Architecture & Urban Research Institute

auri research brief

No. 35

Cho, Young Jin
Associate Research Fellow

Yoo, Kwang Heum
Senior Research Fellow

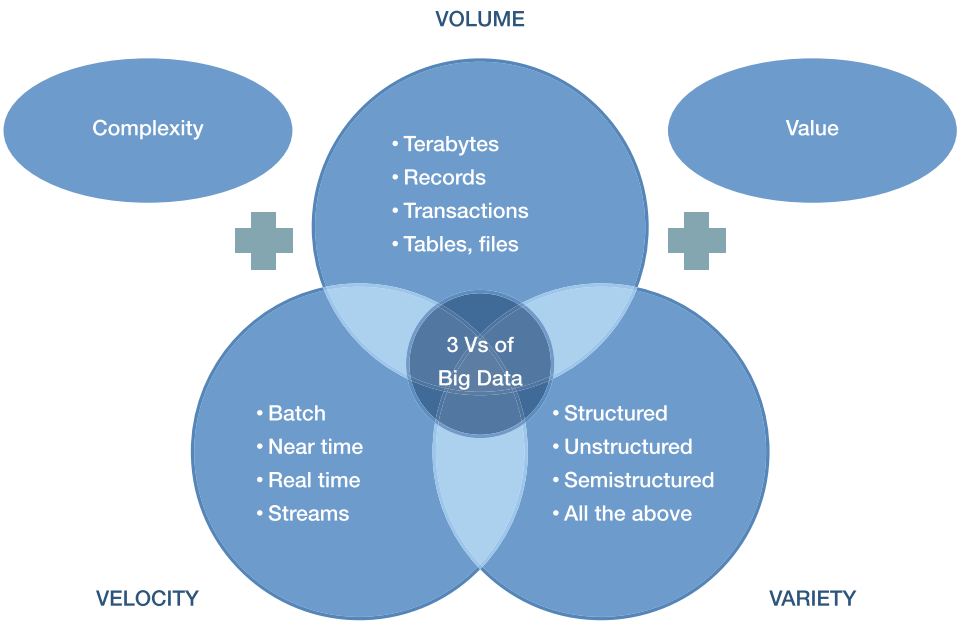
Kim, Shin Sung
Researcher

Big Data Policy Development Framework for Architecture and Urbanism

Evidence-based policymaking is an approach to policy development that is particularly effective in the fields of architecture and urbanism, where public interest is high, civil affairs are often considered, and policy demand is ever-changing. However, to date, there have been very few studies conducted on this issue. In order to improve the quality of policies related to urban architecture, it is urgent that the evidence-based policymaking formulation method be studied.

Foreign developed countries are actively adopting big data as a technology innovation and a novel problem-solving method for policy development. In Korea, there is a need to incorporate big data such as public and social information into policy development. In particular, it is necessary to develop a methodology for using big data to diagnose and predict the demand for and changes in rapidly shifting architecture and urbanism policies.

The first objective of this study was to determine how best to use big data in the fields of architecture and urbanism. The second was to derive a policy development method that could employ big data to the best effect. The final objective was to present a policy development framework for evidence-based policies in this field.



Characteristics of Big Data

Source: Misook Lee, Changhoon Lee, Jiyeon Kim (2014), 「Policy demand analysis in environment field using Big Data」, Korea Environment Institute

The characteristics commonly used to describe big data include data volume, velocity, variety, veracity, and value. Depending on the type of data, classifications such as formal, informal, or semi-formal can be employed. Formal refers to data stored in a certain field that can be managed by a database such as building information, while informal applies to data such as blogs, social information, and news media, which are not defined in an item.

Policy process theory deals with the process of policy development from the point of problem recognition to finalization of the policy, proceeding through the stages of goal setting, alternative analysis, decision making, legalization, enforcement, and evaluation. One representative policy process model used in policy studies is Anderson's model (1975). It is composed of five steps: problem identification and agenda formation, formulation, alternative adoption, implementation, and evaluation. The scope of the policy development corresponds with problem identification and agenda formation, formulation, and alternative adoption.

The problem identification and agenda formation stage is necessary to monitor the public's opinion on specific topics and issues. The formulation stage focuses on creating policy alternatives by combining and linking various information together. Finally, the alternative adoption stage is derived when the best alternative among the various possible is determined, as derived from the formulation stage.

The big data-based architecture and urban policy development framework proposed in this study is composed of the following stages: ①development of the query, ②determination of the

analysis contents, ③comprehension of the data types and characteristics, ④employment of the design analysis method, ⑤data collection and processing, and ⑥analysis and interpretation of the results. A pilot test was conducted on a building maintenance policy to verify the framework.

Search keyword selection for the area of building maintenance

Keywords for policy	Search keywords	
Safety	• Negligent accident	• Earthquake
	• Collapse	• Flooding
	• Fire	• Crime
Compliance with permit standards	• Illegal remodeling	• Open space
	• Split–room remodeling	• Land subsidence
	• Illegal architecture	
Equipment performance	• Equipment replacement	

Keywords for policy	Search keywords	
Energy performance and eco-friendliness	• Condensation	• Insulation
	• Indoor air quality	• Energy saving
	• Eco–friendly interior	
Long life	• Changeability	• Durability
	• Ease of repair	
Maintenance cost	• Maintenance cost	• Heating and cooling costs
	• Electric, water, and gas rates	• Facility assets
Apartment living environment	• Apartment defect repair	• Apartment conflict
	• Apartment noise complaint issues	

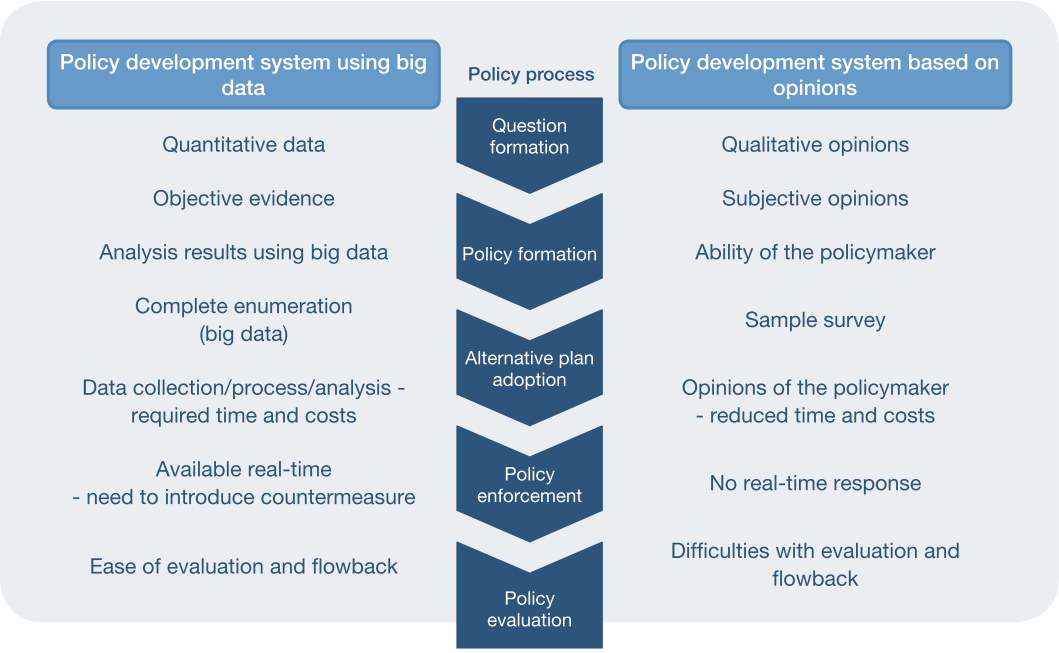
The main questions related to the building maintenance policy were derived in order to verify the usefulness of the problem identification and agenda formation stage. Based on these key questions extracted, an analysis of the public opinion of the building maintenance policy was conducted. The analysis model used include keyword frequency, related keywords, time-series trends, and emotional analyses. For the publicity analysis, social and news data from April 1, 2014 to April 30, 2017 were collected using a web crawler.

The keyword analysis of the building maintenance indicated that the most urgent keyword related to solving the policy problem was “safety.” Next, the results of the detailed analysis of the keyword “safety” revealed that the secondary keyword with the highest amount of buzz was “fire,” which showed that public opinion was the most focused on fire-related issues. Finally, based on the results of the public opinion analysis, “fire safety of buildings” was chosen as the policy agenda.

The main questions related to fire safety were derived in order to verify the formulation stage,. The analysis model was designed based on the derived query, and was subsequently analyzed. The data used for the analysis included fire statistics, building registry and weather information, and detailed census collected from 2012 to 2016.

The analysis confirmed that building fires occurred most often in residential spaces, which is also where casualties were concentrated. A combined analysis of the fire statistics and meteorological data revealed that a 10% drop in monthly average humidity increased the incidence of fires by about 19%. A combined analysis of the fire statistics and census information showed that most villages saw very few fires, and substantially few villages suffered from highly frequent fires. This revealed the power law between villages and fire frequency. In addition, according to the combined machine learning analysis of fire statistics and building property information, the specific types of buildings where fire is frequent were found.

Through these case studies, three building management policy alternatives were developed: 1) improvement fire safety in non-residential buildings, 2) prevention large-scale fires in industrial facilities, and 3) establish flexible firefighting systems in local governments.



Comparison of policy development system using big data with policy development system based on opinions

The big data-based policy development framework represented the capability of producing objective and scientific data-based policies, and thus can be used as a methodology for implementing evidence-based policies. This evidence-based policy development framework should be implemented because it is transparent in the decision-making process. Policy agendas and alternatives should also be implemented based on the objective data. In addition, future evaluations and feedback will be easier to give and receive because they will be developed based on data. Therefore, it is expected that policy development through the quantitative analysis of data will enhance the credibility and rationality of the policies produced.

Keywords : Big Data, Policy Development Framework, Evidence-based Policy, Building Maintenance, Building Fire

(aur i) Architecture & Urban Research Institute

Publishing Organization Architecture & Urban Research Institute
Publisher Kim, Sang Ho
Address #701, 194, Jeoljaero(Eojin-dong), Sejong, Republic of Korea
Tel +82-44-417-9600 **Fax** +82-44-417-9608 **www.auri.re.kr**

• design by_HANA • translation_MASILWIDE