

Editoriale Editorial

Construction Management Workshop 2018

This workshop on Construction Management (CMW18) follows the preceding edition in 2013, again in Ravenna, concerning new research themes and fields of innovation for construction management. The workshop of 2018 focuses on possible and future implementation of digital technologies in the building sector, generally addressed as industry 4.0. This is to be addressed without forgetting other important drivers of change in the societies, business environments and in the real estate and construction sector (REC) itself. The environmental concerns and climate change are already now sources for large scale regulatory changes. On the long run the overall performance of the REC sector shall play a major role in tackling the environmental challenges. This will be also construction and real estate management challenge. The performance of the sector can be improved only via large scale systemic changes and innovations. Industry 4.0 is the current name of the actual trend of automation and data exchange for production processes of manufacturing industry.

Industry 4.0 describes the organisation of production processes based on technology and devices autonomously communicating each other along the value chain (EU, 2016).

It includes Cyber-Physical Systems, Internet-of-Things, Cloud Computing and Cognitive Computing. By this means Industry 4.0 technologies aims at implementing the "Smart Factory", an intelligent factory where Cyber-Physical Systems monitor and control real productive processes by creating a virtual copy of physical world, and take centralized and informed decisions. Cyber-physical systems communicate and co-operate with each-others, and with humans, in real time both inside the production process and outside it with all participants of the value chain, from owners to final clients. The revolutionary idea is to create a simulation of the physical system by creating a Cyber-Twin, a virtual systems that simulates the behaviour of the real one, to improve the monitor and control process by means of sensors and actuators. By integrating the two systems, physical and virtual, an intelligent system is created. This integration of the two worlds, the physical and virtual one, gives new future development possibilities that go far beyond the perspective of traditional automation technologies.

The name Industry 4.0 refers to the fourth industrial revolution, and originated by a strategical vision of the German government that aimed at promoting the computer use in industrial applications, presented in the Hannover exhibition of 2011 (Kagermann, Lukas, Wahlster, 2011).

The fourth industrial revolution concerns a series of disruptive innovations in

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production and leaps in industrial processes resulting in significant higher productivity. It is viewed as the fourth time such a disruption took place following the preceding industrial revolutions. The first Industrial revolution developed in the late 1700s in Europe and America when steam power combined with mechanical production led to the industrialization of production. The second industrial revolution when electricity and assembly lines resulted in mass production from the mid-1800s onwards. The third industrial revolution when electronics and IT combined with globalisation greatly accelerated industrialization since the 1970s (EU, 2016).

WORKSHOP THEME

Recent theories concerning the 4th industrial revolution "**Industry 4.0**", indicate that the digitalization of building construction processes can open new research perspectives and themes for the development of the construction industry, particularly in the field of **Construction Project Management**. The theme of Construction Management in the building project life-cycle phases (design, execution and operation) is of capital importance for the economic recovery and development of the construction sector, an industry sector that still struggles to recapture the pace and find a new identity and future perspectives. Surely, the theme of the **Smart Factory** causes to focus on the building process and its different **Value Chains**, aiming at the creation of a more efficient connection between its players: client/final user; owner; designers; construction companies and their suppliers.

In the research environment created by the collaboration of the research group of building production of the University of Bologna and the one of **Construction Management and Economics** of the Tampere University of Technology of Finland, this workshop has the aim of highlighting the research themes that could develop the drivers of change and innovation in the project management processes of design, construction and maintenance.

The research themes to be investigated could facilitate the innovation process and the development of the "**Smart Factory**" in construction, aiming at creating a "**Smart Building Site**" for construction projects. The objectives are many: implementation of the circular economy principles, orientating towards the improvement of building life cycle environmental and economic sustainability; improvement of process efficiency of the value chains through the development of innovative methods and tools that will improve the design and the execution of building projects; improvement of building life cycle-based design to optimise costs and impacts of operations and maintenance.

Anyway, the overall workshop theme is Construction Management. Construction management is an internationally recognised area of research. Its origins can be surely found in an extension of operations management in the construction sector,

but now it has a broad and heterogeneous body of knowledge that improves its aims and scope (Harty, Leiringer, 2017).

Bennett (1983) proposed a conceptual framework for project management in construction, based upon two distinct phases. The first phase is strategic, being concerned with client objectives, project description and organization. The second is concerned with the execution of basic construction tasks. Also it is recognized that there are sets of co-ordinated human activities aimed at defined objectives, called projects, that tends to be one-off non-routine undertakings with discrete time, financial, and technical goals. The objective of construction projects can be the completion of a building, an industrial processing plant, a bridge, or some other physical object and at the same time the organization arrangements designed to ensure the efficient completion of the project. This is translated into objectives of producing quantities of accommodation, the quality of that accommodation, its cost and the time to be delivered (Bennet, 1983).

Considerable amount of research and development effort has been made towards this direction, and many intellectual roots of project management research have been discovered (Söderlund, 2004). The first and the most important seems to have its origins in the various types of planning and scheduling techniques, such as Gantt chart, CPM, PERT and Precedence Diagramming (Gantt, 1919; Moder, Phillips and Davis, 1983; Wren and Bedian, 2009). Beside this, project management has its origins also in temporary organizational forms (Lundin, Söderholm, 1995). Two different bodies of knowledge seem to be the intellectual roots of project management. The first is engineering science and applied mathematics, primarily interested in planning and scheduling techniques and methods of project management. This line of research would indicate project management as a specific problem-solving method based on project activities' understanding, grouping, planning, scheduling and controlling. The second has its intellectual roots in the social sciences, such as sociology, organization theory and psychology, and it is primarily interested in the organizational and behavioural aspects of project organizations and in organizational theories.

Nevertheless, in the end, it is believed that projects are nothing else than a way of looking at industrial and organizational activity (Söderlund, 2004). Consequently, research into project management can follow one of these two lines, or both. It is a matter of trying to capture the "unique, complex and time-limited processes of interaction, organization and management" (Söderlund, 2004). These management processes can be further divided. The conceptualization of project management theories by Koskela and Howell (2002) in fact, divides the Project Management Body of Knowledge (PMBOK) mainly in two parts, the project theory and the management theory, respectively the work needed to achieve project objectives and work needed to organise and develop project management processes.

With the presented perspective we can expect to see multiform and

multidimensional outcomes from research work and development in the field of Construction Management (Harty & Leiringer, 2017), but the intention of the workshop is, at least, to open debates addressing the new frontiers of construction management.

WORKSHOP TOPICS

In the first planning phase of the workshop, the following topics were selected based on the collaboration of the research group of Building production at the Department of Architecture (University of Bologna) and the Construction Management and Economics unit (Tampere University of Technology). The topics present various dimensions of interests that are seen as potential sources for innovations and amendments to construction management, or, even to reshape it.

1. **Industry 4.0:** IoT and perspectives for the creation of Smart Factory in the construction sector.
 - Internet-Of-Things in the construction site
 - Smart Factory & value chain in the construction sector
 - Artificial intelligence and process simulation
2. **Project Management & Lean Construction:** innovative technologies and Lean Construction with the aim of time, cost, quality and safety in construction.
 - Project control for construction
 - Lean construction & process management
 - Time, cost, quality & scope management in construction projects
 - Hazard evaluation and safety management
3. **Building Information Modelling & Built Heritage:** BIM for new building construction and for renovation and conservation projects Heritage BIM - HBIM.
 - Building Information Models
 - Building Information Modelling and construction process digitization
 - Heritage Building Information Modelling
 - Building Information Modelling and virtual reality in construction
4. **Low – impact building site design** for deep renovation building projects and urban regeneration construction projects.
 - Construction deep renovation projects for buildings
 - Low-impact construction site design
 - Urban and building-blocks regeneration projects
5. **Facility Management & Life Cycle Planning**
 - Life Cycle Assessment LCA
 - Life Cycle Cost Assessment
 - Facility management
 - Building Maintenance & operations
6. **Quality and Safety** in Project

Procurement and Project Control

- Quality management
- Safety management
- Project procurement
- Project & Process Controls

7. **Construction site design and Off-site construction**

- Construction site design and logistics
- Lean design of construction process
- Off-site construction

- Construction site safety and organization

8. **Project Management** standards and competences in the construction sector.

- Project Management for Construction
- Construction management and standards
- Real estate development and construction economics

WORKSHOP PROGRAMME

The main workshop programme included 21 presentations based on the accepted papers. Those address research results or on-going research activities that are clearly contributing new findings and knowledge with respect of the workshop main themes. Work by different scholars can be directly, partially or indirectly linked to the workshop topics listed earlier. The indirect link can mean causality or influence that have been identified in another context (e.g. business sector) but it can have explanatory power elsewhere as well.

Besides of the paper presentation the main programme of the workshop included four keynote presentations by Prof. Angelo Ciribini (The University of Brescia, Italy) "Limits and potentiality of digitalization in the construction sector", Prof. Chris Harty (University of reading, UK) "Using BIM and digital technologies for construction management" and Prof. John L. Heintz (TU delft, The Netherlands) "Project Management capabilities for a Disruptive Future". A closure keynote was presented by Prof. Kalle Kähkönen (Tampere University of Technology, Finland) "Need for modern multidisciplinary research and developments to change the built environment sector".

Furthermore, three industry presentations were given in the workshop. Those were about BIM & ICT (Paola Giordani/Teamsystem corporation, Roberto Gianguialano/Harpaceas corporation), and, clustering for innovation as opportunities for the construction sector (Giulia Landriscina/Cluster Build)

WORKSHOP PROCEEDINGS

The workshop proceedings are published in the IN_BO journal. IN_BO is a scientific journal of the Department of Architecture of University of Bologna. It is an on line & open

access journal, accredited by Italian Ministry for Education, University and Research - MIUR.

The special issue of IN_BO includes all accepted papers. All papers have gone through double-blind review process where the reviewers were the members of scientific committee.

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CLOSING WORDS

The driving idea of the workshop was to have an overview of some outgoing Construction Management Research activities that have relevance to this workshop, and to facilitate discussions and analyses with researchers, practitioners and students. The aim was not to reach a goal or to set limits, but to search for major understanding of some actual and future issues of the construction sector.

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