

The Pennsylvania State University

# Case Study Procedure

Methods used to analysis an owner organization for the planning of BIM implementation

## Executive Summary:

This document outlines the methodology that will be used to conduct and document case studies of owner organizations. The methodology includes collecting background knowledge of the organization, leading focus group meetings, conducting semi-structured interviews with operating unit heads and unit members, and performing artifact analysis of the organization. At the conclusion of the case study, the research team will prepare a report with a summary of the observations. The report will include a background of the organization, a background on the organization's implementation of BIM, a summary of the methodology used on the case study, an analysis of the BIM Planning Elements for Organization and conclusions. The planning element analysis will document the mission and goals; uses and tasks; processes; information needs; legal considerations, infrastructure and personnel. The personnel section will include the organizations hierarchy, roles and responsibilities, and change readiness. The elements on which the organization will be analyzed were identified through working sessions, focus group meetings and detailed content analysis of BIM literature. An outline of the report can be found in the appendix of this document. The overall goal of the case study is to perform the first step, the evaluation step, of the organizations BIM planning procedure.

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## Introduction:

This document outlines the methodology that will be used to conduct and document case studies of owner organizations. The methodology was created through focus group meetings. The categories on which the organizations are analyzed were identified through working sessions, focus group meetings and detailed content analysis of BIM literature including (Eastman et al. 2008), (State Architect's Office 2010), (Brucker et al. 2006), (USACE/Industry BIM Advisory Committee 2011), (AIA 2008), (Autodesk 2008), (US General Services Administration 2006), (Dept. of Veterans Affairs 2010), (CURT 2010), (University Architects Office 2009), (Fallon and Palmer 2006). The methodology includes collecting background knowledge of the organization, leading focus group meetings, conducting semi-structured interviews with representatives of the operating units, and performing artifact analysis of the organization. Once this is all completed, a summary of the analysis will be documented and reported to the organizations.

## Analysis Organizational Background

Before any on-site studies are initiated, an analysis of the organization's internal structure should be conducted. The team should determine and document the purpose of the organization and their current public BIM use. This will be completed through the analysis of organizational websites and other publications. This will help to ensure that the organization's internal processes are understood allowing for onsite meetings to be as productive as possible. The BIM Champion should verify the organizational background and add information if necessary.

## Meeting with BIM Champion

Early in the process an informal meeting with the BIM Champion, the lead contact for the organization, should be conducted. In this meeting the research team will review the methodology for the case study and establish a more detailed plan and schedule. During this meeting, the team will begin to identify necessary personnel for each operating unit to be interviewed. It may be helpful to this task, to diagram the hierarchy of the different operating units and their different basic tasks. The goals of the case study will also be distinctly defined during this meeting. Additionally the BIM champion will be asked to begin locating artifacts of the organization including products and publications. The artifacts should include general statements about the organization and also the details of their BIM Implementation. It is important to understand the background of the organization's BIM Use and whether or not they have a documented BIM Plan. If they have a BIM plan what are their goals for BIM Use as they relate to the mission of the organization. After the informal meeting with the BIM champion is completed, a time for a more detailed planning session with the BIM Planning Committee should be scheduled.

## Focus Group Meeting:

The focus group meeting will have the much of the same agenda as the initial meeting with the BIM Champion, but be a more detailed planning meeting. The group will begin by reviewing the goals of the case study and modifying them as necessary. The research team will once again review the research methodology that will be used for the case study with any revisions from the BIM Champion meeting. After the methodology is introduced, the group will review the interview list and the artifact list created by the BIM Champion making any additions as necessary. From there, the group can begin to schedule the interviews, observations, and analysis necessary to complete the case study. Before the end of the meeting, the group should review goals and vision of the BIM Use as they pertain to the organization's mission. By the end of this meeting the research team should have a comprehensive list of the necessary personnel to be interviewed; a list of artifacts to analyze; and a schedule in which to complete the analysis tasks.

## Semi-Structured Interviews

To help determine the needs of the organization, semi-structured interviews will be conducted. The interviews will be of the both the operating unit supervisors and some of the more hands on staff members. The goal of the interviews is to understand each operating units needs that can be assisted through BIM. The question will be based around the organizational BIM Planning Elements and can be located in the appendix of this document. The interviewees should be allotted at least a half hour of time for each interview. Once the interviews are completed, the responses will be summarized along with other analysis into a report for the organization's assessment.

## Artifact Analysis

To analyze artifacts, we will look at the visible products of the organization and operating units. The visible products include items such as

the architecture of its physical environment; its language; its technology and products; its artistic creations; its style, as embodied in clothing, manners of address, and emotional displays; its myths and stories told about the organization; its published lists of values; and its observable rituals and ceremonies.(Schein 2010)

In these case studies, we will look at products such as charters/missions, formal descriptions of the organizations processes, and organizational hierarchy charts. Moreover we will look at BIM specific publications such as road maps and BIM Plans. Additionally we will consider the products of the organizations process. The products will then be related and evaluated based on the organizational planning elements as mission and goals; uses; process; information needs; etc.

## Observational Analysis

In addition to artifact analysis, the research team will spend time observing the tasks and processes of each operating unit. While observing the process, we will try to get a better understanding of the tasks by observing the operators and supervisors. We will be looking at processes which we do not understand and tasks that maybe unproductive or information heavy. During the observation period we will try to learn if there are any inconsistencies between the artifacts of the organization and the observed behaviors. In other words, do the processes and goals layout within the literature of the organization match what is actually being performed by the organization? The observational analysis will also help to determine how ready to organization is adopt BIM technologies into the daily operations of that unit.

## Change Readiness Analysis

The goal of this analysis will be to determine how ready each operating unit and the organization is for change and BIM adoption based on the observations and interviews of the different operating units. In order to initiate change, an organization must first create a motivation to change within the operating units. In most cases, owner organizational adoption of BIM is a radically innovative change in that this is an entire new practice within the industry. As part of the analysis of an organization, we will determine whether or not steps need to be taken to ensure that the operating units are motivated to change. In addition, the espoused belief and values and the basic undying assumption play a role in the organizational ability to change. We will try to determine if any of the values and assumption of the organization may affect the adoption of BIM. Throughout the interviews and observations, we will attempt to assess organization's attitudes to the factors that may prevent change. Some of these factors include an individual's predisposition toward change; surprise and fear of the unknown; climate of mistrust; fear of failure; loss of status or job security; peer pressure; disruption of cultural traditions or group relationships; personality conflicts; lack of tact or poor timing; and non-reinforcing reward system (Kreitner 2007). At the end of this analysis, we will summarize areas and factors that may affect the adoption of BIM within the case study organization.

## Anticipated Outcomes

At the conclusion of the case study, the research team will prepare a report with a summary of the team's observations. The report will include a background of the organization, a background on the organization's implementation of BIM, a summary of the methodology used on the case study, an analysis of the BIM Planning Elements for Organization and conclusions. The planning element analysis will document the mission and goals; uses and tasks; processes; information needs; legal considerations, infrastructure and personnel. The personnel section will include the organizations hierarchy, roles and responsibilities, and change readiness. An outline of the report can be found in the appendix of this document. The overall goal of the case study is to perform the first step, the evaluation step, of the organizations BIM planning procedure.

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## Appendix A: Semi-Structured Interview Questions:

Note: all questions should not be asked during each interview. These questions would be altered based on the interviewee and the direction to which the interview is emerging.

### Mission and Goals:

- What is the mission of the operating unit?
- What are the goals of the operating unit?
- How often does the operating unit review the goals?
- How does the operating unit's mission and goals support the goals, mission, and purpose of the Organization?
- What are some additional goals that have not yet been attainable due to current organizational processes?

### Tasks (Uses):

- What are the tasks, duties, and responsibilities of this operating unit?

### Processes:

- How does this operating unit function?
- What is the process for each of the major tasks?
- Who are people to work with in order to gain further information on day-to-day processes?

### Information Needs:

1. What information does this operating unit manage?
  - How
  - Where
  - Why
2. What do you use to manage this information?
  - Software
  - Hardware
  - Number of Users
  - Why did they choose this option?
  - Do they share/receive info from other departments?
    - i. Why?
    - ii. With whom?
    - iii. Is the work/information duplicated anywhere?
    - iv. What are the issues regarding sharing/duplicating information?

3. How is a facility handed over?
  - Do you have a documented building commissioning plan?
  - What are your primary steps for handing over building data/information?
4. How do you manage as-builts & record drawings?
  - Are renovations documented?
  - Is “as-maintained” documentation kept for the facility?
  - How do operations acquire documentation of facilities?

## Legal Considerations:

1. Determine all the divisions within planning/design/construction group.
2. How are projects procured?
  - DBB, DB, CM, etc..
  - Why are they procured that way?
3. What is the level of participation?
  - Is the owner actively involved in overseeing the project?
  - Is the operations and maintenance considered during the planning stage?
    - i. Does the operations and maintenance group have input in the design?
4. Is there any contracts or documentation requiring BIM to be used on projects
  - If yes, what does it say (Get a copy if possible)
    - i. Uses
    - ii. LOD
    - iii. Ownership
    - iv. Liability/indemnification
    - v. Collaboration
    - vi. Execution plan
  - If no, why isn't there anything?
    - vii. Would you add it to the contract if you knew what to say?
    - viii. Does liability influence your decision?

## Personnel:

### Hierarchy and Structure of Operating Unit:

1. What level of support does this initiative have from upper management?
2. Is the operations/maintenance division able to make decisions that influence the cost of a project?
  - If yes, are they on the same budget?
3. If no, how can we improve the communication between the two departments while maintaining the existing financial structure?

### **Personnel and Types in Operating Unit:**

- What are the personal and personnel types or categories within your operating unit

### **Roles and Responsibilities in Operating Unit:**

- What are the roles and responsible of each type of personnel within your operating unit

### **Education and Training:**

What is the education and training program for BIM and in general?)

### **Change Readiness:**

### **Infrastructure:**

- What is some of the infrastructure that you have?

### **General Questions:**

- What issues do they experience with their facilities?
  - i. Maintenance/Accessibility/lack of information
  - ii. Poor design
  - iii. Are they able to provide input during the planning of a new facility?
- What would assist them in doing their job more efficiently?
  - iv. additional information
  - v. Increased accuracy
  - vi. More up-to-date information
  - vii. Faster access

## Appendix B: Template of Case Study Documentation:

# Organization Name

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### *An Organizational BIM Implementation Case Study*

#### **Background of Organization:**

(What does the organization do? What is the purpose of the organization? What type of organization are they? Government, Private, etc)

#### **Background of Organizations Implementation of BIM:**

(Document key milestones within their BIM implementation. Also include background on, BIM Champion, BIM Planning Committee, Management Buy-In, current Change Management Plan and BIM Road Map)

#### **Case Study Procedure:**

(brief summary of the events the case study including background research, meetings, interviews, and artifact analysis)

#### **BIM Planning Elements for Organizations:**

(Basic summary of organizations planning elements)

#### **Mission and Goals:**

##### **Mission and Goals of Organization:**

(This is a summary of the goals and mission of the organization. This may also be a part of the Background of the organization. )

##### **BIM Mission Statement and Goals:**

(This is a summary of the BIM Goals and Mission)

##### **How BIM Goals Support the Organizational Mission and Goals:**

(This is an analysis of if and how the BIM goals support the general goals and mission of the organization.)

### Case Study Methodology

## Current BIM Uses and Organizational Tasks:

### Operation Uses and Tasks

(This section will document any Uses of BIM that the organization is currently using within their operating units. The extent to which the Uses are implemented will also be documented in this section. Additionally, those tasks that could be greatly assisted with the implementation of BIM will also be noted in this section.)

### Project Uses and Tasks

(This section will include the current uses; their level of implementation; and task that can be assisted with BIM on construction projects.\_

## Processes

### High Level Organizational Process

(A high-level process map of the organization will be created to better understand how the organization functions)

### Level Two Organizational Process

(Detailed level-two process maps will be made for the tasks that the team determines will benefit from the implementation of BIM)

## Information Needs

(This section will document the facility information that is captured, stored, and reused within each operating unit of the organization. The documentation should include level of detail, data structure, data quality, security and format.)

## Legal Considerations

(Document current project contract language related to BIM along with any delivery method implications related to BIM.

- Do they have BIM contract language
- What is the level of contract development
  - Do they require an BIM Project Execution Plan
  - Do they have a model breakdown in contract language
  - Do they require certain uses of BIM
- what are the elements that should be present in a standard contract?)

## Personnel

(For employees who are working on tasks related to BIM, document their current roles and responsibilities, staff allocation, level of BIM training, and organizational hierarchy.)

**Organizational Hierarchy and Structure:**

(This section will chart the organizations hierarchy)

**Roles and Responsibilities:**

(This section will document the roles and responsibilities of those affected by BIM Implementation)

**Education and Training:**

(This section documents the current education and training program for BIM and in general?)

**Change Readiness:**

(This section documents the organizations readiness to adopt BIM. Additionally it will document the areas of the organization that may resist change.)

**Conclusions:**

(This section will include a summary the organizations as related to the BIM Planning Elements and may include a general direction and recommendation for future BIM Implementation.)