Normative and Cultural Consequences of the Rapid Rise of BIM

Paolo Fiamma and Silvia Biagi

Abstract— There are current normative and cultural consequences of the BIM diffusion in Europe. The authors of the paper retrace some key phases of the history of BIM, in order to understand the current situation, critically. Some logical aspects could highlight an original understanding of the current situation. It is important, also, a critical approach to the ISO, EN and UNI categorization. The core of the proposal is to understand if and how the Public Administrations can approach the BIM method: to include, formally, BIM words in the tenders documents doesn't look like a right way. The paper proposes a balanced approach, specific local courses for Public Administrations and a common European strategy.

Keywords— Design, Critical approach, European Directive, Public Administrations, Public tender

I. INTRODUCTION: RİSE OF BIM

The European Directive No. 24 of 2014 [1] lain the concept of BIM, for the first time, at the attention of Member States. In fact, at the paragraph 4, Art.22 is written that Member States may require the use of "building information electronic modelling tools" for public works contracts and design contests. The European Parliament with the Council decided to insert this "concept" in the E.D. as a strategic resource for public works because in the 2014 it was already positively adopted for decades in the USA, England and other countries. In Italy, after three years an instrument was published which aimed to implement the European request: the Ministerial Decree No. 560 of 2017 [2] by the Ministry of Infrastructure and Transport in force, which was directly interested in the introduction of this "method". In this time, BIM's method and merit were clearly identifiable because the entire international construction sector recognized his creator and father: Prof. Charles Eastman, then at the Georgia Technology Institute in Atlanta, USA [3]. So, BIM was, and always is, a method of modeling the information of the building that combines 3D models object-oriented and process of design, construction and management. See Fig. 1. On the other side, in the States where the research on this topic was still early in birth, many considered BIM another irruption into acquired practices, a sudden impact, obligatory, from above, not entirely clear in content.

II. LITERARY MISUNDERSTANDING

Despite its uniqueness and objectivity, the acronym "B.I.M." was not directly included in the text of the European Directive of 2014 but was just reported in full form (combined

with the term electronic): "Building Information electronic Modeling". So, what has happened: the Member States that knew the method recognized it but the others did not understand what they could require for public works contracts and design contests [5]. In addition to this lexical misunderstanding, it seemed that there was no effort to understand the real meaning of the phrase, probably motivated by general confusion, scepticism and rejection of progress. Very often the BIM's Method was presented only as a software or as a mere standard because of the commercial interests and the intentions of voluntary self-referential standardization, which caused pressure around the market and professional.

In fact, the figures involved in the construction process, prepared for updating, did not possess a technical-cultural background able to understand if and what kind of update operate. In Italian universities BIM has never been taught/mentioned, apart from very rare cases, so graduates, who have become professionals, have not transmitted it gradually, spontaneously and from below, in the world of work as happened abroad.

II. RACE TO THE ALİGNMENT AND CONSEQUENCES

In Italy the novelty of the topic, the plate of public works, the convenience of position, the disciplinary interpretations have not contributed to make up for lost time for an authentic and organic knowledge of BIM. The urgency has pushed towards uncoordinated objectives and the entire construction sector has discovered itself "behind" with respect to BIM: spaces have opened up where journeys in various directions have intertwined and everything has risked becoming BIM, connected experts. This scenario was also reached due to some assumptions contained since Law no. 50/2016 [6], prior to the Ministerial Decree of 2017; in the Italian text of this law the terms present in the European DE "Building Information electronic Modeling" have not been reported, as well as neither appears the acronym B.I.M. nor its extension Building Information Modeling.

The Italian text indicates "methods and specific electronic tools such as those for construction and infrastructure;" this translation has no correspondence, neither technical nor substantial, as incomprehensible as its very necessity. This is the translation that has moved - de facto - the legal obligation of the application of BIM for public works (used all over the world and required by the EU) to an expression that has no meaning. For this reason, it has been possible to reduce BIM from a method to a mere standard or simple software, and consequently more exploitable and more purchasable.

Paolo Fiamma and Silvia Biagi, University of Pisa, Italy

A confusion of merit that arises from confusion of purpose: using BIM and documenting, data in hand, concrete benefits [7]. The same D.M. 560/2017 concerns the terms of the Italian language mentioned in 2016 and not the acronym BIM, which continues not to be written in the text. This would explain why the knowledge of the real contents of BIM has often remained secondary compared to the cogency of its use and to the legal prescriptions. The same ministerial action, in responding to its needs and urgencies, could only partially resume the contents of BIM and angle its implementation



Fig. 1: The co-occurrence map of BIM, edited by [4] in 2019, thanks to VOSviewer

III. CONTENT'S DISSEMINATION

A confusion of merit that arises from confusion of purpose: using BIM and documenting, data in hand, concrete benefits. The same D.M. 560/2017 concerns the terms of the Italian language mentioned in 2016 and not the acronym BIM, which continues not to be written in the text. This would explain why the knowledge of the real contents of BIM has often remained secondary compared to the cogency of its use and to the legal prescriptions. The same ministerial action, in responding to its needs and urgencies, could only partially resume the contents of BIM and angle its implementation. In 2018 an international standard ISO 19650 was issued [8]-[9] which through the Direct Adoption mechanism of the Vienna Agreement becomes a European (EN) and national standard during 2019. Also, in ISO there is no acronym BIM but specific characteristics clearly recall the method. Following the part 1 and 2 of this publication, for example, in England it was decided to insert an annex at the local guidelines and to withdraw BS 1192 and PAS 1192 because whose principles are considered absorbed into the body of ISO 19650. In Italy, on the other hand, given the substantial regulatory status present, it was preferred to establish that the whole UNI 11337, in its various parts, constitutes a national annex to the ISO 19650. With the principle of pre-eminence of the higher standard (19650) over possible interferences or inconsistencies in the dependent standard (11337) [10]. Please note that this standard is only an output of a group of self-nominated "BIM experts", who have not been appointed by any official institution by law. Since the Italian PA's offices have to draw up the public tenders (or contest) document, in order to start the public work, and the

majority of the public workers do not know BIM in practice, the result is only "formal". Slowly, the spread of BIM in Europe has extended to cover almost all states, even if is present an evident misaligned in its use. See Fig. 2 and Fig.3.

IV. PUBLIC ADMINISTRATIONS

For a congruent use of BIM, it was necessary that the Public Administrations (PAs) introduces it into the fabric of equipment and procedures. It is very complex, immediately, to insert a method based on the simultaneous choices of design, construction and management in a logic of tenders that in Italy is based, rather, on a continuous implementation of elements, only partially present in the award phase. So, the part of the process that make the first changing was: the public tenders. In fact, the public tenders that require these alleged competences are "simply" to be challenged because they are not required by law.

BIM was not designed to be circumscribed in the public administration systems of individual states, unless the conception of public tenders and related procedures are radically changed, as happens in countries where it has been truly assimilated. Therefore, today we have an articulated scenario: wide-ranging visions and personal gains; institutional responsibilities and commercial business; and free dissemination of knowledge and personalistic interpretation. BIM is considered, at the same time, part of a generic digitalization and specific knowledge of a specific sector. As we can see in the Fig. 4, the OICE's statistic reveal that from 2015 to 2022 there has been an exponential increase in the use of BIM in the Public tender; What is not evident is the misaligned manner of how they are drafted



Fig. 2: Awareness of the European gap in BIM implementation from the questionnaire in 2019 [11]



Fig. 3: Key market insights for BIM awareness and adoption [12]

IV. DİSCUSSİONS

Above all, professionals are disoriented: the pressure of precise software and paid certificates often leads the individual to forget that these are only commercial products that are not required by any state law and for which there is no obligation. The business of private certifications of paid BIM skills, re-proposes the problem of who certifies the certifiers, as well as the real effectiveness of these representations of knowledge. Increased colleagues grasp the main contradiction of what is happening: is not credible that a certificate can prove the ability of the individual professional to apply a method, especially like BIM, completely consubstantial to design, build and manage. BIM is an ordering method of the knowledge of an engineer or an architect that cannot, in no way, be considered separate from them, or worse, be the subject of further acquisitions despite the degree: all this leaves astonished as much as a certificate that declared a professional "capable of designing in an integrated way" or a procedure "to be in its parametric conception".



Fig. 4: Graphic public tenders in BIM (from January 2020-2023) from Report OICE BIM [13]. Importo = tender cost; importo tendenza = tender cost trend; numero = number; numero tendenza = number trend

Accepting self-certifications "in crosses" or courses of a few tens of hours, which attest to BIM's experts on demand, means accepting a construction system where what matters is "to buy a license and not know how to drive." Anyone who knows this, understands that BIM cannot be improvised. These requests for additional indirect taxes would not seem to help the professional, around whom the circle of a self-referential norm that requires self-referential certification closes. A says that you only learn from B who teaches you only to listen A. For this reason, there is a risk of paradox in some distracted attitude: a State tender, with State resources, which obliges the professional to have a private certification (or assigns it a reward value). Situations to be challenged also in relation to the combined provisions with the legal value of the qualification: the State University graduates engineers and architects, who passed the State exam for the exercise of the profession, could not then participate in the public tenders of the State itself because, according to some distracted announcement, they would not possess a certification bought by private subjects.

We risk making BIM in Italy another piece of paid paper not required by law and not a great opportunity for everyone. Superstructures and licenses do not fill the knowledge gap on BIM or help the real needs of the sector. Facts cannot be substituted for their representation. Interpretations of BIM in generic schematized procedures hinder practices that are proportionate to local situations and cause unmanageable procedures, first of all for the PAs themselves, starting from the Single Procedure Manager. The effectiveness of BIM depends on the specific intervention, the local context, the professionals involved. Considering BIM a standard procedure is a contradiction [14]. The point is the level of BIM to be identified from time to time: "How much BIM?", as Charles Eastman himself reminded us, during his Lectio Magistralis, right at the BIM Master of the University of Pisa [15]. Acquiring BIM by osmosis in one's professional knowledge is a condition for its metabolization. Open source software exists; No law requires private certifications, nor does it impose tenders with content that is not proportionate to those who will manage them. In order to understand that BIM can reduce the costs of public

works by 30%, it is crucial that the world of Orders calls everyone to a system responsibility.

V.CONCLUSION

The authors consider necessary that in the rapid rise of BIM the Normative must be according with the cultural and technical meaning of the real BIM method contest and, also, to the real conditions of the national public work construction field. Remembering that in addition to the ED 24/2014/EU, ISO standards act worldwide, EN at European level and UNI at National level, there have been a lot of developments in recent years. Starting from ISO 19650 other Parties were annexed to the text in 2020 and in 2022, while the Italian UNI remained aligned with the first part of ISO 19650. As regards EN, over the years a series of amendments have been published, without legal effect, as documentation of attributes but, since the problem of "translation" has not been identified, Article 22 Paragraph 4 has remained unchanged and the acronym BIM has not been introduced. The last amendment is from November 2021.

The consequence of this situation looks like really confused. On the one hand, the self-nominated expert's groups that produces, often, a too much extended quantity of standards, documents, requests and so on offer an opportunity to help the professionals and the Institution, but at the same time these dynamics can be too much complicated and analytics. On the other hand, especially with regards to the public administration needs, all these efforts can be used only as a way to write the public contests according to the use of some BIM words, just formally. In fact, the problem is that a protocol cannot start a cognition dynamic, in any knowledge field. In addition, the public procedure about the public works cannot start from a project that implies all the data, because the specific materials brand, cannot be insert in the design phase: must be choose after the adjudication of the contest itself.

This procedural dynamic, the only one admitted by Law in Italy represent an obstacle to a logical adoption of the BIM method. Another critical point emerges in the self-nominated expert's groups, generally speaking, there are not people of the public administration. The most correct procedural to disseminate the BIM method, method should be offering specific BIM courses for public offices. Is not so easy, due to the cost and the so few times assigned for upgrade the competences in the public offices. A balance between all the needs become urgent. The authors consider necessary to issue a simplified EN standard, which allows to align European States in the use of BIM and allow UNI (national law) to interface with regulatory compendiums at European level (and not international). The starting point must be the real conditions of the public works offices because the BIM become mandatory in Europe, only for the public works. It is also evident that is necessary to support the Public Administrations in the drafting of public tenders in BIM which, although they have increased exponentially (by virtue of the mandatory nature of BIM in public works), is always dressed on the need and not optimized.

REFERENCES

- [1] EUR-Lex. Direttiva 2014/24/UE del Parlamento europeo e del Consiglio, del 26 febbraio 2014, sugli appalti pubblici e che abroga la direttiva 2004/18/CE Testo rilevante ai fini del SEE. Available online: https://eur-lex.europa.eu/legal-con-tent/IT/TXT/?qid=1485620527972&u ri=CELEX:32014L0024
- [2] Ministero delle Infrastrutture e dei trasporti. Decreto Ministeriale numero 560 del 01/12/2017. Available online: https://www.mit.gov.it/normativa/decreto-ministeriale-numero-560-del-01 122017
- [3] C. Eastman, D. Fisher, G. Lafue, J. Lividini, D. Stoker, C. Yessios, "An Outline of the Building Description System," in Institute of Physical Planning. Research Report No. 50 September 1974.
- [4] X. Yin, H. Liu, Y. Chen, M. Al-Hussein, "Building information modelling for off-site construction: Review and future directions," in Automation in Construction. Volume 101, Pages 72-91, 2019.
- [5] P. Fiamma, S. Biagi, "Critical Approaches on the Changes Taking Place after 24/2014/EU in BIM Adoption Process," in Buildings. 13, 850, 2023. https://doi.org/10.3390/buildings13040850
- [6] bosettiegatti. Decreto legislative 18 aprile 2016, n.50 Codice dei contratti pubblici. Available: https://www.bosettiegatti.eu/info/norme/statali/2016_0050.htm
- [7] R. Miettinen, S. Paavola, "Beyond the BIM utopia: Approaches to the development and implementation of building in-formation modeling," in Automation in Construction. Volume 43, Pages 84-91, 2014. https://doi.org/10.1016/j.autcon.2014.03.009
- [8] ISO 19650-1:2018 Organization and digitalization of information about buildings and civil engineering works, including building information modelling (BIM) – Information management using building information modelling – Part 1: Concepts and principles. Available: https://www.iso.org/ics/93.010/x/
- [9] ISO 19650-2:2018 Organization and digitalization of information about buildings and civil engineering works, including building information modelling (BIM) – Information management using building information modelling – Part 2: Delivery phase of the assets. Available: https://www.iso.org/ics/93.010/x/
- [10] UNI 11337-1:2017 Edilizia e opere di ingegneria civile Gestione digitale dei processi informativi delle costruzioni - Parte 1: Modelli, elaborati e oggetti informativi per prodotti e processi. Available: https://store.uni.com/uni-11337-1-2017
- [11] R. Charef, S. Emmitt, H. Alaka, F. Foucha, "Building Information Modelling adoption in the European Union: An overview," in Journal of Building Engineering. Vol. 25, 100777, April 2019. https://doi.org/10.1016/j.jobe.2019.100777
- [12]NBS "10th Annual BIM Report 2020". UK, 2020. Available: https://www.thenbs.com/PublicationIndex/documents?Pub=NBS
- [13] OICE, CONFINDUSTRIA, "Rapporto sulla digitalizzazione e sulle gare BIM 2022, Analisi delle gare pubbliche e del mercato," Roma. Marzo 2023. Available: https://www.oice.it/800451/2023-oice-6-rapporto-gare-bim-2022

- [14]X. Pan, A. M. Khan, S. M Eldin, F. Aslam, S. K. Ur Rehman, M. Jameel, "BIM adoption in sustainability, energy modelling and implementing using ISO 19650: A review," in Ain Shams Engineering Journal, 2023. https://doi.org/10.1016/j.asej.2023.102252
- [15] UniBIM. Master BIM Università di Pisa. Available: http://www.unibim.it/it/