World Construction Forum 2019
BUILDINGS AND INFRASTRUCTURE RESILIENCE
Ljubljana, Slovenia
8 – 11 April 2019
WFEO / FMOI
IZS
Univerza v Ljubljani
Fakulteta za gradbeništvo in geodezijo

Perspectives for Industry 4.0 in Construction

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Forum topics		
	☐ Energy in 21st Century	☐ Cultural Heritage in Digital World
	☐ Engineering Capacity Building	☐ Disaster Risk Management & Governance for Resilient Communities
	☒ Construction 4.0	☐ BIM Lifecycle, Facility & Asset Management

Abstract: (250 to 500 words: for each heading use the bullet points or narrative - the submission including graphics should not exceed one page)

Problems - Issues / Challenges-Needs	In the early 2010s the German industry started their revival under the umbrella term "Industrie 4.0". European industry's strategies recapitulated most of the ideas and the European architecture, engineering and construction (AEC) industry is following. This contribution will elaborate on how to understand in structure the Industry 4.0 ideas in the context of construction. Special attention will be given to the relation to the building information modelling technology which is seen as the main driver of this new technological approach in the AEC industry, however, within the industry 4.0 it becomes an important building block.
Solutions - Methods / Results - Findings	We are exploring the concept using the structure-function-behavior paradigm. Structurally what explore technologies are involved, such as: • internet of (people and) things, • cloud, digital twins, robotics and • cognitive computing. We structure the technologies into five levels as per literature and give examples from the domain of construction. Five levels of complexity of cyber-physical systems are presented. Functionally, we explore aspects of what the Industry 4.0 provides for the customer, for the company and for the industry. Based on these criteria, an analysis was carried out asking where the elements of construction 4.0 can already be found, what is still missing and what is the direction that research and work of the builders should focus on to retain the leading role in the design of the built environment. As such environment will inevitably become a cybernetic-physical system, building and construction professionals will have to compete against professions providing a cybernetic part. This contributes to the behavioral part of the concept.
Novelty - Value / Relevance to …	It's is increasingly hard to find an industry in the 21st century that is more physical and less digitized than AEC. That is why cyber-physical systems are among the major challenges for the construction industry. They are closely related to the shift of the AEC industry from business models, where the product is of a material nature, to information and digital products, data and intellectual business models. The competition for networking the built environment is large and comes from different sides, so it is necessary to take initiative. We are presenting and evaluating strategies and directions derived from Industry 4.0 that could enable us to achieve that.
Forum statement	Unless construction industry does not adopt and develop industry 4.0 concepts it is exposing itself to danger that it would be a subcontractor of those who will be developing intelligent built environment.

Keywords: industrial policy, construction 4.0, information modelling, cyber-physical systems

Graphics: (please use the gray area bellow for *representative graphics* or *graphical summary*: select the gray area bellow and paste your graphics)