Context Diagram of the Online Agricultural Information System

Figure 3 shows the overall statistics of Silang in terms of production, area planted, area harvested, and area loss. There is a select a crop dropdown that when clicked, a list of crops is displayed.

There are 2 radio buttons, table and chart. The user can select whether the data to be displayed is in table or graph form. Once the show data button is clicked, the data analysis is displayed.

Figure 3. Overall Statistics of the Online Agricultural Information System

Figure 4 shows the overall statistics per barangay. There are four dropdowns shown, select a crop, select year, select element and sort. Once show data

button is clicked, the data analysis that is based on the user's selection is then displayed.

Figure 4. Statistics per Barangay of the Online Agricultural Information System

Figure 5 shows the add new production record form wherein the admin or the farmer can add new production record depending on the crops planted. The form includes farm name dropdown in which the administrator can select a specific farm, crop

dropdown, area planted textbox, area harvested textbox, production textbox, date planted date picker, date harvested date picker, problems encountered checkboxes namely pests and diseases checkbox and weather condition drop down.

Please fill up the following with reliable and accurate data.

Add New Production Record

Farm Name:
 Crop:
 Area Planted (square meters):
 Area Harvested (square meters):
 Production (kilograms):
 Date Planted:
 Date Harvested:
 Problems Encountered
 Pest:
 Disease:

Figure 5. Add New Production Record of the Online Agricultural Information System

Figure 6 shows the view and compare data page. It provides a multi-selection of crops and barangay wherein the user can choose what crops and areas are to be compared. The user can also choose

between table and graph to display the data, select what the user wants specifically to compare (view by crop or barangay) and in what years the user wants to see the records.

Figure 6. View and Compare Data of the Online Agricultural Information System

Figure 7 shows the analysis of the problems encountered by the farmers particularly pest. In this page, the user is given a selection of crop, selection of pest according to the selected crop, selection of

barangay, he can choose between table and graph to display the data, and select the years the user wants to see the record. This page only displays the area lost by the farmers during the harvest time.

Figure 7. Problem Analysis (Pest)

Statistical Result

Table 2 shows that Content had a sub mean of 4.73 with 0.02 error, standard deviation of 0.27 and a remark of excellent. Navigation had a sub mean of 4.67 with 0.02 error, standard deviation of 0.26 and a remark of excellent. Structure and Design had a sub mean of 4.70 with 0.02 error, standard deviation of 0.24 and a remark of excellent.

Appearance and Multimedia had a sub mean of 4.52 with 0.03 error, standard deviation of 0.39 and a remark of excellent. Uniqueness had a sub mean of 4.76 with a 0.03 error, standard deviation of 0.32 and a remark of excellent. Overall, the website had a mean score of 4.68 with a standard error of 0.02, standard deviation of 0.20 and a remark of excellent.

Table 2. Results of the Performance Acceptability of the Website

INDICATOR	N	MEAN	SD	ERROR	REMARKS
CONTENT					
Utility Content	150	4.77	0.45	0.04	Excellent
Completeness of Information	150	4.59	0.51	0.04	Excellent
Subject Specializations	150	4.72	0.48	0.04	Excellent
Reliability of Content	150	4.72	0.45	0.04	Excellent
Syntax of Content	150	4.87	0.38	0.03	Excellent
Sub mean	150	4.73	0.27	0.02	Excellent
NAVIGATION					
Convenience of Navigation Tools	150	4.61	0.49	0.04	Excellent
Identify of Site	150	4.63	0.50	0.04	Excellent
Means of Navigation	150	4.71	0.46	0.04	Excellent
Link to Other Sites	150	4.65	0.52	0.04	Excellent
Ease of Use of Navigation Tools	150	4.65	0.48	0.04	Excellent
Search Engines	150	4.77	0.44	0.04	Excellent
Sub mean	150	4.67	0.26	0.02	Excellent
STRUCTURE AND DESIGN					
Order of Elements	150	4.67	0.49	0.04	Excellent
Loading speed	150	4.56	0.52	0.03	Excellent
Site map	150	4.79	0.41	0.03	Excellent
Information structure	150	4.68	0.47	0.04	Excellent
Software requirements	150	4.66	0.50	0.04	Excellent
Browser compatibility	150	4.73	0.44	0.04	Excellent
Real time information	150	4.77	0.44	0.04	Excellent
Sub mean	150	4.70	0.24	0.02	Excellent
APPEARANCE AND MULTIMEDIA					
Graphics representation	150	4.64	0.51	0.04	Excellent
Readability of content	150	4.50	0.51	0.04	Excellent
Multimedia: image, voice and video data	150	4.41	0.58	0.05	Excellent
Sub mean	150	4.52	0.39	0.03	Excellent
UNIQUENESS					
Uniqueness of content	150	4.73	0.46	0.04	Excellent
Aesthetics of content presentation	150	4.77	0.44	0.04	Excellent
Uniqueness of design characteristics	150	4.80	0.42	0.03	Excellent
Sub mean	150	4.76	0.32	0.03	Excellent
OVERALL	150	4.68	0.20	0.02	EXCELLENT

Legend of Range:

5.00 – 4.20	=	Excellent
4.19 – 3.40	=	Very Good
3.39 – 2.60	=	Good
2.59 – 1.80	=	Fair
1.79 – 1.00	=	Poor

IV. Discussion

The online agricultural information was developed to generate, transform, transfer, consolidate, receive and feedback information for the consumption of agricultural producers [1].

The respondents perceived the performance of the online agricultural information system as excellent. This meant that the system's content is of quality, complete, specialized and reliable; navigation is easy when moving in and around the site; structure and design maximized information presentation consistency, website's loading speed, quality and availability of site map, the information structure, software requirements, browser compatibility, and real time information; appearance and multimedia contributed to the usefulness and ease of use of the site; and uniqueness was attained [9]. These suggest that the local government may already put the system into use, since all the criteria for an online agricultural information system were met. Moreover, it shows that the farmers were satisfied with the system's performance.

V. Conclusion

This research has developed an online agricultural information system that is capable of managing the data provided by farmers, comparing and analyzing data, and generating statistics, analytics and reports which can be used for undertaking production economics and crop management research.

The system's perceived performance acceptability is excellent which suggests that the online agricultural information system is ready for use and would be beneficial for both the local government and the farmers in their efforts to efficiently manage agricultural resources.

The development of an online content management for agricultural crops provide up-to-date and consistent information to the users that helps in decision-making. System users can view the analysis of problems encountered in the productivity of agricultural products like different weather conditions, pests, and crop diseases within the municipality. The system allows to view and compare data such as crops, location, dates and

elements selected. And for the user-friendliness of the system, the system's functionalities are simple in able to be understood by the users and provide instantaneous information.

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