Project Name: - BIM for Improved Building Design Communication between Architects and Clients in the Schematic Design Phase

Investigator: - Yohannes Abbay Tessema

Introduction
Building Information Modeling (BIM) technologies are revolutionizing how architecture is practiced and constructed and will impact how architects will communicate with clients, consultants, industry and among themselves. According to the US National Building Information Modeling Standard (US NBIMS), “Building Information Modeling (BIM) is a data based digital representation of functional and physical characteristics of a building from earliest conception to demolition”. “BIM, most importantly, is a collaboration of different stakeholders at various phases of the building life cycle to explore, insert, extract, update or modify building information in the BIM database to support and reflect the roles of that stakeholder” (see Figure 01 below). The US NBIMS promote that BIM interchanges are based on shared digital representation, interoperable information (computer to computer exchange), and an open standard based information exchange which could be defined in contract language.1 Information refers to the representation of a building design using two dimensional (2D) and three dimensional (3D) drawings, graphics, data, concepts, thoughts, and other documents produced in the building design process. The activity of conveyance, exchange, and transmission of this building information establishes communication.2 During the building design process, communication is an exchange of building design information among the stakeholders.

The most important stake-holder in this exchange of information is the client. The client is an individual or a party, - a person, a corporation, or an institution - for whom an architectural service is rendered. Whether the client is a single person or a group, client satisfaction is a prime determinant in measuring success in architecture practice and the success of the architecture.\(^3\) Strong client-architect relationships are rooted in understanding, commitment and effective communication and serve to reinforce client satisfaction.\(^4\) The effectiveness of the marriage between client and architect is a major factor in making decision throughout the architectural service.\(^5\) The quality and quantity of information provided to the client during the design process is paramount to the success of that design process, and hence qualitative as well as quantitative improvement of building design information improves building design communication between architects and clients.

Clients have very specific project objectives and critical to meeting these objectives is the clients understanding of how the building is to be used (function), how much they can afford to pay (cost), and what the building looks like (appearance).\(^6\) The quality and quantity of information concerning the Function, Cost, and Appearance of a building design are the three most important aspects of a building design where most clients want to know and need to make decisions during the design process.

---

\(^4\) Ibid.
\(^6\) Ibid., 2001 Edition, p567
The American Institute of Architects (AIA) Document B141, the most commonly used form of owner-architect agreement, establishes five project phases (design phases) - Schematic Design, Design Development, Construction Documents, Bidding/Negotiation, and Contract Administration. Among these phases, the schematic design phase is the initial and most important phase. It is here that the architect and client make the most definitive decisions on the function, cost and appearance of the architecture, and hence the most important decisions are made for the remaining project phases. Communication on the schematic design between architect and client is critical for the success of the entire project.

Though BIM substantially targets the collaboration of various stakeholders at different phases of the building lifecycle, it is most often considered a production tool and used for design development and especially for construction document phases. Its benefit for improving building design communication between architects and clients at the schematic design phase has not yet been fully analyzed and interpreted. Architects most often use conventional design and communication methods to do the schematic design and then re-draw using BIM tools as they progress with the Design Development and Construction Document phases. The question arises: Is BIM being used to its fullest extent? Do conventional methods of delivering schematic design, including manual drawings and Computer Aided Design and Drafting (CADD), limit the exchange of design information between architects and clients? Is perhaps BIM an invaluable technology for facilitating and improving the communication between architects and clients during the schematic design process? Is it possible we are able to improve client satisfaction and architectural design from improving the quality and quantity of design information and communication through the use of BIM in the schematic design phase?

---

Goals and Proposal Objectives

The long term goal of this research is to improve architect-client building design communication in the building lifecycle. The objective of this study is to understand how BIM could improve the quality of information available to the architect and client, and hence improve architect-client communication in the schematic design phase. The investigator aims to show that BIM can produce schematic design documents that hold improved information about the function, cost, and appearance of a building and therefore improve architect-client communication. It is the hypothesis of the investigator that BIM can enhance the quality of information in the schematic design phase improving architect-client communication.

Research Method

This study will compare conventional and BIM schematic design documents of a typical design project to determine if BIM improves the quality of information and therefore improves communication between architects and clients. TABLE 1 lists the typical building design documents provided to the client at the end of schematic design phase required to meet the
professional standard of care established by the AIA. Each of these documents provides building information needed to communicate the Function, Cost and Appearance of the schematic design to the client.

**Table 01: - Typical documentation at the end of the Schematic Design phase**

<table>
<thead>
<tr>
<th>FUNCTION</th>
<th>COST</th>
<th>APPEARANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site plans</td>
<td>Preliminary construction cost estimate</td>
<td>Elevations</td>
</tr>
<tr>
<td>Floor plans</td>
<td></td>
<td>3D model (optional)</td>
</tr>
<tr>
<td>Sections</td>
<td></td>
<td>Illustrative Materials (optional and includes rendering, physical model &amp; computer simulation)</td>
</tr>
<tr>
<td>Statistical summary of design area</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outline specifications</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

This case study will compare the quality of building design information provided by Conventional and BIM methods. The subject of comparison will be conventional schematic design documents developed by a leading architecture firm for a medium scale architectural project and BIM schematic design documents developed by the investigator for the same project. An appropriate BIM tool will be selected out of the currently available BIM tools for architectural services, especially for the schematic design phase. After the BIM schematic design documents have been produced by using the selected BIM tool(s), the quality of information contained in these Conventional and BIM documents will be identified and analyzed. These two sets of documents will be evaluated for their quality of building information. Comparison and evaluation will be made in regards to the Function, Cost, and Appearance of the building provided in both methods.

The BIM documents must first meet the standard of a Conventional schematic design set. The list of required documents listed in Table 01 will be compared for their quantity to determine the BIM sets efficacy of providing a comparative set of documents. If the BIM set meets these standards then the two sets will be evaluated to determine if the BIM documents provide better quality of information than the Conventional Method. It is assumed if BIM provides improved building design information it can logically be argued that improved architect-client building design communication will take place.

---

Of course, the time to create each set of documents has to also be compared. If a BIM set of drawings take 200% more billable hours than a conventional set then the appropriateness of utilizing BIM must be considered. The “cost” of doing the two sets of schematic documents will be determined by comparing the number of hours it takes the investigator to produce the BIM set with the firm’s billable hours for producing a conventional set. This data will be provided and so the reader can make appropriate comparison between the quality of the documents to the relative “cost” of their production.

The schematic design proposal for Eastfield College-Parent Child Study Center, Dallas County Community College district designed by HKS Inc11., is proposed as a case study for this research. The study center comprises various school facilities serving children ranging from infant to school age. This project has an approximate area of 20,030 sq. ft and a project budget of $5,378,414.00.

![Figure 04](image)

Figure 04: schematic floor plan and perspective produced using conventional method.

---

11 HKS is a leading architecture firm for more than 65 years with offices in 23 towns worldwide. It is among the top-three nationwide and top-ten worldwide architecture firms recognized for award-winning architectural, interior design and planning services.
The significance from this research is to document how BIM may assist in architect-client communication to the function, cost, and appearance of a building in the schematic design. The outcome of this study will improve the understanding of how BIM could improve architect-client building design communications. The long term impact of this study is improvement of building design communications between architects and clients.

**Qualifications of the Investigator**

The principal investigator Yohannes Abbay Tessema has completed all the required courses of visualization certificate at Texas Tech University (TTU) College of Architecture. He has done various BIM related projects and research. He is a licensed architect with seven years experience as an architect and currently teaching architecture in Mekelle University, Ethiopia. During his graduate study in TTU, College of Architecture, his efforts has been focused to the study of the benefits of BIM to the Architecture/Engineering/Construction (AEC) industry. Moreover, he has assessed the National Building Information Modeling Standard (NBIMS) and applied BIM software. The College of Architecture at TTU is a leader in the use of computing technology for advancing knowledge of professionals concerning the field of architecture. Professor Kuhn Park and architect Jeff Larue have been chosen as thesis advisors because of their expertise in BIM. In addition, the university offers a wide range of professional expertise, computing resources, various BIM software, and library resources for this particular research.