Autodesk BIM Deployment Plan: A Practical Framework for Implementing BIM

IMPORTANT — PLEASE READ

This document is being provided for informational purposes only. THE FRAMEWORK AND GUIDANCE CONTAINED IN THIS DOCUMENT ARE NOT SUBSTITUTES FOR YOUR PROFESSIONAL JUDGMENT. THEY ARE INTENDED TO ASSIST YOU IN DEVELOPING A FRAMEWORK APROPRIATE TO YOUR PROJECT NEEDS GIVEN THE LARGE VARIETY OF POTENTIAL APPLICATIONS. THE FRAMEWORK AND GUIDANCE SET FORTH IN THIS DOCUMENT HAVE NOT BEEN TESTED IN ALL SITUATIONS UNDER WHICH THEY MAY BE USED AND MAY BE UPDATED FROM TIME TO TIME, SO AUTODESK SHALL NOT BE LIABLE IN ANY MANNER WHATSOEVER FOR THE RESULTS OBTAINED THROUGH ITS USE. PERSONS DEPLOYING THE FRAMEWORK AND GUIDANCE SET FORTH IN THIS DOCUMENT ARE RESPONSIBLE FOR THE OUTCOME OF THEIR APPLICATION. THIS RESPONSIBILITY INCLUDES, BUT IS NOT LIMITED TO, THE DETERMINATION OF APPROPRIATE CHANGES AND IMPLEMENTATION TO ACHIEVE INTENDED RESULTS, IDENTIFYING AND REVIEWING OTHER CONSIDERATIONS RELEVANT TO ITS DEPLOYMENT, AND SEEKING APROPRIATE PROFESSIONAL COUNSEL AS NECESSARY.

NO WARRANTY. AUTODESK, INC. ("AUTODESK") MAKES NO REPRESENTATIONS ABOUT THE SUITABILITY OF THE CONTENT OF THIS DOCUMENT FOR ANY PURPOSE. THIS PUBLICATION AND THE INFORMATION CONTAINED HEREIN IS MADE AVAILABLE BY AUTODESK, INC. "AS IS." AUTODESK HEREBY DISCLAIMS ALL WARRANTIES, EITHER EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, TITLE, AND NON-INFRINGEMENT, REGARDING THESE MATERIALS. IN NO EVENT SHALL AUTODESK BE LIABLE FOR ANY SPECIAL, INDIRECT, EXEMPLARY, OR CONSEQUENTIAL DAMAGES OR ANY DAMAGES WHATSOEVER, INCLUDING BUT NOT LIMITED TO LOSS OF USE, DATA, OR PROFITS, WITHOUT REGARD TO THE FORM OF ANY ACTION, INCLUDING BUT NOT LIMITED TO CONTRACT, NEGLIGENCE, OR OTHER TORTS, ARISING OUT OF OR IN CONNECTION WITH THE USE, COPYING, OR DISPLAY OF THIS DOCUMENT.

None of the information contained herein should be construed as legal advice. If you need legal advice, please seek the advice of independent legal counsel. No attorney client-relationship is formed by virtue of the content or use of this document.

Occasionally, Autodesk makes statements regarding planned or future development efforts for our existing or new products and services. These statements are not intended to be a promise or guarantee of future delivery of products, services, or features but merely reflect our current plans, which may change. The company assumes no obligation to update these forward-looking statements to reflect any change in circumstances, after the statements are made.

Published by:
Autodesk, Inc.
111 McInnis Parkway
San Rafael, CA 94903, USA

Executive Summary

In today's architecture, engineering, and construction (AEC) industry, new technologies and practices are making a significant difference in how building projects get delivered. Owners, architects, engineers, and contractors are using collaborative communication platforms to manage and share information and standardize their business processes. Meanwhile, advanced model creation tools let stakeholders visualize, simulate, and analyze how a building might behave, perform, or appear—with more precision than ever before.

But the plethora of new tools, technologies, and practices may seem confusing. To help users navigate and take advantage of the savings in cost and time these tools can offer, we have created this document.

The Autodesk BIM Deployment Plan outlines practices and provides a framework for using building information modeling (BIM) technology and practices that can help to deliver projects faster, more cost-effectively, and more sustainably.

Filled with information and planning templates designed to streamline project communications, this plan focuses on helping you reduce design and construction costs through collaborative communication. By using this document as an adaptable template to establish organizational and project standards and responsibilities from the start, you'll ensure that all stakeholders get the information they need during every phase of the building project. The accompanying supplement (in Microsoft Word format) includes tables that you can fill in and edit as needed to create your own plan.

Contents

SECTION 1:

Organizational BIM Deployment Plan

1.0.0.0 Overview

In recent years, new technologies and practices have fundamentally changed how building projects are delivered. These technologies range from new tools for model creation to the use of visualization, simulation, and analysis tools to better predict a building's behavior, performance, or appearance. In addition, collaborative communication platforms are used to manage and share information and drive business process standardization.

The intent of this Autodesk BIM Deployment Plan document is to provide a framework that lets owners, architects, engineers and contractors deploy building information modeling (BIM) technology and best practices to deliver projects faster and more cost-effectively. This document also makes suggestions on the roles and responsibilities of each party, the detail and scope of information to be shared, relevant business processes, and supporting software. The document is divided into two sections: The Organizational BIM Plan and The Project BIM Plan. The Organizational BIM Plan helps companies implement BIM technologies at the organizational level, while the Project BIM Plan helps project teams implement BIM technologies.

For stakeholders in building projects, the potential benefits of applying the framework and suggestions include:

- Improved communication and collaboration among all project team members
- Fewer problems related to overruns in cost, schedule, and scope, or quality concerns
- The ability to reliably deliver projects faster, more economically, and with reduced environmental impact.

BIM technology helps builders ensure that project knowledge remains accessible continuously throughout the different phases—planning, bidding, building, and operating—of any construction project. But before they deploy BIM technology, builders need information on how to streamline their communications and select the right tools.

Autodesk created this BIM Deployment Plan to help guide companies like yours through the process. It helps you define project teams, indentify key processes and dependencies throughout your project, assign roles and responsibilities, and select software solutions that use collaborative communication to reduce your project costs.

1.1.0.0 Organizational BIM Vision

In this section you'll define your Organizational BIM Vision, including goals, objectives, and alignment with your overall organizational vision.

1.1.1.0 Alignment with Organizational Vision

The implementation of BIM technologies can have a large impact on the operations of your organization. In the space provided below, list your organization's vision statement and specify how the implementation of BIM technologies enhances and or alters that vision. The first lines show examples.

Organization Vision Statement
To be the premier general contractor for complex construction projects, in which meeting challenges through technology sets us apart from our competition.
BIM Enhances Vision
BIM tools enhance our company's technology offering and help us provide superior service to our clients.
BIM Alters Vision
BIM technologies will allow us to compete in the IPD market.

1.1.2.0 Goals for BIM

Implementing collaborative project management and BIM technologies across your organization can offer tangible as well as intangible benefits. List your goals and objectives for using BIM and collaborative project management technologies and processes below. Also note how you will measure the achievement of these objectives and their targeted timeframes. The first row shows an example.

BIM Goal	Measureable Objective	Achieved If	Projected Timeframe
Improve operations management on all new facilities	*Obtain an as-built model on all new construction showing mechanical systems information*	*A model is collected or updated by the project team after each project or WO*	*April 2010*

1.2.0.0 Modeling Plan

In this section you will evaluate the different types of models to be created as part of your organization's service offerings. You will evaluate planned models, set modeling standards, and modeling analysis options.

1.2.1.0 Planned Models

During the course of a project, the project team may generate multiple models. Typically the architect and architecture subconsultants generate a Design Intent model to depict the design intent of the building, and the contractor and contracting subcontractors generate a Construction model to simulate construction and analyze the constructability of the building. The construction team should provide input for the Design Intent model, while the design team should provide input for the Construction model.

Even when the team is committed to using integrated project delivery (IPD) methods, creating separate models is sometimes necessary due to contractual obligations, risk factors, and the functional intent of each model. For example, the Design Intent model—used to depict the design intent—may not include information on the means and method or sequencing of construction. Other models may be created specifically for certain types of analysis, such as energy consumption or safety. These Analysis models are usually spinoffs of either the Design Intent model or the Construction model. Analysis models will be specified further in section 2.2.3.0 of this document, which covers Analysis models and planning.

In the table below, outline the models that your organization may create in a typical project. List model name, model content, the project phase when the model will be delivered, and the model authoring tool to be used. For models that will not be created by your organization, leave the row blank; add rows for model types that you anticipate needing that are not already listed. The first row offers an example.

Model Name	**Model Content**	**Project Phase**	**Authoring Tool**
Coordination Model	*Architectural, structural, and MEP components of main building and parking garage structure*	*Design development and construction documents*	*Autodesk® Revit® Architecture software*
Civil Model			
Architectural Model			
Structural Model			
MEP Model			
Construction Model			
Coordination Model			
As-Built Model			

1.2.2.0 Modeling Standards

Establishing modeling standards is a critical component of implementing BIM technologies. In this section, you will establish guidelines for precision and dimensioning, object properties, level of detail, and measurement convention.

1.2.2.1 Precision and Dimensioning

Models should include all appropriate dimensioning as needed for design intent, analysis, and construction. With the exception of the exclusions listed below, the model will be considered complete. In the list below, enter which items' placement will not be considered for completeness of the model and should not be relied on for placement or assembly.

[*List items that will not be considered for dimensioning or placement*]

1.2.2.2 Modeling Object Properties

Your organization must establish how much information will be stored in object properties. The amount of information needed is a function of what it will be used for. The standard objective property data must also take into consideration the types of analysis to be performed on the models. See section 2.2.3.0 for more details on model analysis.

[*Define the amount of object property information here.*]

1.2.2.3 Modeling Level of Detail

A detailed Level of Detail (LOD) Analysis can be performed using the Exhibit A spreadsheet, which will help your organization identify which components will be modeled, by whom, during which project phase or milestone, and at what level of detail. The LOD is broken down into four levels: L1, L2, L3, and CD. In L1, the model will include basic shapes that represent approximate size, shape, and orientation of objects. These objects may be in 2D or 3D. In L2, the model will include object assemblies with approximate size, shape, orientation, and object data.

In L3, the model will include data-rich assemblies with actual size, shape, and orientation. In CD (Construction Documents), the model will include detailed assemblies with final size, shape, and orientation used for construction and fabrication. Proceed to Exhibit A for further details and instructions.

Certain items may be excluded from the model, and can be defined by expressed exclusion and/or object size.

1.2.2.3a Exclusions: List any objects that will be excluded from the model in the space below.

[*List exclusions here*]

1.2.2.3b Size: Any object smaller than [_____] *(Fill in item size, for example, 6"x6"x6")* will not be included in the model.

1.2.2.4 System of Measurement Convention

Specify the standard units convention for the organization. [_____] (Metric or English)

1.2.3.0 Analysis Models

A number of analysis tools allow you to leverage BIM technologies for superior foresight on your design and construction. This section outlines the major types of analysis tools.

1.2.3.1 Quantity Takeoff Analysis

The objective of quantity takeoff analysis is to use modeling property data to automate or simplify the quantity takeoff process. The information from the quantity takeoff tool can then be imported or tied to cost-estimating software. For the quantity takeoff process to work seamlessly, the original modeling author must include the relevant property information in the design.

1.2.3.2 Scheduling Analysis

Scheduling analysis lets the project team use the project model to analyze the timeline and sequencing for construction. This information can then be used to modify or adjust the construction schedule. While tools do exist that allow project team members to visualize construction over time, no such systems yet interact automatically with scheduling tools.

1.2.3.3 Clash Detection Analysis

Clash detection analysis is done to check for interferences between the designs of one or many models. To reduce change orders during construction, clash detection should be performed early and continue throughout the design process. For clash detection to work properly, your project's models must have a common reference point and must be compatible with the clash detection tool.

1.2.3.4 Visualization Analysis

Visualization tools let the project team view the design or construction of the project in 3D, giving a more accurate perspective on the end product.

1.2.3.5 LEED Rating/Energy Analysis

LEED (Leadership in Energy and Environmental Design) rating/energy analysis tools help the project team evaluate the impact of design decisions on sustainability and energy consumption. This analysis model is usually based on the main Architectural model, after which material and building system inputs can be used to evaluate the project's sustainability and energy consumption.

1.2.3.6 Structural Analysis

Structural analysis tools use the model to analyze the building's structural properties. Structural analysis programs typically use the finite element method (FEM) to measure the stresses on all structural elements of the design. For structural analysis to work seamlessly, the original structural modeling tool must be compatible with the structural analysis tool, and the original structural model property data must include information about the structural elements.

1.2.4.0 Planned Analysis Tools

List the types of analysis tools that your organization plans on implementing. Select the checkbox and list the name of the tool if known.

Analysis	Checkbox	Analysis Tool
Visualization	☐	
Structural	☐	
Clash Detection	☐	
Quantity Takeoff	☐	
Scheduling/4D	☐	
Cost Analysis/5D	☐	
Energy/LEED	☐	
Daylight/Lighting	☐	

1.3.0.0 Staffing Plan

In this section you'll define your organization's staffing plan, which includes analysis of organizational structure, personnel skills, and staff acquisition and training requirements.

1.3.1.0 Organizational Structure

The implementation of BIM technologies may change the structure of your organization. Some organizations form new departments and/or new positions to handle the management of BIM technologies or services. In this section, you'll outline your current organizational structure, and recommendations will be made for your future organizational structure as it relates to BIM technologies and services.

1.3.1.1 Current Structure

[*List your company's current organization structure. Include an org chart if needed.*]

1.3.1.2 Recommended Structure

[*List the recommended organization structure. Include an org chart if needed.*]

1.3.2.0 Personnel Skills

The implementation of BIM technologies may require new skills. In this section, you'll outline your organization's current skills, and recommendations will be made for skills your organization will need to implement BIM technologies.

1.3.2.1 Current Skills

In the space below, fill in your organization's current skills by listing personnel type, number of employees of each type, and average skill level. The first row shows an example.

Skill	Personnel Type	No.	Average Skill Level
2D CAD Design	*Administrative assistant* *Associate architect* *Project manager* *Executive*	*5* *37* *8* *3*	*None* *Expert* *Novice* *None*

1.3.2.2 Required Skills

In the space below, fill in desired skills by listing personnel type, number of total employees, the desired average skill level, and the number of employees with the desired skill level. The first row shows an example.

Skill	Personnel Type	Total No.	Desired Skill Level	Desired No. w/Skill Level
3D BIM Design	*Administrative assistant* *Associate architect* *Project manager* *Executive*	*5* *37* *8* *3*	*None* *Expert* *Intermediate* *None*	*0* *10* *2* *0*

1.3.3.0 Staff Acquisition

In some situations, additional staff will be needed to implement BIM technologies. In the space below, list staffing requirements including type, number of current type, number of new staff needed, location or region, and hiring timeframe. The first row shows an example.

Staff Type	Current No.	Needed No.	Location/Region	Timeframe
Project BIM Coordinator	*0* *1*	*3* *5*	*Atlanta office* *Tampa office*	*February 2010* *December 2009*

1.3.4.0 Training Requirements

Current and acquired staff will need to be trained on new BIM technologies. A detailed Training Plan is outlined in section 1.4.2.0 of this document. In the space below, list training requirements including skill, personnel type, number of personnel to be trained, and number of training hours required per individual. The first row shows an example.

Skill	Personnel Type	No. of Staff	Training Hours
Autodesk® Revit® Structure	*Associate architect* *Project manager*	*10* *2*	*40* *8*

1.4.0.0 Systems Implementation Plan

In most cases, consultants will guide your organization through the implementation of new BIM technologies. Consultants may provide your organization with additional implementation documents including a project schedule, project plan, and other deliverables. In this section you'll define your organization's implementation plan, which includes a Communication Plan, Training Plan, and Support Plan.

1.4.1.0 Communication Plan

Implementing BIM technologies can create a significant shift in your organization's operations. It is important to have effective communication regarding implementation, to ensure a smooth transition and avoid confusion or misinformation. List your organization's Communication Plan below.

[*List your organization's Communication Plan here.*]

1.4.2.0 Training Plan

Training is needed to effectively implement BIM technologies. In the space below, list the training courses to be provided to staff and organizational partners. Include the systems they will be trained on, intended audience, class length in hours, number of people to be trained, and timeframe. The first row shows an example.

System	Audience	Class Length	No. to be Trained	Timeframe
Autodesk® Quantity Takeoff	*Project engineer* *Estimating manager* *Project manager*	*16* *16* *4*	*10* *2* *15*	*February 2010* *February 2010* *February 2010*

1.4.3.0 Support Plan

Your organization will need support throughout the implementation process, and especially after training. In many cases, software vendors offer various levels of support. Your organization may also have internal support. In the space below, list your support options including system, support type, contact information, and hours of support. The first row shows an example.

System	Support Type	Contact Information	Support Hours
Autodesk® Revit® Architecture	*Autodesk Premium Support*	*1-800-555-5555*	*8 AM–6 PM EST*

1.5.0.0 Corporate Collaboration Plan

Creating a corporate collaboration plan will help your staff efficiently communicate, share, and retrieve information created from your new BIM technologies. In some cases your organization will be able to leverage existing collaboration and communication protocols. In other cases, BIM technologies may force you reevaluate how your organization communicates, shares, and retrieves information.

1.5.1.0 Document Management

You can create a file folder structure on your network or in your organization's document management system, and give staff the ability to upload, download, edit, mark up, and view documents in the folder structure, based on permissions assigned by the network administrator.

1.5.1.1 Permissions and Access

Your company's network administrator should control permissions for the network or document management file folder structure.

1.5.1.2 Folder Maintenance

Although file folder structure and permissions should be defined, the network administrator is responsible for setting up the structure and maintaining the system.

1.5.1.3 Folder Notifications

Select groups, individuals, or the entire staff can be notified based on activities in the file folder structure. Notification messages should include information about the file(s) updated and who updated them.

1.5.1.4 File Naming Convention

All files should be accurately and descriptively named. Avoid using the date in file names, as the collaborative project management system or network will control the dates and versions.

[*If there are files with special naming requirements, list them here.*]

1.6.0.0 Corporate Technology Plan

In this section, you'll define your organization's corporate technology plan. You will evaluate your current technology capability and access the requirements needed to implement new BIM technologies—including software, infrastructure, and hardware requirements.

1.6.1.0 Software Selection

To get optimal results from your BIM tools, we recommend using tools that meet the following criteria.

1.6.1.1 Model Creation

The model creation tool should be built on a database platform that allows the creation of parametric and information-rich objects. Parametric modeling dependencies should be automatically updated whenever changes are made. Since a design may come from multiple parties, the BIM tool should accommodate file linking, sharing, or referencing. The BIM technology must be capable of producing 2D plans to fulfill contract document deliverable requirements. The system should be able to create and output files that conform to the IFC (Industry Foundation Classes) file type standards developed by the International Alliance for Interoperability (IAI).

1.6.1.2 Model Integration

The model integrator will be used to combine multiple design files from different software platforms. The tool will also be used for model simulations. The simulation tool must allow the user to simulate construction processes over time and allow for real-time walkthroughs. The model integrator should be able to open and combine at least .dwg, .dwf, .dxf, .sat, .ifc, .dgn, .prp, .prw, .ipt, .iam, and .ipf file types.

1.6.1.3 Clash Detection/Model Mediation

The clash detection tool should be able to perform clash detection analysis on one or more design files. The system should be able to generate clash detection reports, which can be exported into either .xls, .csv, or .xml file formats. The clash detection reports should include a list of clashes along with visual evidence.

1.6.1.4 Model Visualization

The model visualization software will be used by project team members who do not need the full functionality of the BIM model creation, integration, or simulation tools. The visualization tool must allow users to look around, zoom, pan, orbit, examine, and fly through the model.

1.6.1.5 Model Sequencing

The 4D model sequencing tool will be used to visualize the scheduled assembly of the building. The tool should allow users to visualize the assembly of the building based on scheduling input. It should also integrate with standard scheduling systems such as Microsoft Project or Primavera.

1.6.1.6 Model Quantity Takeoff

The quantity takeoff tool will be used to extract quantities from BIM models for cost-estimating and purchasing purposes. The tool must be able to extract quantities automatically both from 3D and 2D design files. The quantity takeoff software must be able to integrate with estimating programs, or the information from the system must be exportable to an .xls, .csv, or .xml file format. The quantity takeoff tool must be compatible with the model creation tool listed below in section 1.6.1.7.

1.6.1.7 Collaborative Project Management

The collaborative project management system may be made up of one or more software packages. However, for best results, the complete collaborative project management system should:

- Be web-based or web-enabled—so all relevant, authorized project team members can access it remotely
- Accommodate different permissions profiles for different project team members
- Allow communication through either internal messaging or system-generated email
- Include document management capability that lets the project team create a customized and permission-based folder structure that offers upload, download, and version control capabilities
- Include a viewer that allows the project team to view .dwg, .dgn, .plt, .dwf, .pdf, .tif, .jpg, .doc, and .xls files
- Include construction management capabilities for tracking requests for information (RFIs), submittals, design review, meeting minutes, daily reports, issues, correspondence, and transmittals
- Be able to interact with the file folder structure in the document management section
- Include bid management capability, and allow the project team to post contract drawings and specifications for viewing in the form of a Plan Room
- Allow for cost management controls including budgeting, contracting, change orders processing, and payments applications tracking.
- Allow the project team to run reports based on the information in the system
- Allow for workflow and routing throughout the documentation, construction, and cost management components of the solution

Select the components and specific software you will use and list them below for easy reference.

	Software Component	Model	Software System	Version
☐	Model Creation	Architectural Design		
☐	Model Creation	Civil Design		
☐	Model Creation	Structural Design		
☐	Model Creation	MEP Design		
☐	Model Creation	Coordination		
☐	Model Creation	Construction		
☐	Model Creation	As-Built		
☐	Model Integration			
☐	Model Mediation			
☐	Model Visualization			
☐	Model Sequencing			
☐	Model Quantity Takeoff			
☐	Collaborative Messaging and Communication			
☐	Document Management			
☐	Design Management			
☐	Bid Management			
☐	Construction Management			
☐	Cost Management			
☐	Facility/Operations Management	As-Built		

1.6.2.0 Infrastructure Requirements

Infrastructure requirements will differ based on current capabilities and intended BIM technologies outlined above. Analysis must be done based on your organization's current technology infrastructure and on the requirements of the software systems selected above. In the space below, list infrastructure additions that must be made to accommodate the new BIM technologies.

[*List infrastructure additions needed to accommodate BIM technologies.*]

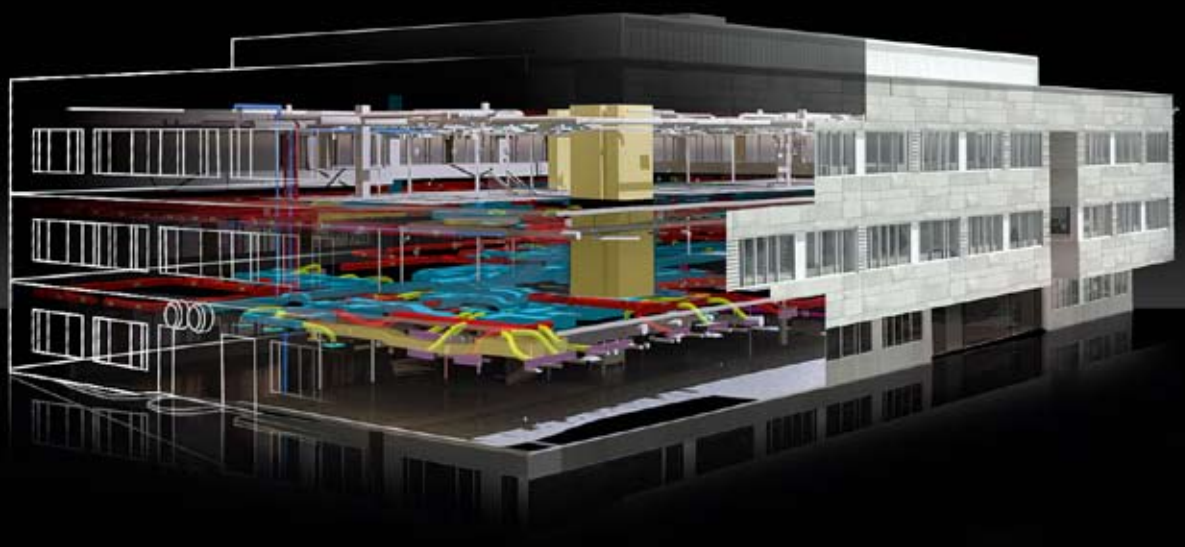
1.6.3.0 Hardware Requirements

Hardware requirements will be different based on current capabilities and intended BIM technologies outlined above. Analysis must be done on your organization's current hardware and software requirements as selected above. In the space below, list the hardware additions that must be made to accommodate the new BIM technologies.

[*List hardware additions needed to accommodate BIM technologies.*]

SECTION 2:

Project BIM Deployment Plan



2.0.0.0 Overview

In this section of the BIM Deployment plan, you'll learn how to establish a planning framework for your building projects, and discover information about different kinds of technology that can help you work more efficiently:

- Solutions that help project teams create, adapt, and reuse information-rich digital models during every stage of the project, including design, construction, and operations.
- Analysis tools that deliver insight into the constructability and potential performance of buildings before they are built. Using this analysis, your project teams can make more informed decisions about building materials, energy, and sustainability—and detect and prevent costly clashes among elements such as pipes and beams.
- A collaborative communication platform that helps reinforce business processes while ensuring that all team members share project information in a structured manner.

With these solutions, you can help keep BIM data intact throughout all phases of development. At the beginning of a project, the team can work together to resolve design problems before breaking ground. When a project is completed, instead of delivering unwieldy rolls and boxes of paper documentation, the team can present the building owner with a complete digital model that provides all information necessary to manage and operate the building.

Project teams can use the BIM Deployment Plan as a collaborative, working template for establishing project standards and alignment early in a project. The BIM Deployment Plan will also help your teams define the roles and responsibilities for each team member, what types of information to create and share, and what kind of software systems to use and how to use them. Your project teams will be able to streamline communications and plan more effectively—reducing costs as well as concerns about quality, scope, and schedule across all phases of construction.

2.1.0.0 Project Initiation

To start the process, you'll define your Core Collaboration Team, as well as your project objectives, project phases, and overall communication plan throughout the project's phases.

2.1.1.0 Project Description

Enter key information about the project below. Include the project name, owner's project number, address, project description, and areas of the project that will and will not be modeled.

Project Name	
Owner's Project Number	
Project Address	
Project Description	
Areas Modeled	

2.1.2.0 Core Collaboration Team

Your project's Core Collaboration Team ideally should include at least one person from each stakeholder involved in the project, such as the owner, architect, contractor, subconsultants, suppliers, and trade contractors. This team is responsible for:

- Completing this BIM Deployment Plan
- Creating the document management file folder structure and permission levels in the collaborative project management system
- Enforcing the action plan set out in this document throughout design and construction of the project

To complete this BIM Deployment Plan, the Core Collaboration Team will:

- List the goals and objectives of using BIM and collaborative project management technologies on your project
- Specify project phases/milestones
- Map out communication among project team members for each project phase.

List the Core Collaboration Team members for your project below.

Contact Name	Role/Title	Company	Email	Phone

2.1.3.0 Project Goals and Objectives

Using collaborative project management and BIM technologies on projects can offer tangible as well as intangible benefits. Below, list your objectives for using BIM and collaborative project management technology and processes on this project. Also note how you will measure the achievement of each objective, and its target time frame. The first row shows an example.

Project Goal	Objective	Achieved If	Projected Timeframe
Streamline structural steel procurement	*Include the steel supplier in the modeling process in order to start fabrication earlier*	*Steel is ready and delivered to site when needed*	*April 2010*

2.1.4.0 Collaborative Process Mapping

To get the most out of collaborative project management and BIM initiatives during your project, invest a bit of time up front to map out planned collaboration among team members at each phase of the project.

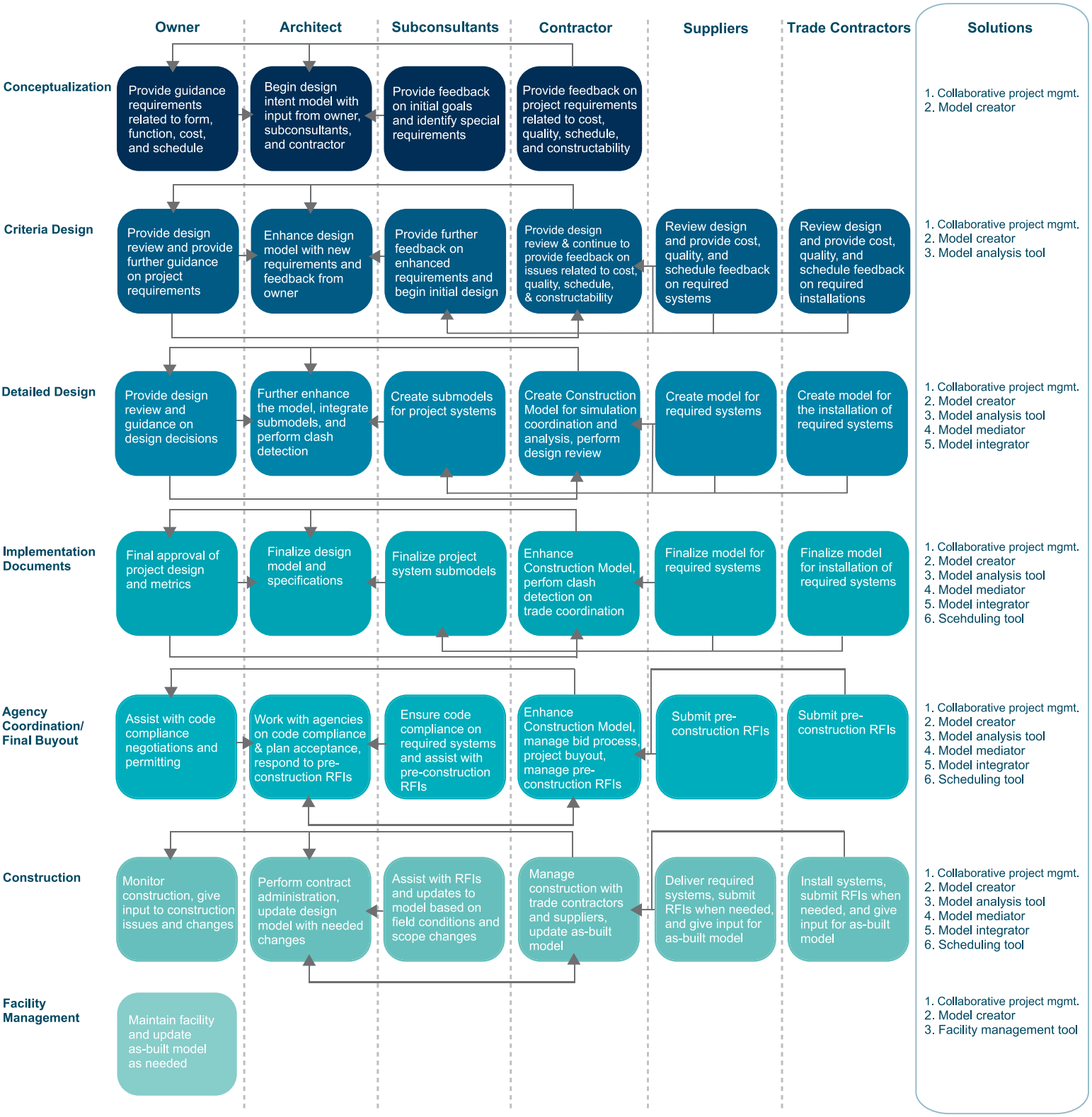
Below is a sample collaboration plan for three different project delivery methods—integrated project delivery, design-build project delivery, and design-bid-build project delivery. Use the blank chart following the example to enter your project's delivery method and collaboration plan. The resulting process map should show the phases of your project along the *y* axis, stakeholders involved in each phase along the *x* axis, the anticipated collaboration among team members in the text boxes, and software to be used in the last column.

Definitions for each project delivery method:

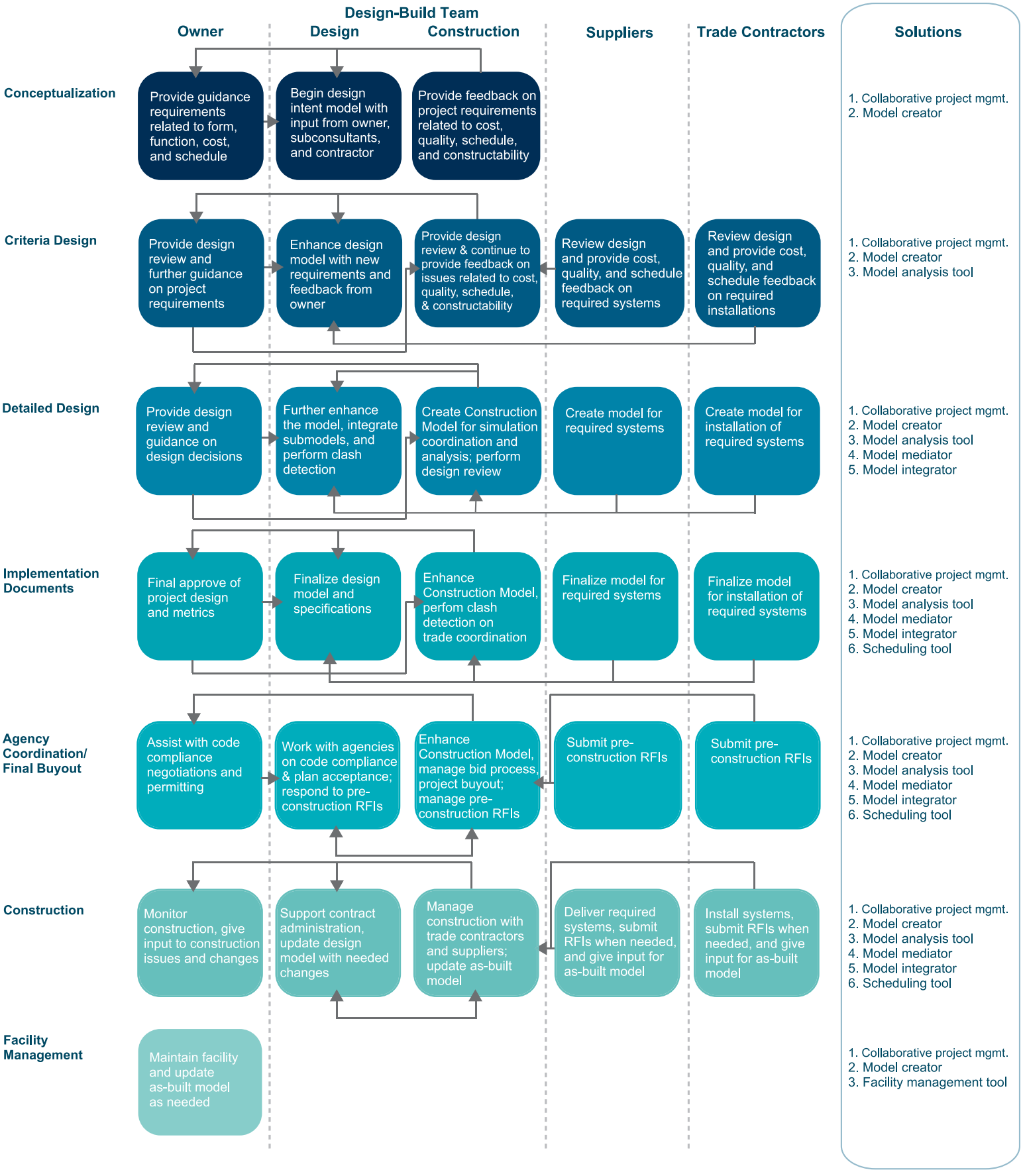
- **Integrated Project Delivery:** This method calls for integration at the onset of a project, and utilizes up-to-date technology to foster flexibility and successful project outcomes. This method collaboratively harnesses the talents and insights of all participants, fosters a great degree of communication, and promotes intense collaboration among the project team.

- **Design-Build Project Delivery:** With this method, one entity performs both architectural/engineering and construction under a single contract. The design-builder warrants to the contracting agency that it will produce documents that are complete and free from error.
- **Design-Bid-Build Project Delivery:** With this method, documents are fully developed by a designer paid by the owner before bidding by multiple contractors. This method limits a contractor's ability to use BIM to its full potential as a coordination tool.

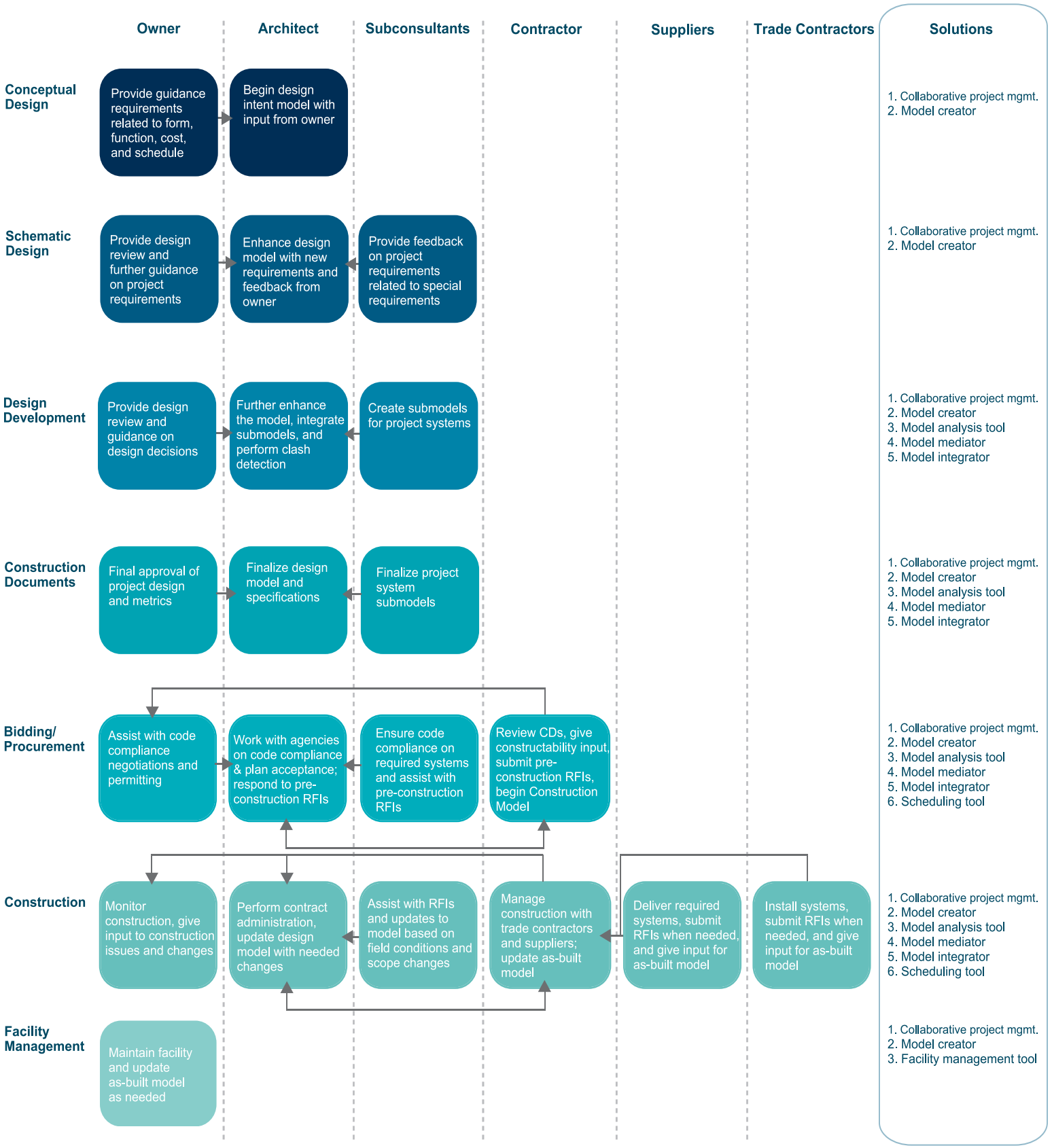
Integrated Project Delivery



Design-Build Project Delivery

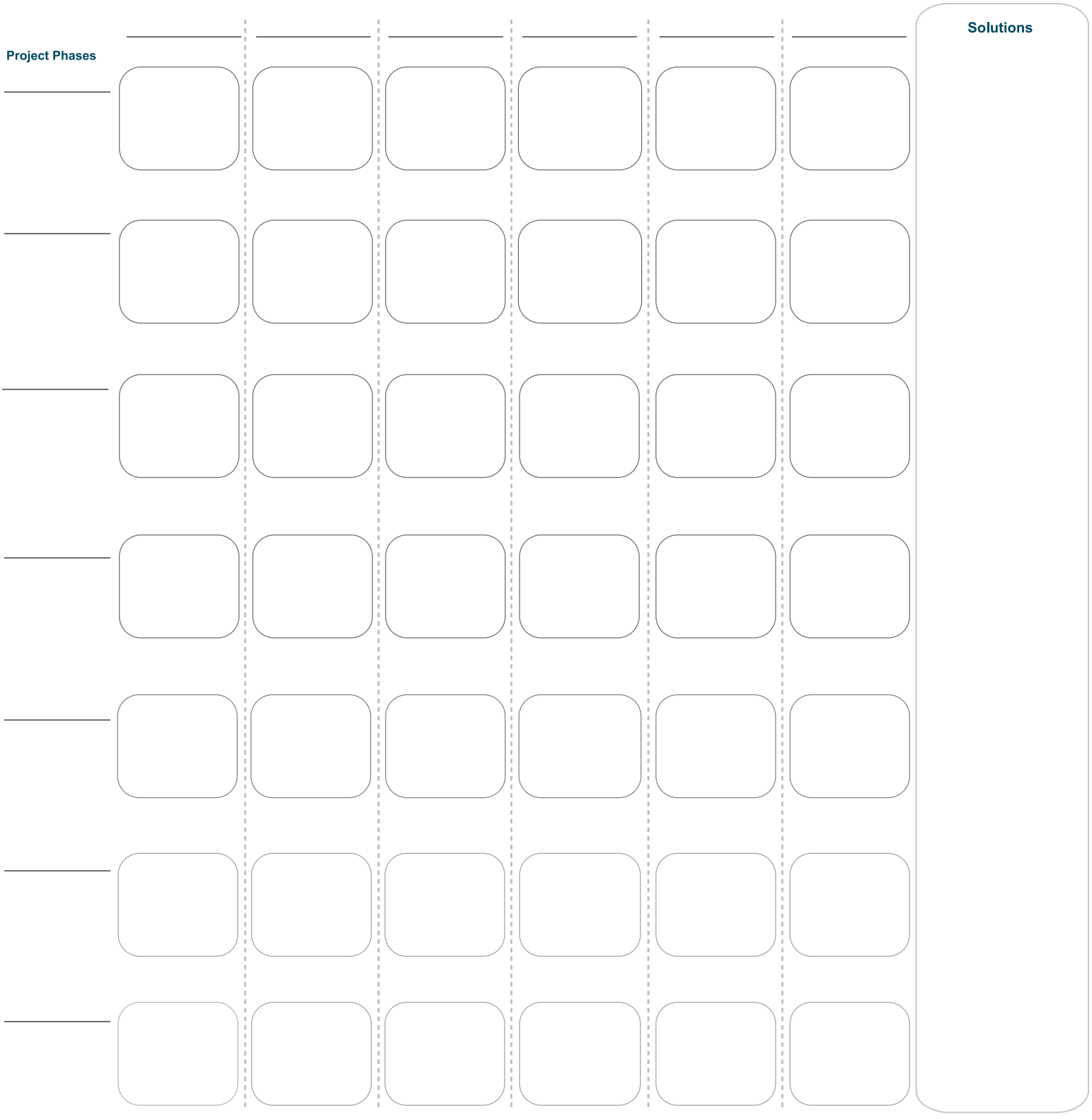


Design-Bid-Build Project Delivery



Use the blank chart below to create your project's collaboration plan. The process map should show the phases along the *y* axis, the stakeholders involved in each phase along the *x* axis, the anticipated collaboration between project team members in the text boxes, and software to be used in the final column.

Project Collaboration Plan



2.1.5.0 Project Phases/Milestones

Traditional project delivery includes phases of schematic design, design development, construction documents, construction operations, etc. Integrated project delivery (IPD) phases may include conceptualization, criteria design, detailed design, implementation documents, and others. For more information on IPD project phases, see the American Institute of Architects 2007 publication *Integrated Project Delivery: A Guide* (available at **www.aia.org/ipdg**).

In the table below, outline the phases of your project, their estimated start dates, and the stakeholders involved. The first row shows an example.

Project Phase/Milestone	Estimated Start Date	Estimated Completion Date	Project Stakeholders Involved
Conceptualization	*2/1/2008*	*4/1/2008*	*Owner, A/E, subconsultants, CM*

2.2.0.0 Modeling Plan

To help your project run more efficiently and cost-effectively during every phase, do as much advance planning as possible. Decide which models will be created during the different phases of the project and who will be responsible for updating models and distributing them. Content and format of models should also be predetermined as much as possible.

2.2.1.0. Model Managers

Each party—owner, architect, contractor, or subconsultant—responsible for contributing modeling content should assign a model manager to the project. Each model manager has a number of responsibilities that include but are not limited to:

- Transferring modeling content from one party to another
- Validating the level of detail and controls as defined for each project phase
- Validating modeling content during each phase
- Combining or linking multiple models
- Participating in design review and model coordination sessions
- Communicating issues back to internal and cross-company teams
- Keeping file naming accurate
- Managing version control
- Properly storing models in the collaborative project management system

List the model managers for the project in the table below.

Stakeholder Company Name	Model Manager Name	Email	Phone

2.2.2.0 Planned Models

During the course of your project, the project team may generate multiple models. Typically the architect and any subconsultants generate a Design Intent model to depict the design intent of the building, while the contractor and any subcontractors generate a Construction model to simulate construction and analyze the constructability of the project. The construction team should provide input for the Design Intent model, while the design team should provide input for the Construction model.

Even when the team is committed to using integrated project delivery (IPD) methods, it is sometimes necessary to create separate models due to contractual obligations, risk factors, and the functional intent of each model. For example, the Design Intent model—used to depict the design intent—may not include information on the means and method or sequencing of construction. Other models may be created specifically for certain types of analysis, such as energy consumption or safety. These Analysis models are usually spinoffs of either the Design Intent model or the Construction model. Analysis models will be specified further in section 2.3.0.0 of this document, which covers Analysis models and planning.

In the table below, outline the models that will be created for the project. List the model name, model content, project phase at which the model will be delivered, the model's authoring company, and the model authoring tool to be used. For models that will not be used or created in your project, just leave the row blank; add rows for any model types you anticipate a need for that are not already listed. The first row offers an example.

Model Name	Model Content	Project Phase	Authoring Company	Authoring Tool
Coordination Model	*Architectural, structural, and MEP components of main building and parking garage structure*	*Design development and construction documents*	*ABC Designers*	*Autodesk® Revit® Architecture software*
Civil Model				
Architectural Model				
Structural Model				
MEP Model				
Construction Model				
Coordination Model				
As-Built Model				

2.2.3.0 Model Components

As an aid to usability during later phases of your project, specify what the content, level of detail, and file naming structure of your models should look like.

2.2.3.0a File Naming Structure

Determine and list the structure for model file names. The first line offers an example.

Formatting for Model File Names
model type, hyphen, date—e.g., DESIGN-011208

2.2.3.0b Precision and Dimensioning

Models should include all appropriate dimensioning as needed for design intent, analysis, and construction. With the exception of the exclusions listed below, the model will be considered accurate and complete. In the table below, enter which items' placement will not be considered entirely accurate and should not be relied on for placement or assembly.

Items Not to be Considered Accurate for Dimensioning or Placement

2.2.3.1 Modeling Object Properties

The level of property information in the modeling objects and assemblies depends on the types of analysis to be performed on the model. See section 2.3.2.0 for the types of analysis that will be performed.

2.2.3.2 Modeling Level of Detail

A detailed Level of Detail (LOD) Analysis will be performed using Exhibit A. The exhibit will help the team identify which components will be modeled, by whom, the level of detail, and during which project phase or milestone they will be modeled. The LOD is broken down into four levels: L1, L2, L3, and CD. In L1, the model will include basic shapes that represent approximate size, shape, and orientation of objects. These objects may be in 2D or 3D. In L2 the model will include object assemblies with approximate size, shape, orientation, and object data. In L3, the model will include data-rich assemblies with actual size, shape, and orientation. In CD (Construction Documents), the model will include detailed assemblies with final size, shape, and orientation used for construction and fabrication. Proceed to Exhibit A for further details and instructions.

Certain items will be excluded from the model. These items can be defined by expressed exclusion and/or by object size.

2.2.3.2a Exclusions: List the objects to be excluded from the model in the table below. The first row offers an example.

Items to be Excluded from the Model
Door hardware

2.2.3.2b Size: Any object smaller than [_____] *(fill in item size, for example 6"x6"x6")* will not be included in the model.

2.2.3.3 Model Reference Coordination

Models may be linked or combined. In order for the referencing to work properly, a (0,0,0) reference point must be established. Fill in the (0,0,0) reference point for this project in the table below.

Project (0,0,0) Reference Point	

2.2.3.4 System of Measurement Convention

Specify the units convention for the project. The following project will utilize the [_____] (Metric or English) measurement system.

2.2.4.0 Contract Document Deliverable Requirements

Two-dimensional paper drawings or documents may be generated from certain models to fulfill contract document deliverable requirements. Certain models will be used for analysis purposes only and will not be included as part of the contract document deliverable requirements. List the models that will be considered part of the contract documents in the table below.

Models to be Considered Part of Project Contract Document Deliverables

2.2.5.0 Detailed Modeling Plan

For each phase of the project, the project team should create a detailed modeling plan, which should include modeling objectives, models included, and the roles and responsibilities of model contributors. Model objectives and model manager roles and responsibilities by phase are outlined below.

2.2.5.1 Conceptualization/Conceptual Design

2.2.5.1a Objectives: Provide initial design based on conceptual parameters established by the owner, ensure that code and zoning requirements meet project objectives, and establish a 3D reference point of model coordination. [*List further objectives if needed.]*

2.2.5.1b Model Roles: A model may or may not take shape during the Conceptualization/Conceptual Design phase. If a model is created, its role will be to depict the visual concept and general layout of the project. [*List further roles if needed.]*

2.2.5.1c Responsibilities: The architect's designated model manager will establish a baseline model to be used as the basis for other models. During the Conceptualization phase, model managers from all parties will establish modeling standards and guidelines. [*List further responsibilities if needed.]*

2.2.5.2 Criteria Design/Schematic Design

2.2.5.2a Objectives: Provide spatial design based on input from the Conceptualization/Conceptual Design phase; provide initial design for building system and attributes including architectural, structural, and MEP; identify initial coordination issues among building systems; receive input from suppliers and fabricators regarding system cost, placement, fabrication, and scheduling. [*List further objectives if needed.]*

2.2.5.2b Model Roles: The Architectural model will show the general design and layout of the building structure and act as the baseline for all other subsystem designs, such as MEP and Structural models. The subsystem designs will be used to show initial selection and layout of building components. The combined Coordination model will show the spatial relationship of the Architectural model and subsystem design models. [*List further roles if needed.]*

2.2.5.2c Responsibilities: Once the baseline conceptual structure has been created, the architect's model manager will send the model to the subconsultants so they can develop their designs. The subconsultants' designated model managers will audit and deliver the completed models to the architect's model manager. The architect's model manager will review the models to ensure compliance with the phase requirements. Once the models meet the requirements, the architect's model manager will link or combine cross-disciplinary models. The architect's model manager should also eliminate duplicate or redundant objects, and accurately name the Coordination model and store it in the collaborative project management system. [*List further responsibilities if needed.]*

2.2.5.3 Detailed Design/Design Development

2.2.5.3a Objectives: Provide final design of building and building systems; resolve coordination issues between building systems; provide a Construction model capable of analyzing schedule, cost, and constructability; provide Fabrication models to analyze the coordination of trades. Once the final design decisions have been made, the architect's model manager will send the Coordination model to the subconsultants so they can finalize their designs. [*List further objectives if needed*.]

2.2.5.3b Model Roles: The Architectural model will continue to act as the baseline for all other subsystem designs. The subsystem designs will be modified accordingly to represent the enhanced design. The combined Coordination model will continue to show the spatial relationship of the Architectural model and subsystem models. [*List further roles if needed.]*

2.2.5.3c Responsibilities: The subconsultants' model managers will use the Coordination model to revise and complete their designs. Once the models are complete, the subconsultants' model managers will deliver their models to the architect's model manager. The architect's model manager will review the models to ensure compliance with the phase requirements. Once the models meet the requirements, the architect's model manager will link or combine the multiple models to update a new Coordination model. The model manager should also eliminate duplicate or redundant objects. The architect's model manager will deliver the Coordination model to the contractor's designated model manager. The contractor will use the Coordination model for the basis of the Construction model. [*List further responsibilities if needed.]*

2.2.5.4 Implementation/Construction Documents

2.2.5.4a Objectives: Finalize design of the building and all building systems, prepare documentation for agency review, and provide construction modeling that highlights constructability, trade coordination, and fabrication. [*List further objectives if needed*.]

2.2.5.4b Model Roles: All design models will be used to reflect the final design. The models will then be used to generate the contract documents. The Construction model will be used primarily for estimating, scheduling, and constructability analysis. [*List further roles if needed.]*

2.2.5.4c Responsibilities: The architect's and subconsultants' model managers will prepare contract documents for agency review based on the Coordination model. The contractor's model managers will send the baseline Construction model to the suppliers and subcontractors. The suppliers and subcontractors will submit Fabrication models, which replace traditional "shop drawings." The contractor's model manager will incorporate these models into the Construction model. [*List further responsibilities if needed.]*

2.2.5.5 Agency Coordination Bidding

2.2.5.5a Objective: Revise Coordination model based on agency feedback and finalize Construction model. *[List further objectives if needed.]*

2.2.5.5b Model Roles: The design models will be adjusted to reflect agency feedback. The Construction model will be enhanced and further used for estimating, scheduling, construction sequencing, trade coordination, and constructability analysis. [*List further roles if needed.]*

2.2.5.5c Responsibilities: The architect's model manager will communicate agency comments back to the design team. The subconsultants' model managers will revise their design models accordingly and submit them back to the architect. The architect's model manager will update the final Coordination model. [*List further responsibilities if needed.]*

2.2.5.6 Construction

2.2.5.6a Objectives: Update Coordination model based on submittals, RFIs, or owner-directed changes; maintain the Construction model based on construction activities; develop an As-Built model to reflect the actual fabrication of the building. The construction team will submit RFIs and submittals through the collaborative project management system. [*List further objectives if needed*.]

2.2.5.6b Model Roles: The Coordination model will be revised throughout construction, based on owner directives and unforeseen conditions. The model will always reflect the revised contract documents. The Construction model will be used for scheduling analysis, construction sequencing, and trade coordination. The As-Built model will be used to represent the actual assembly of the building(s). [*List further roles if needed.]*

2.2.5.6c Responsibilities: The architect's model manager will work with the architect's consultants to answer the RFIs and submittals and adjust the Coordination model accordingly. The contractor's model manager will update the Construction model and will work with the suppliers and subcontractors to develop an As-Built model. [*List further responsibilities if needed.]*

2.2.5.7 Facility Management

2.2.5.7a Objective: Use the As-Built model for facility management, and update the model based on ongoing operations. [*List further objectives if needed*.]

2.2.5.7b Model Roles: The As-Built model will be used to represent the actual assembly of the building(s) from construction. The model can be updated further and used to show construction changes and facilitate the operation of the facility. [*List further roles if needed.]*

2.2.5.7c Responsibilities: The facilities management model manager will update the model based on ongoing operations. [*List further responsibilities if needed.]*

2.3.0.0 Analysis Plan

By listing and specifying what types of analysis your project is likely to require at its inception, you can ensure that key models will include relevant information, making analysis easier and more efficient.

2.3.1.0 Analysis Models

Your project's scope of work may require certain kinds of analysis, such as those listed below, based on existing or specially created model(s). In most cases the quality of analysis depends on the quality of the original model from which the analysis is derived. Therefore the project team member performing the analysis should clearly communicate the analysis requirements to the original model authoring team member.

2.3.1.1 Quantity Takeoff Analysis

The objective of quantity takeoff analysis is to use modeling property data to automate or simplify the quantity takeoff process. This information from the quantity takeoff tool can then be imported into or tied to cost-estimating software. For the quantity takeoff process to work seamlessly, the original modeling author must include the relevant property information in the design.

2.3.1.2 Scheduling Analysis

Scheduling analysis lets the project team use the project model to analyze the timeline and sequencing for construction. This information can then be used to modify or adjust the construction schedule. While tools do exist that allow project team members to visualize construction over time, no such systems yet interact automatically with scheduling tools.

2.3.1.3 Clash Detection Analysis

Clash detection analysis is done to check for interferences among the designs of one or many models. To reduce change orders during construction, clash detection should be performed early and continue throughout the design process. For clash detection to work properly, your project's models must have a common reference point and must be compatible with the clash detection tool.

2.3.1.4 Visualization Analysis

Visualization tools let the project team view the design or construction of a project in 3D, giving a more accurate perspective on the end product.

2.3.1.5 LEED Rating/Energy Analysis

LEED (Leadership in Energy and Environmental Design) Rating/Energy Analysis tools help the project team evaluate the impact of design decisions on sustainability and energy consumption. This analysis model is usually based on the main Architectural model, after which material and building system inputs can be used to evaluate the project's sustainability and energy consumption.

2.3.1.6 Structural Analysis

Structural analysis tools use the model to analyze a building's structural properties. Structural analysis programs typically use the finite element method (FEM) to measure the stresses on all structural elements of the design. For structural analysis to work seamlessly, the original structural modeling tool must be compatible with the structural analysis tool, and the original structural model property data must include information about the structural elements.

2.3.2.0 Detailed Analysis Plan

For each type of analysis that may be performed for your project, list the models used for the analysis, which company will perform the analysis, the file format required, the estimated project phase, and the tool to be used for analysis. If there are other instructions associated with the analysis, mark the Special Instructions column and list the details in the Special Instructions table in the next section.

Analysis	Analysis Tool	Model	Analyzing Company	Project Phase(s)	File Format Required	Special Instructions
Visualization						
Structural						
Clash Detection						
Quantity Takeoff						
Scheduling/4D						
Cost Analysis/5D						
Energy/LEED						
Daylight/Lighting						

2.3.2.1 Special Instructions

Certain types of analysis may call for specific requirements or instructions. The company performing the analysis should communicate these to the original model authoring company. List specific requirements in the table below.

Analysis Requiring Special Instructions	Detailed Special Instructions

2.4.0.0 Project Collaboration and Communication Plan

Creating a collaboration and communication plan early on will help team members efficiently communicate, share, and retrieve information throughout the project. Such a plan helps you get the most out of your collaborative project management system, saving time and increasing ROI.

2.4.1.0 Communication Plan

2.4.1.1 Messaging and Communication Protocol

All electronic communication on the project should be captured and stored as part of the project record. Many collaborative project management systems have internal messaging functionality. All electronic communication between Core Collaboration Team companies on the project should be uploaded or sent through the collaborative project management system. A copy of all project-related emails sent from outside the collaborative project management system should be uploaded to a folder in the document management file folder structure, or uploaded to the correspondence module. List your project's electronic messaging protocol below.

[*List the project electronic messaging protocol here*]

2.4.1.2 Meeting Minutes

Meeting minutes and agendas can be created in the collaborative project management system. The minutes and agendas should include general information such as time, date, and location of meeting, attendance, and discussion details. The discussion details should include information such as issue origination date, responsible parties, and required completion date. Meeting minutes should be posted to the system no later than [__] business days after completion of the meeting and should be electronically sent to all attendees. The attendees have [__] business days to dispute the content of the minutes, and all disputes must be resolved by the following meeting.

There will be different types of meetings on the project, including general progress meetings, design coordination meetings, safety meetings, etc. In the space below, list the types of meetings necessary for the project, meeting host(s), required attendees, and required technology. The first row shows an example.

Meeting Type	Host	Required Attendees	Required Technology
BIM Design Coordination	*Architect*	*Owner, Architect, GC, Subconsultants, Suppliers*	*Internet, Autodesk® Navisworks® software, Projection, Whiteboard, NetMeeting*

2.4.1.3 Correspondence

All formal correspondence among Core Collaboration Team companies should be generated in, or scanned and uploaded to, the collaborative project management system. Important correspondence received from non-Core Collaboration Team companies can also be scanned and uploaded to the system in the correspondence module.

2.4.2.0 Collaboration Plan

2.4.2.1 Document Management

You can create a file folder structure in your collaborative project management system, then give project team members the ability to upload, download, edit, mark up, and view documents in the folder structure, based on permissions assigned by the Core Collaboration Team.

2.4.2.1a Permissions and Access

The Core Collaboration Team for your project should decide on permissions for the document management file folder structure. In the table below, list the folder or subfolder, intended file content, and permission levels. Examples are shown below.

Folder	Content	Permissions
Drawings	*All project drawings in subfolders*	*Upload: A/E* *View: Contractor, Owner* *None: Sub*
Schematic Design	*Schematic drawings*	*Upload: A/E* *View: Contractor, Owner* *None: Sub*

2.4.2.1b Folder Maintenance
Although file folder structure and permissions should be defined by the Core Collaboration Team, the project system administrator (PSA) is responsible for setting up the structure and maintaining the system.

2.4.2.1c Folder Notifications
Select groups, individuals, or the entire project team can be notified based on activities in the file folder structure. Notification messages should include information about the file(s) updated and who updated them. List the people and groups to be notified for different activities in various folders in the table below. The first row shows an example.

Folder	Activity	Group to Notify
Drawings	*Upload and revise*	*Entire project team*

2.4.2.1d File Naming Convention
Earlier in this document (see section 2.2.3.0a, *Model Components File Naming Structure*), you specified the file naming convention for model files for this project. All other files should be accurately and descriptively named. Avoid using the date in file names, as the collaborative project management system will control the dates and versions. If there are files with special naming requirements, list them in the table below. The first row shows an example.

File Type	Naming Convention
Progress Photos	*Location, hyphen, Authoring Company Initials, hyphen, Description (e.g., Parking Deck-ABC-Cracking)*

2.4.2.1e Design Review
The collaborative project management system lets you efficiently manage your design review process, enabling the appropriate parties to efficiently log and update their design review comments, issues, and clash detection reports. Your collaborative project management system should allow users to log design review comments. The system will also track progress and resolution of the design review comments. In the table below, list the model(s) being reviewed, the reviewers, estimated design review start and completion dates, and how many days the authoring company has to respond to the design review comments. An example has been provided.

Model	Reviewing Companies	Estimated Review Start Date	Estimated Review Completion Date	Days to Respond by Authoring Company
Schematic Design Model	*ABC Owners* *Acme Contractors*	*1/21/2008*	*2/11/2008*	*14 days*

2.4.2.2 Bid Management

For faster, more efficient bids, all bid documentation—including drawings and specifications—can be made available in a Plan Room on the collaborative project management system. The potential bidders can be given access to this Plan Room by the PSA, and may access the documents, download them, or have them printed at a reprographics firm. When there are changes to the plans in the form of addenda, the collaborative project management system will automatically notify all bidders.

2.4.2.3 Construction Management

The collaborative project management system supports your construction management process by managing requests for information (RFIs), submittals, meeting minutes, daily reports, and other modules selected by the Core Collaboration Team. The Core Collaboration Team will also define permission levels and access to the construction management modules.

2.4.2.3a RFIs

RFIs will be created in the collaborative project management system by the [_____] (*specify role*). The RFIs will be issued to the [_____] (*specify role*) for a response, and copied to the [_____] (*specify role*). The primary reviewer will have [___] days to respond to the RFI. The RFI will include all appropriate information that describes the issue, along with electronic attachments that may include photos, specifications, and marked-up drawings.

2.4.2.3b Submittals

Submittals will be organized and electronically submitted through the collaborative project management system. The [_____] (*specify role*) will organize and submit the submittal packages. The packages will be organized by specification section and should be numbered with the following format: [_____] (*Fill in submittal package numbering format, e.g., spec section-package number within spec section 09900-01*). The packages will consist of one or more items. The items should be numbered with the following format: [_____] (*Fill in submittal item numbering format, e.g., auto-number 001,002)*. The submittal packages will be issued to the [_____] (*specify role*) for a response and copied to the [_____] (*specify role*). The submittal packages will include all appropriate information along with electronic attachments of the submittal items whenever possible. The submittal packages will be issued with an electronic transmittal. The primary reviewer will have [___] days to respond to the submittal package. Each item within the package will receive a response. The possible responses include [_____] (*list responses*). All revised submittal items will be resubmitted through a package revision, as opposed to a new package.

2.4.2.3c Daily Reports

Daily reports can be entered in the collaborative project management system. The following parties are responsible for creating daily reports: [_____] (*specify role*). The daily reports will include the date, general information, weather conditions, activities, manpower, major equipment used, major material deliveries, safety incidences, and quality control issues. In addition, progress photos and other electronic files should be attached to the daily reports when necessary. Daily reports should be entered into the system no later than [___] day(s) after the day of the report.

2.4.2.3d Other Construction Management Business Processes
Most collaborative project management systems have a number of modules not listed above. List the modules the project team plans to use, including any special instructions and processes, in the table below.

Additional Business Process Modules to be Used	Special Instructions or Processes

2.4.2.4. Cost Management

The collaborative project management system will facilitate cost management by managing budgeting, purchasing, the change order process, and the payment application process, as well as cost reporting. The Core Collaboration Team for your project will define permission levels and access to the cost management modules.

2.4.2.4a Budgeting
The [_____]'s (*specify role*) budget will entered and tracked in the collaborative project management system. The [_____] (*specify role*) will be responsible for entering and tracking the budget in the system.

2.4.2.4b Purchasing
The [_____]'s (*specify role*) contracting documents will entered and tracked in the collaborative project management system. The [_____] (*specify role*) will be responsible for entering and tracking the contract documentation in the system. The executed documents may, if needed, be scanned and attached to the contract records.

2.4.2.4c Change Order Process
Requests for change orders (RCOs) will be created and tracked in the collaboration project management system. RCOs will be created by the [_____] (*specify role*). Each RCO will include all appropriate information that supports the change. Electronic backup can be attached the RCO document. RCOs should be sent to the [_____] (*specify role*) for review. Once an RCO is approved, the [_____] (*specify role*) will issue the [_____] (*specify role*) a formal owner change order (OCO).

2.4.2.4d Payment Applications
Payment applications can be created in the collaborative project management system. The [_____] (*specify role*) is responsible for creating a payment application in the system based on an approved schedule of values (SOV). A signed copy of the payment application must be submitted to [_____] (*specify role*) and copied to [_____] (*specify role*) by the [___] day of the month.

2.4.2.5 Project Closeout

The collaborative project management system can ease your closeout process. The punch list process will be managed in the system either through system functionality or by uploading the documentation to the file folder structure. A number of documents, such as As-Builts, commissioning documents, warranties, and O&M Manuals, will need to be submitted to the owner. These documents can be uploaded in the file folder structure.

2.4.2.5a As-Built Model
An As-Built model [_____] (*fill in: will/will not*) be delivered to the owner at the end of the project by the [_____] (*specify role*). The As-Built model should represent the actual built conditions. The level of detail in the As-Built model will be governed by section 2.2.3.2, *Modeling Level of Detail*. List any inclusions or exclusions from the As-Built model content in the table below.

As-Built Model Inclusions	As-Built Model Exclusions
[List special items that will be included in the model above and beyond the Level of Detail specified in section 2.2.3.2.]	*[List items that will be excluded from the model above and beyond the Level of Detail specified in section 2.2.3.2.]*

2.4.2.5b System Archiving
At the end of the project, Core Collaboration Team companies can request an electronic copy of the project documents that were created and stored in the collaborative project management system. This information will be provided by the system owner at the requester's expense. Each company will have access to the project documents to which it had access while the project was active.

2.5.0.0 Project Technology Plan

In this section you'll define your project's corporate technology plan. You will select the software systems to be used and define requirements and administrative responsibilities.

2.5.1.0 Software Component Selection

So you may get optimal results from your BIM tools, we recommend using tools that meet the following criteria.

2.5.1.1 Model Creation
The model creation tool should be built on a database platform that allows the creation of parametric and information-rich objects. Parametric modeling dependencies should be automatically updated whenever changes are made. Since the design may come from multiple parties, the BIM tool should accommodate file linking, sharing, and referencing. The BIM technology must be capable of producing 2D plans to fulfill contract document deliverable requirements. The system should be able to create and output files that conform to the IFC (Industry Foundation Classes) file type standards developed by the International Alliance for Interoperability (IAI).

2.5.1.2 Model Integration
The model integrator will be used to combine multiple design files from different software platforms. The tool will also be used for model simulations. The simulation tool must allow the user to simulate construction processes over time and allow for real-time walkthroughs. The model integrator should be able to open and combine at least .dwg, .dwf, .dxf, .sat, .ifc, .dgn, .prp, .prw, .ipt, .iam, and .ipf file types.

2.5.1.3 Clash Detection/Model Mediation
The clash detection tool should be able to perform clash detection analysis on one or multiple design files. The system should be able to generate clash detection reports, which can be exported into either .xls, .csv, or .xml file formats. The clash detection reports should include a list of clashes along with visual evidence.

2.5.1.4 Model Visualization
The model visualization software will be used by project team members who do not need the full functionality of the BIM model creation, integration, or simulation tools. The visualization tool must allow users to look around, zoom, pan, orbit, examine, and fly through the model.

2.5.1.5 Model Sequencing
The 4D model sequencing tool will be used to visualize the scheduled assembly of the building. The tool should allow users to visualize the assembly of the building based on scheduling input. It should also integrate with standard scheduling systems such as Microsoft Project or Primavera.

2.5.1.6 Model Quantity Takeoff
The quantity takeoff tool will be used to extract quantities from BIM models for cost-estimating and purchasing purposes. The tool must be able to extract quantities automatically from both 3D and 2D design files. The quantity takeoff software must be able to integrate with esti-

mating programs, or the information from the system must be exportable to an .xls, .csv, or .xml file format. The quantity takeoff tool must be compatible with the model creation tool listed below in section 2.5.1.7.

2.5.1.7 Collaborative Project Management

The collaborative project management system may be made up of one or more software packages. However, for best results, the complete collaborative project management system should:

- Be web-based or web-enabled—so all relevant, authorized project team members can access it remotely
- Accommodate different permissions profiles for different project team members
- Allow communication through either internal messaging or system-generated email
- Include document management capability that lets the project team create a customized and permission-based folder structure that offers upload, download, and version control capabilities
- Include a viewer that allows the project team to view .dwg, .dgn, .plt, .dwf, .pdf, .tif, .jpg, .doc, and .xls files
- Include construction management capabilities for tracking requests for information (RFIs), submittals, design review, meeting minutes, daily reports, issues, correspondence, and transmittals
- Be able to interact with the file folder structure in the document management section
- Include bid management capability, and allow the project team to post contract drawings and specifications for viewing in the form of a Plan Room
- Allow for cost management controls including budgeting, contracting, change orders processing, and payments applications tracking
- Allow the project team to run reports based on information in the system
- Allow for workflow and routing throughout the documentation, construction, and cost management components of the solution

Select the components and specific software you will use and list them below for easy reference.

	Software Component	Model	Software System	Version
☐	Model Creation	Architectural Design		
☐	Model Creation	Civil Design		
☐	Model Creation	Structural Design		
☐	Model Creation	MEP Design		
☐	Model Creation	Coordination		
☐	Model Creation	Construction		
☐	Model Creation	As-Built		
☐	Model Integration			
☐	Model Mediation			
☐	Model Visualization			
☐	Model Sequencing			
☐	Model Quantity Takeoff			
☐	Collaborative Messaging and Communication			
☐	Document Management			
☐	Design Management			
☐	Bid Management			
☐	Construction Management			
☐	Cost Management			
☐	Facility/Operations Management	As-Built		

2.5.2.0 System Requirements and Administration

2.5.2.1 Model Creation, Clash Detection, Visualization, Sequencing, Simulation, and Quantity Takeoff Tools

2.5.2.1a IT Requirements

The BIM tools should meet the criteria and perform the functionalities outlined in section 2.5.1.0, *Software Component Selection*. All project team members who use the tool should have the hardware and software to use the system properly; refer to the vendor's system requirements for more details. We recommend running BIM software on Intel Core® 2 Duo 2.40 GHz or equivalent AMD Athlon™ processors, Windows® XP Professional (SP2 or later) with 4 GB RAM, 5 GB free disk space, and a dedicated video card with hardware support for OpenGL® spec 1.3 or later.

2.5.2.1b Funding Source
Acquisition and access to the BIM systems will be funded by [_____] (*specify role*).

2.5.2.1c Data Ownership
For language or information on electronic information and model ownership, see AIA® C106™-2007 Digital Data Licensing Agreement or ConsensusDOCS™ 200.2 Electronic Communications Protocol Addendum.

2.5.2.1d Administration
Each party is responsible for access, licensing, and administration of the BIM software systems used.

2.5.2.1e User Requirements
All parties are responsible for obtaining training in the use of the BIM tools. [_____] (*specify role*) is responsible for expenses related to training.

2.5.2.2 Collaborative Project Management

2.5.2.2a System Owner
The [_____] (*specify role*) will provide access to the collaborative project management system. System licenses will be provided to all project team members who need to access the information.

2.5.2.2b IT Requirements
The collaborative project management system should perform all functionality outlined in section 2.5.1.7, *Software Component Selection, Collaborative Project Management*. All project team members who use the tool should have the hardware and software to use the system properly. Most systems operate efficiently on Intel® Pentium®-based or equivalent processors, Windows XP Professional (SP2 or later), 256 MB RAM, and a broadband Internet connection. Refer to the vendor's system requirements for more details.

2.5.2.2c Funding Source
Acquisition and access to the collaborative project management systems will be funded by [_____] (*specify role*).

2.5.2.2d Data Ownership
Each Core Collaboration Team company can, at its own cost, request an electronic copy of the project documents that were created and stored in the collaborative project management system at the end of the project, as outlined in section 2.4.2.5b, *System Archiving.* For more information on digital data ownership, see AIA® C106™-2007 Digital Data Licensing Agreement or ConsensusDOCS™ 200.2 Electronic Communications Protocol Addendum.

2.5.2.2e Administration
The system owner should designate a Project System Administrator (PSA) to manage the administration of the system. The PSA will be responsible for managing and creating all new user accounts. The PSA will also be responsible for managing the company and contact information in the database.

2.5.2.2f User Requirements

- High-speed Internet access is required at all locations where the system will be accessed.
- Each user should have a unique and valid email address.
- System licenses to use the database will be provided by the system owner for all users who require access.
- Licenses will be granted for current projects only, and in accordance with permission levels defined by the Core Collaboration Team.
- Requests for new user licenses should be submitted to the PSA.
- Company and contact information will be managed in the database by the PSA.
- All parties should submit company and contact information and revisions to the PSA; each party is responsible for ensuring that his or her information is accurate.
- Each project team member will have his or her own license and access to the system.

- Licenses should not be shared by two or more persons; passwords should be confidential.
- Users will be prompted to change their passwords no less than every [___] days.
- All users will log into the system no less than once a week (unless otherwise dictated by project requirements) while the project is ongoing, to check for messages and outstanding items.
- All parties should notify the PSA immediately when an employee with access to the system has been terminated, in order to deactivate that employee's user account.
- All parties are responsible for obtaining training in the use of the collaborative project management system.

2.5.2.2g Security Requirements
The security of the collaboration project management system should include 24/7/365 system monitoring, perimeter security with designated access only, mirror data storage with a secondary facility in a separate location, daily backups of the information saved for the life of the project, an Intrusion Detection System (IDS), and at least 128-bit Secure Socket Layer (SSL) technology.

Appendix

Definitions of Terms Used in This Document

As-Built Model—The final model that shows how a building was actually delivered and assembled. Sometimes referred to as the Record Model.

Building Information Modeling (BIM)—An integrated process aimed at providing coordinated, reliable information about a building project throughout different project phases—from design through construction and into operations. BIM gives architects, engineers, builders, and owners a clear overall vision of the project—to help them make better decisions faster, improve quality, and increase profitability of the project.

Clash Detection—The process of checking for clashes and interferences in the design of one or more BIM models. Also referred to as model mediation.

Collaborative Project Management—A software solution that enables effective management of and collaboration on all project-related communication, information, and business processes across the plan, build, and operate phases of the building lifecycle. The most common processes include collaborative documentation, design, bid, construction, cost, and operations management.

Construction Model—The model used to simulate and analyze the construction of a building.

Coordination Model—A model created from two or more models, used to show the relationship of multiple building disciplines such as architectural, civil, structural, and MEP (mechanical, electrical, and plumbing).

Core Collaboration Team—The group of people—which should include someone from each party working on the project, such as the owner, architect, contractor, subconsultants, suppliers, and trade contractors—responsible for completing a BIM Deployment Plan, creating the document management file folder structure and permission levels in the collaborative project management system, and enforcing the action plan set out in that document throughout design and construction of the project.

Design Intent Model—The model used to communicate the design intent of a building.

Industry Foundation Classes (IFC)—A neutral and open file format structure developed by the International Alliance for Interoperability (IAI) to enable interoperability between modeling software systems.

Integrated Project Delivery (IPD)—A project delivery process that integrates people, systems, business structures, and practices to collaboratively harness the talents and insights of all participants in order to optimize project results, increase value to the owner, reduce waste, and maximize efficiency throughout all phases of design, fabrication, and construction (AIA, *Integrated Project Delivery: A Guide*, 2007, available at www.aia.org/ipdg).

Model Integrator—A tool used to combine and/or link design files from different software platforms.

Model Manager(s)—The project team member(s) responsible for managing the collaboration and sharing of electronic files during the project. Model managers are also responsible for maintaining the integrity of BIM models, which can include gathering, linking, and uploading updated models.

Parametric—The relationships among and between all elements of a model that enable coordination and change management. These relationships are created either automatically by the software or manually by users as they work.

Project System Administrator (PSA)—The person who administers, and sets up folders for, the collaborative project management system. Responsible for managing and creating new user accounts, as well as contact and company information.