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Dolna 17, Warsaw,
Poland 00-773
+48 226 0 227 03
editorial_office@rsglobal.pl

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SCOPE ON BIM AS A TOOL FOR DESIGNING ARCHITECTURAL PROJECTS FOR ARCHITECTS AND ENGINEERS. CASE OF ALGERIA

Khalid Zaouia *(Corresponding Author)*
Ph.D. Student, Faculty of Earth Sciences and Architecture. LEQAREB Laboratory, University Larbi ben Mhidi, Algeria
ORCID ID: 0000-0002-6709-0798

Said Mazouz
Professor, Faculty of Earth Sciences and Architecture. LEQAREB Laboratory, University Larbi ben Mhidi, Algeria

ABSTRACT

Building Information Modeling, often known as BIM, is considered an indispensable component of the design and construction process in many nations throughout the world. In order to analyze the practitioners' perceptions of BIM's influence on construction in connection to the many tools and software, surveys were carried out and analyzed with the sphinx tool. The surveys were also carried out to determine the architects' and engineers' capacities to integrate BIM into their design processes. Despite having limited understanding about BIM as a new method of work, the results indicated that both architects and engineers are concerned about improving design processes in order to provide a higher level of quality to the projects they are working on in Algerian context.

KEYWORDS

BIM, Survey Techniques, Sphinx, Architects, Engineers

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1. Introduction.

The National Institute of Standards and Technology (NIST) conducted an assessment in 2004 estimating that inadequate connectivity and data processing costs the building sector $15.8 billion per year, or around 3-4% of overall industry revenue (Re Cecconi et al., 2017). The BIM system (Building Information Modeling), an open disclosure technology incorporated in the latest design apps such as REVIT or ARCHICAD, can assist in overcoming the aforementioned disruptions and achieving a quality architecture by making sure collaborative relationships among the actors involved implicated in the architectural process. The BIM is a computerized system composed of parametric modeling that would facilitate interconnection among various players (Kensek, 2018). The BIM framework is a virtual design that tries to integrate the diverse stakeholders; the BIM concept sought to discover a file type that is compatible with all IFC tools . As an architect or construction manager, we may access the data at any moment to view the three - dimensional model of the structure's morphological and functional attributes.

To be able to use the BIM technique in the Algerian setting, it was important to first assess the level of BIM expertise among architects and engineers on the ground. Such knowledge will better educate us on the path to pursue if we want BIM to be included into the architectural project conception process as it is in various nations across the world, since it ensures the project's success. Some specific contexts such as developing countries need more comprehension on how to implement BIM strategy in their construction and design processes. For example (Coates, P. Y. Arayici. L. Koskela. M. Kagioglou, C. Usher, 2010) addressed research gaps on BIM adoption in developing countries and may serve as a catalyst for scholars and academicians in

how BIM might be embraced in a developing country environment. (Ismail et al., 2017) also gave views on how BIM is progressing in certain countries, including motivations and impediments to adoption, and how this may alter in the approach.

When adopting a new system like BIM, it's important to identify the basic activities toward which it's being used. (Coates, P. Y. Arayici. L. Koskela. M. Kagioglou, C. Usher, 2010) provides a basis of behavior and experiences that happen in contemporary architecture so the function and possibility of implementing BIM as a foundation for re-engineering can be examined. Some of this researches adopted survey techniques such as (Mohd-Nor & Grant, 2014) in which the strategy is based on surveying all design companies in Malaysia; the results will be used for future study, where good quality investigation is necessary to explain this new technique. In order to raise awareness of BIM and encourage its use in the building sector, in developing countries various suggestions were made by (Rezaei & Sistani, 2016).

(Wong et al., 2013) revealed that both the public and private sectors have different responsibilities in supporting BIM depending on the country's economy and financial structure. While (Sinenko et al., 2020) tried to determine the aspects that are crucial for the achievement of Bim adoption, such as BIM possibilities and the effect of these possibilities on boosting the effectiveness of BIM-implementing industries, and reviewing relevant literature, offers survey results and major aspects recognized on the effects of BIM adoption and institutional quality enhancement. In (Takashi Kaneta et al., 2016) The researchers explored the issues with managing projects in order to demonstrate the approach for developing the new edition of BIM, with the intention of sharing the benefit with all involved parties in both Singapore and Japan as different contexts with different ways of thinking.

Many researches were centered on BIM and software, for example (Logothetis et al., 2017) intended to leverage a FOSS CAD system that creates BIM plug-ins capable of importing and editing aspects of photogrammetrically produced heritage and culture modeling. By comparing BIM to traditional ways of design, (Czmoch & Pękala, 2014) discussed BIM implementation obstacles and how these correlate to possible advantages. A study has highlighted a BIM-prepared layout. (Onur & Nouban, 2019) developed a roadmap for engineers and architects regarding software such as Freecad Architecture, Graphisoft Archicad, Sketchup, Allplan Architecture, Dynamo Studio, Autodesk Revit Architecture and so on.

Recently the BIM were a central interest in Algeria, some researchers tackled this domain such as (Khalid et al., 2019; Khalid & Lim, 2020). This article is set in the same framework and employs surveys as a method of research in front of architects and engineers for a preliminary assessment of the feasibility of incorporating such technology into the design process to improve the quality of architectural projects.

2. Materials and Methods.

In this article the survey was addressed to architects and engineers to measure the degree of their ability to insert themselves in a BIM process through the measurement of their ability to use the techniques and software related to it. The survey was developed in French and Arabic language.

In fact, for administrative buildings, the typical development team is led by an architect who considers all relevant constraints (building timeline, location, budget, legislation). It advises local planning authorities on plan approval in disputed cases. In the case of a governmental project, consultants are also involved in the design process. With the enterprise that identifies realize and completes the project. Sphinx is the tool that was used to analyze the results (https://en.lesphinx-developpement.fr/teaching-and-research/logiciels/sphinx-campus/).

3. Results and Discussion.

3.1 Actual reality about the process

The bulk of those who responded to this questionnaire had 5 to more than 5 years of experience, while some had fewer. The younger architects and engineers have a greater ability to learn the BIM approach as well as the working method (Fig. 1), which is why they were picked. BIM could be integrated in the whole process of construction life time till the destruction. Which make BIM the most developed technique that could collect all the stakeholders together to better take decisions in time Fig. 2.

The survey conducted among the various architects and engineers revealed the following results:

People with greater experience are more likely to work using traditional ways that they are more familiar with (Fig. 3). With a majority of architects as well as engineers who answered our questionnaire. And it is sensible given that architects now have more impact on the design process of projects in Algeria using existing approaches.

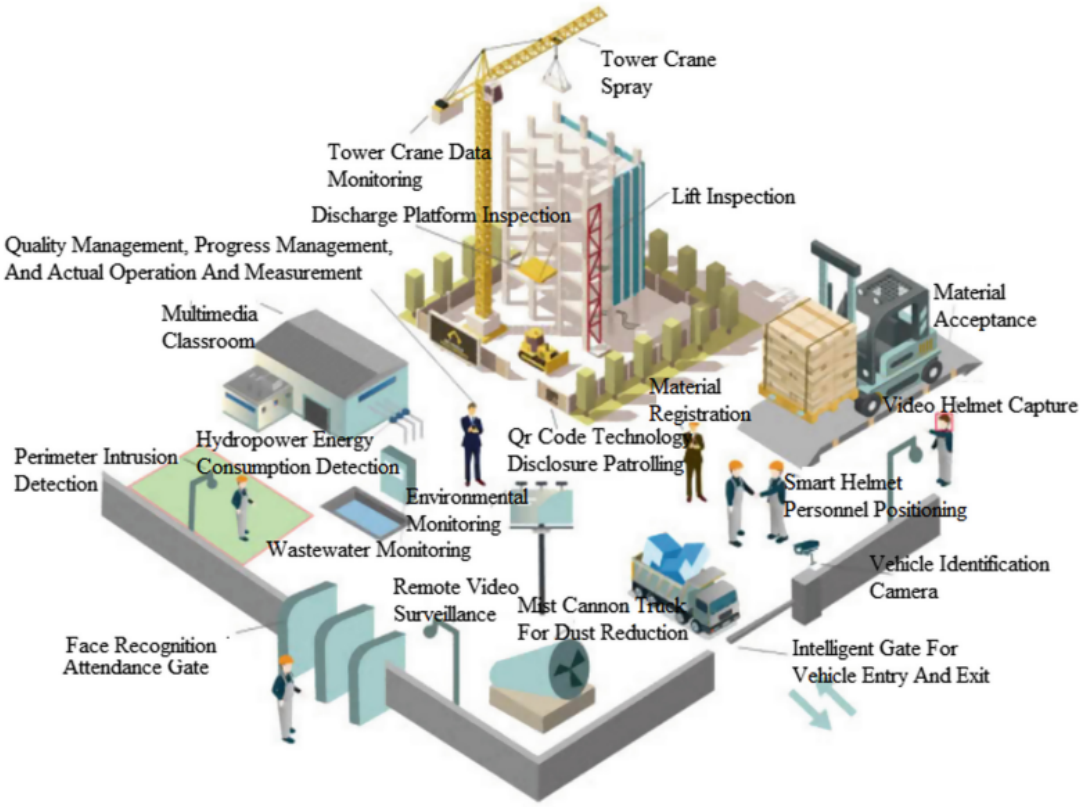

Fig. 1. BIM application by (Costa et al., 2015)

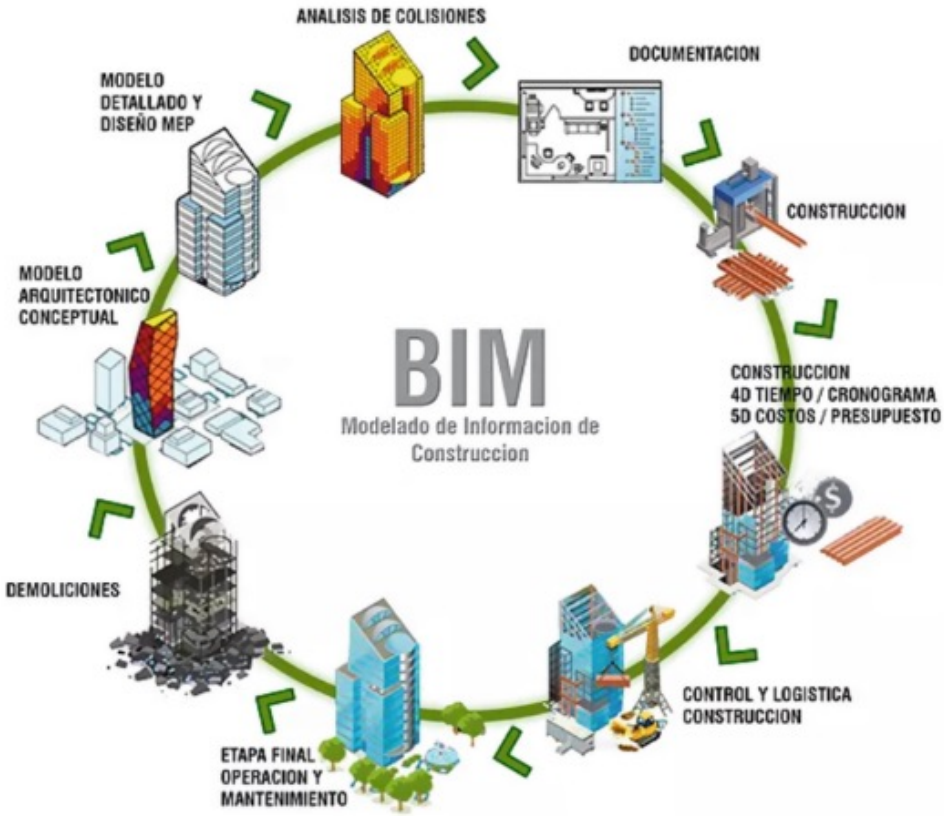

Fig. 2. BIM Life cycle in construction process

For this reason the survey was divided into two phases; phase one survey results from architects, and phase two survey results from engineers, as follow:

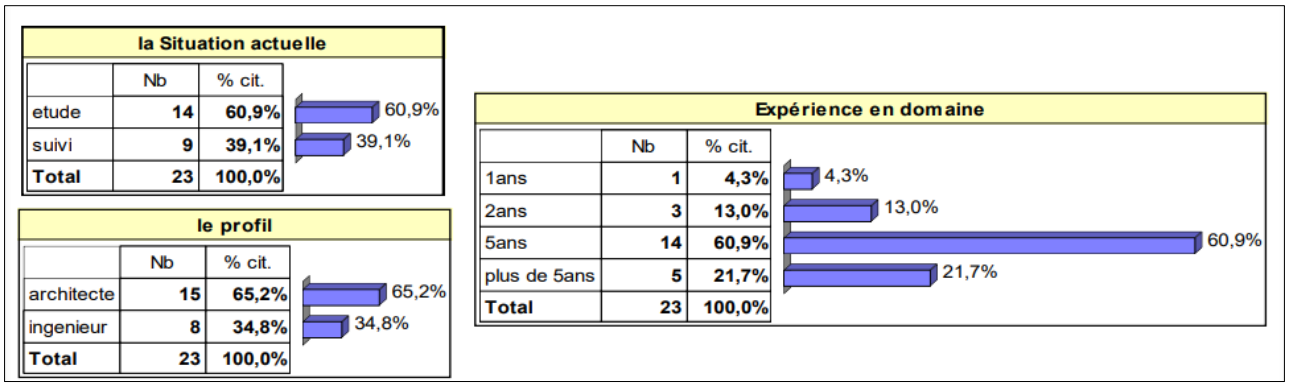

Fig. 3. Results from survey Actual state (situation actuelle), Domain experience (experience en domaine),and Profile (le profil)

a. For Architects

What is unexpected is that the architects indicated that the process is done in a very linear manner, without iteration, and that this is felt by everybody, despite the fact that they are well aware that it is the existing style of working that necessitates it.

The survey also found that energy measuring software was used with restraint Fig. 4. The use of such a question was meant to assess one of the architectural quality criteria, namely the decrease of energy value throughout the design process. We might extrapolate from this observation that the design process disregards such measures and prefigures conformity with administrative regulations; if this is achieved, the architect confines his design to easy choices without considering more appropriate options. Despite the fact that Algeria has laws and circulars dedicated to the design process, this is still the case.

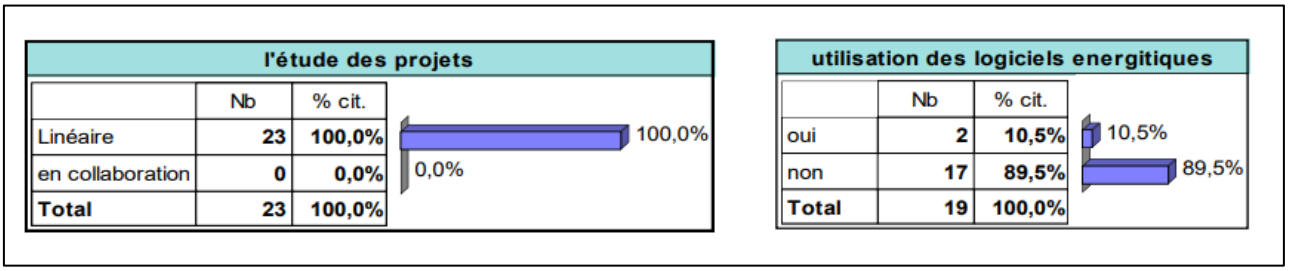

Fig. 4. Results from survey; Project study (L'etude du projet), Use of energy software (l'utilisation des logiciels énergétiques)

During the survey, emphasis was placed on the degree of knowledge about the software used by the various idea designers, with the results displayed in the figures. And it shows that

- Lumion, 3DSMAX, and Atlantis are the most popular and well-known among architects.
- The majority of them learned during their university studies and continued to learn after they completed their studies.
- Architects prefer Autocad and Archicad for modeling their ideas.

It's also worth noting that for many architects working in this field, BIM is still a minor consideration. Even if the name BIM is well-known, the actual steps to follow are less well-known (Fig. 6). The degree of significance of BIM's influence on project quality and costs is felt by the architects themselves as showed in Fig. 7. It has also been mentioned that BIM integration is possible, given that certain architects are already familiar with tools like Archicad. In a comparative study (Costa et al., 2015), the use of CAD and REVIT was done and results are shown for the same projects so advantages from both software could be presented.

As a result of this trend, business and university recognized that include Improve learning in diploma program is a critical prerequisite for meeting trade educational need which is challenging and complex as

reported by (Abdirad & Dossick, 2016). Despite this challenging aspect, some developing countries are trying to study the possibility of its application such as in Pakistan (Abbas et al., 2016).

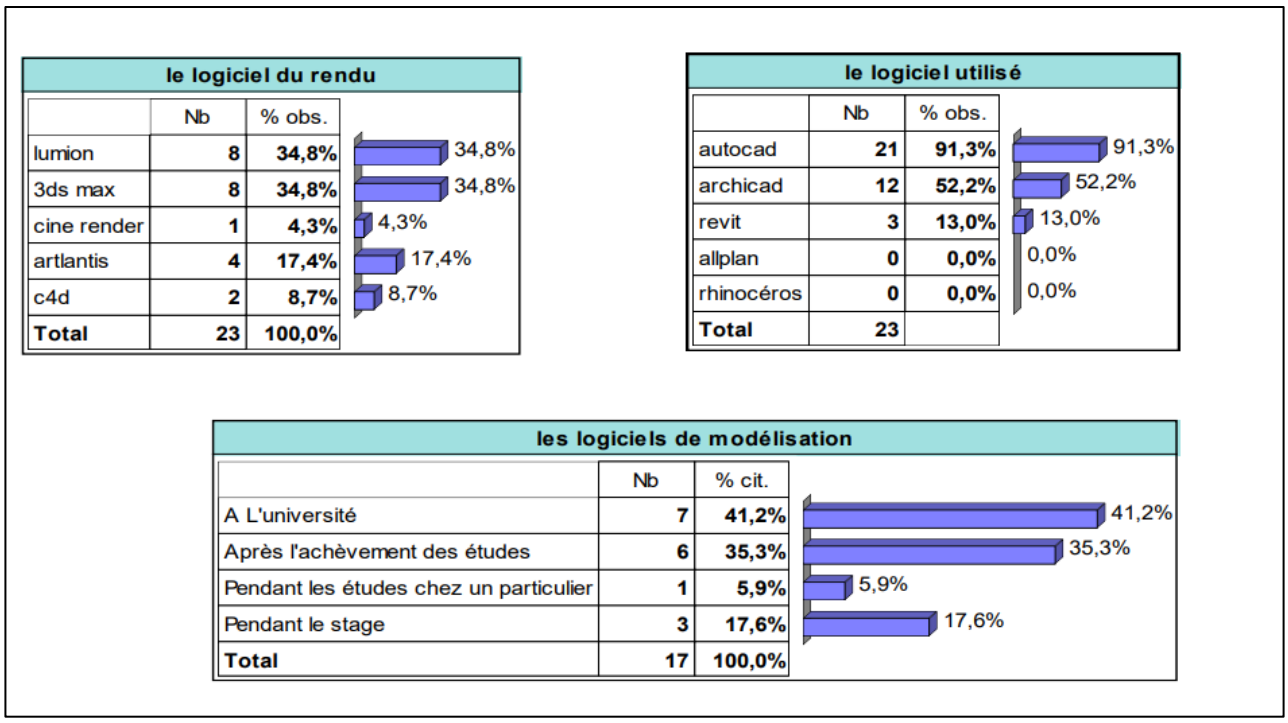

Fig. 5. Results from survey; Rending software (logiciel du rendu), Used software for modelling (Logiciel utilize), Modelling software in different steps of career (Les logiciels de modélisation)

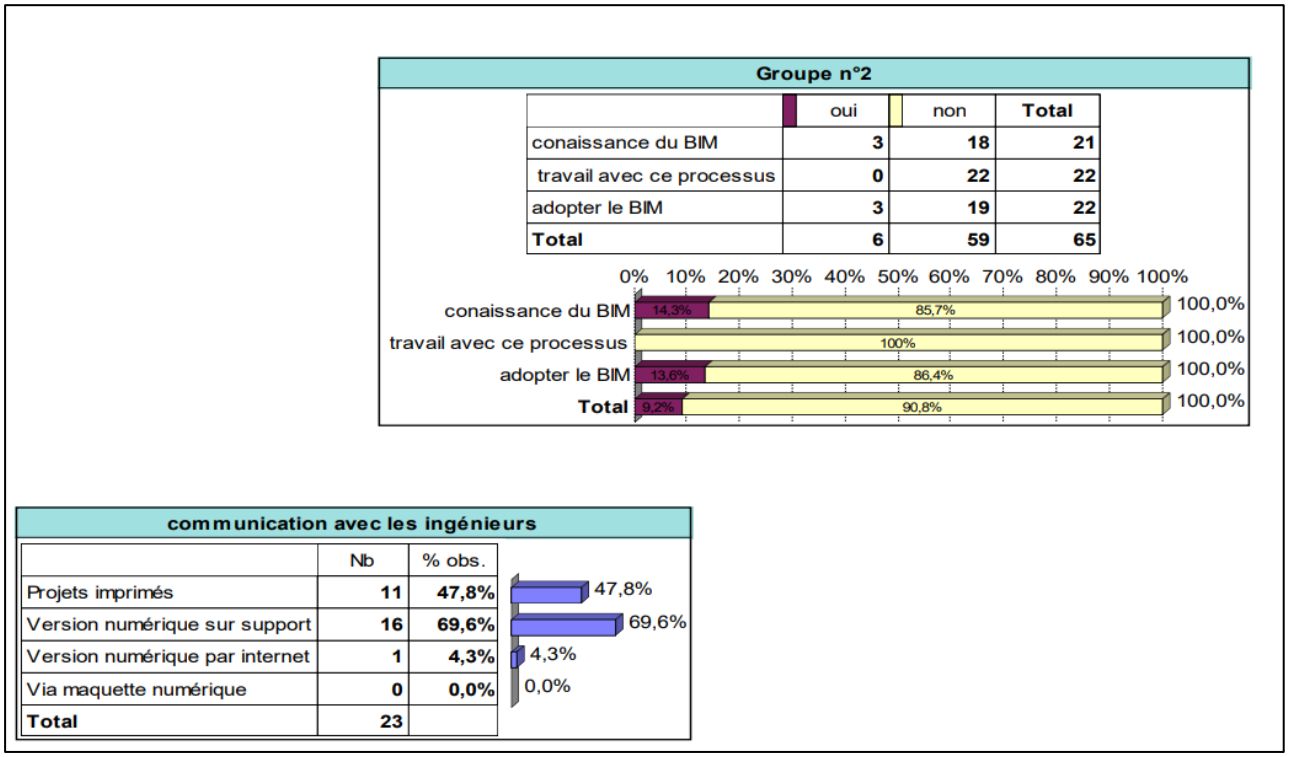

Fig. 6. Survey results, Knowledge measure for BIM strategy (Groupe2), Communication methods with engineers ' communication avec les ingénieurs)

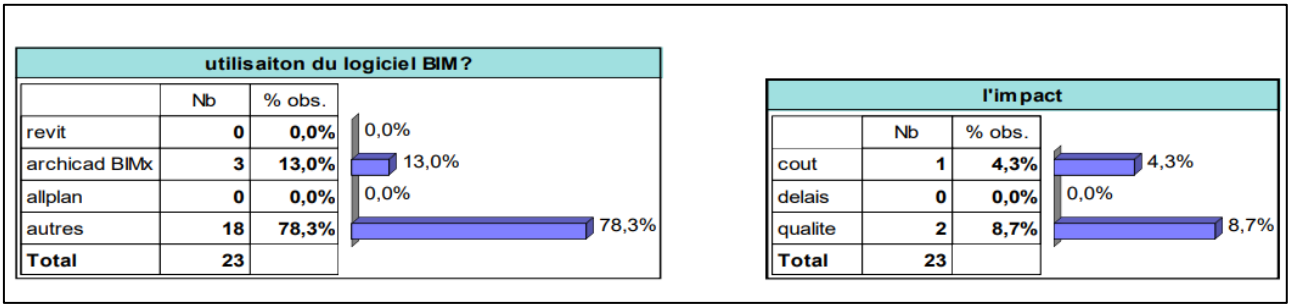

Fig. 7. Survey results; BIM software (Utilisation des logiciels BIM), Impact (L'impact)

a. For Engineers

The second part of the survey as previously mentioned was addressed to engeneers as a part of the construction process. Results are shown in both Fig. 8 and Fig. 9. SOFTWERE TECKLA was the most used followed by Robot and Etabs, but most engineers declared not using sap2000 or other software. Software linked o BIM for engineers are still not well known and need more studies and training for them.

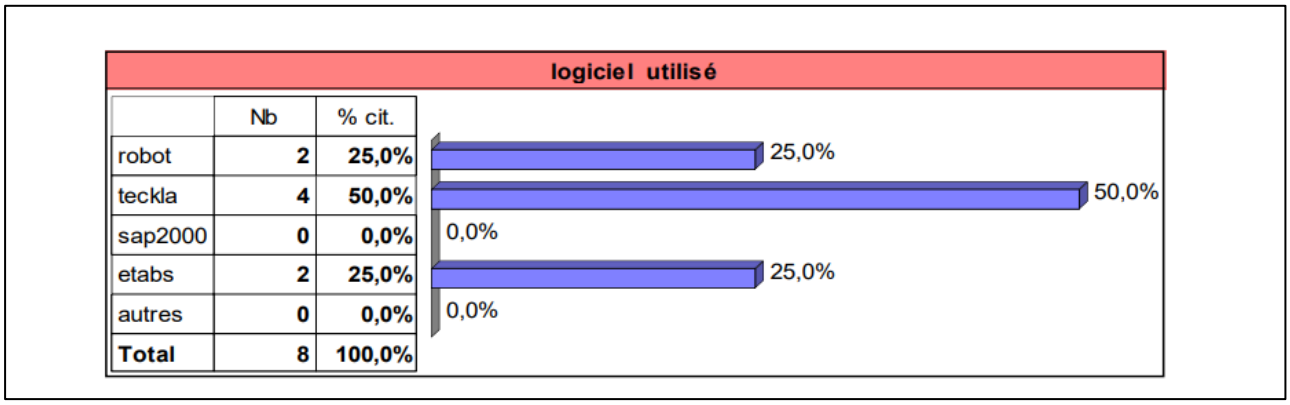

Fig. 8. Survey results; software used by engineers (Logiciels utilisés)

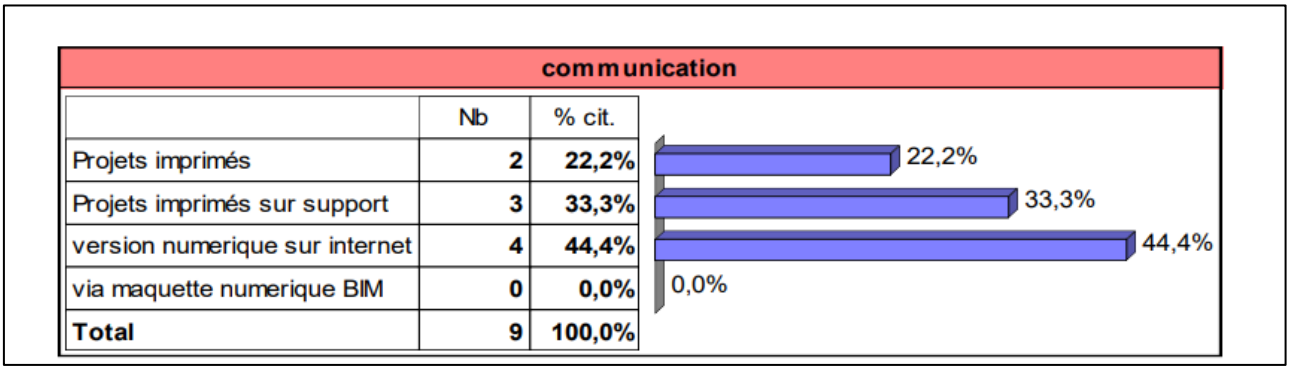

Fig. 9. Survey results; Communication methods (communication)

In most design offices, the flow of work is still unidirectional, and there is no system in place for receiving feedback on completed projects. The BIM concept and the commitment it makes to architectural excellence are familiar to an extremely limited number of people. Because engineers and architects work in a sequential way while using software packages, the adoption of BIM requires a full grasp of the process.

4. Conclusions.

BIM helps scientists and designers to get more and more productive in Algerian projects. We may see a structure as a set of systems, visualize the construction timeline, discover founder concerns, and collaborate with others. BIM has quickly transformed architectural design and implementation. Architecture institutions must adapt. When we don't fully utilize BIM, we lose many of the content perspective outlined previously. Design offices are generally linear and lack responses. Few understand BIM's dedication to architectural quality. Engineers and architects utilize technology sequentially, thus implementing BIM needs a detailed grasp of the workflow. The move from drawing lines to inserting parts changes how we build. If this is how professionals operate, architectural schools must adapt. This requires better collaboration at several levels: between legislators when deciding on a pure BIM system, within architectural programs at universities, and between designers and technologists.

Further studies could be done with other stakeholders such as politicians, administrators and university professors to better understand the situation of integrating BIM as a new technique to ameliorate the quality of architectural projects.

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