Computational Design for the IT Crowd

Timon Hazell
Presentation Summary

Intro
Computational Design
Dynamo Basics
Example Use Cases
Live Demo (Developed for IT Leaders)
Best Practices for IT and Office
Supporting Dynamo Users
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Lead SilmanBeta
About Your Speaker

- Training
- Curiosity
- Opportunity
LOOKING AT PROBLEMS FROM MULTIPLE DIRECTIONS

- THE PATH
- PROBLEM
- SOLUTION

LINEAR

LATERAL
Poll the Room

Dynamo
Grasshopper
In House Programmers
Other Software Platforms
Computational Design Programs
AEC Specific Visual Tools
App Developer

How do I use it?

When you click the button it does everything inside.

Now send the message.

Play sound

Change status color

Text field properties (send to, and what to send)

It works like a puzzle. Just put the pieces together where they fit.
Flowhub
Status of Computational Design in the Industry
How Dynamo Became a Household Word
ACTUALLY, IT DOES!

WE NEED THREE MORE DESIGNERS
USE VISUAL PROGRAMMING METHODS.

VISUAL PROGRAMMING DOESN'T JUST MEAN DOING MORE WORK WITH FEWER PEOPLE.

FIND ME SOME WORDS THAT DO MEAN THAT AND ASK AGAIN.
What is Dynamo?
Open-source Dynamo is a visual programming extension for Autodesk® Revit that allows you to manipulate data, sculpt geometry, explore design options, automate processes, and create links between multiple applications.

- Rapid design iteration and broad interoperability
- Lightweight scripting interface
- Current builds for Autodesk Revit 2016, 2017 and 2018

Version 2.0.0

Autodesk® Dynamo Studio is a visual programming platform that functions fully independently of any other application. Employ all the power of visual programming without buying another Revit license.

- Rapid design iteration and broad interoperability
- Lightweight scripting interface
- Direct access to cloud services
- Includes advanced geometry engine

Version 1.3.0 (Please make sure to update your initial install using the Autodesk Desktop App)
BASIC USER INTERFACE

Code Block
"Top Offset";

Element.GetParameterValueByName

- element
- parameterName

5.0ft
DYNAMO USE CASES

Automating Repetitive Tasks

Revit Model Management (Quality Control)

Linking with other Software
What is Dynamo?
It’s all about logic

My conversion
External Data

Importing Data from OpenSource Map Applications
Geometry (parsed to straight line segments)

SAP2000
- Analyzed Members
- Nodes Locations
- Member Nodes
- Analyzed Section Sizes

Dynamo
- Modify Tables from SAP and organize by member and match to geometry in Grasshopper
- Table shall have:
  - Node coordinates
  - Steel Shape Name
  - Steel Shape Geometry

Dynamo
- Use Rhino Geometry and SAP Analysis Data, match and Model in Revit
Structural Discretization
Color Override Legend by Parameter: 'Thickness'

- 0.125
- 0.1875
- 0.25
- 0.3333333333333333
- 0.3958333333333333
- 0.4166666666666667
- 0.5
- 0.5208333333333333
- 0.6041666666666667
- 1.0
- 1.25
Here is the report for a preliminary grid comparison for [Redacted].

It was compared to the linked model titled: [Redacted]

The following grids exist in the Silman model, but could not be found in the linked model:

Congratulations, all grids in the linked model exist in the Silman model.

Congratulations, all grids in the linked model exist in the Silman model.

The following is a list of grids and offset distances for grids that are not aligned between the two models.
{D.5,5''}
{K.1,5''}
{A.2,1''}
{15,5''}
{1.4,5''}
{11.5,8''}
{M.7,1/32''}

The following grids in the Silman are not referenced by any Column Location Mark:
{D,J.5,8.7,C.1,L.8,E.N,E.P,E.Q,E.R,E.S}
What issues have IT leaders had with Dynamo or other scripting?
Live Demo
(time permitting)
More on the Dynamo Framework and Best Practices
Script Design

Single Use
Single Project – Reuse
Multi project – Firmwide

Flexible Standards
Office Wide Scripts

Best Practices Discussion Point:
- Vetting Scripts
- Sharing Scripts
- Script Locations
- Dynamo Player
Dynamo Packages

What are they?
Which are the best?

Beware of Risks!

Find the balance between risk management and open source innovation
• PACKAGE MANAGER

Questions to Group:
Should Users be Allowed to Install? Network or Local Directory
LINKING WITH OTHER SOFTWARE
What installation experience does the room have?
More on Installations
Revit Version Compatibility

As both Revit and Dynamo continue to evolve, you may notice that the Revit version you are working with is not compatible with the Dynamo for Revit version you have installed on your machine. Below outlines which versions of Dynamo for Revit are compatible with Revit.

<table>
<thead>
<tr>
<th>Revit Version</th>
<th>Last Supported Dynamo for Revit Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>0.6.3</td>
</tr>
<tr>
<td>2014</td>
<td>0.8.2</td>
</tr>
<tr>
<td>2015</td>
<td>1.2.1</td>
</tr>
<tr>
<td>2016</td>
<td>1.3.2</td>
</tr>
<tr>
<td>2017</td>
<td>Latest Daily Build</td>
</tr>
<tr>
<td>2018</td>
<td>Latest Daily Build</td>
</tr>
</tbody>
</table>
Silent Installation of Dynamo

Process:
1. Remove all previous versions and types of Dynamo

2. Ensure all machines have the correct Revit version installed, including all updates and patches.

3. Install the version of Dynamo:
   - Start with Dynamo Core
   - Add all relevant versions of Dynamo for Revit 20XX

4. Set up the settings to work with the correctly mapped packages and custom node paths accordingly.
Settings Configuration

- Dynamo settings are saved in an XML file.

- Default location: `C:\Users\<USER>\AppData\Roaming\Dynamo\Dynamo Revit\1.X`

- These can be manually configured or overwritten in whole or in part, as you do for any other locally stored setting file.
Installation Tips and Tricks

From the Dynamo development team:

- Many issues are noted on the dynamo Github page - [https://github.com/DynamoDS](https://github.com/DynamoDS).
- Dynamo dev recommends placing packages on a server with a minimal drive size. Otherwise searching for packages and starting dynamo will be slower. Network drives are likely to require partitions.
- Silent deployment typically happens with an .msi file and with the command line
- Bad updater events have appeared in versions 1.3.1 and 1.3.2 resulting in a visible grid but no graphics – to fix this, uninstall and reinstall outside of the Autodesk Application Manager. (Only in Dynamo Studio or Core/Sandbox)
- Microsoft Fix It Utility is very helpful for managing a corrupt installation – this removes any corrupted or bad program: [https://support.microsoft.com/en-us/help/17588/fix-problems-that-block-programs-from-being-installed-or-removed](https://support.microsoft.com/en-us/help/17588/fix-problems-that-block-programs-from-being-installed-or-removed)
If I don’t know the program... how can I guide my designers?
Encourage Writing Out a Plan

Beams → Get Location Lines → Project Lines to Surface → Get Surfaces

Relocate Beams → New Line
SIMPLE EXAMPLE APPLICATION

Before:

After:
Encourage Writing Out a Plan

Beams ➔ Get Location Lines ➔ Project Lines to Surface ➔ Get Surfaces

Relocate Beams ➔ New Line
Basic Logic

Selecting  Modifying  Applying
ENCOURAGE INVOLVEMENT IN A USER GROUP
Explore Dynamo Nodes

Standard Nodes
Standard, or out of the box (OOTB), nodes come installed with Dynamo.

Custom Nodes
Custom nodes are made by combining standard nodes. Sets of custom nodes can be shared as packages.

Workflows
Workflows are the final product: a visual program, usually designed to execute a specific task.

BROWSE STANDARD NODES →
BROWSE PACKAGES →
BROWSE WORKFLOWS →
Dynamo Package Manager

Share and discover workflows for Dynamo visual programming

<table>
<thead>
<tr>
<th>Packages</th>
<th>Newest</th>
<th>Most Recently Updated</th>
<th>Most Installed</th>
<th>Most Depended Upon</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Newest</strong></td>
<td>VP · TestFormiT</td>
<td>CarlBuffReinforcement</td>
<td>LunchBox for Dynamo</td>
<td>LunchBox for Dynamo</td>
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<td></td>
<td>Life Safety Areas</td>
<td>Modelical</td>
<td>archi.lab.net</td>
<td>archi.lab.net</td>
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<tr>
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<td>WeCoordinate Tools</td>
<td>VP · TestFormiT</td>
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<td>Clockwork for Dynamo 1.x</td>
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<td>Igor Ramos</td>
<td>MEPover</td>
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<td>spring nodes</td>
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<td>BIM4Tunneling_Abdel</td>
<td>Synthesize toolkit</td>
<td>Rhythm</td>
<td>Rhythm</td>
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<tr>
<td></td>
<td>StructuralConnection2019</td>
<td>Orchid</td>
<td>SteamNodes</td>
<td>Quads from Rectangular...</td>
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<tr>
<td></td>
<td>UOga</td>
<td>Life Safety Areas</td>
<td>Rhino</td>
<td>SteamNodes</td>
</tr>
<tr>
<td></td>
<td>Daniel</td>
<td>RIE</td>
<td>BumbleBee</td>
<td>Evaluate Sun Directness ...</td>
</tr>
</tbody>
</table>

1029051 INSTALLS 1271 PACKAGES 472 AUTHORS
The Dynamo Primer

For Dynamo v1.3

Welcome

You have just opened the Dynamo Primer, a comprehensive guide to visual programming in Autodesk Dynamo Studio. This primer is an ongoing project to share the fundamentals of programming. Topics include working with computational geometry, best practices for rules-based design, cross-disciplinary programming applications, and more with the Dynamo MATHS.

The power of Dynamo can be found in a wide variety of design-related activities. Dynamo enables an expanding list of ready-to-use components for you to get started:

- **Introduce visual programming for the first time**
- **Educate contributors in various software**
- **Engage in active community of users, contributors, and developers**
- **Develop an open source platform for combined improvement**

In mind of this activity and existing opportunities for working with Dynamo, we need a document of the same caliber, the Dynamo Primer.

This Primer offers chapters developed with Habitat Labs. These chapters focus on the essentials you will need to get up and running developing your own visual programs with Dynamo and the insights on how to take Dynamo further! Know what you can expect to learn from the primer:

- **Overview**: What exactly is "Visual Programming" and what are the concepts I need to understand to dive in to Dynamo?
- **Getting Started**: How do I get Dynamo and create my first program?
- **What is a Program**: What are the fundamental parts of Dynamo and how do I use them?
- **Building Blocks**: What is "Output" and what are some fundamental types I can start using in my program?
- **Geometry for Design**: How do I work with geometric elements in Dynamo?
- **Lists, Lists, Lists**: How do I manage and manipulate data structures?
Presentation Recap

Computational Design
Dynamo Basics
Example Use Cases
Live Samples (Developed for IT Leaders)
Best Practices for IT and Office
Supporting Office without Deep Knowledge
Thank you.

Questions?

Thank you.

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