

GROW/HARVEST CALL FOR PROPOSALS 2022

1. THE ICT CHALLENGE FOR THE CONSTRUCTION SECTOR

The entire construction process & the production of the built environment need to be digitalised¹

The digitalisation of the construction sector is increasingly recognised as a potential game changer. The European Commission has supported, promoted and developed several policies and initiatives to foster the digitalisation in the construction sector (Strategy for the sustainable competitiveness of the construction sector and its enterprises (2012), EU BIM Task Group and EU Digital Construction platform (upcoming)).

Building Information Modelling (BIM) is a frontrunner in regard to digital innovation aiming at facilitating information exchange in a highly fragmented industry. Its use in construction projects is promoted by the EU directive on Public Procurement (2014), and indeed, several Member States have already made BIM compulsory in public procurements, which has been a main driver for BIM implementation. However, the adoption of BIM by the construction industry remains limited, showing a gap between policy and practice, between big construction firms and small and medium companies. Indeed, significant performance gains in terms of productivity, quality of the construction, and optimization of operation would be enabled by a full deployment of BIM and, in the longer term, (dynamic) Digital Twins; by automation and robotics; and more generally by data-based tools and services (which make use of the latest advances in Internet of Things (IoT) and embedded sensors, cloud computing, massive processing of Big Data, and Artificial Intelligence). Furthermore, all key enabling digital technologies and IT infrastructures need to be integrated in a dynamic way and to be used to support the achievement of societal and climate change goals. The inclusiveness of this transformation (i.e. embark all actors of the construction ecosystem, in particular SMEs, and be accepted by all EU citizens) is a prerequisite to ensure the success of digitalization and maximise its positive impact on the value chain and the Built Environment of EU citizens as a whole.

However, the construction sector is the economic sector with the lowest digital intensity index in the EU and although many of the enterprises in the sector have already initiated their digitalization, in many cases they are still in the 1st level of the Digital Transformation. In general, ICT tools have been adopted to develop specific and isolated tasks, but these tools have no impact on the business processes of the companies. Digital transformation will make its way sooner or later, nevertheless the construction sector should actively foster it and to ensure that it takes place in a fair and inclusive way (i.e. involving all actors, from construction SMEs to end-users) to maximise its benefits for all.

ICT challenges in METABUILDING

To contribute to the strategic challenge above, the European construction sector needs to bring to its value chain digital solutions adapted to all its stakeholders. Digitalisation has become pervasive in our everyday lives and there is no reason to believe that it cannot reach even the smallest of the construction sector SMEs.

Digital tools need therefore to be adapted to the required tasks and targeted end-users. The use of standards and open formats like Industry Foundation Classes (IFC) can help reaching out to a large public and reducing the costs of basic services and tools. Concrete actions should focus on the progressive uptake of digital tools by construction companies, in particular SMEs.

Moreover, the digitalisation of the construction sector will also contribute to a transition to clean energy and more sustainable living. Thanks to digital technologies and data economy, buildings and infrastructures will become an active part of the energy system. Data storage, protection and accessibility are other focal points, which need to be addressed carefully.

¹ This introductory section is based upon the ECTP's *Strategic Research & Innovation Agenda*, 2021-2027, November 2019. The ECTP SRIA 2030 objective is that in Europe, all construction companies, including SMEs, adopt digital tools in a common and open framework, to deliver smart-ready buildings and infrastructures.



TOPICS OF THE ICT CHALLENGE:

1.1 Monitoring and managing energy consumption/comfort/health performance in buildings

This topic aims at exploring new possibilities (i) in order to monitor energy performance, comfort and indoor air quality performance of buildings, (ii) to implement a health monitoring of construction materials used in a given building, (iii) to perform a traceability of components in relation with Digital Twin technology: from the design to the exploitation phase, (iv) to explore the use of Radio-frequency identification (RFID) sensors, IoT, and connected materials/components as a source for gathering data from the living environment and its external/internal conditions at any given moment.

A specific subsector of the above: Development of open source tools. Different digital open-source platforms are being developed for managing data (BIMserver2, BEMServer3, etc.) are available offering in a marketplace open frameworks as a basis for the development of new applications/services for the monitoring and control of energy performance, for indoor comfort/health management of buildings or for BIM enabled projects. Based on this approach, developers of applications can focus on their expertise/development without having to deal with data collection or the connection and/or interaction with other applications.

Expected Outcomes/Impacts:

The challenge here aims at empowering the building sector stakeholders and the building (new or renovation) process via innovative digital services that enhance energy efficiency, comfort, health and wellbeing in buildings by bringing new solutions based on the use of new, affordable, and ubiquitous hardware devices, new uses of untapped existing devices possibilities (like IoT or home servers, smart appliances, edge computing, cheap sensors, etc.), open-source platforms and Digital Twins implementation over the full life-cycle of buildings, among other possibilities.

1.2 New BIM and digital tools for SMEs

The European construction sector is not a homogeneous one. Big companies performing big scale, high complexity, high-tech building or renovation projects coexist with the remaining 92% of the sector (SMEs contractors with less than 10 employees) dealing with small scale, low-tech construction projects mostly for the private sector, working directly for end-users or as subcontractors in big operations. Although economically these SMEs represent up to 80% of the output of the whole construction sector, they are dramatically lagging behind in the digital transformation, including BIM deployment and implementation. Considering that financial investments and trainings are the main barriers to a successful adoption by SMEs, adapted, intuitive and affordable tools for the digitalisation process are needed. Those tools should tackle specific tasks and expertise: for example BIM-based energy audits, fast detection of asbestos, issue detection for the installation of HVAC systems... The tools can be based on different technologies, from 3D scanning, cloud points, augmented reality hardware/software, to simplified, affordable/open-source BIM software or construction management platforms.

Expected Outcomes/Impacts:

Digital technologies that provide clear and measurable benefits for applications and markets, with resulting technology applications that are tailored to SMEs; simplified BIM/digital tools targeting the SMEs of the construction sector and supporting them in their day-to-day activities to get higher quality works, better organisation and coordination with other contributors possibilities, for instance in order to increase the construction quality and reduce the disorders resulting in bad performances, optimise the time span of construction but also support the facility management activities as well as the deconstruction activities using BIM-based tools. Here the SMEs involved in the construction and exploitation phases are targeted with a clear objective to maximise the benefits of a BIM-based approach over the entire lifespan of a construction project.

² BIMserver is an open source development and has been a leader in the openBIM world for more than 10 years. The Building Information Model server (short: BIMserver) enables to store and manage the information of a construction (or other building related) project, data being stored in the open data standard IFC as objects. <https://github.com/opensourceBIM/BIMserver/>

³ BEMserver is the world's premier Open Source Building Energy Management Platform and has been developed in the framework of the Horizon 2020 project HIT2GAP. It is an open source solution to deploy a modular, scalable and secure Building Energy Management System, allowing building managers to install applications that answer to their specific needs, instead of being confined to a monolithic, rigid solution. Every software developer can contribute in augmenting the functionalities of the energy management solution, and make the overall community benefit from it. <https://www.bemserver.org/>

