Journal of Modern Technology and Engineering
Special Issue | IECHCI2022, 2023, pp.59-64

ANALYSIS BASED ON UX DESIGN OF MOBILE PLATFORMS APPLIED IN AGRICULTURAL SECTORS

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Abstract. The article discusses the problem of the lack of a unified approach to the user interface and user design of mobile software platforms used in agricultural industries. The use of mobile robotics and mobile software platforms for managing them in agricultural industries increases labor productivity, efficient use of equipment and mechanisms, staff shortages, 24/7 operation mode, etc. allows solving such problems. The study analyses various methods and techniques, and also discusses the features of using User Experience/User Interface (UX/UI) technology in the development of agricultural software applications. The main stages for specialists designing UX/UI technologies are determined, the distinctive features of a web service and a mobile application are analyzed, and a systematization of the main types of work on a problem area when designing a platform is proposed.

Keywords: UX/UI technology, artificial intelligence, mobile platform, web services.
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Received: 15 October 2022; Revised: 11 November 2022; Accepted: 11 December 2022; Published: 13 January 2023.

1 Introduction

On a global scale, drones and robots in the form of mobile devices for various purposes, such as harvesting, monitoring, control and planning, have penetrated directly into the activities of the agricultural sector. The role of mobile software applications in autonomous and remote control of these devices is undeniable. It is known that effective management is currently being solved by the use of artificial intelligence programs to collect and analyze large amounts of data. The ease of use of mobile platforms designed for this purpose is one of the most urgent problems of professionals working in this field and services.

User experience is now a term considered to refer to any software product intended to be consumed and controlled by users, and it solves the problems associated with optimizing software development, especially their user interface. Essentially, UX covers information architecture, psychology, analytics, design and testing. The UX process with the definition of assumptions, needs, facts and additional information, followed by the design process using various design methods, testing and validating the designs created ends. This process is repeated in iterations until the ideal result is achieved in the form of an application that can be used without any problems. In this regard, the main purpose of the study is to consider the features of using UX/UI technology to ensure the autonomous and efficient operation of robotic devices in agriculture, and also analyzed the main stages of designing a mobile platform (Aliyev et al., 2005; Mustafayeva, 2021; Doğan et al., 2016; Cagiltay, 2011; Dickinson et al., 2007; Bishop, 2007).

2 Formulation of the problem

Ease of use. One of the building blocks of UX design is usability. Usability - describes how well software applications can be used in a convenient, intuitive way, while controlling how well they meet standards and requirements, regardless of which category the other party falls into (disabled or elderly users, professionals, etc.). In recent years, the trend towards usability in the design of mobile versions of web services and mobile applications has been growing rapidly. In this regard, the analysis of the characteristic features of web services and mobile applications allows us to solve the problems that arise during the design. Analysis of the distinctive features of web services and mobile applications is described in Table 1 (Cagiltay, 2011; Wang, 2014).

Table 1: Difference web services and mobile apps performance analysis

No	Web services	Mobile apps
1	A web service is an electronic resource system implemented in the form of a request to a server based on the requests and suggestions of a user category through a browser. For example, kontakt.az, google.az etc.	The mobile application is created by specialists who have special knowledge and skills to determine the functionality of the subject area. For example, application xCode for iPhone and others.
2	The data in the mobile web service is returned from the servers hosting the web service.	The mobile application is the user's phone after being downloaded from the mobile platform services (App Store, Google Play, Windows Phone, Ovi Store) and may not interact with other servers
3	The mobile web service works equally on all devices and platforms, because the developer defined them in accordance with the designer's layout.	Each mobile platform has its own instructions for each version of the operating system.
4	In the mobile web service, when adding a file, you need to call the third-party application "Explorer".	The download is direct in the mobile app.
5	The mobile web service does not have this feature.	The ability to take pictures with the phone's camera without leaving the application, as well as add additional functions to it.
6	The mobile web service does not have this feature.	Using geolocation with a mobile application allows you to track your location in real time, lay a route and much more.

Unlike other areas, the usability and quality of software products used in the agricultural sector still lags behind other specialized software applications. When creating practical smartphone applications for the agricultural sector, mobile developers and researchers must take into account the low level of literacy and understanding of application interfaces among farmers and adapt the interface design to their target users. Applications targeted at farmers should have an intuitive interface; they may find it confusing or difficult to use a lot of text as an interface. In this regard, in order to increase user interest in design, methods representing a visual graphical interface can be grouped as follows:

- The study of physical sensory systems. These sensors provide opportunities for researchers and designers to create useful applications that can be activated or improved. Thus, the data obtained from vision technology in mobile robotic devices is sent to the server for processing, and the results can be correctly and in time transmitted to farmers using a software application on mobile phones (Doğan et al., 2016; Cagiltay, 2011; Dickinson et al., 2007; Bishop, 2007).

- Training of algorithms for the operation of the system using artificial intelligence. In addition to using accelerometer data to detect various agricultural activities, researchers can use artificial intelligence algorithms to determine if a farmer is performing certain agricultural activities correctly. For example, using accelerometer data, the algorithm can determine from the movement of the farmer's hand that he is spreading fertilizer correctly. Otherwise, the software can give real-time advice to the farmer to correct the hand movement (Mustafayeva, 2021).

- The presence of a warning signal about the state of the battery of the smartphone. In many applications, it is observed that the aspect of battery efficiency is not taken into account in the design and development process. Indeed, the peculiarity of working on a farm is that farmers are usually away from a power source and face the problem of charging their phones after their batteries run out. Thus, the design and development of software for efficient battery use is critical to the practicality of any smartphone application, and conducting research in this area can lead to various scientific directions.

- Appropriate UI design for target users. As mentioned earlier, the wide range of target users for the agricultural sector makes it difficult to develop appropriate mobile user interfaces. Intuitive interfaces for the right user groups are critical to the success of smartphone applications. The level of literacy and familiarity with gadgets is one of the main factors to consider when developing applications for smartphones (Cagiltay, 2011; Wang, 2014).

- Improved mobile network coverage. When using smartphone applications, there are many problems such as poor mobile network coverage, GPS connectivity, etc. Although network coverage is expected to improve continuously, providing a solution that adapts to network coverage is one of the factors affecting efficiency. That is, the application must be able to use the Internet when it is available, but also allow users to perform their tasks without the Internet and synchronize with the appropriate database when the network connection reappears (Doğan et al., 2016; Dickinson et al., 2007).

3 Analysis of mobile software platforms and the process of creating infrastructure in the agricultural sector

The methods mentioned will make it possible to adapt the UX to the software platforms used in agriculture and the associated implementation costs, making them more accessible and, above all, more understandable, ensuring low and affordable costs. To this end, the problems facing agriculture in our country are productivity and labor issues; can be divided into two areas, technical and technological problems (Aliyev et al., 2005; Mustafayeva, 2021; Doğan et al., 2016; Cagiltay, 2011; Dickinson et al., 2007).

Productivity and labor issues include: employment cuts (job closures) due to profitability (reduced incomes); the problem of attracting labor force due to the seasonal nature of activities in agriculture. This problem is especially evident for entrepreneurs; an increase in labor costs (costs of fuel, fertilizers and an increase in the minimum wage); maximum losses when harvesting vegetables and fruits; lack of water resources; that the soil is sandy, rocky and saline; adverse effects of weeds on agriculture and crop production; overgrowth of areas that have been infected by harmful insects and fungi.

The problems associated with technical and technological issues include the following: technical equipment is expensive; operation of this equipment on poor-quality and unproductive land plots; the lack of the ability to control technical means for problems that may arise during the cultivation and ripening of crops over large areas (fire in crop areas etc.) Mobile platform analysis and the application of a unified system approach can significantly affect the condition (soil analysis by categories, analysis of the ecological state of the soil, fertilizer scarcity, irrigation, plant health and agricultural production productivity etc.).

Analysis of the functional capabilities of the mobile platform. Controlling an autonomous device using a mobile software platform application has the following functionality:

- implementation of remote irrigation;
- modification of water resources in the district; - ensuring harvest;
- soil monitoring;
- determination of territories affected by harmful insects and territories inhabited by toxigenic species of mushrooms;
- the possibility of mobile communication.

Based on the listed functionality, the mobile platform controlling the proposed device will improve the following indicators:

- productivity improvement;
- economy of time;
- easy to use;
- mapping of seed plots;
- acceleration of investment payback period.

Agricultural software is usually intended for individual users. Much of the agricultural data available on mobile devices focuses on diagnostics and decision making at the field or farm level, while very little data clearly links farms to the wider landscape and underlying knowledge bases (Figure 1).

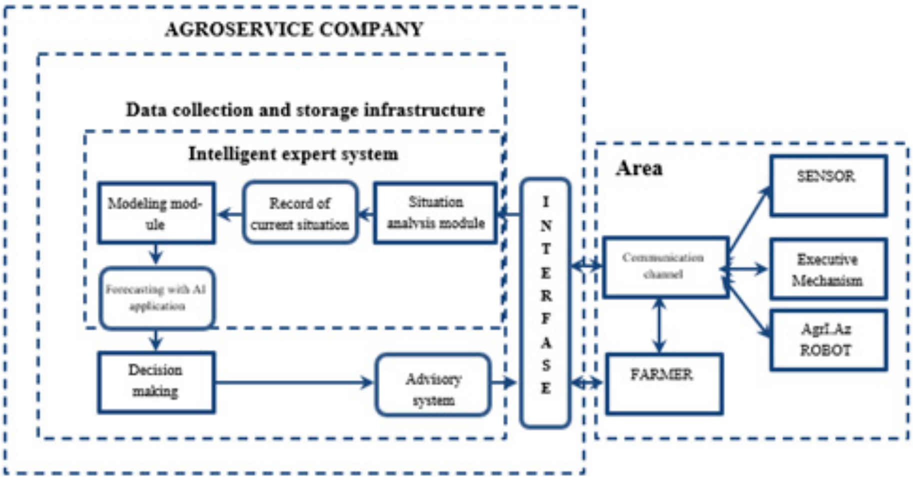

Figure 1: Infrastructure of the mobile application platform in the agro-industrial complex

The proposed infrastructure could facilitate integration into the knowledge base, which will open up more decision-making opportunities in the agricultural sectors. It can also develop a decision support system that shows regional practices and relative costs for soil and crop improvement, for example by linking farmers to local extension staff as a means of increasing training and financial resources. This bottom-up approach can increase farmer ownership of technology decisions and facilitate the successful adoption of sustainable practices. In general, to ensure the sustainability of the agricultural sector, the design of the system should be formed in software platforms according to 3 criteria (Cagiltay, 2011; Wang, 2014):

1. Performance;
2. Reliability;
3. User experience.

The performance criterion is mainly considered in the joint system design of hardware and software, and it is considered appropriate to consider the following indicators: powerful operating system, usefulness, flexible response to the needs of farmers, adaptability, user audience.

The reliability criterion basically determines the degree to which the created application meets the stated requirements and is stable. This criterion combines the following indicators:

horizontal and vertical related exchange, stakeholders, scientific data, business plan, continuous updates.

User experience means how meaningful, simple and accessible the already created platform is for a user audience. This criterion will allow farmers to acquire the habit of making decisions, reduce costs and eliminate wasted time.)

Software applications of intelligent robotic technologies allow the agricultural sector to solve the above problems by analyzing data collected by sensors or computer vision systems with machine learning algorithms. At the same time, these technologies make it possible to analyze market demand, predict product prices, and determine the optimal timing of sowing and harvesting. In general, the introduction of mobile application platforms using artificial intelligence technologies determines the development of digital agriculture in three directions in the near future:

1. Effective use of agricultural machinery and robotic devices: There are different types of agricultural machinery and robotic devices (flying, walking, etc.) depending on their purpose and functionality (for example, spraying, irrigation, soil monitoring, mapping, etc.). d.).

2. Monitoring of soil and crops: determination of soil salinity, sandiness or stonyness before planting, analysis of water reserves and water consumption, organic and inorganic substances in plant stems, identification of the first sources of pests and weeds, evaluation of plant vegetation indicators, etc. covers issues such as

3. Analytical analysis that realizes prediction: a comparative analysis of incoming data from cameras and satellites using a mobile platform, as a result of which optimal decisions are predicted and made.

4 Conclusion

Recommended software development features for a broadly applicable knowledge sharing system to improve the resilience of the agricultural sector are described. Thus, at first glance, mobile application platforms may seem similar in how they work with similar technologies available around the world. However, the main idea here is to direct software applications created using artificial intelligence, such as mobile devices, to design a single hybrid information architecture in accordance with the proposed infrastructure. The use of digital technologies in the agricultural sector will, on the one hand, reduce the use of foreign resources, and on the other hand, maximize the use of local factors of production.

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