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A Study on the Management of Safe Health Data Analysis based on Blockchain

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Abstract. This paper aims to increase the reliability of data with research that suggests how health data can be managed safely and efficiently using blockchain technology. Therefore, blockchain technology is applied to prevent forgery of data, and customized services are needed for consumers based on the results analyzed by utilizing the produced data. By being able to provide safety and reliability for health data, we will be able to identify the intent of use for consumption or production of data. If reliability can be provided based on such secured data, it will be a direction of development related to the fourth industry in the future. If blockchain and big data can be used as a history management system that combines complex technologies rather than one system, it will be a customized service for future trends.

Keywords: blockchain, big data, data analysis, safe health data, fourth industrial revolution

1. Introduction

It is necessary to manage the history of individual health data by utilizing blockchain technology, and to prevent or utilize forgery of personal data by managing consumption history using blockchain technology. The purpose is to study and develop solutions for personalized convenience or personal propensity by leveraging the data produced in this way. Users will need a new interface to use various devices to transmit personal health data, and users' fatigue is expected to increase further by using various smart devices to post data on SNS. In addition, there will be changes in SNS platforms to address the increased risk of excessive personal information exposure and flooding of existing SNS services. You will be interested in being able to provide communication services while staying in different places far away, not in the usual form of change. Operating a blockchain-based sales and record management system can help small-scale healthcare data increase their sales and manage their sales records. Moreover, an IoT with blockchain-based record management system can help prevent the falsification of personal data. It could also help better utilize personal data, as collected data can be used to create solutions tailored to one's convenience and personal taste. If a blockchain-based system for the sales and consumption of produce as proposed in this paper is implemented, it would also have a job creation effect. Jobs would be created for the offline sales at local communities, as well as jobs related to managing produce records and safety online. Above all, if platforms using blockchain are developed, they could be expanded into various businesses and other industries. Eco-friendly certification could also be possible during the distribution process.

2. Literature Review

2.1. Blockchain and technology

A Blockchain is a technology for analyzing and processing data. Data, such as transaction details, is distributed and stored in all users in the network. Here, blocks are tied together in the form of chains, and refer to the storage points where data from individuals and individual transactions are saved. Since user transactions are saved throughout the blockchain, it is possible to transparently check the transaction information without fear of data forgery since the information can be compared and verified based on the data shared by all users (Dagher et al., 2018). Distinguishes between existing transaction methods and IoT with blockchain methods. This paper conducts research on developing a sales record management system for personal data produce using blockchain technology. Using blockchain technology will help small-scale healthcare data increase their produce sales. Applying the blockchain data record system for sales will allow user information to be kept safely by preventing the falsification of personal data and sales data. Once enough data is collected for use as big data, solutions can be tailormade for the user based on convenience and personal tastes.

Consumers demand information about the produce they purchase covering the entire process from production to distribution. They demand the food to be safe and information credible. This is because consumer awareness on food safety and quality is increasing, leading to changes in patterns in consumption. Guaranteeing the safety of the food and the credibility of the information will allow producers to better identify consumer preferences. Producers may reflect the data collected to have a better overview of the flow of their products and change up their promotional efforts accordingly (Yan et al., 2021).

2.2. Changes in distribution structure in the digital era

Among the new types of distribution channels, a market that is showing noticeable growth is an interest in individual health data. Since sensitive data can be collected together with respect to individual health data, there is a great deal of interest in visualization of the data utilizing it. This is because customized solution drugs, treatments, and exercises are possible with visualized information, not just for visualization (Patel 2018). Since it is possible to provide a variety of solutions that have never been experienced before, the field of utilization of health data could be Blue Ocean (Heston 2017).

As shown in Figure 1, with the advent of the digital era, existing offline sales channels have transformed into online channels, thereby necessitating the diversification of sales channels and customized purchased.

Fig. 1: Record Management and data analysis in the 4th industrial revolution in the digital era.

3. Research Methodology

3.1. Collect personal health data

Since there are many difficulties in utilizing existing distribution channels for individual health data, it is necessary to prepare a new form of distribution channels based on distribution issues. It is also necessary to apply new IT technologies to sell,

manage and operate personal health data. The technology was judged to be suitable for blockchain technology, and it was determined that it would be effective in preventing market expansion or forgery in the future. In addition, distribution costs can be reduced through new forms of distribution channels, and customized services using blockchain will be needed to create new types of value added in line with the era of buying and selling personal health data changed to blockchain (BaM et al., 2014). Figure 2 shows that the future market is a solution for accessing users and linking individual health data to blockchain. Family healthcare data and other healthcare data engaging in small-scale healthcare data have difficulty accessing existing distribution channels. Thus, small-scale healthcare data need to establish new forms of distribution channels to overcome such issues. Also, there is a need to apply new IT technologies to the production, management, distribution, and sales of agricultural products. IoT with Blockchain was deemed the appropriate technology to this end, and also because it was judged to be efficient in expanding future markets and in preventing falsification in product distribution.

Fig. 2: Health data platform using blockchain.

Consumption history management using blockchain technology will help prevent forgery and utilize personal data, and will be able to implement and present solutions for personalized convenience or personal tendency by utilizing the produced data in Figure 3.

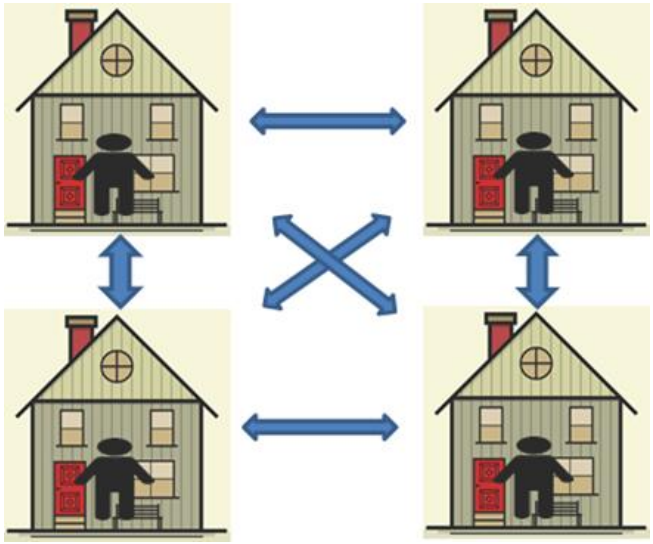


Fig. 3: Wi-Fi-based healthcare data collection system.

The method presented in this paper implements a consumption history system for blockchain and individual health data sales, and if combined, job creation related to various forms of offline sales is expected, and job creation related to safety is also possible (Suna Kyun et al., 2021). Above all, Figure 4 it is believed that it can be applied to various industries by developing platforms necessary for expanding various business fields using blockchain.

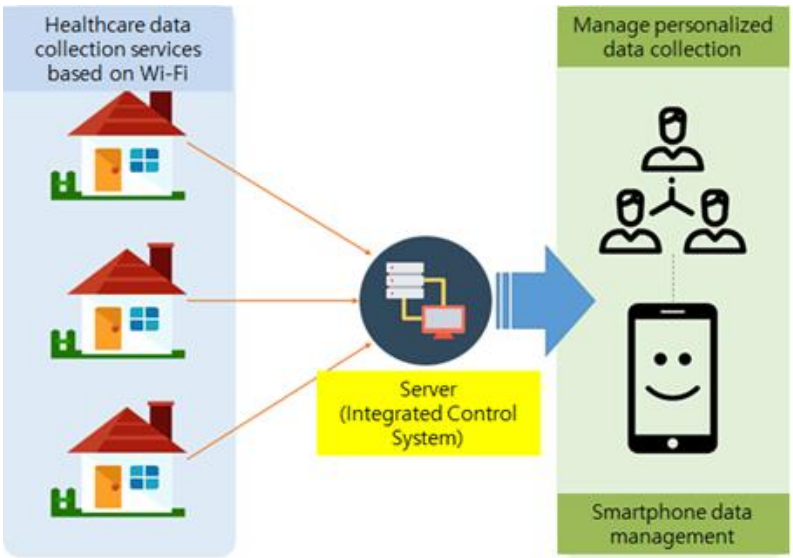
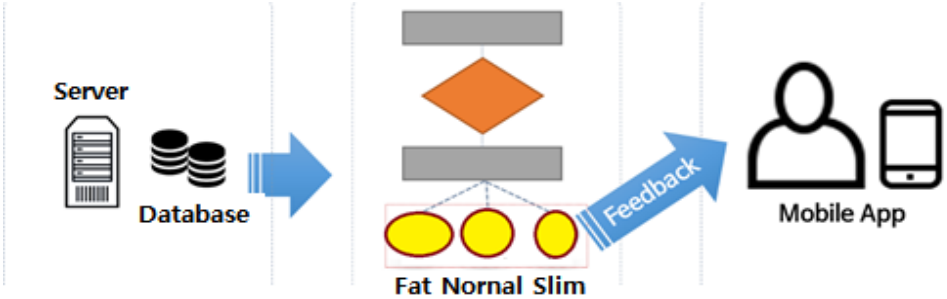


Fig. 4: Blockchain and personal health data.

Furthermore, new form of distribution channels, such as direct distribution to consumers, may help small-scale healcare data reduce distribution costs. Such healcare data also need to keep up with the current agricultural market, and thus blockchain technology is a tool that can create new added value via customized services that support data security and allow for personalization based on sales records. Figure 5 as shown future produce markets will need to provide solutions for small-scale healcare data that incorporate both online channels as well as offline channels such as sales within the local community.

Fig. 5: Machine learning and personal health data analysis services.



3.2. Analysis of data on history management of personal health data

By computerizing the system that manages the history of consumption on personal health data using sensors, it can be utilized as data and can be convenient management by linking it to mobile. Once accumulated data can be used as an analysis of the distribution path or sales of personal health data through data analysis, so it will be efficient in that it can provide the necessary data where it is needed.

Large-scale healcare data are able to sell their produce via existing distribution channels such as wholesale markets, which are difficult to access for small-scale healcare data. Thus, there is a need to establish new healcare data of distribution channels that address such issues. It is common for small-scale healcare data to try and reduce distribution costs and increase added value by newer forms of distribution channels, such as directly selling to the consumers. Small-scale healcare data not only produce food, they also perform functions such as contributing to food security and better nutrition; helping societies address poverty and starvation issues; preserving the environment and biodiversity; and maintaining the local economy. The majority of healcare data are small and medium-sized healcare data, while only a few are healcare data of large, commercial scale. Most healcare data systems are centered on small healcare data and family healcare data [7][8].

The produce from small-scale healcare data are mostly consumed by the healcare data themselves, and what is leftover is sold through various channels. It is not easy for such healcare data to utilize existing distribution channels such as wholesale markets for produce. Therefore, as seen in Figure 6 such healcare data seek to reduce distribution costs and increase added value through newer, trust-based distribution channels such as direct trading with consumers [9].

Fig. 6: Blockchain Services Overview.

If history management using blockchain is carried out in the process of selling and consuming personal health data, there may be data that is difficult to process with conventional data processing methods, and definitions may be needed. Since data is originally based on reliability, the need for blockchain will be recognized by anyone [10]. When using blockchain to manage sales and purchase records, farmers may encounter data that are not fit for traditional data processing methods. Such data would need to be defined. Data requires credibility, and as such, the need for blockchain is widely acknowledged worldwide. Data in relation to big data can be defined by the storage and analysis technologies applicable to particular points in time. It is estimated that a record management system that incorporates such data but also real-time data through social media and location data using GPS would soon be needed [11].

As shown in a variety of methods and analysis techniques, based on technology such as data mining, machine learning, natural language processing, and pattern recognition, can be applied in order to utilize the collected data. Due to the increase in unstructured data in recent years, clustering analysis is often utilized by text mining and opinion mining based on natural language processing technology [12]. Representation technologies such as NodeXL, Gephi, and R-based packages are used

to visualize the meaning and the value of the analyzed data. A result analysis module is developed by recognizing food, and items of food are extracted from the dietary image input by the user. In addition, the automatic calorie calculation function according to the food item is implemented to add up the calories, and it is recorded in the user diet information server with blockchain technology [13].

Effective utilization of public data will be needed along with the opening of data in the use of big data related to the analysis of personal health data. Although diverse kinds of data are being generated and accumulated during the production, distribution, and consumption of personal data via sensor-based ICT, they are not being fully utilized [14]. It is Figure 7 widely regarded that data can be categorized into meaningful and meaningless data.

Fig. 7: From data collection to analysis and utilization.

The use of big data in the agricultural sector will require the open data and the efficient use of public data. Although diverse kinds of data are being generated and accumulated during the production, distribution, and consumption of agricultural products via sensor-based ICT, they are not being fully utilized. It is widely regarded that data can be categorized into meaningful and meaningless data.

However, it can be difficult to determine which data is meaningful. Thus, incorporating the collected data into an analysis for statistical inference and prediction is also a difficult task. In order to combine large amounts of data for statistical modelling, it is necessary to quantify the relevant information extracted from the personal data collected. Then, these numerical figures need to meet statistical assumptions.

3.3. Proposed System

A blockchain distributes the transaction records to all network participants for storage. It is a technical solution that can guarantee the efficiency and transparency of transactions at a relatively low cost. This is because there is no need for a central supervisory agency for transactions as the system allows the transaction to be verified and certified by the participants involved. Korea currently lags behind other countries when it comes to harnessing technology that can verify the quality of Personal Health

Data. A blockchain-based system that can manage sales and purchase records of personal data will allow Korea to surpass those countries technologically in this regard. There are companies in Japan, the U.S.A., and Europe that have already incorporated blockchain technology and are analyzing the data collected from the production and distribution of personal data.

In order to proceed with continuous health care in connection with the healthcare system, an internal algorithm needs to be implemented, and my status can be checked in real time. It is possible to expand the age group of users while providing services that can naturally manage their health while enjoying the convergence of existing healthcare technology and game content, and to provide intuitive feedback functions through game characters. In addition, it provides integrated services for various wearable devices, extracts specific data from information to wearable devices, uses it for services, and enables comprehensive device linkage. In addition, it will be possible to form a network through communication and competition between users in Figure 8.

4. Results and Discussion

4.1. Proposed Techniques

If there is an outbreak of disease linked to a certain personal data, rapidly tracking the production and distribution history of the product may curb the spread of contaminated food. Likewise, the world might have been able to respond faster to the current COVID-19 pandemic if similar record systems had been in place. It could have also prevented secondary damages caused by the spread of unconfirmed information.

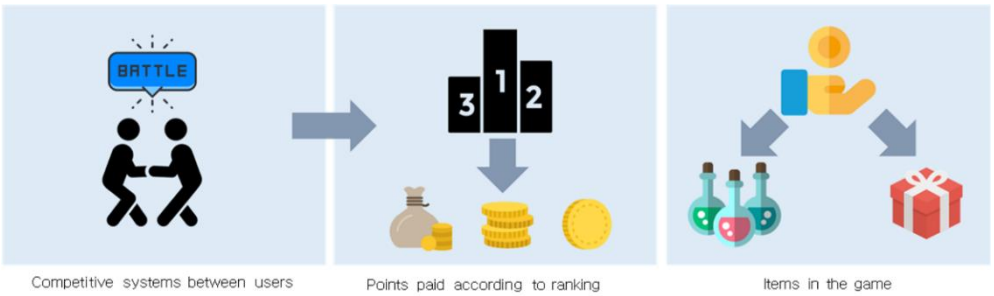
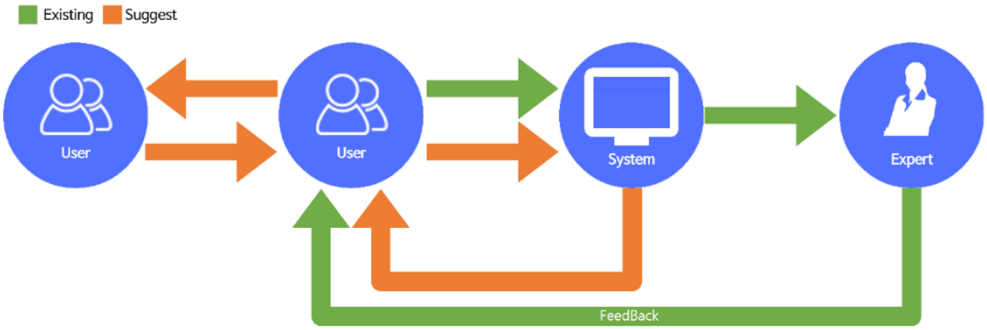


Fig. 8: Proposed System Configuration.

Blockchain is a technology that encrypts, shares, and saves the transaction records of goods and assets in the ledgers of all participants involved in the transaction. By using sensors to computerize their system for managing sales records, these farmers will be able to accumulate meaningful data. They could also make the system accessible via mobile devices for added convenience. The accumulated data can be analyzed to create a better overview of their distribution and sales channels in Figure 9.

Fig. 10: Differences in proposed techniques.



It is necessary to analyze the status quo of food tracking systems in order to introduce and apply blockchain technology solutions. Coming up with measures on how to apply blockchain technology to the foods that are managed via tracking would also be needed. However, it will take some time before support measures for industries applying blockchain technology to their platforms are established and the effects of regulations on blockchain application analyzed. It will also take time for measures using blockchain to prevent the forgery and falsification of data related to the sales and purchase of agricultural products are introduced. In addition, agricultural product distribution networks should be thoroughly tracked to be more transparent and thus more trustworthy for consumers. The effectiveness of applying blockchain technology to tracking and managing agricultural product records should be increased. Future industries will need to adapt to environmental changes as well as the Fourth Industrial Revolution and address the safety issues of agricultural products stemming from those changes. It will need to focus on increasing the efficacy of systems designed to track sales and purchase records. In order to integrate blockchain technology into agricultural sales, it is necessary to analyze the status quo of the current tracking systems in use, and to examine the application of blockchain technology in agricultural markets both domestic and overseas.

It will increase their efficiency in targeting sales outlets. It can reduce the risk of forgery and falsification of transaction information and can ensure transactions are efficient and transparent at a relatively low cost in Figure 10.

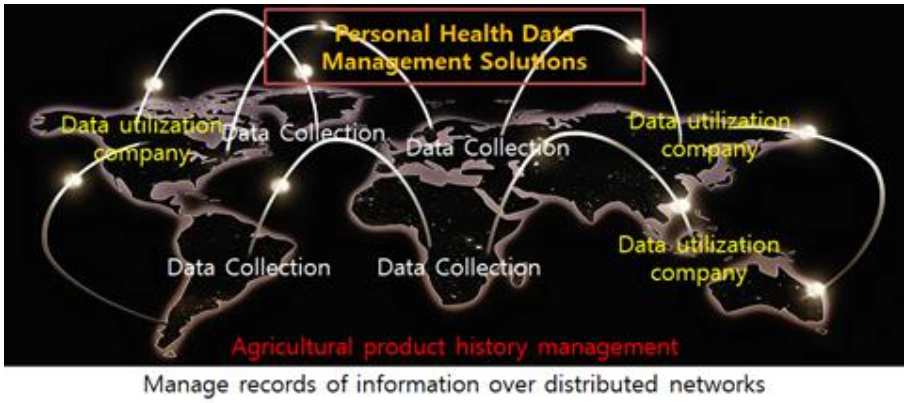


Fig. 11: Data Collection App.

4.2. Design of Record Management System Using Blockchain

Personal health care data management systems using blockchain are recently approached by many companies. The difference between the solutions proposed in this paper is to create personal identification data utilizing blockchain techniques.

In Figure 11 aims to prevent data from being transformed from the beginning by utilizing blockchain to manage from sales to consumption of personal health care data.

It is necessary to analyze the introduction and application of blockchain with the status of personal health data management systems and systems, and to prepare measures to apply blockchain to the tracking management of personal health data. It will take time to prepare measures to support industries according to blockchain application and analyze the regulatory impact of blockchain application, and secure measures to prevent forgery and alteration of data history information related to sales and consumption. In addition, transparency and consumer reliability should be secured through transaction information tracking of personal health data, and effectiveness should be enhanced by introducing blockchain necessary for tracking and managing personal health data in Figure 12.

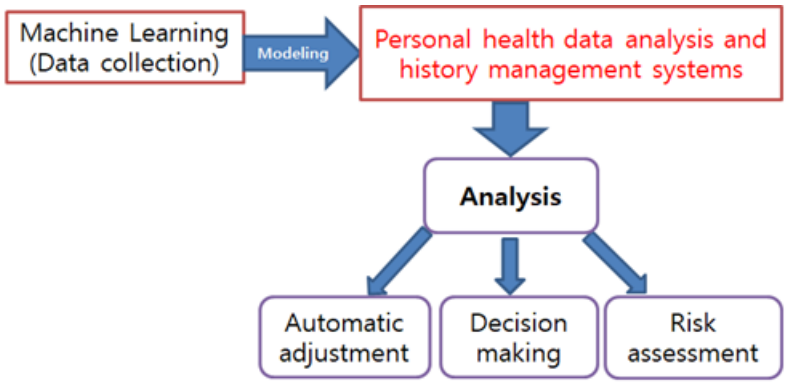


Fig. 11: Conceptual of a blockchain-based system for the sales of personal data and management of purchase records.

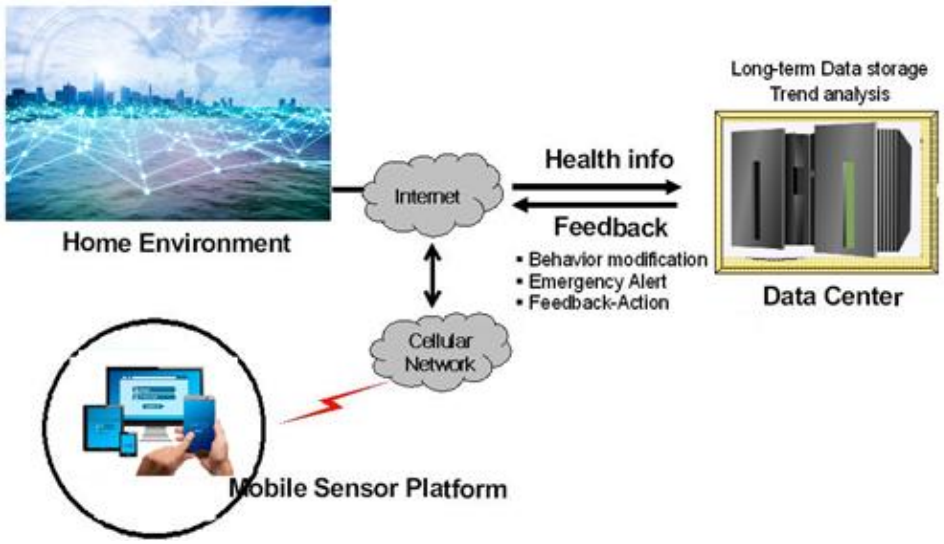


Fig. 12: Healthcare data collection and management.

In the future, the industry will need to enhance safety issues of personal health data following the fourth industrial revolution and environmental changes, and the effectiveness of the history tracking management system for sales and consumption should be enhanced. It is necessary to analyze the current status of the tracking management system of personal health data for the introduction of blockchain, and to investigate the application status of blockchain at home and abroad.

5. Conclusion

In selling individual health data, consumers' confidence in reliability certification and history-tracking management certification is not high, and if reliability is poor, they need to approach it in a way that increases the value of data and creates added value.

In order to trade health data at consumer's level, it is necessary to create jobs related to data usage history and safety in relation to industrial structure, and to develop platforms necessary to expand various business areas using blockchain. In addition, solutions should be in place to cope with hacking or unwanted data leakage. It is important to create a history system for analysis and sales of individual health data using IT technologies such as blockchain. Platform development projects for sales and consumption history systems of personal health data will be carried out, and management will be transparent if they can be applied in other industries.

Acknowledgements

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