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BLOCK III_ BIM tenders for projects and public works and

BIM implementation processes

BIMVET3 Tutorial No. 2

Title: BIM IMPLEMENTATION IN THE ORGANIZATION, ROLES AND COMPETENCIES

1 – Aims

The objectives tutorial are as follows:

To get acquainted with and be able to apply the BIM methodology in implementation in the organization, roles and competencies

To understand and be able to use information exchange guidelines BIM in implementation in the organization, roles and competencies.

The student will get acquainted with and learn to set the main guidelines for the information exchange processes to be achieved in BIM implementation in the organization, roles and competencies.

2 - Learning methodology

- The teacher will provide an explanation of the material with examples.
- Students will read this lesson and analyze examples of the video.
- To evaluate the achievements of the practical teaching, each student will write short descriptions and answer questions provided.
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3 - Tutorial duration

The practice described in this tutorial will be carried out in a computer classroom.

It will last 2 teaching hours.

Note: the duration of the tutorial depends on the professionalism of the teacher.

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4 – Necessary teaching recourses

Hardware require: computer room with computers with access to multimedia and internet. Required software: BIM 360 BUILD module Cost Management.

5. Tutorial Contents

BIM IMPLEMENTATION IN THE ORGANIZATION, ROLES AND COMPETENCIES

5.1 Introduction

BIM is not a new technology at this time. It has already passed the inspection stage and it is safe to say that it has a basis for practical application. In addition, the vision for the next phase, which will expand the technologies and their applications, is already clear. A phase of competence and productivity growth is currently underway. It is important to emphasize that the level of development and use is highly dependent on the individual organization, the market, and other factors, even the prevalent software. The problems and limitations of BIM have already been discovered, and an understanding of what can be achieved with this technology is already clear. Technologies are emerging that complement and extend the benefits of BIM: artificial intelligence, virtual and augmented reality, automation solutions, the wider use of BIM in specific areas such as Retail Information Modeling (RIM), Bridge Information Modeling (BrIM), Historic/Heritage BIM (HBIM). It is very important to discover and decide what is the goal of the organization's BIM in the short term (1-3 years) and what are the goals in the longer term (3-5, 5-10 years). The goals will determine the choice of software, training strategy, storage of information (all information must be stored, its amount and form is important). The formation of goals can start with the goals and activities of the organization and the follow-up strategy.

Each project has different uses for BIM, with different benefits of BIM being achieved accordingly. In determining how BIM will be applied to a project, it is important to define what results are expected and to identify key performance indicators for BIM.

Professionalism is important for the installation process. The better BIM deployment will be organized, the cheaper the whole process will be. Often, the cost of installation becomes higher than the cost of the intended savings, so the first projects are likely to be unprofitable. When implementing BIM, on average, projects are integrated through 2-4 projects. It is at that time that the overall benefits of BIM unfold. 2-4 projects are equal to 2-3 years, so BIM implementation is a long-term process.

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There are cases where BIM brings benefits in the first project. These are projects for which the traditional process would simply be too complex: complex geometry of the building, complex construction organization, high energy performance requirements of the building. The emergence of BIM was driven by the needs of "impossible" projects. The studios of such famous architects as Frank Gehry or Zaha Hadid are the carriers of technological innovations in working with works with free forms, complex nodes, unique facade elements, volumetric constructions. Without the application of 3D BIM, such projects would not be possible and would not have economic potential. Thus, BIM software ideas open up from the need to work better, to take advantage of the technical capabilities of computers to achieve greater efficiency. https://www.makebim.com/2016/09/05/implante-o-bim-com-a-coordenar/?lang=en

5.2 Specifics of BIM implementation in the organization

The role of the head of the organization in the implementation of BIM is paramount. BIM can become very expensive if installed inefficiently. It is very important for the head of the organization to mobilize the team, formulate the vision and communicate it very well. If there is a chain of leadership in the organization's structure, all its members need to be involved, understand the goals, differentiate how much and where resources can be donated in order to progress. It is necessary to implement a support system in the organization that would ensure the stability of the team during the introduction of change (1 Fig.). The manager must constantly support and evaluate the progress of the implementation. The team should be encouraged to provide feedback, actively participate in the process of change, and contribute to decision-making. The BIM manager plays a bridging role, supporting and encouraging everyone to get involved, solving problems and advising on all issues.

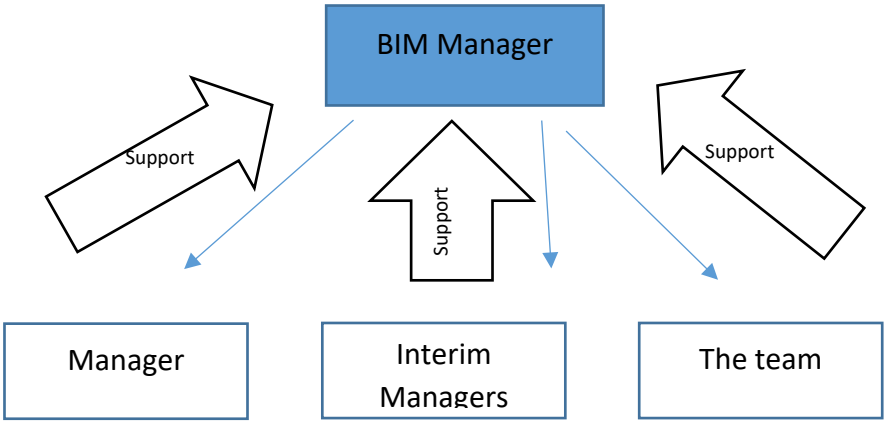

Fig 1. BIM installation team support system

Appropriate technological competencies are also required for the successful implementation of BIM. Technological leadership is an integral and important part in the successful implementation of BIM in an organization. It can be internal or external. A technology leader must point the way in an organization, manage change, and discover the best return on investment ratio.

Technological competencies must cover everything from hardware to specialized software. The position of technology leader is held by the director of technology or the head of the IT department, as well as the connecting specialty - the head of BIM. The head of BIM is a temporary position in the long run.

In addition to the organization's strategic issues, technical support is very important at the project level, so a competent specialist is needed to advise the team on software and hardware issues, engage in quality control, communicate with an external project team, develop work standards, and contribute to contract preparation. Due to the scope and significance of the work, this position must be performed by a dedicated specialist, the BIM Coordinator.

A BIM coordinator is often assigned to a team member who is well versed in the software, has a technical understanding and knowledge of the aspects of teamwork, is more interested in innovation, and is able to prepare texts, communicate with the team, and conduct training.

The team is at the heart of this process, so all attention must be focused on the team members. In addition to accurate communication and reasoning as to why this change is happening, why it is necessary, what benefits it will bring and how it will be better than the current situation.

Training and its organization are inevitable and an integral part of introducing change. Trainings need to be organized for the whole team, individual specialists, some of them will have to be done with internal resources, some will have to be hired. A training plan linked to the organisation's BIM implementation plan must be developed. The aim of the training is to achieve such a level of team competence development that each member would have enough knowledge to formulate the task and the rest of the information they could find and elucidate by themselves. This usually accounts for about 60-70% of all software knowledge. This percentage will be recommended by the consultant conducting the training or the expert advising during installation. Training also needs to be organized in the context of the project so that the subjects taught can be applied directly in practice.

Training must first be provided for managers. It is important that they communicate harmoniously with each other and communicate the same things, so a discussion of all aspects

of the implementation must take place before the presentation to the team. If the organization is larger, it is recommended to organize workshops to discuss best practices, potential risks, deployment management plan, and time period targets,- all of which are summarized in an overall strategy and implementation plan. This part is often missed, resulting in uncoordinated implementation, leaders communicate different things to a team, causing confusion, and increasing the risk of more complex deployments, which becomes a major barrier to successful implementation.

BIM roles are divided separately at the organizational and project levels. Roles are defined differently in different standards. BIM is constantly evolving and adapting. The essence of BIM is to leverage technology for the benefit of the organization and the team.

There are three levels of BIM roles in an organization that can be called differently. One person can perform multiple roles. If the organization is smaller, the roles at the organizational level may overlap with the project roles.

The BIM Deployment Manager, commonly referred to as the BIM Manager, can hold the positions of Technical Director, IT Manager, BIM Architect, BIM Technology Manager, and more. This person plays the role of strategy maker, business case creator, as well as the primary role of team preparation and follow-up, maintenance and control.

The BIM coordinator is responsible for the technical implementation of the BIM, he may also be called the BIM technologist, the Head of the BIM team, the head of some part of the project. BIM developers are all participants in a BIM project who contribute to the implementation of BIM projects according to defined requirements. They can be called BIM engineers, BIM modelers, BIM plotters or BIM technicians. Often these are designers and engineers working in a certain part of the project.

The roles of BIM in a project vary depending on the roles of the organization, so requirements need to be defined separately for each project. To speed up the process and make it more efficient is possible by developing templates, that would be applied to each project individually, and clear internal agreements, with a well-defined role for each in the project.

The BIM project needs to manage specific aspects:

- Legal - harmonization of the contract, BIM protocols, standard and other documents and descriptions of the procedure for their implementation.
- Technological - to prepare a common data environment, to select a map of technologies, to assess the needs of communication (Internet technologies), to ensure compliance with the development of a future project.
- Communications - to provide channels and forms of cooperation, communication

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procedures (rules), principles of registration and recording.

- Competencies - to ensure that all project participants have sufficient knowledge of technology, procedures, rules and software. Conduct training to raise the level of competence of the team accordingly.
- Interests - to ensure that the interests of the participants are safeguarded at the project and organizational levels, and that no legitimate comments or changes are made that ensure the qualitative and project management and other aspects of the interests of the parties.
- Quality control and management - to continuously monitor the quality of communication, use of systems and the information contained in them, to study the quality of models and the information contained in them using technologies such as automated intersection verification, automation using coding (Scripts).

Lots of aspects. Clearly, it would be difficult for a single position to cover such a range of competencies and work, given that these aspects need to be managed at both the organizational and project levels.

So, if the organization is not small and there is more than one project, it is not a matter of one position. The composition of the BIM team also depends on the scope of the project, the number of participants, competencies, project requirements, project specifics and even innovation. In larger projects it can be very broad, in smaller roles it can be combined. With a different team composition, the competency map also changes, so one thing is clear - the BIM development plan is different for each project.

It is important to emphasize that there is an attempt to standardize the roles of the project team and their names, but practically there is no single standard. In this context, it is necessary for each project to define the roles, obligations and responsibilities of the position or to specify project standard and its deviations.

Fig 2. BIM implementation strategy

Based on the findings of the experts, here are some tips for a successful BIM implementation:

- Under no circumstances unrealistic goals should be set (e.g. to reduce construction time by 30% or to use and try too many tools at once).
- Do not buy software just because it is the most expensive and well-known on the market. Technological solutions should show clear value.
- Present only facts, don't try to show things nicer than they really are.
- All projects are unique. Every project needs to discover and exploit technology, that has not yet been used and tested, way of working, or other innovation. This way you will move forward with each project and have the best customer feedback.
- On the other hand, use only those technologies that will really bring value. If the project doesn't require a complicated process, simplify everything to the most primitive safe process possible.
- Apply innovations not only at work, but also in communication, try new ways of communicating, surveys, communication apps and so on. Make the project fun and exciting.
- The customer is always paramount. He must approve of any action, after hearing a negative attitude (no doubt, because doubt can get credits that will need to be justified), abandon the idea.

https://www.bimthinkspace.com/2008/06/episode-9-bim-s.html

5.3 The need for competencies of BIM specialists on a construction project

There are three main levels of competence in a BIM project, as at the organizational level, but there may be more, depending on the size of the project.

At the BIM management level, the key is usually the BIM manager, who develops, coordinates the BIM documentation - the BIM protocol, the main project document, as well as develops and coordinates project standards, client(s), delegates tasks and is ultimately responsible for managing the entire project BIM. In addition to the BIM manager, the project may include a BIM architect, a person in charge of BIM strategy, who assists the client or project board in developing the desired strategy and project objectives, translating them into technical language for the BIM manager and team. This position is required in the case of a large project or a number of project participants where a very large number of interests need to be reconciled. In this case, the project is very sensitive to the strategy and decisions made, BIM and project management knowledge alone is not enough.

The BIM coordination level is the practical level of BIM implementation at which the BIM protocol becomes a practice. The BIM coordinator is responsible for the selection of tools, their launch, the involvement of members, the quality control of the project part. Due to the large amount of work, the project often has more than one BIM coordinator with several working teams (subcontractors). It is best for the BIM coordinator to have separate teams. Otherwise, it is particularly difficult to manage information and responsibilities. In smaller projects, the BIM leader and coordinator may be the same person, but this is not recommended due to the excessive range of competencies required. Such a person must have legal knowledge as well as specific software and hardware knowledge.

The BIM developer level is the most important level for all end-users of BIM tools. Good technical and tool knowledge, ability to transmit information (data in the format that is most useful to receive the final recipient of information). It is important that procedures are in place to deviate from the BIM protocol in agreement with the BIM manual if this clearly contributes to the objectives of the project. In this case, the highest value is born.

In the long run, coordination and BIM project managers will be needed less and less. As the development of BIM becomes a common work tool and industry standards become more permanent, more technologically advanced data transfer standards will emerge, and project managers and information managers will take over the roles of BIM coordinators and BIM managers.

BIM technology professionals must have a good understanding of the engineering process and a solid IT knowledge baggage such as an Internet Security, Internet Networking, software, hardware, and programming. Be able to manage change, risk, stress tolerance, the ability to persuade people when they need it most. Be able to sell and get enough resources inside and outside the organization. Must have knowledge of contract preparation, knowledge

of existing regulations, industry standards. It is necessary to know the engineering specifics of each part of the project that is being worked on. The BIM manager of an organization, that makes all engineering parts, needs to know what, for example, the design of an electrical part consists of, how it is designed and assembled, why this form of information is chosen, what questions one document or another answers. It is necessary to know the basics of project management.

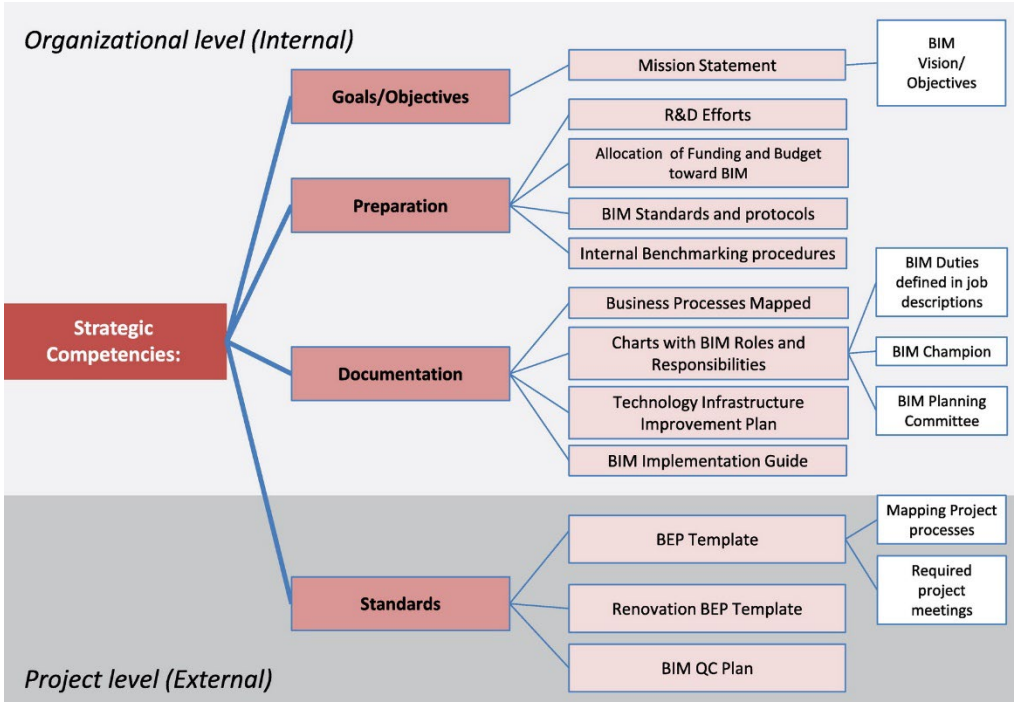

Fig 3. Organizational level

6. Deliverables

To assess the achievement of the practice, students will write a report of 2 pages maximum and will have to answer the submitted test questionnaires.

In this report, the student will explain the the BIM methodology in implementation in the organization, roles and competencies. Is able is able to identify the main groups of criteria for preparation for the application of BIM methodology.

7. What we have learned

The student is acquainted with the BIM methodology in implementation in the organization, roles and competencies in the construction sector.