Ain Shams University
Faculty of Engineering
Department of Architecture Engineering

Towards Enhancing Building Information Modeling Implementation in the Egyptian AEC industry

A thesis Presented in Partial Fulfillment of the Requirements for Master of Science Degree in Architecture Engineering

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Disclaimer

This thesis is submitted as partial fulfillment of M.Sc degree in Architecture, Faculty of Engineering, Ain Shams University.

The work included in this thesis was carried out by the author during the period from 2014 to 2016, and no part of it has been submitted for a degree or qualification at any other scientific entity.

The candidate confirms that the work submitted is her own and that appropriate credit has been given where reference has been made to the work of others.

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Abstract

Since the expression "Building Information Modeling" (BIM) was initially presented in the Engineering and Construction AEC industry in the most recent decade; it has changed numerous parts of the design, construction, and operation of a building. BIM is a Middleware; connector represents the advancement and utilization of PC .

BIM has various frameworks which have been conducted by the pioneers in BIM industry to enhance the BIM process. Then there was a study of the reflection of those frameworks on the Egyptian AEC industry to overcome the threats that prevent Egypt from applying BIM technology more broadly.

In addition, a comparison is conducted between the successful countries which implemented BIM in their projects, and managed to enhance their adoption through studying their local challenges and targets then made strategies and standards to overcome those threats, and then applied successful actions which can match with the Egyptian industrial requirements.

This research is expected to define the challenges which are facing the Egyptian industry to apply BIM and the potential capabilities of solving those problems. To acquire the vital information to carry on this research a questionnaire was created and distributed in the AEC community. The reason for the study was to see how experts consider BIM as a device in the fields of design and construction in general and in the Egyptian industry particularly.

Finally several case studies are discussed, analyzed and compared, in order to explore the importance of using BIM and the effect of different parameters on implementing BIM, which helped in proposing BIM framework with evaluating matrix contains attributes to measure its success and to help the Egyptian companies make real business decisions about enhancing BIM implementation through this framework.

Keywords

Building Information Modeling- AEC (Architecture, Engineering, Construction) Industry-BIM Standards-Egyptian Firms-BIM Frameworks-Return on Investment-SWOT Analysis-Man Hours

List of Acronyms

ADA	Arriyadh Development Authority
AEC	Architecture, Engineering, Construction
AIA	American Institute of Architects
BDS	Building Depiction System
BEM	Building Energy Modeling
BHS	Baggage Handling System
BIM	Building Information Modeling
BOQ	Bill of Quantity
Brep	Boundary representation
CAD	Computer Aided Design
CBA	cost-Benefit Analysis
CSG	Constructive solid geometry
DFMA	Designed for Manufacture and Assembly
DIS	Draft International Standards
FM	Facility Management
GPA	Government Property Agency
HA	The Housing Authority
HVAC	Heating, Ventilation, and Air Conditioning
IFC	Industry Foundation Classes
IPD	Integrated Project Delivery
LOD	Level of Detail
MEP	Mechanical, Electrical, Plumbing
NBIMS-US	National Institute of Building Information Modeling Sciences – United States
nD	"n'' Is the Unspecified Number of Dimensions, Essentially Forming An (n) Model
PAS	Publically Available Standards
PM	Project Manager
RCBA	Risk & Cost-Benefit Analysis
RFI	Request For Information
ROI	Return on Investment
RPTP	Riyadh Public Transport Project
QS	Quantity Surveying
WBS	Work Breakdown Structure
2D	Two-Dimensional
3D	Three-Dimensional
4D	Four-Dimensional 3D+Schedule Related Information (Time)
5D	Five-Dimensional 3D+ (Time+Cost)
6D	Six-Dimensional 3D+All Aspects of Project Lifecycle Management Information

List of Definitions

3D Parametric Modeling	(3D Model with Attributes) D Parametric Modeling (3D Model with Attributes) Model elements not only include visual aspects of the building elements they represent, but also have the properties (or knowledge) of the solids they represent.
BIM	Building Information Modeling is the development and use of a computer software model to simulate the construction and operation of a facility. The resulting model, a Building Information Model, is a data-rich, object-oriented, intelligent and parametric digital representation of the facility, from which views and data appropriate to various users' needs can be extracted and analyzed to generate information that can be used to make decisions and improve the process of delivering the facility.
4D Model	Model Term used to describe the linkage of a schedule to a model—essentially turning on model elements in the order in which they are built.
5D Model	Model Term used to describe the linkage of estimating software to a model—element quantities are downloaded from the model database and imported directly into estimating software.
Construction Coordination	The process of ensuring that the various elements of a building are constructed in a sequence that allows the various elements of the building to be.
Coordination Model	A Building Information Model that is developed from a completed design. The creation of the model is an interpretation of a design as opposed to the creation of a design.
Design Coordination	The process of ensuring that the various elements of the design (architectural, structural, electrical, etc.) fit together and complement one another.
Interoperability	(as it relates to BIM) The ability of data rich models to share valuable data, either through import or export.
Integrated project delivery (IPD)	a collaborative alliance of people, systems, business structures and practices into a process that harnesses the talents and insights of all participants to optimize project results, increase value to the owner, reduce waste, and maximize efficiency through all phases of design, fabrication, and construction.
Obstacles to standard implementation of BIM technology	Necessity to concurrently perform the activities of design and construction; divergent protocols of data input and extraction; the lack of an appropriate software platform to catalog all aspects of the project; and the lack of sufficient infrastructure to provide access to the model by all members of the project team.

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