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Pilot Construction and Application Study on Geospatial Big Data on Buildings

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SUMMARY

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The Fourth Industrial Revolution technology development has triggered various data-based services and policies, such as big data, meta bus, digital twin, and smart city. In addition, data are being noticed more as the basis for realizing new services and policies. In particular, the data on buildings, or people's living spaces, are becoming more critical as essential information to improve people's quality of life. Yet, the need for spatial informatization of data and connection of heterogeneous data is increasing to utilize more the value of building-related data and use them for policies and services.

In line with this, the government is proceeding with the construction service industry information system (construction HUB). The system serves as a data hub for smoothly distributing building-related information. The scheme aims to support the construction industry, where the related information platform is poor compared to its market size, and respond to developing new construction industry and diversifying the construction industry. The construction service industry information system has many data, such as approximately 100 information systems of the Ministry of Land, Infrastructure and Transport and nearly 400 related agency systems, and it draws the attention of related industries that need to build big data related to buildings.

The construction service industry information system supports linkage and data distribution between systems intending to support policies based on building-related DB and building service big data. However, the standards for quality improvement and standardization measures of data to be the basis of the construction service industry information system are insufficient. In particular, research on building spatial information big data for data linkage and utilization is in the initial stage, lacking prior research on information construction and linkage utilization plans, which is highly likely to cause data quality deterioration, such as errors when building spatial information big data are constructed in the future. Therefore, this study intends to 1) demonstrate the method of building spatial information big data, 2) identify problems that will occur in the construction process, 3) establish building spatial information big data, and provide information standards for data to be distributed through the construction service industry information system by actually linking various public data, including building data. This study also intends to review utilization directions based on actual data by constructing pilot building spatial information big data.

This study established the concept of building spatial information big data by investigating spatial information, shape information, and attribute information, and additionally analyzing spatial information big data. The study found two emerging characteristics evaluating the status of building geospatial information big data. First, the building spatial information big data are steadily updated for all buildings nationwide. Second, the building spatial information big data include high utilization value to be analyzed by combining data constructed by each lot and building unit with other datasets. This study aims to define the building spatial information big data as "data that include location information, shape information, and property information of all buildings and secures ease of linking with datasets."

This study constructed and utilized actual data on a trial basis based on the concept of the building spatial information big data that the study established. It is necessary to find out whether it is possible to link various datasets provided by the existing platform and used for convergence/composite analysis with building shape information and property information through a pilot construction. Through this, the study seeks to derive the optimal data connection strategy to construct the building spatial information big data and enhance the possibility of their convergence and complex utilization.

This study used road name address building data as building shape information and location data. The data were suitable for this study as they stay up to date compared to building integrated information. In addition, as the fundamental property of the building, the building ledger data provided by the building data private open system were used. The building ledger data have a high utilization value as primary data for the building spatial information big data as they have several identification keys for data linkage, such as PNU keys for each lot and PK keys for each building. In addition, this study assumed that it would be possible to link building information with non-building information in the future and linked data provided by standard datasets from public data portals.

The study built the spatial information big data as a pilot and analyzed the data created. The study investigated the use cases of the building spatial information big data by dividing them into state-led and private-led utilization and focused mainly on analyzing the flood risk of buildings and information on shopping malls in all-inclusive units based on the investigation results. The study established building spatial data, such as the building shape and location information, by using building integrated information and building property information, using building ledger information. In this study, the building spatial information big data were established on a pilot basis by linking 147 standard datasets additionally built by public data provision standards.

In this study, flood and shopping mall information analysis were performed using the spatial information big data of the building built as a pilot. As a result, the study derived various results that could not be obtained from existing data by creating spatial information big data. The flood analysis confirmed additional information, such as whether the building subject to flood damage had a basement and how old the building was, unlike previous studies that could identify only which buildings could be damaged by floods. Regarding shopping mall information analysis, this study researched the location of shopping malls in more detail.

In addition, this study found various problems, such as problems linking building ledger information in the process of building data, those occurring when linking public data, and problems when connecting shopping mall information, etc. The study put together these problems and derived improvement directions for constructing efficient and accurate building spatial information in the future and data standardization direction to respond to the construction service industry information system.

The study proposed a data standardization and linkage plan to realize the building spatial information big data. In detail, this study reviewed standardization measures for ten architecture and urban space-related data provided by the Ministry of Land, Infrastructure and Transport through literature research, data pilot construction, advisory meetings, etc. This study first proposed a method to standardize problem items through data standardization methodology and individual data review. In addition, this study suggested the Ministry of Public Administration and Security's address information base map, the numeric topographic map, and building integrated information production and update system of the Ministry of Land, Infrastructure and Transport to standardize the building spatial information. Through this, the study reckons that standardizing the building location information, shape information, and property information can be possible. Finally, this study proposed a standardization methodology to link efficiently the standard dataset built according to the public data provision standard with the building spatial information.

The study's results suggest data standardization and connection plans to respond to introducing the building service industry's information system. In addition, this study suggested what positive effects the synergy that occurs in data standardization and linkage can lead through the pilot construction of the building spatial information big data. The study results will help collect and utilize architectural and urban space data more, preemptively solve various problems that arise in architecture and urban space if related studies continue, and improve people's quality of life.

Keywords :
Data Standardization, Building Big Data, Geospatial Big Data, Public Data, Data Connection