Structuring data information models of the built environment using dependency networks

Kinda Al_Sayed
k.sayed@ucl.ac.uk
++44 02030395304
The Bartlett School of Architecture, UCL
140 Hampstead Road, London NW1 2BX
United Kingdom of Great Britain and Northern Ireland

Alan Penn
a.penn@ucl.ac.uk
The Bartlett School of the Built Environment, UCL
United Kingdom of Great Britain and Northern Ireland

Mark Bew
mark.bew@ecstrategies.co.uk
UK Government Department of Business, Innovation and Skills, EC Strategies
United Kingdom of Great Britain and Northern Ireland

Abstract

This paper focuses on the technical and engineering perspectives of BIM and smart cities, by extending building and urban morphology studies as to respond to the challenges posed by Big Data, and smart infrastructure. The paper provides some empirical basis to support data information models through building dependency networks as to represent the relationships between different existing and smart infrastructure components. On the building scale, the paper will demonstrate the possibility of applying graph theoretic models of dependency networks to represent relationships between building data sets (configurations and room size), and environmental datasets. On the city scale, dependency networks are applied to represent relationships between urban data sets in Barcelona including; accessibility measures of street networks, street width, density of blocks, density of high buildings, density of retail land uses, and density of sensors in the smart municipal network, all binned per grid square area. The dependency networks are thought to inform decisions on how to represent building and urban data sets in response to different social and environmental performance requirements, feeding that into void and solid descriptions of data maturity models. Through structuring data information models, dependency networks will help reducing the complexity of architectural and urban layouts, hence supporting design and decision-making during construction and operation phases of infrastructure projects.