



CCC 2018

Proceedings of the Creative Construction Conference (2018)

Edited by: Miroslaw J. Skibniewski & Miklos Hajdu

DOI 10.3311/CCC2018-140

Creative Construction Conference 2018, CCC 2018, 30 June - 3 July 2018, Ljubljana, Slovenia

The Gradual Transition to BIM in Syrian Companies

Sonia Ahmed ^{a*}, Petr Dlask ^a

^aCTU, Prague 6, Czech Republic

Abstract

The successful execution of construction projects, keeping them within estimated cost and the specific schedules primarily depends on the existence of an efficient construction sector capable of sustained growth and development in order to handle with the requirements of social and economic development and to utilize the latest technology in planning and execution. Many studies and researchers discussed the situation of construction in both of developed and developing countries; there is considerable dissatisfaction with the quality, cost and delay of construction, and Syria, not an exception.

The researcher suggested BIM as a tool to improve and innovate the building reality by using a good method to measure the performance of GCEC company in Syria; this method is the: BIM3 (BIM Maturity matrix) which is a tool to identify the current BIM maturity of organization or project team. It does not only give an indicator of the last performance, moreover, it helps the building's company in moving from measurement to management, and to anticipate needed changes in the organization's strategic, by measuring the current BIM level in the company through BIM maturity areas (TECHNOLOGY, PROCESS, POLICY) based on capability set v5 and key maturity areas at granularity level1 (initial, defined, managed, integrated, optimized) and putting recommendations for moving to next level. Successful accomplishment of these two tasks represents the foundation of good performance management.

Measurement provides the basis for an organization to assess how well it is progressing towards its predetermined objectives, help to identify areas of strengths and weaknesses and decides on future proposals. Performance measurement is not an end in itself, but a tool for more effective management.

© 2018 The Authors. Published by Diamond Congress Ltd.

Peer-review under the responsibility of the scientific committee of the Creative Construction Conference 2018.

Keywords: BIM; BIM maturity; building; performance; Syria

1. Introduction

Clients are interested in improving quality with reduced time, and cost, likewise contractors and architects are interested in performance improvements to increase their profits, meet client satisfaction and enhance their competitive advantages.

The complication and involvement of the different disciplines in construction processes form a complicated issue to manage; so the construction industry needs significant changes in its strategies.

Performance measurement is the first step and an essential agent of change, in another hand, performance management is a crucial concept that has taken on renovated importance in diversities of organizations. For a building company to make practical use of the results of performance measurement, it is a compulsion to be ready to move from measurement to management. It must also be able to expect required and accept the changes in its strategy; through improvements and raising the capacity of three fields: Technology, Process, and Policies.

The researcher used "Building Information Modelling Maturity Matrix" BIM3 which is a knowledge tool for identifying the current BIM Maturity of organization or project team; and provided some recommendations in three BIM fields.

This step forms the first one to move to Building Information System (BIM) in Syrian building companies. General Company for Engineering Studies and Consultations (GCEC) has chosen as a case study to measure its reality and readiness to begin a gradual plan towards adopting BIM.

The reason of chosen is: GCEC is the largest and most important company in Syria in designing field. The GCEC is committed to quality, excellence and continuous development in its performance and a high level of creativity and taste, and the application of commercial quality standards through a team of integrated technical engineers and administrators with a good experience. The company's staff consists of 2190 employees working in locations spread throughout Syria. Staff always have proper training on the related programs; which leads to improve the situation of the company continuously and increase its productivity at the appropriate cost and promptly.

The agreement with the director of GCEC- Branch of Coastal Zone has done; aims to evaluate the performance of the company [1], and determinate of the extent of the company's ability and readiness with its engineering, technical, administrative, etc., to gradually move towards the application of BIM, and to make GCEC a first step towards pushing other institutions to go for competition.

1.1. The BIM Maturity Matrix (Bim3):

Performance measurement is a crucial agent of change, and performance management is a recognized conception that has taken on improved importance in changes of organizations [2]. Measurement provides the basis for an organization to assess how well it is progressing towards its predetermined objectives, help to identify areas of strengths and weaknesses and decides on future proposals. The evaluation method used in this research is "BIM3" which identified as a Knowledge Tool for identifying the current BIM Maturity of organization or Project Team. The BIM³ has two axes - BIM Capability Sets and the BIM Maturity Index [3], [4]. To benefit from BIM3; it is essential first to review the concepts of BIM Capability and BIM Maturity:

BIM Capability refers to the minimum abilities of an organization or team to deliver measurable outcomes. As in figure 1.

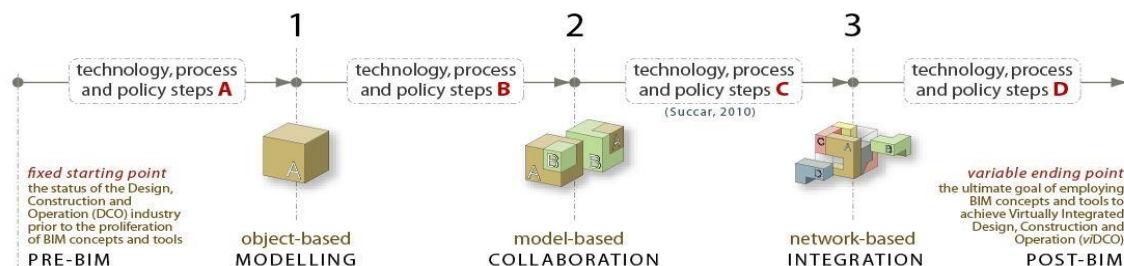


Fig.1 BIM Capability measured through BIM Stages separated by BIM Steps. Post 3 on the BIM Framework Blog

BIM Maturity refers to the gradual and continual improvement in quality, repeatability, and predictability within available BIM Capability. As in figure 2.

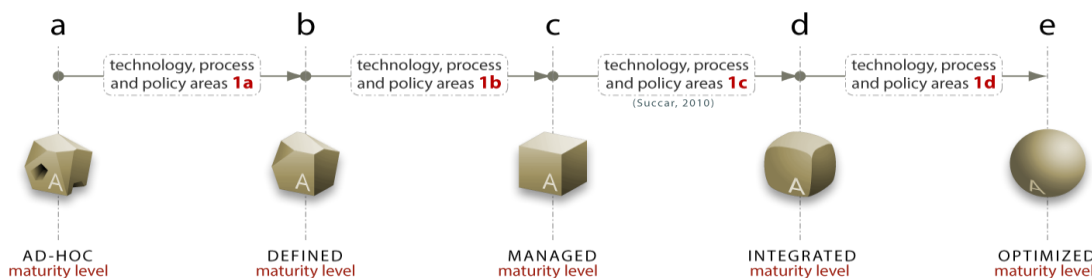


Fig. 2 BIM Maturity Index which has five levels. Post 10 on the BIM Framework Blog

The BIM³ is intended for low-detail organizational self-assessment (Organisational Discovery, Granularity Level 1). For best results, must follow the below-recommended steps:

- Identify the best person to lead the assessment effort – someone with significant experience in BIM tools, workflows and protocols and sufficient insight into the organization's systems.
- Manner this assessment as a group activity, a workshop with 3-9 individuals representing punishments and seniority levels.
- Set aside one hour to complete the self-assessment exercise and its follow-up discussions.

Assessment:

For each Capability Set (e.g., Software), read the full row within the Matrix before selecting the cell that best describes the organization's current BIM maturity level.

- Either use the recommended scores (10-40).
- Don't apply a score to a cell if the previous cell (to its left) has partial or no maturity.
- Don't calculate total scores (per column or per row) as these totals are deceptive.

Rating Results:

The matrix translated by the researcher and presented to a group of experienced engineers in the company (GCEC); a meeting held between them and the researcher to explain the matrix and its working structure. The engineers were asked to apply the precise method of processing and answering accurately for each cell after reading all the cells of each group, and to put a signal to clarify the cases achieved in the company after reading the entire line of each capability. The numbers placed under each cell are intended to determine exactly where the problem is and to discuss solutions, not to give an indicative number and computational ratio.

1.2. Main Maturity Areas: Technology

- Software: (applications, deliveries, and data): Company has achieved column b (specific) in addition to attaining one aspect of cell c; the final value is 11 out of 40. In this case, with cells with lower values, these cells have a priority in working to improve them. All cells must have this optimization. Therefore, to move the software in the company to the column (the subsequent cell) (orbit) entirely and also towards the integration and optimization as much as possible, for example:
 - Setting strategic goals for the company and based on which programs are selected and managed
 - Enable interoperability of various applications by proposing formats such as IFC, which helps to use, store, share and maintain data as part of the overall strategy of the company.
- Devices: (equipment, delivery, location/roaming): It took the assessment 0. Therefore the hardware is not suitable for the process of Building Information Modelling, so:
 - Buying appropriate equipment for Building Information Modelling, and purchase workstation equipment that can be cheap or used but with good specifications (gradual change).
 - Convince the management that the replacement and promotion of equipment is an investment.
 - The standardization of hardware specifications within at least one team.
- Network (Solutions, Delivery, Security/Access Control): It takes a value of 0; which means that the network mode is not useful, you must look for the reasons.
 - One solution is to secure the network and its solutions to ensure that information is shared between teams within a single organization and between organizations working together.
 - Solutions can replace with innovations that are regularly tested and evaluated, such as: Ensuring proper bandwidths that allow storage and exchange of data and knowledge
 - The allocation of project portals that allow for the exchange of significant data and make it interchangeable between the stakeholders in the project, leading to the participation of different parties and this reflected in

improving the process and development of communication channels.

Table 1. *Performance Measurement Results, Main Maturity Areas: Technology. Author results, 2017.*

Performance Measurement Results			
Main Maturity Areas: Technology			
Capability set v5.0	Software: applications, deliverables, and data	devices: equipment, delivery and location/roaming	Network: solutions, deliverables, and security/access control
Key maturity areas at granularity level 1 and Score	Defined (b) Score: 10	Initial (a) Score: 0	Initial (a) Score: 0
Recommendations	- Set the strategies goals for the company. - Enable interoperability of various programs by using IFC format.	- Buying appropriate equipment, and workstation. - Aware of the benefit of using BIM tools. - Standardize on hardware specifications.	- Secure the network solutions. - Manage solutions and integrate the Modelling process. - Allocate of project portals.

1.3. Main Maturity Areas - Process

- Resources (infrastructure, physical and precognition): Value of 5, the Company's employees consider that the work environment and workplace tools directly affect employee motivation and productivity. So:
- Control this environment and secure the appropriate work tools and work on the management and integration, which achieves the company's performance strategies.
- Monitor the work environment regularly to suit the requirements of its employees and contribute to their ability to more work and productivity.
- There is also poverty in the way of exchange and sharing of knowledge. Also recommended using specific standards and shared data environment (like CDM) and commitment which will stimulate employees and increase productivity.
- Activities and Workflow (Knowledge, experiences and related dynamism): The value is 10 out of 40 as illustrated above. There is good knowledge of an essential section of the company's members about BIM and its benefits and the need to apply it. So that:
- A BIM team should be formed, roles of all participants should be defined, and the technology should be introduced into a small pilot project, and then they become essential in the company work.
- Create a spirit of cooperation and provide the necessary communication tools within the working group and within the organization in general.
- Gradually replace the traditional teams with newly trained teams. Or training the existing teams gradually so that the transition doesn't cause any defect or delay in the work of the company.
- Products and services: (specification, differentiation, research, and development): Based on the answers of the company engineers, it took value 10.
- The company recognizes that it uses a unique statement to define the specifications and characteristics of the components of the 3D model, but there is no individual standard (such as an integrated BIM model which serves as a reference model for mensuration) can be consulted indicating the specifications to be achieved if the model is submitted.
- To reach a product with high specifications; must specify the specifications for the progress of the model and control the product in the desired stages of development.
- Adopt a national or international code.
- Leadership and management: (organizational, strategic, managerial, communication, invention, and innovation): The rating is 0.
- The first important step is to persuade the management to move to the BIM and provide all the supporting factors.
- Cooperate with the supplier and develop a method to deal with him.

Table 2. Performance Measurement Results, Main Maturity Areas: Process. Author results, 2017.

Performance Measurement Results				
Main Maturity Areas: Process				
Capability set v5.0	Resources: infrastructure, physical and precognition	Activities and Workflow (Knowledge, experiences and related dynamism)	Products and services: (specification, differentiation, research, and development)	Leadership and management: (organizational, strategic, managerial, communication, invention, and innovation)
Key maturity areas granularity level 1 & Score	Defined (b) Score: 5	Defined (b) Score: 10	Defined (b) Score: 10	Initial (a) Score: 0
Recommendations	- Work on the management and integration. - Monitor the work environment. - The sharing of knowledge. - Use specific standards such as the British Standard: PAS- 1192.	- A BIM team should be formed. - Provide the necessary communication tools. - Gradually replace the traditional teams with new one.	- The company needs an integrated BIM model. - The evaluation of the BIM product. - Adopt a national or international code.	-Persuade the management to move to BIM and provide all supporting factors. - Cooperate with the supplier and develop a method to deal with him.

1.4. Major Maturity Areas: Policies

- Preparation: Research, educational/training, and delivery programs. It came in a specific box and took the assessment 10 out of 40
- Training should be adopted on an ongoing basis and not when necessary
- Set specific strategic objectives, so that the training fructifies.
- MEP needs special attention. If the architectural and structural specialist had followed the REVIT and MEP engineer followed the AutoCAD program, the company would not be working on the second level of the BIM.
- The developing a time plan.
- Involve all parties, even those who do not work with BIM, like Quality management, and Planning.
- Innovation strategy.
- Organization: Blogs, regulations, legislation, classifications, guidelines, and standards, The rating is 0
- The researcher recommends the adoption of reliable codes such as British code.
- Evaluation for each project, is the code used for this situation?
- Need the guidance for the best methods of learning and training.
- Regarding the course, is it better to be: some long hours taught at home or class in the company.
- The development of unique records containing reports: take advantages of the recording mistakes.
- Contractual: Responsibilities, Remunerations and Risk Allocations: Also took rating 0.
- Must be done before sitting with the client and agreeing with him on the work plan.
- Method of dealing with contracts such as CIC BIM may propose to use in work within the BIM projects.

Table 3. Performance Measurement Results, Main Maturity Areas: Policies. Author results, 2017.

Performance Measurement Results				
Main Maturity Areas: Policies				
Capability set v5.0	Preparation: Research, educational / training, and delivery programs	Organization: Blogs, regulations, legislation, classifications, guidelines, and standards	Contractual: Remunerations and Allocations	Responsibilities and Risk
Key maturity areas granularity level 1 and Score	Defined (b) Score: 10	Initial (a) Score: 0	Initial (a) Score: 0	

Recommendations	- Ongoing training.	- Adopt of reliable codes.	- Work plan.
	-Set specific strategic objectives.	- Provide an evaluation of each project.	- Method of dealing with contracts such as CIC BIM
	- Provide special attention to MEP Revit courses.	- Learning and training.	
	- Develop a time plan.	- Recording of errors and take advantages of it later.	
	- Innovation strategy.		

Conclusion

- Most of the public administration staff in Syria know little about the BIM. Appropriate follow-up to this research will be an analysis of their knowledge and desire to implement it in public administrations and institutions.
- Readiness and willingness to change are necessary to further develop the application of BIM in Syria and the world.
- An initial team of BIM set up to be trained with the provision of subsequent staff to support the first team and start to evaluate the performance and the reality of the company and work to move gradually towards BIM as a qualitative and individual step and with remarkable cooperation for public companies in Syria.
- The analysis of the company performance was based on the BIM Maturity Matrix, evaluation criteria are determined by specific needs of the various participants of the building process. This leads to the successful project completion and subsequent management of the lifecycle of the building [5].
- Recommendations have been made for all aspects of the so-called BIM fields of technology, processes, and policies of the organization with an aim to improve its position and pushing it towards the second level of BIM.

Acknowledgments

SGS17/121/OHK1/2T/11

References

- [1] S., Ahmed, et al. 2016. Analyzing the Change Orders Impact on Building Projects. *Journal of Engineering and Applied Sciences*, 11(7): 1532-1537
- [2] Amaratunga, D., Baldry, D. (2002) "Moving from performance measurement to performance management," *Facilities*, Vol. 20 Issue: 5/6, pp.217-223, <https://doi.org/10.1108/02632770210426701>
- [3] B., Succar. BIM ThinkSpace (Oct 2005), available at <http://www.bimthinkspace.com/about.html/>
- [4] BIMarabia, issue 12, 2017. <http://bimarabia.com/bimarabia-english/>
- [5] Bouška, R. 2016, "Evaluation of Maturity of BIM Tools across Different Software Platforms," *Procedia Engineering*, pp. 481