Effectiveness of the Use of the Internet of Things (IoT) in the Agricultural Sector

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Abstract

The current internet architecture has been developed into the Internet of Things (IoT). The IoT idea seeks to improve effectiveness, accuracy, and financial gains. This research aims to analyse the Effectiveness of the Use of the Internet of Things (IOT) in the Agricultural Sector. This study employs qualitative methods with descriptive analysis techniques. The data collection method uses literature reviews from various reputable national and international journals. This research revealed that with the rise of the Internet of Things and the digital transformation of rural areas, using these technologies to remotely monitor agricultural development, soil moisture, and crop danger has become feasible. Automation of human intervention, particularly when leveraging the Internet of Things, can improve the efficacy of agriculture and farming processes.

Keywords: *Internet of Things, Effectiveness, Agricultural sector.*

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A. INTRODUCTION

There needs to be an immediate statement of the usefulness of agricultural land. To achieve a high level of production, effectiveness must be matched with good performance efficiency. As a result, efficiency should be practiced by both farmers and the government, especially when it comes to fertilizer management. Due to the numerous advantages it offers to both farmers and the government, this efficiency must be realized right now. Costs associated with agriculture are reduced, agricultural activities are easier to implement, and crop failure is less likely as a result, among other advantages. So it's not improbable that farmers and the government will gain a lot from the efficiency of technology-based agriculture if it can be put into practice (Rafsanjani et al., 2020).

The current internet architecture has been developed into the Internet of Things (IoT). Different items, including sensors and home appliances, are connected to the internet network under the IoT concept. The IoT idea seeks to improve effectiveness, accuracy, and financial gains. This objective can be met by creating a trustworthy decision support system using sensors, software, and internet networks. To enable the implementation of precision agriculture, for instance, IoT can be used to manage agricultural sensors and connect them to cloud infrastructure (Data, M., Yahya & Kurniawan, 2020).

Meanwhile, Hussain (2017) defines IoT (Internet of Things) as the ability to wirelessly interconnect an object that is used to identify, implement, and transmit information in the real world. IoT is a novel approach to using the internet to make human life easier. IoT is desperately needed and can undoubtedly assist humans in

the real world because it is adaptable and can be used without regard for space or time constraints. IoT can be thought of as a single entity that can connect to anyone, anything, place, service, or network.

B. LITERATURE REVIEW

The process of human survival heavily depends on agriculture. The majority of people in Indonesia work in agriculture. However, human labor is still used to cultivate and maintain agricultural land in the traditional manner. Crop yields will be significantly impacted by the manual land management practices now used in agriculture (Rouf & Agustiono, 2021).

According to the United Nations, humanity will reach 7.7 billion million people by 2050. This raises concerns about the food production requirements in 2050. This is due to a number of factors that have contributed to a decline in food production over the last few decades. Several countries have begun implementing IoT in agricultural processes in anticipation of this problem, with the goal of improving the quality, quantity, and efficiency of existing resources. In agriculture, IoT is used to overcome human limitations in plant care, such as time and stamina. With the adoption of IoT, monitoring during the treatment process can be carried out 24 hours, and resources are used more effectively to satisfy crop needs. Prioritization study of the IoT to be used is necessary before using IoT in agriculture. In order to do this, a number of factors that can be collected from the process's participants must be taken into account. A technology called Quality Function Deployment was created to match user needs with the intended product. The user's point of view and the product's point of view are combined in QFD's prioritization process. This makes QFD a great fit for this research because it considers business processes and the Internet of Things from two different points of view (Pinandito, 2021).

C. METHOD

This study employs qualitative methods with descriptive analysis techniques. The data collection method uses literature reviews from various reputable national and international journals. This research attempts to describe the existing phenomena, which are happening now or in the past. This article highlights the Effectiveness of IoT Applications in Agriculture.

D. RESULT AND DISCUSSION

Indonesia's raw rice field area (Lahan Baku Sawah/LBS) is 7,463,948 hectares. The island of Java dominates the ownership of the largest area of raw rice fields. East Java is the province with the largest LBS in Indonesia. The province has an LBS of 1.2 million hectares. Central Java and West Java have LBS of 1,049,661 hectares and 928,218 hectares, respectively. The total area of raw rice fields is stipulated in the Decree of the Minister of ATR/Head of BPN No. 686/SK-PG.03.03/XII/2019 On December 17, 2019 concerning Determination of the National Rice Field Areas in 2019. This information becomes the basis for calculating the area of rice harvested. The

National Institute of Aeronautics and Space (NIAS), the Ministry of Agriculture, the Ministry of Agrarian and Spatial Planning, the Geospatial Information Agency (BIG), and the Central Statistics Agency (BPS) all participate in the collecting of LBS data (LAPAN). After the issue of disparate land data arose, the ministry and numerous affiliated agencies collaborated to equalize data (Pusparisa, 2020).

Modern technology is advancing quickly. Everyone uses nearly exclusively technical tools. IoT, or the Internet of Things, is a notion in which an object has the capacity to transport data across a network without requiring contact between people or computers, turning technology into a tool for people to use at work. Technology advancements in agriculture should be a priority for future development. Precision farming methods are currently being studied from a strategic perspective. A farming method known as "precision agriculture" maximizes the use of resources to produce the highest possible yields while also having the least negative environmental effects (Mangesa et al., 2022).

With a wide range of sensors utilized for diverse smart agricultural goals, the IoT has recently made a big impression on the agriculture industry as well. Every year, the number of IoT applications grows significantly, connecting numerous networked devices to mobile devices using the internet, such as many sensors, drivers, and smart objects. Due to the widespread use of cloud-based remote data capture, IoT services include the exchange of information with intelligent control and decision-making services. The smart agriculture sector can benefit from these skills by getting efficient production. The traditional strategy to agriculture is to develop modernized farming while investigating the IoT region of interest in the agricultural sector. Over the past ten years, IoT development has produced enormous benefits across all industries (S., 2021).

Most nations place a high value on agriculture, hence it is essential that this sector develop into one that is "Smart." The industry is currently advancing toward agricultural modernisation by utilizing cutting-edge smart technologies to identify strategies for the efficient usage of limited resources, thereby satisfying the continuously growing global population's consumption needs. The emergence of the Internet of Things and the digital transformation of rural areas have made it possible to use these technologies to remotely monitor agricultural growth, soil moisture, and risks to crops. Utilize artificial intelligence-based analytics to quickly examine operational data paired with outside data, such as weather services, expert opinions, etc., to bring fresh perspectives and better decision-making, so enabling farmers to practice "Smart Agriculture." This research effort focuses on the remote management of agricultural activities and the automation of those activities utilizing modern technology (Navulur et al., 2017).

Numerous environmental studies, including those on acidification, pollution, and nutrient intake, depend on accurate measurements of soil water fluxes and content. Effective water conservation and protection is currently a major priority, and as emphasis turns to the effects of climate change, this interest is certain to grow. As a

result, soil water content plays a crucial role in many modelling studies, including those that calculate evapotranspiration and estimate losses to groundwater (Gaskin & Miller, 1996).

Increasing the productivity of agricultural and farming activities is essential to increasing yields and cost-effectiveness as new technologies, like the Internet of Things, proliferate. By automating human intervention, IoT, in particular, can increase the effectiveness of agriculture and farming processes. Nearly every aspect of life has transformed as a result of the rapid development of Internet of Things (IoT)-based tools, including business, agriculture, surveillance, etc. In the face of diverse challenges, these radical breakthroughs are upending conventional farming techniques and offering new possibilities. Data on climate changes, soil fertility, the quantity of water needed for crops, irrigation, insect and pest detection, bug location disruption of organisms to the sphere, and horticulture may all be collected with the use of IoT. Farmers may efficiently use IoT to monitor their forms remotely and around-the-clock. Due to its precise output and application, a variety of sensors, including distributed WSNs (wireless sensor networks), are used for agricultural inspection and control. Cameras are also used to observe the scene from a distance. This study aims to provide a thorough evaluation of IoT-based smart agriculture methods. The study presents IoT applications, advantages, current challenges, and prospective remedies in smart agriculture. Finding existing methods that can be used to increase crop productivity and cut down on time, such as crop, pesticide, irrigation, and water management, is the goal of this intelligent agricultural system (Rehman et al., 2022).

E. CONCLUSIONS

The number of Internet of Things (IoT) applications, which use the internet to link a large number of networked devices, including many sensors, drivers, and smart objects, to mobile devices, increases dramatically each year. These abilities can help the smart agriculture sector produce goods more effectively. Utilizing these technologies to remotely monitor agricultural development, soil moisture, and crop danger has become viable with the emergence of the Internet of Things and the digital transformation of rural areas. The effectiveness of agriculture and farming processes can be increased by automating human intervention, especially using IoT.

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