Advanced Techniques for Managing Building Data in Autodesk® Revit®

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The collection and management of building data, including the requirements for rooms, equipment, and other needs, as it evolves from early design through construction documentation and as a basis for facility management, can be enhanced through advanced techniques in Autodesk Revit software.

This includes linking to an external data source, automating the creation of areas and rooms, creating room data sheets, and other graphic and non-graphic processes that complement BIM. This class covers basic database theory, the structure of objects and their relation to data management, and Revit techniques for implementing this general theory in actual projects.

We also discuss third-party software and customizations, and how they are used to further advance these processes. The class goes beyond learning Revit commands and looks at the underlying information requirements of emerging integration in project delivery.
Key learning objectives

At the end of this class, you will be able to:

- Understand how building data is represented in objects and databases.
- Evaluate computer system architectures and software options.
- Use Revit to study conceptual design and building massing.
- Create room data sheets in Revit and in an external database.

The presentation also includes sections on:

- Supplemental Material.
- Example Project.
Introduction to Building Data
The Problem

Kinds of Project Information:

- **“Building Data”**: rooms, activities, ownership, furniture, equipment, etc.
- **“Project Data”**: team makeup, project budget, schedule, etc.
  (We are not going to talk about this.)

Needs for Managing Data:

- Accuracy.
- Validation.
INFORMATION FLOW THROUGH A DATABASE SYSTEM

SOURCE DATA
- CLIENT REQUIREMENTS
- PRE-DESIGN INTERVIEWS
- DESIGN TEAM EXPERTISE
- AGENCY REQUIREMENTS
- DESIGN DECISIONS

DATABASE SYSTEM
- BIM
- DATABASE
- SYNCHRONIZE

DELIVERABLES
- DRAWINGS
- REPORTS
- MODELS / DATA

CONSTRUCTION
FACILITY MANAGEMENT

THE PROBLEM

Automated Techniques for Managing Building Data in Autodesk® Revit®
Information Flow

Owner’s Requirements
- Designed for readability.
- Complex data structure
- Paper or raster mode.

### Office of the Port Director
**Administration/Security Operations Building**

<table>
<thead>
<tr>
<th>Ref. #</th>
<th>User Type</th>
<th>Design Guide Area SF</th>
<th>2022 Cr. %</th>
<th>Staff</th>
<th>Unit/ Rms.</th>
<th>NSF</th>
<th>Cir.</th>
<th>Total UsF</th>
<th>Total GSF</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1301</td>
<td>PO</td>
<td>225</td>
<td>225 25%</td>
<td>1</td>
<td>1</td>
<td>225</td>
<td>56</td>
<td>281</td>
<td>252</td>
<td></td>
</tr>
<tr>
<td>1302</td>
<td>PO</td>
<td>175</td>
<td>175 25%</td>
<td>2</td>
<td>1</td>
<td>175</td>
<td>44</td>
<td>219</td>
<td>227</td>
<td></td>
</tr>
<tr>
<td>1303</td>
<td>PO</td>
<td>175</td>
<td>175 25%</td>
<td>2</td>
<td>1</td>
<td>175</td>
<td>44</td>
<td>219</td>
<td>227</td>
<td></td>
</tr>
<tr>
<td>1304</td>
<td>WS</td>
<td>175</td>
<td>175 35%</td>
<td>2</td>
<td>1</td>
<td>75</td>
<td>26</td>
<td>101</td>
<td>127</td>
<td></td>
</tr>
</tbody>
</table>

Subtotal - Staff: 4
Subtotal - Personnel Spaces (NSF): 650
Circulation: 170
Total Usable - Personnel Spaces: 820

### SUPPORT SPACES

<table>
<thead>
<tr>
<th>Ref. #</th>
<th>Class</th>
<th>Design Guide Area SF</th>
<th>2022 Cr. %</th>
<th>Staff</th>
<th>Unit/ Rms.</th>
<th>NSF</th>
<th>Cir.</th>
<th>Total UsF</th>
<th>Total GSF</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1305</td>
<td>Director’s Public Reception Waiting</td>
<td>20/seat</td>
<td>20 10%</td>
<td>5</td>
<td>100</td>
<td>10</td>
<td>110</td>
<td>128</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1306</td>
<td>Director’s Conference Room</td>
<td>300 300 20%</td>
<td>1</td>
<td>300 60 360 450</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1307</td>
<td>Coffee Service</td>
<td>45 45 25%</td>
<td>1</td>
<td>45 31 58 70</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1308</td>
<td>Copier/Fax/Shredder</td>
<td>80 80 25%</td>
<td>1</td>
<td>80 20 100 325</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1309</td>
<td>File Area</td>
<td>12/lin.</td>
<td>12 25%</td>
<td>2</td>
<td>144 36 180 229</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1310</td>
<td>Closet</td>
<td>20 25%</td>
<td>2</td>
<td>20 5 25 31</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1311</td>
<td>Shared Printers</td>
<td>20 25%</td>
<td>2</td>
<td>40 10 50 62</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Subtotal - Support Spaces (NSF): 729
Circulation: 152
Total Usable - Support Areas: 881
Advanced Techniques for Managing Building Data in Autodesk® Revit®

Design Team Requirements

- Relational data.
- Software use.
- Reporting.
First, we want to understand our data, and define objectives for using it.

Then, we can implement software to achieve those objectives.
General Principles of Objects and Databases
Objects and How Revit Uses Them

Object-oriented programming (OOP).

“Things” in Revit.

All objects have:

- Methods: Behavior (wall hosting.)
- Properties: Data (dimension; manufacturer.)

Ole-Johan Dahl and Kristen Nygaard developed Simula in the 1960s at the Norwegian Computing Center in Oslo. (Wikipedia)
Object Inheritance

- Objects derive from parent object.
- Children inherit properties.

DATA PRINCIPLES

OBJECTS AND HOW REVIT USES THEM

DATA ACCUMULATES WITH EACH GENERATION
Object Types (Classes)

- Families are one kind of thing.
- Types are different kinds of the family.
- Instances are placements of a specific type.

DATA PRINCIPLES

OBJECTS AND HOW REVIT USES THEM

Families → Types → Instances

Model → Size → Material

Families – Types – Instances
Revit Parameters
(object properties with data in them)

**Shared Parameter:** Same name is used in other models.

**(Not-shared) Parameter:** Name is used only in this model.

**Project Parameter:** Parameter applies to all families.

**Family Parameter:** Parameter is part of the family.

**THESE ARE INDEPENDENT OF ONE ANOTHER**

**THEY ARE NOT RELEVANT TO BUILDING DATA**
**Built-in Parameter**  
(Family-level Parameter)
Type Parameter

FAMILY EDITOR

MODEL ENVIRONMENT

TABLE
FAMILY

FAMILY TYPES

36" x 36"
72" x 36"

FAMILY
INSTANCES

36" x 36"
36" x 36"
72" x 36"
72" x 36"
Instance Parameter

Table Family

Family Types

36" x 36"
72" x 36"

Family Instances

36" x 36"
36" x 36"
72" x 36"
72" x 36"
Data equivalence of Types and Instance Parameters

DATA PRINCIPLES

OBJECTS AND HOW REVIT USES THEM

DOOR FAMILY

ONE DOOR TYPE
- Instance Parameter: Door Color
  - Door Color: RED
  - Door Color: BLUE

TWO DOOR TYPES
- Door Types:
  - Type A: RED
  - Type B: BLUE

DOOR SCHEDULE
<table>
<thead>
<tr>
<th>Door ID</th>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>RED</td>
</tr>
<tr>
<td>200</td>
<td>BLUE</td>
</tr>
</tbody>
</table>

DOOR ID
- 100
- 200

AUTODESK UNIVERSITY 2013
Advanced Techniques for Managing Building Data in Autodesk® Revit®
Use of Schedule Keys with Instance Parameters

**DATA PRINCIPLES**

**OBJECTS AND HOW REVIT USES THEM**

**DOOR FAMILY**

**ONE DOOR TYPE**

- INSTANCE PARAMATER: *Door Color*

**PATIENT ROOM**

- **DOOR STYLE**
  - **Door Color**
  - **SCHEDULE KEY**
    - **DOOR STYLE** | **DOOR COLOR**
      - Patient Rooms: RED
      - Offices: BLUE

**DOOR SCHEDULE**

<table>
<thead>
<tr>
<th>DOOR ID</th>
<th>COLOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>RED</td>
</tr>
<tr>
<td>200</td>
<td>BLUE</td>
</tr>
</tbody>
</table>
Basics of Relational Databases

Tables and Relationships
### Tables
- **Rows**
- **Columns**

#### Basics of Relational Databases

<table>
<thead>
<tr>
<th>ROOM ID</th>
<th>TYPE</th>
<th>FLOOR</th>
<th>AREA</th>
</tr>
</thead>
<tbody>
<tr>
<td>10101</td>
<td>OFFICE - LARGE</td>
<td>FLOOR 01</td>
<td>1000</td>
</tr>
<tr>
<td>10101A</td>
<td>OFFICE - MEDIUM</td>
<td>FLOOR 01</td>
<td>800</td>
</tr>
<tr>
<td>10102</td>
<td>OFFICE - SMALL</td>
<td>FLOOR 01</td>
<td>400</td>
</tr>
<tr>
<td>10103</td>
<td>CONFERENCE</td>
<td>FLOOR 01</td>
<td>640</td>
</tr>
<tr>
<td>20110</td>
<td>BREAK ROOM</td>
<td>FLOOR 02</td>
<td>820</td>
</tr>
<tr>
<td>20111</td>
<td>COPY AREA</td>
<td>FLOOR 02</td>
<td>220</td>
</tr>
<tr>
<td>20123</td>
<td>STORAGE</td>
<td>FLOOR 02</td>
<td>100</td>
</tr>
<tr>
<td>20843</td>
<td>CLASSROOM – 1</td>
<td>FLOOR 02</td>
<td>740</td>
</tr>
<tr>
<td>30102</td>
<td>CLASSROOM – 2</td>
<td>FLOOR 03</td>
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<tr>
<td>30104</td>
<td>CLASSROOM – 3</td>
<td>FLOOR 03</td>
<td>1020</td>
</tr>
<tr>
<td>30105</td>
<td>STUDY AREA</td>
<td>FLOOR 03</td>
<td>600</td>
</tr>
</tbody>
</table>
**Primary Key Field**

Uniquely identifies a record.

It must be:
- Not Null
- Unique

<table>
<thead>
<tr>
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<td>FLOOR 03</td>
<td>600</td>
</tr>
</tbody>
</table>
**Foreign Key** Field

Points to the Primary Key of another table.

It may be Null.

<table>
<thead>
<tr>
<th>ROOM ID</th>
<th>TYPE</th>
<th>FLOOR</th>
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<td>FLOOR 01</td>
<td>800</td>
</tr>
<tr>
<td>10102</td>
<td>OFFICE - SMALL</td>
<td></td>
<td></td>
</tr>
<tr>
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<td>FLOOR 01</td>
<td>640</td>
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<tr>
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<td>30105</td>
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<td>FLOOR 03</td>
<td>600</td>
</tr>
</tbody>
</table>
**One to Many** Relationship

Defined by a Foreign Key.

A value can occur:

- Once on the "**one**" side.
- Many times on the "**many**" side.

<table>
<thead>
<tr>
<th>ROOM ID</th>
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</tr>
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<td>FLOOR 03</td>
<td>600</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>FLOOR ID</th>
<th>AREA</th>
</tr>
</thead>
<tbody>
<tr>
<td>FLOOR 01</td>
<td>23100</td>
</tr>
<tr>
<td>FLOOR 02</td>
<td>32800</td>
</tr>
<tr>
<td>FLOOR 03</td>
<td>32400</td>
</tr>
</tbody>
</table>
Referential Integrity

The “one” side must exist before the “many” side can be used

- Changes can cascade from the one to the many.
- Deletions can cascade but may delete the whole record.

### ROOMS TABLE

<table>
<thead>
<tr>
<th>ROOM ID</th>
<th>TYPE</th>
<th>FLOOR</th>
<th>AREA</th>
</tr>
</thead>
<tbody>
<tr>
<td>10101</td>
<td>OFFICE - LARGE</td>
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</tr>
<tr>
<td>10102</td>
<td>OFFICE - SMALL</td>
<td>FLOOR 01</td>
<td>400</td>
</tr>
<tr>
<td>10103</td>
<td>CONFERENCE</td>
<td>FLOOR 01</td>
<td>640</td>
</tr>
<tr>
<td>20110</td>
<td>BREAK ROOM</td>
<td>FLOOR 04</td>
<td>820</td>
</tr>
<tr>
<td>20111</td>
<td>COPY AREA</td>
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<td>30105</td>
<td>STUDY AREA</td>
<td>FLOOR 03</td>
<td>600</td>
</tr>
</tbody>
</table>

### FLOORS TABLE

<table>
<thead>
<tr>
<th>FLOOR ID</th>
<th>AREA</th>
</tr>
</thead>
<tbody>
<tr>
<td>FLOOR 01</td>
<td>23100</td>
</tr>
<tr>
<td>FLOOR 02</td>
<td>32800</td>
</tr>
<tr>
<td>FLOOR 03</td>
<td>32400</td>
</tr>
</tbody>
</table>

**THIS VALUE “FLOOR 04” CANNOT BE ADDED SINCE THERE IS NO SUCH VALUE IN IN THE FLOORS TABLE**
Normalizing Data

A table is **Not Normalized** if it has redundant data.

<table>
<thead>
<tr>
<th>NAME</th>
<th>OFFICE</th>
<th>ADDRESS</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADAM SMITH</td>
<td>ACME CONSTRUCTION</td>
<td>123 NORTH MAIN ST., CULVER CITY, CA 94306</td>
</tr>
<tr>
<td>BETTY JONES</td>
<td>ACME CONSTRUCTION</td>
<td>123 NORTH MAIN ST., CULVER CITY, CA 94306</td>
</tr>
<tr>
<td>CLARK KENT</td>
<td>BEST ENGINEERING</td>
<td>2100 FLAGSHIP WY., SACRAMENTO, CA 94563</td>
</tr>
<tr>
<td>STEVE WONG</td>
<td>BEST ENGINEERING</td>
<td>2100 FLAGSHIP WY., SACRAMENTO, CA 94563</td>
</tr>
<tr>
<td>MARY STAFFORD</td>
<td>BEST ENGINEERING</td>
<td>2100 FLAGSHIP WY., SACRAMENTO, CA 94563</td>
</tr>
</tbody>
</table>

CONTACT TABLE WITH OFFICE ADDRESSES

The data can be **Normalized** by using two tables.

**CONTACT TABLE**

<table>
<thead>
<tr>
<th>Name</th>
<th>OFFICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADAM SMITH</td>
<td>ACME CONSTRUCTION</td>
</tr>
<tr>
<td>BETTY JONES</td>
<td>ACME CONSTRUCTION</td>
</tr>
<tr>
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<td>STEVE WONG</td>
<td>BEST ENGINEERING</td>
</tr>
<tr>
<td>MARY STAFFORD</td>
<td>BEST ENGINEERING</td>
</tr>
</tbody>
</table>

**OFFICE TABLE**

<table>
<thead>
<tr>
<th>Office</th>
<th>Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACME CONSTRUCTION</td>
<td>123 NORTH MAIN ST., CULVER CITY, CA 94306</td>
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<td>2100 FLAGSHIP WY., SACRAMENTO, CA 94563</td>
</tr>
</tbody>
</table>
**Flattening Data**

Normalized data can be difficult to use in Revit.

The data can be *Flattened* by compressing it into a single table.
Revit Objects and Relational Data

Mapping Revit Objects to Database Tables

**OBJECT INSTANCES**

**REVIT**
- AREA OBJECTS
- ROOM OBJECTS
- FURNITURE OBJECTS
- ...

**DATABASE**
- AREA TABLE
- ROOM TABLE
- FURNITURE TABLE
- ...

**OBJECT TYPES**

**REVIT**
- FURNITURE OBJECTS
- OBJECT TYPE
- FURNITURE TYPES

**DATABASE**
- FURNITURE INSTANCES TABLE
- RELATED TABLE
- FURNITURE TYPES TABLE
Mapping Revit Parameters to Database Fields

**PARAMETERS – DATABASE MAPPING**

**REVIT OBJECTS**
- OBJECT
  - KEY PARAMETER
    - PARAMETER - 1
    - PARAMETER - 2
    - PARAMETER - 3

**DATABASE TABLE**
- RECORD
  - KEY FIELD
    - FIELD - 1
    - FIELD - 2
    - FIELD - 3

**OBJECT INSTANCES**
- OBJECT
  - KEY PARAMETER
    - PARAMETER - 1
    - PARAMETER - 2
    - PARAMETER - 3

**LINK**
- OTHER VALUES

**RECORD**
- KEY FIELD
  - FIELD - 1
  - FIELD - 2
  - FIELD - 3
Mapping Revit Parameters to Database Fields

**TYPE PARAMETERS – DATABASE MAPPING**

**OBJECT TYPES**

<table>
<thead>
<tr>
<th>Revit Objects</th>
<th>DATABASE PRIMARY TABLE</th>
<th>DATABASE PRIMARY TABLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Object Key Parameter</td>
<td>Record Key Field</td>
<td>Record Key Field</td>
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<tr>
<td>...</td>
<td>FOREIGN KEY</td>
<td>FOREIGN KEY</td>
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<tr>
<td>...</td>
<td>FIELD - 1</td>
<td>FIELD - 1</td>
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<tr>
<td>...</td>
<td>FIELD - 2</td>
<td>FIELD - 2</td>
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<tr>
<td>TYPE PARAMETER</td>
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<td>RECORD</td>
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<td>ID KEY FIELD</td>
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<td>PARAMETER - 2</td>
<td>OTHER VALUES</td>
<td>TYPE FIELD</td>
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<tr>
<td>OTHER VALUES</td>
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</tr>
</tbody>
</table>

**OTHER VALUES**
System Architecture and Software Options
Advanced Techniques for Managing Building Data in Autodesk® Revit®

Software Options

System Architecture

Single User
- Option 1: Revit Add-in only.
- Option 2: Windows application.

Advantages:
- Simple; easy to use.

Disadvantages:
- Single-user.
Multi-User – LAN / WAN

Advantages:
- Multi-user.
- Mature technology.

Disadvantages:
- Only inside “Firewall”
Multi-user – Internet (Web – Cloud)

Advantages:
- Collaboration.
- Centralized administration.

Disadvantages:
- Complex.
- Less functional.
Advanced Techniques for Managing Building Data in Autodesk® Revit®
Ideate - BIMLink

Link Microsoft Excel to Revit

Inexpensive, Wide Adoption

Features:
- No training required
- FlexLM licensing
- Access to Revit Data beyond Schedules
- Element Creation
- Standards Management

http://www.ideatebimlink.com/
SYSTEM ARCHITECTURE – IDEATE BIM LINK
WhiteFeet – Tools for Revit

Link Database to Revit

Hobbyist – Unlimited Free Trial

Database Options:
- Microsoft Access.
- SQL Server.
- MySQL.

Room Data Sheets
- In Revit.
- Database report.

www.WhiteFeetTools.com
SYSTEM ARCHITECTURE – WHITEFEET REVIT DBLINK
Treelligence – Affinity

Stand-alone Application
- Proprietary Graphics
- Proprietary Data Format
- Link to Revit/Vasari, ArchiCAD, AECOsim, SketchUp, and IES

Features:
- Architectural Programming
- Early Design
- Design Validation
- BIM Integration
- Sustainability Analysis

http://www.treillage.com/
Advanced Techniques for Managing Building Data in Autodesk® Revit®

SYSTEM ARCHITECTURE – AFFINITY

SOFTWARE OPTIONS

REVIT MODEL

AFFINITY MULTI – USER OPTION

LOCAL-AREA NETWORK

SHARED REVIT MODEL

WIDE-AREA NETWORK

AFFINITY DATABASE

AFFINITY WINDOWS APPLICATION

AFFINITY GRAPHICS

REVIT WORKSHARING

LOCAL REVIT MODEL

REVIT ADD-IN

AUTODESK UNIVERSITY 2013

Advanced Techniques for Managing Building Data in Autodesk® Revit®
**CodeBook**

CAD/BIM linked to Database

- CAD/BIM Options: Revit, AutoCAD, Navisworks, MicroStation and ArchiCAD.
- Database Options: Access, SQL Server

Strong in Healthcare market, especially in UK.

Features:

- Boosts economic viability
- Links everything to the brief
- Validates design changes
- Delivers results

http://www.codebookinternational.com/
SYSTEM ARCHITECTURE – CODEBOOK
Nosyko – dRofus

“Cloud” Solution based on Open Standards
- Revit, IFC, ArchiCAD.
- Historically strong in European Healthcare.
  - Government and industry collaboration.
  - Now in United States and other markets.

Features:
- Logs: What changes have been made.
- Report generator, Excel and Word.
- Room Data Sheets.
- Central server; work from any location.
- Just PC and internet connection.
- Standardized solutions.
- Higher quality and control of data
- Controlling programmed requirements.
- Validate designed solution.

SYSTEM ARCHITECTURE – DROFUS
Onuma Planning System

Services and Middleware
- ArchiCAD, Revit, SketchUp, and GIS.
- Open Standards: IFC and OGC.
- Strong in Government and Education
- Wide community involvement.

Features:
- Predictive planning - early project stages.
- Programming requirements for a project.
- Management of as-built data for facilities.
- Creates BIM with no BIM training required.
- Many BIMs in a relational online database.
- Multi Site, Multi Building.
- Floors, Spaces, Furniture & Equipment.
- Multi user collaboration on projects.

http://www.onuma.com/
SYSTEM ARCHITECTURE – ONUMA PLANNING SYSTEM
Conceptual Design and Building Massing
CONCEPTUAL DESIGN PROCESS

Formalizing the Space Program

Interpreting a Space Program

**CLIENT REQUIREMENTS**
(EXCEL WORKSHEET)

**DOCUMENT:**
- READABLE FORMAT
- UNSTRUCTURED DATA

**DATA TABLE:**
- ROOM TYPE
- ROOM USE
- HOW MANY OF EACH

**SPACE PROGRAM**
(ACCESS TABLE)

**ROOMS LIST**
(ACCESS TABLE)

**ROOM OBJECTS:**
- GEOMETRY
- DATA ATTRIBUTES

**BIM**
(REVIT PROJECT)
Organizational Uses and Room Types

- Organization: activity or department.
- Type: characteristics of the room.

**SINGLE-LEVEL ORGANIZATIONAL USES AND ROOM TYPES**
Space Program

- Organization and Type.
- Quantity.
- Area Each.

SPACE PROGRAM TABLE IN MICROSOFT ACCESS
CONCEPTUAL DESIGN PROCESS

Linking Revit to a Database

WhiteFeet RevitDbLink
### Aggregate Planning Areas

<table>
<thead>
<tr>
<th>ORGANIZATIONAL USES</th>
<th>ROOM TYPES</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>UNIQUELY IDENTIFIABLE</strong> (ORGANIZATION VALUE)</td>
<td><strong>GROUPING</strong> (ROLL-UP OF AREAS AND COUNTS)</td>
</tr>
<tr>
<td>ORGANIZATION</td>
<td>ORGANIZATION CATEGORY</td>
</tr>
<tr>
<td>PRESIDENT</td>
<td>OPERATIONS</td>
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<td>ADMINISTRATION</td>
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<td>MAINTENANCE</td>
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</tr>
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**GROUPING OF ORGANIZATIONAL USES AND ROOM TYPE**
• Architectural Parti
Importing as Unplaced Areas
- Placing Areas
- Developing Massing
Manipulating Planning Areas
Architectural Elements
Validating Areas

CONCEPTUAL DESIGN PROCESS

AGGREGATE PLANNING AREAS
Creating Rooms

Room Characteristics

<table>
<thead>
<tr>
<th>ORG ID</th>
<th>DEPARTMENT NAME</th>
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<tr>
<td>01</td>
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<td>FACILITIES</td>
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<table>
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<td>CONF</td>
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<td>STOR</td>
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DEFINITION OF TYPE AND ORGANIZATION KEY VALUES
**SPACE PROGRAM**

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**ROOMS LIST**

<table>
<thead>
<tr>
<th>ROOM ID</th>
<th>PROG ID</th>
<th>ORG</th>
<th>TYPE</th>
<th>NUMBER</th>
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<tr>
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**ORGANIZATIONAL USES**

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</tr>
<tr>
<td>CONF</td>
<td>CONFERENCE</td>
</tr>
<tr>
<td>BREAK</td>
<td>BREAK ROOM</td>
</tr>
</tbody>
</table>
Creating Room List in Database

Set rstl = db.OpenRecordset( 
  "SELECT DISTINCT OrganizationID " _ 
& "FROM ProgramSpace " _ 
& "ORDER BY OrganizationID ")
Do While Not rst1.EOF

  strOrg = Trim(rst1!OrganizationID)

  If Len(strOrg) = 1 Then
    If IsNumeric(strOrg) Then
      strOrgRoot = ""
      strOrgNumber = strOrg
      intIncrement = Int(strOrgNumber)
      If intIncrement = 0 Then intIncrement = intIncrement + 1
    Else
      intIncrement = 1
    End If
  Else
    If IsNumeric(Right(strOrg, 2)) Then
      strOrgRoot = Left(strOrg, Len(strOrg) - 2)
      strOrgNumber = Right(strOrg, 2)
      intIncrement = Int(strOrgNumber)
      If intIncrement = 0 Then intIncrement = intIncrement + 1
    ElseIf IsNumeric(Right(strOrg, 1)) Then
      strOrgRoot = Left(strOrg, Len(strOrg) - 1)
      strOrgNumber = Right(strOrg, 1)
      intIncrement = Int(strOrgNumber)
      If intIncrement = 0 Then intIncrement = intIncrement + 1
    Else
      strOrgRoot = strOrg
  End If

<table>
<thead>
<tr>
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<th>ProgramSpaceID</th>
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</table>

Advanced Techniques for Managing Building Data in Autodesk® Revit®
Creating Rooms

- Importing Unplaced Rooms
- Placing Rooms
- Rooms in Their Actual Location
Validating Program with the Database
Supporting Construction Documentation

Data Not Included in the BIM

- Room Requirements
- Doors and Hardware
- Furniture and Equipment Specifications
Room Data Sheets
Numbering Rooms

Construction Documentation *Room Number*

Different from:

- RoomId.
- Signage.
Processes

Stages
- Programming
- Design Development

Workflows
- All in Revit
- In Access
Data Sheets in Revit

View for each room:

- 2D PLAN option.
Tag all rooms:

- Special room tag.
- Room data values.
Place Views on Sheets
Data Sheets in Access

Two views for each room:
- 2D Plan option.
- 3D Options:
  - View angle.
  - Extents:
    - Section box.
    - Crop box.
  - Both.
Export images:

- Naming.
- File type.
### Used in User Group meetings to record decisions.

**SAMPLE PROJECT**

<table>
<thead>
<tr>
<th>Input Form:</th>
<th>Room Data Input Form</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Department Name:</strong> Education</td>
<td><strong>Program No.:</strong> 530 CLRM</td>
</tr>
<tr>
<td><strong>Space No.:</strong> 105 Classroom</td>
<td><strong>Program Area:</strong> 1,301 SF</td>
</tr>
<tr>
<td><strong>Room ID:</strong> 211.00</td>
<td><strong>Room Area:</strong> 517 SF</td>
</tr>
</tbody>
</table>

#### Architectural and Structural:
- Wall Construction: Security Walls, Full Height Walls, Security Celing
- Door Control Type: Standard Classroom type
- Door Glazing Type: Safety glass
- Structural: Provide additional bracing at projector mount

#### Casework and Finishes:
- Finishes: Wall: Off-White, Floor: VCT, Paint: Wall: Floor theme
- Ceilings: Aquarium, Red, Painted: White

#### HVAC and Plumbing:
- HVAC: Ducted, 72 CFM, 50% of Design, 24 Hr., HVAC on Emergency Power
- Plumbing: Hot water, Drinking Fountain(s), Plumbing Floor Drain

#### Power, Lighting, and Communications:
- Power: Main 1, 1000 Watts, Lighting type: Recessed
- Outlet Power: Controls: At door
- Electrical: Provide dedicated computer circuits to all room locations

#### Equipment and Furnishings:
- Equipment: Fixed, Ceiling-mouted CRT projector, pull down screen, Wall mounted LCD screens
- Furnishings: Fixed: Bookcases under windows, full length of room

#### Remarks:
- This room will be used for night classes when the main areas of the building are secure. Provide method of accessing the bathrooms without entering the main lobby area.
Report:

- Used to validate decisions and track data.
Supplemental Topics
Parent-Child Family Relationships

Site FAR Example:
- Parcels: Areas.
- Buildings: Masses.
- Buildings → Area.
- Roll-up floor areas.
Floor-Area-Ratio (FAR)

- $\text{Area}_{\text{BLDG}} = \text{Floor Areas.}$
- $\text{Building} \rightarrow \text{Property}$
- $\text{Area}_{\text{PROPERTY}} = \text{Property Area.}$
- $\text{FAR} = \frac{\text{Area}_{\text{BLDG}}}{\text{Area}_{\text{PROPERTY}}}$
- View Filter
Related Database Tables in Revit Color Fill Plans

Room Type Category:

- Indirect values.
- Rolled-up values.
- Concatenation.
SUM ROOM AREA:
- BY ROOM TYPE CATEGORY
- BY FLOOR
Derived Values:

In Access:

- Related Tables:
- Primary Key
- Foreign Key
Advanced Techniques for Managing Building Data in Autodesk® Revit®

Revit \(\leftarrow\) Access

- Using RevitDbLink
  - Update Derived Values
  - Related Table.

Parameter **RoomTypeCategoryId**.
- Value from:
  - Room Parameter **RoomTypeId**.
  - Foreign Key to: **RoomTypes.RoomTypeCategory**.

Parameter **RoomTypeCategoryDescription**.
- Value from:
  - Room Parameter **RoomTypeCategoryId**.
  - Foreign Key to: **RoomTypeCategories.Description**.
String Concatenation:

- **String Values From:**
  - Parameter *RoomTypeCategoryIld*.
  - Constant “–“
  - Level Number

- **Combined To:**
  - Parameter *RoomTypeCategoryFloor*.
  - Form: “FOOD-01”

- **Identifies Rooms:**
  - Same category.
  - Same floor.
Math Calculation:

- Numerical Values:
  - Parameter *Area*.

- Grouped by:
  - Parameter *RoomTypeCategoryFloor*.

- Summed to:
  - Parameter *RoomTypeCategoryFloorArea*.
Convert Number to String:

**Numerical Value:**
- Parameter `RoomTypeCategoryFloorArea`.

**Converted to String:**
- Parameter `RoomTypeCategoryFloorString`.
Using RevitDbLink
- Update Derived Values
  - Concatenation.

Parameter: `RoomTypeCategoryTitle`.

- Value from:
  - Room Parameter: `RoomTypeCategoryId`.
  - Constant: “ – ”.
  - Room Parameter: `RoomTypeCategoryDescription`.
  - Constant: “ ( ”.
  - Room Parameter: `RoomTypeCategoryFloorString`.
  - Constant: “ SF )”
Room Type Category

- BATH - Bathrooms (394 SF)
- CIRC - Circulation (687 SF)
- FOOD - Food Preparation and Dining (1800 SF)
- INSTR - Instruction (4827 SF)
- MEET - Meeting Spaces (2157 SF)
- MEP - Mechanical/Electrical (422 SF)
- OFF - Office (341 SF)
- STOR - Storage (108 SF)
Example Project
Example Project

CONCEPTUAL DESIGN PROCESS

Images courtesy Catherine Chan - HDR.

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### EXAMPLE PROJECT

![Image courtesy Catherine Chan - HDR.](Image)
### EXAMPLE PROJECT

**ROOM DATA SHEET**

**PROGRAM**
- Dept: Health Care Services - Specialty Clinic / Specialty Clinic Patient Care Areas
- Program No: 2-C06100.067 / Space: Telemedicine Exam / Treatment Room
- Qtr: 1 / Program Area: 160 SF

**FINISHES**
- Wall: Epoxy Paint
- Floor: Resilient Floor
- Base: Settled Glass

**OPMENS**
- Window Type: WinConstruction1
- Glazing Type: Glassy 2
- Daylight: Operable
- Special Requirements: Pass-through

**FURNITURE, EQUIPMENT AND FURNISHINGS**
- Furnishings: Bed, Exam Table, Chair, Wall Hooks, Suicide-resistant
- Equipment: Furnished by: Contractor
- Medical Equipment: Installed by: Contractor
- Casework: Countertop 1: SSM, Lockable
- Special Requirements: N/A

**ENGINEERING SYSTEMS**
- Electrical: Power Outlets: Duplex (30A) 6, Quadruplet (30A) 1
- Special Volts: Phase Amp
- Power Source: Normal
- Lighting Level: 50 fc
- Lighting Source: Norm/Even Start
- Special Lighting Control
- Ecol: Hot Water: 4.0
- Computer Equipment: Required Air Changes Per Hour: 8 ACH
- HVAC: Cooling: 24/7, Temperature: 60-71 F
- Heating: 24/7, Temperature: 60 F
- Exhaust Fan: Yes
- Filtration Requirements: MERV rating
- Acoustic: Room Noise: 63
- Room Finish: 1
- Plumbing: Battery Operated Sensor Faucet
- Low Plumbing: Water (WC, Sink)

**REMARKS**

---

Image courtesy Catherine Chan - HDR.
## Architectural Space List - Progress Draft

<table>
<thead>
<tr>
<th>Space No</th>
<th>Room Name</th>
<th>Program Required Area</th>
<th>Program Accessible Family Visiting Unit</th>
<th>Program</th>
<th>Current Program Required Area</th>
<th>Current Program</th>
<th>Current Design Required Area</th>
<th>Deviation from Program (&gt;10% in Red)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-AS0110</td>
<td>Facility A (Facility B Sim) 2-AS0110.001 Entry</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2-AS0110.002</td>
<td>Living &amp; Dining Room</td>
<td>230</td>
<td>3</td>
<td>690</td>
<td>230</td>
<td>3</td>
<td>690</td>
<td>230</td>
</tr>
<tr>
<td>2-AS0110.003</td>
<td>Kitchenette</td>
<td>70</td>
<td>3</td>
<td>210</td>
<td>70</td>
<td>3</td>
<td>210</td>
<td>70</td>
</tr>
<tr>
<td>2-AS0110.004</td>
<td>Bathroom</td>
<td>80</td>
<td>3</td>
<td>240</td>
<td>80</td>
<td>3</td>
<td>240</td>
<td>80</td>
</tr>
<tr>
<td>2-AS0110.005</td>
<td>Bedroom 1</td>
<td>190</td>
<td>3</td>
<td>585</td>
<td>190</td>
<td>3</td>
<td>585</td>
<td>190</td>
</tr>
<tr>
<td>2-AS0110.006</td>
<td>Bedroom 2</td>
<td>130</td>
<td>3</td>
<td>390</td>
<td>130</td>
<td>3</td>
<td>390</td>
<td>130</td>
</tr>
</tbody>
</table>

### Calculations
- **Total Net Area** = 2,115
- **Circulation Grossing Factor @ 0.25** = 529
- **Building Grossing Factor @ 0.10** = 254
- **Total Gross Area (GSA)** = 2,908

### Notes
- **X 2** = 5,816

---

<table>
<thead>
<tr>
<th>Space No</th>
<th>Room Name</th>
<th>Program Required Area</th>
<th>Current Program Required Area</th>
<th>Current Design Required Area</th>
<th>Deviation from Program (&gt;10% in Red)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-AS0120</td>
<td>Facility A (Facility B Sim) 2-AS0120.008 Vestibule</td>
<td>80</td>
<td>1</td>
<td>80</td>
<td>0</td>
</tr>
</tbody>
</table>

---

**Administration and Staff Processing**
- 2-AS0120.001 Processing
- 2-AS0120.002 Vestibule

**Visitor Waiting and Processing**
- 2-AS0120.003 Visitor Lobby with Officer's Station
- 2-AS0120.004 Female Toilet
- 2-AS0120.006 Male Toilet

**Sunday, October 06, 2013**

*Image courtesy Catherine Chan - HDR.*
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EXAMPLE PROJECT

Images courtesy Catherine Chan - HDR.
Architectural Program Statement

Room No. Source Name Room Name - Area  Description Remarks E.O.S Code

01 Facility Support Services Building

2-C50100 Health Care Services

Healthcare Administration - Administration - Medical

2-C50100.001 General Hospital Program Analyst 44 2 120 2C 00100.001

2-C50100.002 Dietician 1 10 2C 00100.002

2-C50100.003 Conference Room 302 1 325 2C 00100.003

2-C50100.004 Conference Room 201 1 200 2C 00100.004 Conference Room 201 1 200 2C 00100.004 Conference Room 201 1 200

2-C50100.005 Files 14 4 55 2C 00100.005

2-C50100.006 Hallways 50 1 83 2C 00100.006

2-C50100.007 Office Technician 52 1 112 2C 00100.007

2-C50100.008 Reception / Waiting Area 45 1 144 2C 00100.008

Healthcare Administration - Administration - Mental Health

2-C50100.010 Office Technician 45 3 144 2C 00100.010

Health Information Services - Medical Records

2-C50100.022 Health Record Technician I 94 3 182 2C 00100.022

2-C50100.024 Health Record Technician II / Supervisor 110 1 210 2C 00100.024

2-C50100.026 Intake/Health Records 500 1 530 2C 00100.026

2-C50100.028 Office Assistant / Office Technician 48 2 95 2C 00100.028

2-C50100.034 Volunteer / Public Counter 115 1 115 2C 00100.034

Medical and Clinical Services - Specialty Clinic - Specialty Clinic Administration

2-C50100.040 Nursing / OTT Observation 172 1 172 2C 00100.040

2-C50100.047 Institutional Support 160 1 180 2C 00100.047

Medical and Clinical Services - Specialty Clinic - Specialty Clinic Inpatient Area

2-C50100.052 Custody Office 45 1 45 2C 00100.052

2-C50100.054 Single Inpatient Patient Holding / Vest 55 1 55 2C 00100.054

Medical and Clinical Services - Specialty Clinic - Specialty Clinic Patient Care Areas

2-C50100.056 Tramway Entry / Treatment Room 160 1 160 2C 00100.056

Medical and Clinical Services - Specialty Clinic - Specialty Clinic Support Areas

2-C50100.067 Storage, Furniture and Toolroom 120 1 120 2C 00100.067

2-C50100.069 Storage, Furniture and Toolroom 120 1 120 2C 00100.069

Medical and Clinical Services - Specialty Clinic - TTA Inpatient Patient Area

2-C50100.074 Ward / Fracture Room 160 1 160 2C 00100.074

Medical and Clinical Services - Administrative

2-C50100.078 Nursing / OTT Observation 300 2 300 2C 00100.078

Medical and Clinical Services - Inpatient Area

2-C50100.082 Custody Office 45 2 90 2C 00100.082

2-C50100.084 Treatment / Treatment Room 15 2 30 2C 00100.084

2-C50100.086 Inpatient Patient Holding / Vest 260 2 830 2C 00100.086

2-C50100.087 Single Inpatient Patient Holding / Vest 55 2 150 2C 00100.087

2-C50100.090 Junior Cabinet 30 1 30 2C 00100.090

Images courtesy Catherine Chan - HDR.
Thank You

Please complete a *Speaker Evaluation Form*

Mario Guttman
Senior Design Technology Specialist
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