Smart Buildings in Italy, some BIM designed examples

Abstract
The real value of BIM, as a method, is partially undiscovered and require deeper understanding of what real potentialities are and how to take advantage of them in the professional activities. More than ever before the collaboration between engineers, architects and technicians is promoted thanks to BIM. On top of this, the construction industry has realized that the main weakness for decades were the lack of effective communication through reliable and timely channels. Naming BIM, the entire design process should be revised, because we should finally accept that the cooperation, communications and sharing are the seminal elements of the success. This paper, starting with these premise, will present and analyze some good examples of BIM designed projects realised recently in Italy, as the Unicredit Pavilion in Milan by Architetto Michele De Lucchi and the Forti HQ in Pisa by ATIProject that marge smart building processes with environmental targets and a new vision for the urban fabric quality.

Keywords: BIM, Design Process, Case study, Italy

When dealing with Building Information Modelling, a concept introduced with the birth of the modern computers and machine drawing in the 60’s of last Century led by Ivan Sutherland at MIT, we still think about programs that enable us to draw our projects through newer software programs. Furthermore, many of us consider BIM as an innovation that should be used because of the advantages widely publicized in the prospects of the software companies that produce software like Tekla, Archicad or Revit, just to name few. Perhaps, the real value of BIM, as a method is partially undiscovered and requires deeper understanding of what are its real potentialities and how to take advantage of them in the professional activities.

More than ever before the collaboration between engineers, architects and technicians is promoted thanks to BIM. On top of this, the construction industry has realized that the main weakness for decades has been the lack of effective communication through reliable and timely channels. Having in mind the Abernathy-Utterback Model for the innovation dynamics, the field of Building Information Modelling is represented in ill. 1 through the characteristic curves of product and process innovation. As we can notice, products as Archicad, Revit and Tekla occupy more than 40% of the software market for computer aided design and they have a well-established user interface which overall maintains the same philosophy embedded in BIM. Since the methodology incorporated in these software is considered stable, we assume that many companies are seeking to innovate in the field of organizational processes that are broadly defined or not defined at all. Past surveys on one of the most developed markets which is the North American one, confirms the abovementioned statement: BIM is considered as a mature methodology to be applied among vast majority of players in the field of architecture, engineering and constructions.

Jointly to the latter, the Gartner’s Hype curve (ill. 2) explains even better in which phase the Building Information Modelling is in respect to the AEC industry expectations translated in visibility on the model. Starting from the CAD in the 80’ and the dot-com boom in the beginning of the 2000s, each innovation like BIM follows quiet the same characteristic trajectory described by Gartner after many observations and analyses.

Since BIM adoption in each single country has reached different levels, a summarized consideration of the international AEC field could be done using the hype curve. It holds realities ranging from advanced use in USA (ill. 3), Australia and Hong Kong to basic applications (Germany, France) or almost non-adoption (Italy and Eastern Europe). The reasons for that are, as always, political, cultural and sectorial and should be analysed apart.

Before making an investment in this kind of technology we should know that there is not just a unique piece of software behind the BIM concept. Thus, the entire design process should be revised, because it should be finally accepted that cooperation, communications and sharing are the seminal elements of success. Seeking to obtain all this, a strategy should be identified that further entail broadly our ideas for the future.

The first and most important part of the BIM paradigm is “us”, stated as personal skills and
the willingness to achieve great results with intelligent and state of the art tools that at the same time enhance creativity. We should revise our workstyles, rethinking our relationships as professionals with other professionals and deciding what we want to deliver to our clients and what our customers appreciate the most.

Further, the openness is not a threat. Publishing your plan timely with sufficient details for the right purpose is important for the stakeholders of the project. Someone could argue that in this way the project become an easy candidate to be turbulent, full of ambiguities and apparently disordered. One of the crucial elements that we should accept is to work smarter and not harder. We should just leave all prejudices about the profession of the architect (and all the other kind of professionals) and let our minds open, telling ourselves that everything is possible and we just try to build something more efficient like in our dreams. Dare to dream is one of the steps that we should undertake. On other hand, distributing and defining the roles, appointing responsibility to each person, requirements for data drops, deliverables and creation of storage containers, are all administrative and organizational tasks to be defined by the team members or managers. Fortunately, differently from the past, all these tasks have their cyber equivalent living in the digital world and great part of this could be done via the tools offered by BIM and by mainstream ICT. Translating the physical world into a digital one is creating the so-called cyber-physical system, where each complex system that we maintain become a digital one, with all advantages and disadvantages we can imagine.

Third, before the transfer of even one byte of our work into the new paradigm, we should evaluate professionally and clearly the flawed competences and what we need to learn before undertaking our new journey towards BIM. Thus, skill endowment of the professionals is much more important than both the software and the organizational scheme. To empower the professionals, strong technological skills should be developed through continuous seminars, workshops that are developed on firm’s projects. Lastly, the program or the set of programs, that support the BIM method should be selected. This selection should consider:

• The characteristics of the computers and availability of funds for upgrades;
• How the organization is built, and what type of professionals reside in it;
• How the present and potential partners of the team are endowed;
• The average complexity of the projects developed by the teams;
• What are the deliverables required by law and by the customers?

The average complexity of the projects designed in BIM is virtually divided into five groups having different propensity to absorb innovation and the Roger’s model fits well in this conceptual explanation. At the same time, connected to this, we can apply real empirical example depicted briefly by ill. 6, which practically show what are the benefits for the first two groups defined by Rogers. Thus, both Innovators and Early Adopters gain higher benefits in terms of ROI, having adopted BIM as part of its business. The study presented by McGraw Hill Construction clearly shows that half of the highly-engaged organizations reach a ROI higher than 25%. Afterwards we can underline that being committed to BIM and having the understanding that it is worth in long term, could generate efficiencies for the organization, supporting at the same time creativity, and increasing customer value. To support the latter, three examples in the building construction and architecture in Italy are presented here.

These three examples provide an insight about how organizations different by structure, size and ownership can interpret and adopt BIM, and which are the functionalities they value most.

There are different fields in which the outcomes Building Information Model will provide as output, depending on the diverse work teams. These outputs can be classified according the following respective disciplines as Urban planning, Structural Design and Engineering, Installations (HVAC, electrical, Plumbing), Architecture, Energy Management and Energy Efficiency, Life Cycle Assessment, Life Cycle Costing, and Adaptive and Dynamic Computational Design.

Furthermore, existing pre-concepts that imply rigid separation of different disciplines are going to be changed adopting this model, thriving for more holistic and comprehensive framework through series of project management approaches managed in integrated and organic way through cooperative and flatter networks of professional subjects acting alone or in formal organizations (ill. 4).

Rate of adoption can be better explained through Roger’s adoption curve introduced on ill. 5 which explains how an innovation is adopted in certain customer environment. Here, it can be assumed that the AEC sector is virtually divided into five groups having different propensity to absorb innovation and the Roger’s model fits well in this conceptual explanation. At the same time, connected to this, we can apply real empirical example depicted briefly by ill. 6, which practically show what are the benefits for the first two groups defined by Rogers. Thus, both Innovators and Early Adopters gain higher benefits in terms of ROI, having adopted BIM as part of its business. The study presented by McGraw Hill Construction clearly shows that half of the highly-engaged organizations reach a ROI higher than 25%. Afterwards we can underline that being committed to BIM and having the understanding that it is worth in long term, could generate efficiencies for the organization, supporting at the same time creativity, and increasing customer value. To support the latter, three examples in the building construction and architecture in Italy are presented here.

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Unicredit Pavilion (Michele De Lucchi Architects, 2015)
The Unicredit Pavilion has been built in the heart of one of the latest Milanese urban regeneration plans located in Porta Nuova district nearby the “Vertical Forest” complex, the icon of bioclimatic architecture by Stefano Boeri Associati. As part of Unicredit Bank’s identity and as manifestation of the rising attention on urban environment and sustainability, the building encompasses a variety of technologies and approaches that provide together outstanding results helping in this way the increase of the smart-city concept.

Result of an architectural competition organized by the developer Hines with Unicredit Bank and won by the Studio of Michele De Lucchi, Pavilion’s construction started in 2013. In the multifunctional building, opened in 2015 in coincidence with the EXPO Milan events, find place a kindergarten, an auditorium and a multipurpose conference hall.

In this project designers wanted to merge both the architectural-artistic expression and technical integrated design, through which goals like natural resources savings, costs and time optimizations during the design phase and the following built-up life cycle, as well as a LEED Gold certification have been achieved. Looking behind the outstanding architectural result reached by this construction, authors would like to mention the approach designers adopted to achieve it.

Chiefly, the design phases have been developed using one of the leading BIM software through which a significant level of integration has been accomplished during the preliminary, definitive and final design, and lastly during the construction phase. Furthermore, thanks to Building Information Modelling, the specific architectural form and the load bearing structure have been continuously refined simultaneously, considering at the same time the technical equipment and spatial coordination. Moving the project on the Revit platform, the collaborative 3D environment enabled many professionals and consultants to manage architectural, technical and estimation issues in order to be solved jointly. More the use of the Revit model allowed the exchange of always updated information among parties, simplifying and speeding-up the overall process. Ultimately, the BIM platform offered by REVIT software helped contractors and suppliers to deliver seamlessly services and equipment needed for the timely completion of the project.

For example, the roof contractor notably decreased production and installation time of the state-of-the-art rooftop composed by...
thanks to a requalification and innovation enhancing plan that has the aim to strengthen the sustainable and equitable development of one of the largest metropolitan areas in Italy. The Strozzi Public School is one of them. Once completed, it will meet highest environmental and energy performance standard reaching LEED Platinum standards and will provide flexible and well-designed study spaces.

Architecture Studio ATIproject is the winner of the public bid organized by the City of Milan. The studio provided an integrated design approach through BIM, convinced that this method of design could be the only new new way to rethink the approach from larger brown-field recovering projects to a smaller urban requalification scale.

Having started the construction in April 2017, the School has a three-storeys main building which hosts classrooms, a library, and offices, along with a second building dedicated to sport activities, special events and a canteen. Both buildings, made by timber frames, are surrounded by green areas, and a vegetable garden. The Strozzi School is innovative both for its social and educative characteristics and for the environmental targets that would like to accomplish, and has been designed with one of the most innovative BIM tools as Revit. Looking at the ATIproject’s design we discover that the bioclimatic approach is accompanying and integrated all along the project phases, merging with all the disciplines as architecture, structural engineering, and HVAC, renewable energy sources plumbing and electrical systems plants. Furthermore, all these disciplines have given the birth to an integrated and fully functional 3D model full of all relevant data that characterize each single element to be built. For prefabrication process purposes, BIM offers great definition of each construction element, so the prefab procedure is facilitated by the continuous flow of executive drawings useful to the producers of timber beams, columns, partition walls and ducts that have to be manufactured off site. In other words, the prefabrication methods together with this new method of designing provided by an advanced software, jointed to a transparent collaboration philosophy including the participation element, have brought ATIproject to a successful realization, that will increase the value of the town, as a whole.

Forti Office building (ATIproject, 2016)

Unlike two previous examples, where big institutional clients lead extensive projects within the urbanized area of Milan, here we present another good example showing how extensive and versatile can be BIM in different environments.
development of the other sub-routines. How happened in the Strozzi School design, also for this project BIM has been used as a tool through which has been designed the glazing façade and the HVAC system in order to fulfill the client’s requests. Notably, the use of BIM helped the designers to determine and simulate the behaviour of the building under different skills, as proved by the two projects of ATIProject, and this comes as a confirmation of the initial thesis presented in ill. 4.

In summary, we can confirm that the development of innovative and smart initiatives in the urban environment cannot miss the adoption of new and less explored tools that should be applied wisely and without forgetting to develop the skills of the professionals that should carry on architectural, structural and systems design.

BIBLIOGRAPHY

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