



## An outlook on the usage of BIM by Brazilian public universities in construction projects

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**Abstract.** Building Information Modelling (BIM) is a paradigm that combines technology with human resources and industrial processes. It improves the management of construction projects, allowing efficient life-cycle building management. This work presents an outlook on adopting BIM processes by Brazilian public universities. To this, we surveyed all Brazilian public universities with an 80% answer rate. Results suggest that despite most universities not using or being mature in using the BIM process on their construction projects, this scenario could change with the employment of the academic expertise already possessed by most universities.

**Keywords:** BIM; Construction; Project Management; Public Administration.

### 1 Building Information Modelling

In a fast-moving age, project management performance is also bound to the adoption of new technological tools. Many technologies have been presented to improve the effectiveness and efficiency in allocating resources during construction projects in the last years. This is the case of Building Information Modelling (BIM), a paradigm that combines technology with human resources and industrial processes to generate and manage data during the whole life cycle of a building [1]. Thus, it is not restricted to the generation of 3D models, as some may think. Still, it also provides a digital, intelligent, and integrator process that facilitates all phases of a building project, from design, in the pre-construction phase, to maintenance, in post-construction [2]. The numbers associated with BIM show its importance. It reduces up to 10% of a project's total cost and up to 20% of supply costs [3]. It eliminates up to 40% of non-predicted changes in the budget and reduces up to 7% of a project's total duration [4]. Projects using BIM face considerable improvements in communication, coordination, quality, negative risk reduction, and organizational gains [5].

On April 2nd, 2020, the Brazilian federal government promulgated the decree 10306, which establishes the direct or indirect usage of BIM in engineering projects addressed to the buildings under federal administration, such as public universities.



From the decree, the implementation of BIM in construction projects inside the universities occurs in three phases, starting in 2021, and then 2024, and 2028. The adoption of construction projects through BIM is expected to intensify with each new phase. Since the promulgation of the decree, the Higher Education Secretary (SESU) of the Ministry of Education (MEC) has integrated the Strategic Committee for BIM Implementation (CE-BIM) with a focus on teaching and research activities. In the context of BIM, SESU works as an induction organism, pushing BIM adoption through the sage of academic competence.

## 2 Methodology and Results

In this work, we investigate the maturity level of the Brazilian public universities in using BIM processes. Thus, we performed a survey, asking all public universities spread across all Brazilian regions questions about their maturity in using BIM software, the training level on BIM of the construction professionals, and the main difficulties they face to effectively attend to the phases of the decree 10306. The contact with the universities occurred on October 15th and 25th, 2021, and 80% of them (55 out of 69 universities) replied to the form.

The collected data indicate that all respondents, generally the construction managers, know about the existence of BIM software. However, 24% of all respondents have no knowledge of using BIM, 72% have little or some knowledge, and only 4% graded their experience on BIM as good or excellent. Yet concerning the construction managers at each university, 14% hold Ph.D.'s, and 84% have Masters or Specialization degrees. We did not find significant correlations between BIM usage and managers' formal education levels.

Although 78% of the managers have some knowledge of BIM processes, only 7% of all universities use BIM on their projects on all university campuses. Only 20% make use of BIM on some of their campuses. Thus, 73% of the universities do not use BIM on their projects. In Brazil, it is possible to find public universities of all sizes. We did not find a significant Pearson correlation between the build-up area and BIM usage. However, we found a weak correlation (0.28) between BIM usage and total area. It may indicate that bigger universities with space to grow are more interested in using BIM in their construction projects. Regarding the leading university campus position, we did not find any significant correlation between its position, metropolitan region or countryside, and BIM usage.

Concerning the BIM software used by the universities, 25% make use of Autodesk Revit BIM, 23% QiBuilder, 16% Eberick, 14% Autodesk Civil 3D, 9% Graphisoft Archicad, 7% Autodesk 360 BIM, and 13% make use of other BIM software. Among the 15 universities that are already adopting BIM, 11 (73%) make use of one or more software. Among the 40 universities that do not use BIM, 18 (45%) have at least one software BIM. Among the universities already using BIM, 14 do it during the pre-construction phase, 10 during construction, and 10 in post-construction. However, according to



the universities, most of the time spent on BIM software is on tasks addressed to pre-construction, then construction, and a few tasks of post-construction.

In a general manner, the results indicate that the universities still have room for adopting BIM practices, mainly by using the academic expertise they already possess. Brazilian public universities are well known for their excellent undergraduate and graduate programs. Many already teach BIM-related disciplines in their courses. This human potential could speed up the implementation of Decree 10306. Complementarily, studies on advantages and difficulties faced by the universities also seem interesting, in order to refine actions for effective BIM implementation.

## References

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