Sandia National Laboratories Cognitive Task Analysis Visio Add-in

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Contents

Introduction
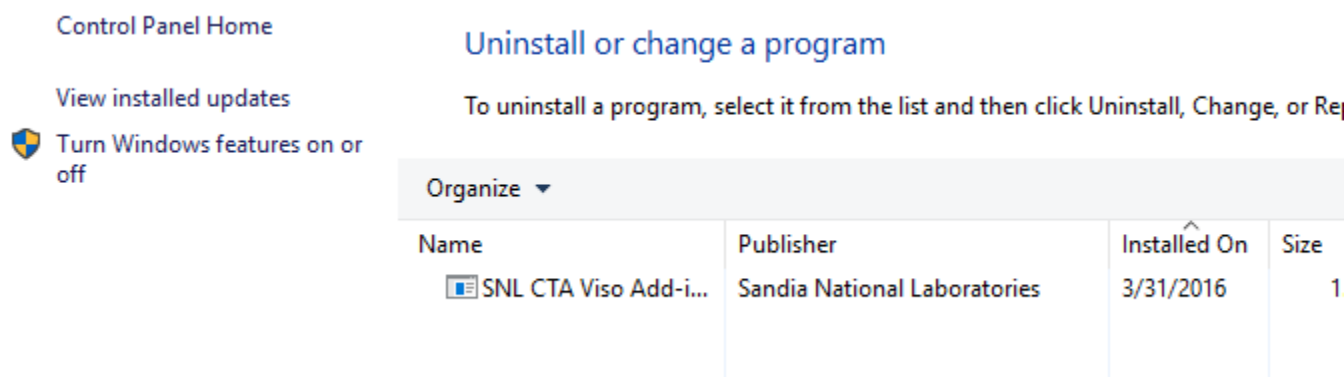
This add-in serves two purposes:

1. To layout flows of observable and cognitive tasks, with appropriate directions, connections, descriptions and categories.
2. To allow subject-matter experts to provide ratings for each task.

As such, the tool allows for a "design mode" and a "run mode", so to speak. As we describe the various features of the add-in, keep these modes in mind.

Installation

The file **CTA Installer.msi** should run an install the latest version of the add-in over older versions. Simply run this msi file to install the add-in. You will need Visio 2013 or 2016 on your machine in order for the add-in to make sense.

If there is a problem with running the installation, you may have to first uninstall the older version. Depending on your version of Windows, go to "Programs and Features" or "Add and Remove Programs" and search for SNL or CTA. You should find the add-in listed, and be able to uninstall it:

Control Panel Home

View installed updates

Turn Windows features on or off

Uninstall or change a program

To uninstall a program, select it from the list and then click Uninstall, Change, or Re

Organize ▼

Name	Publisher	Installed On	Size
SNL CTA Viso Add-i...	Sandia National Laboratories	3/31/2016	1

Alternatively, find the older CTA Installer.msi file, run it, and choose to uninstall.

Deactivating the Add-in Temporarily

If you are use Visio for other purposes, you can temporarily disable the add-in without uninstalling it.

There are two ways to get there:

1. Developer > Add-ins > COM Add-ins, uncheck the add-in and it will unload from Visio.

2. File > Options > Add-ins > Manage COM Add-ins > Go…, uncheck the add-in and it will unload from Visio.

## Ribbon: Design-mode and Default

When the add-in is successfully installed, you should see a new ribbon group, titled CTA, on the very right of the Home tab. Not only is this your central location for accessing the add-ins features, it is also the easiest way to tell if the add-in installation was successful, and that it is working:
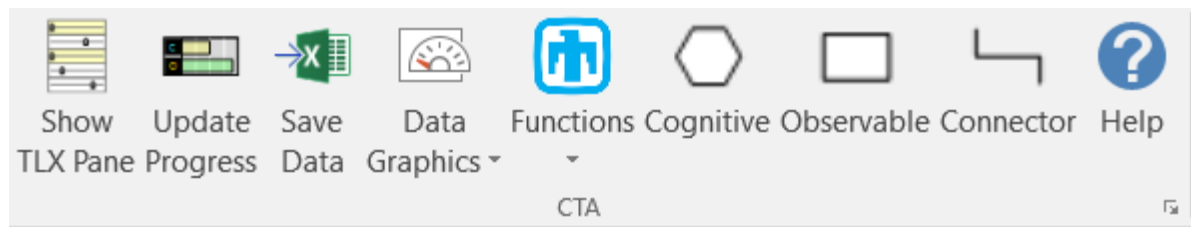
You can right-click these items and add them to the Quick Access Toolbar, or even add its buttons to your own custom ribbon groups. Adding to the QAT puts commands atop Visio's main window; they are always visible, no matter which ribbon tab is active. This can save you a lot of time because it alleviates the need to return to the Home tab to access the add-in's tools.

Ribbon: Run-mode

When a diagram is deployed for users to fill-out, a so-called "Design Mode" can be turned off, and a reduced set of menus are available:
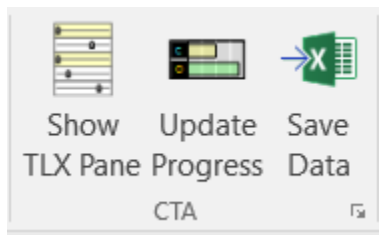
To turn off design mode (and turn on run mode), click the dialog box launcher (the little box-with-arrow) in the lower-right hand corner of the CTA group. There is a check box entitled "Developer/Design Mode" that you can uncheck.

There is more information on run mode vs. design mode later on in this document.

Note: any design-mode commands you've added to custom ribbon groups or the Quick Access Toolbar will still be available in run mode, so you'll want to be sure and clean-up any custom UI before letting users fill out the task ratings.

Starting a New Diagram

When the add-in is installed, a CTA Template is installed in Visio's start screen. The first time you look for it, it will be a bit tricky to find, as it is buried behind the CATEGORIES tab in the Template Gallery. You'll need to do this:

1. Start Visio
2. Click **CATEGORIES** in the Template Gallery
3. Open the **SNL** folder:
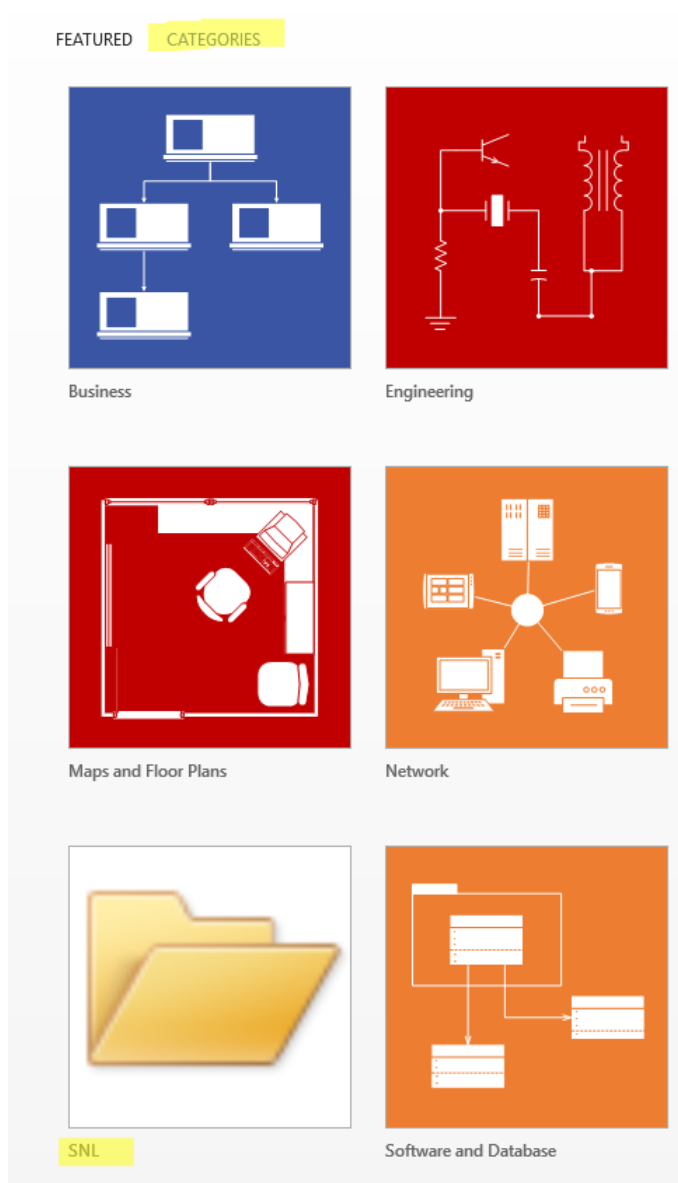
4. Click the **CTA Template** item to start a new, blank, unsaved diagram:
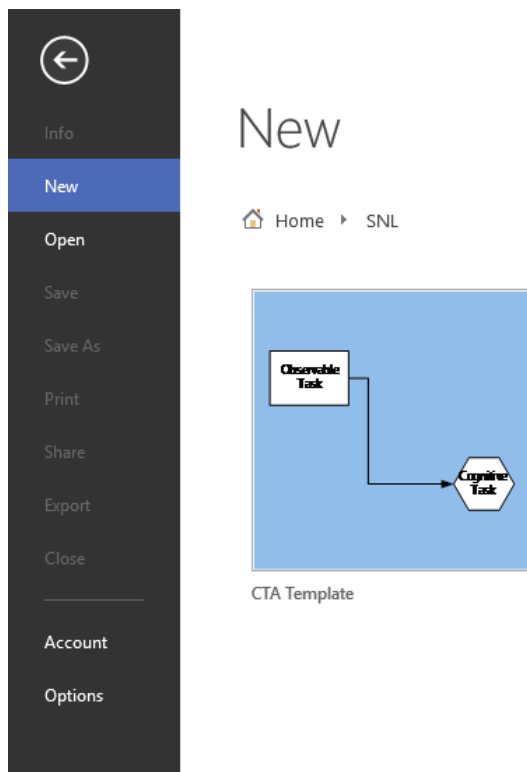
From within the Visio drawing environment, you can also click on the CTA group's **Functions** drop-down, and choose **New CTA Diagram**.

The Config Page

When you start a new CTA diagram, note that there are two page tabs: **Diagram** and *config*. The config page is a background page, hence the italics. This page will not print, so no worries about wasting paper.
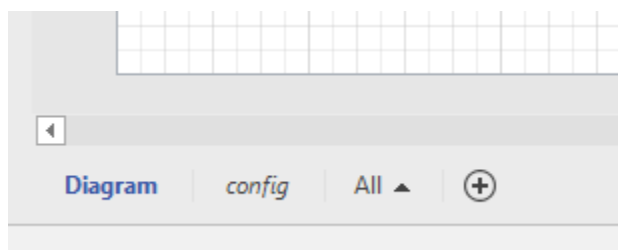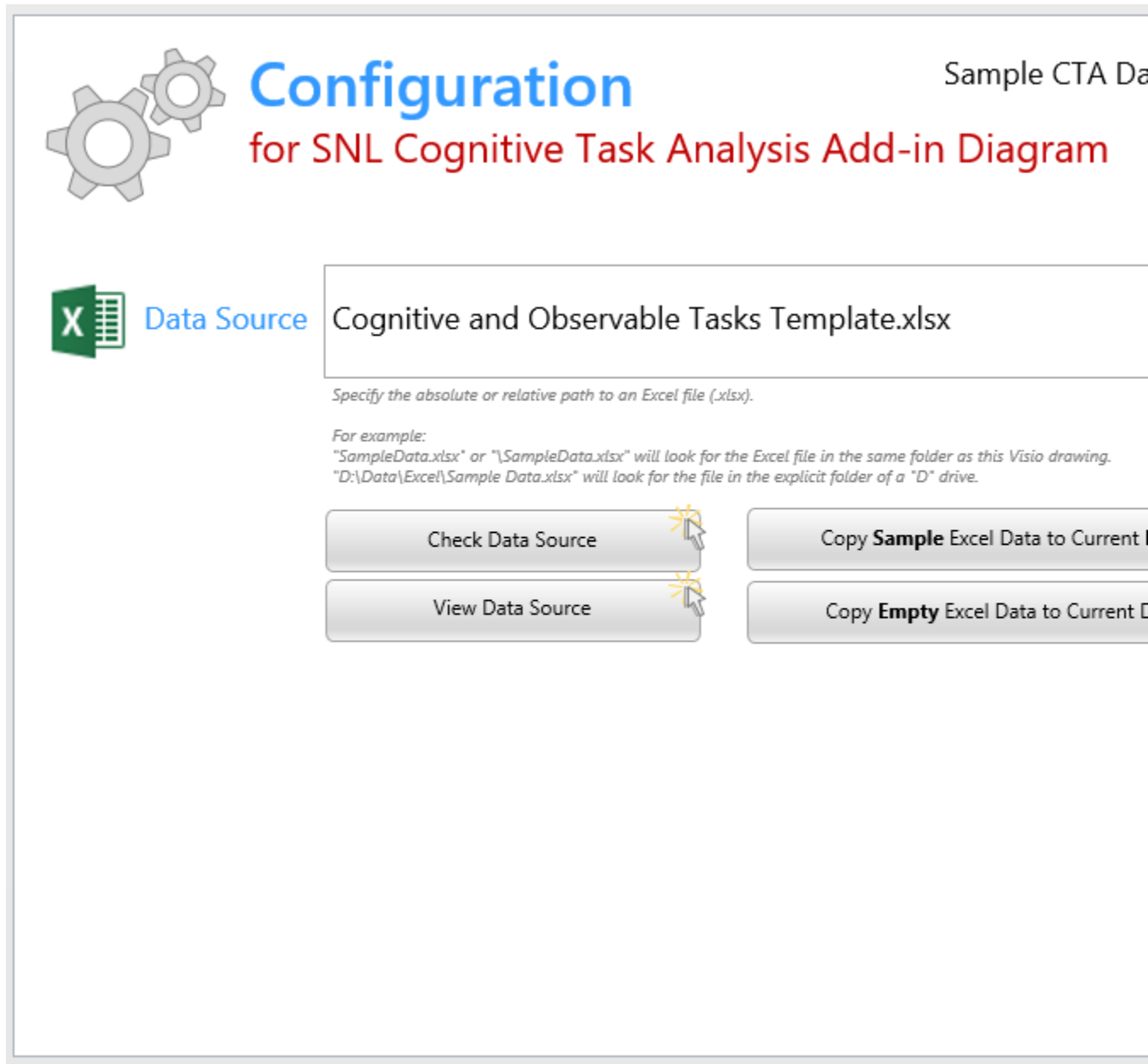

The config page is where you set up your data source—an Excel file.

The idea is to use Visio shapes on a page sort of like a custom windows form to execute functions and to hold values. Keep in mind that this is a drawing page, not a Windows form, so the interaction is a bit different. Those rectangles that look like buttons are actually just shapes. You'll need to *double-click* them to get anything to happen. Alternatively, you can right-click them to get at the same functionality, or click the Action Tag menu that appears when you mouse-over one of the shapes.

The **Data Source** shape holds the path (relative or absolute) to the Excel file that is your data source for the corresponding diagram. If there is no complete path, then it is assumed that the xlsx file is in the same directory as the Visio file. The […] button-shape will allow you to browse to an existing Excel file.

To get started quickly, you can double-click one of the "copy" buttons to quickly copy either a blank Excel file or sample Excel file containing 500 cognitive and 500 observable records. It also sets the path in the Data Source field, so that subsequent data-related operations will function properly.

The Excel template and sample file are organized into two sheets: "Cognitive Tasks" and "Observable Tasks". Each sheet has the appropriate column headers.

The **Description** column is being used as the unique identifier, or key, for this solution. Currently, the **Task Number** column is not being used, but remains "just in case".

If you're having difficulties reading or writing from the Excel file, double-click the **Check Data Source** button shape. A report will show in a pop-up window. If all is OK, it will look something like this:
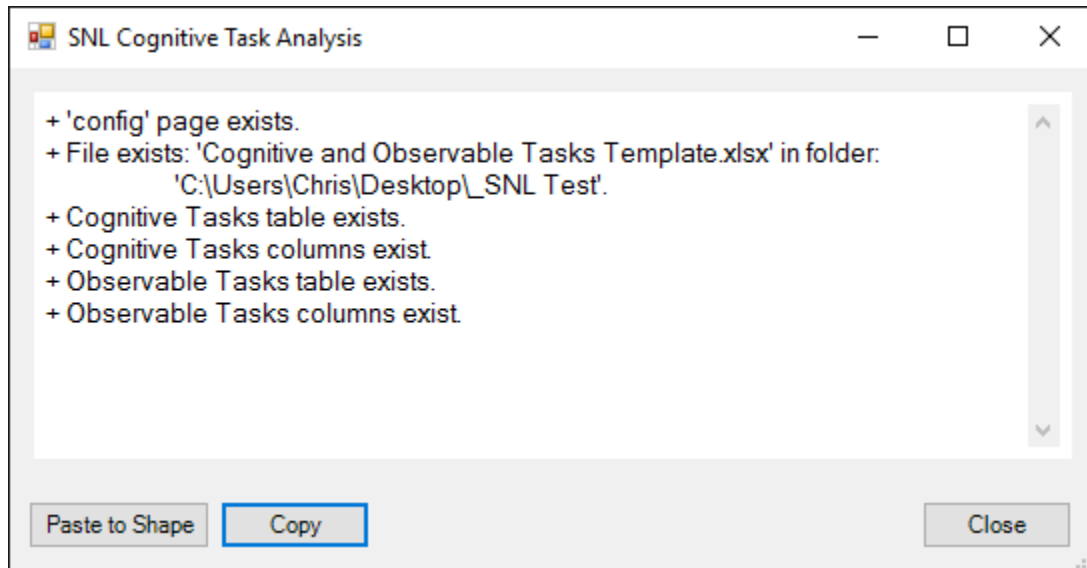
If you see minus signs, then something is wrong.

One mysterious issue that was encountered while developing the add-in was that the "Observable Tasks" tab was not being found in the Excel file (Even though it was in the file! It is suspected that single-quotes were somehow invisibly wrapping the sheet's name). A solution was to copy all of the data onto a new worksheet tab, delete the original one, then rename the new one (back) to "Observable Tasks". Strange, yes!

Tip: note the **Paste to Shape** button on the report form. This button is available for many of the reports that are offered by the add-in. Clicking it will create a Visio shape on the active page with the text contained in the dialog. This is great when you have an issue, or want to preserve some "current status" information before stopping a work session. You can leave a reminder of where you were, and what needs to be done right on the Visio page!

CTA Ribbon Group Functions

As mentioned previously, the add-in installs a custom ribbon group, titled CTA on Visio's Home ribbon tab. Let's describe all of the functions on this tab:
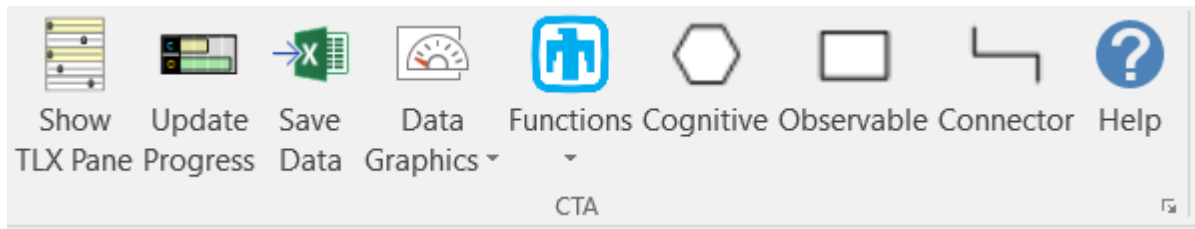
Show TLX Pane

Shows a panel for editing the ratings of the selected cognitive or observable task shape. This is mainly intended for run-mode. The options panel has a setting for automatically turning this panel on when a "CTA" document is opened in Visio.

Here we can see that a cognitive task shape has 5 out of 6 ratings set, two of which are set to N/A.
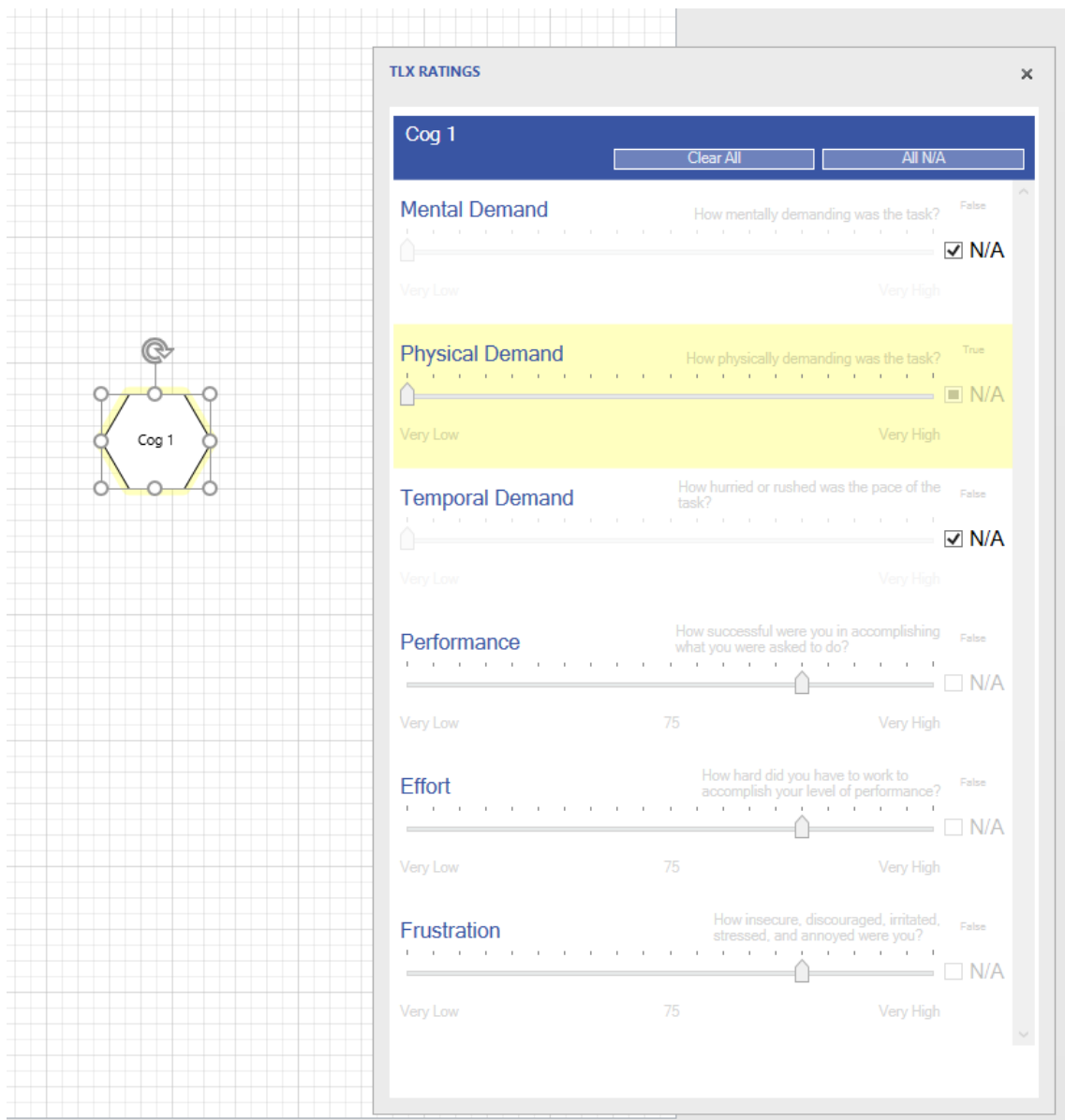
The yellow field, Physical Demand, has not been rated. Note that the shape also displays a yellow halo when it is not named and all of its ratings are not set.

Hint: you can double-click the blank area around each slider to reset a rating to "unset". Two buttons at the top of the form allow you to clear all ratings (i.e. back to yellow), or set all ratings to N/A.

Update Progress

This function will update the **Progress Bars** shape to show how many tasks have been fully-rated. It looks something like this:
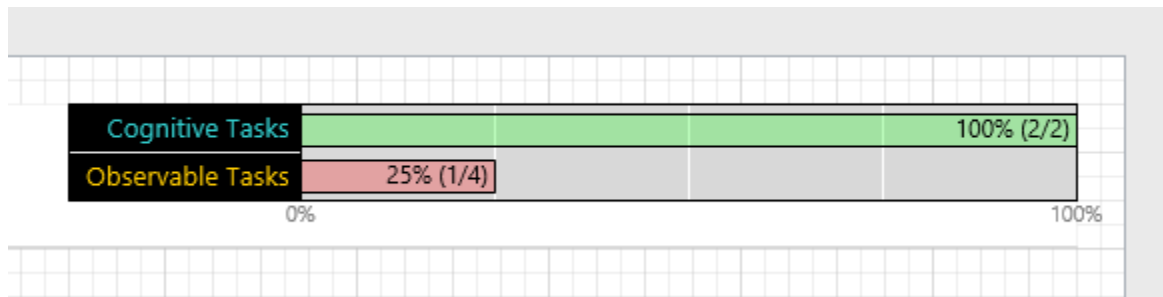
A diagram can have any number of Progress Bars shapes. The function will update them all with the same results. You can also right-click a Progress Bars shape and update it via: **Refresh Progress Bar**.

Note that the progress is for *tasks on the page*, as opposed to tasks in the database. If you have fully rated four of the four observable tasks on the page, then Progress Bars will show 100%, even if there are 500 tasks in your Excel data source.
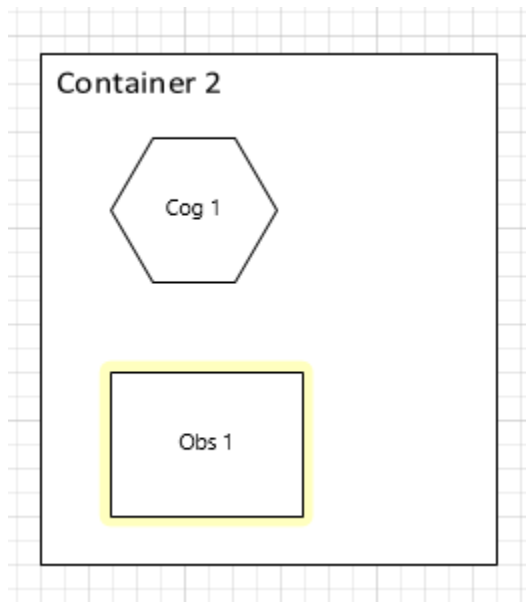
Task shapes also display a visual clue—a yellow halo—that indicates that they do not have a description, or are not fully rated. For smaller diagrams, it might be easier to just look for yellow shapes, rather than depend on the Progress Bars function, or on some of the issue highlighting that we will describe later.

Save Data

This function will analyze the current document's diagram page, update categories related to containers and layers, and then export the data to the Excel. Ratings data in Visio task shapes will overwrite any data in the Excel file. If a shape has a Description that is not in the Excel file, then a new row will be written to Visio.

If there are duplicate task shapes (same task type, with same Description), an error message will pop up, and no export will take place.

Data Graphics

Visio datagraphics can be applied to shapes in a page using the menu items in the **Data Graphics** drop-down menu in the CTA ribbon group. For CTA-specific datagraphics, the custom drop-down is much easier to use than Visio's built-in functionality, located on the Data tab.

Applying CTA DataGraphics

The items in the Data Graphics menu are a bit smarter than Visio's native functionality in that you don't have to first select the shapes to which you want to apply the datagraphics. When you choose a Data Graphics menu item, the add-in is smart enough to apply appropriate datagraphics to the appropriate shapes. So "cognitive" datagraphics are applied to cognitive task shapes, and "observable" datagraphics are applied to observable task shapes.
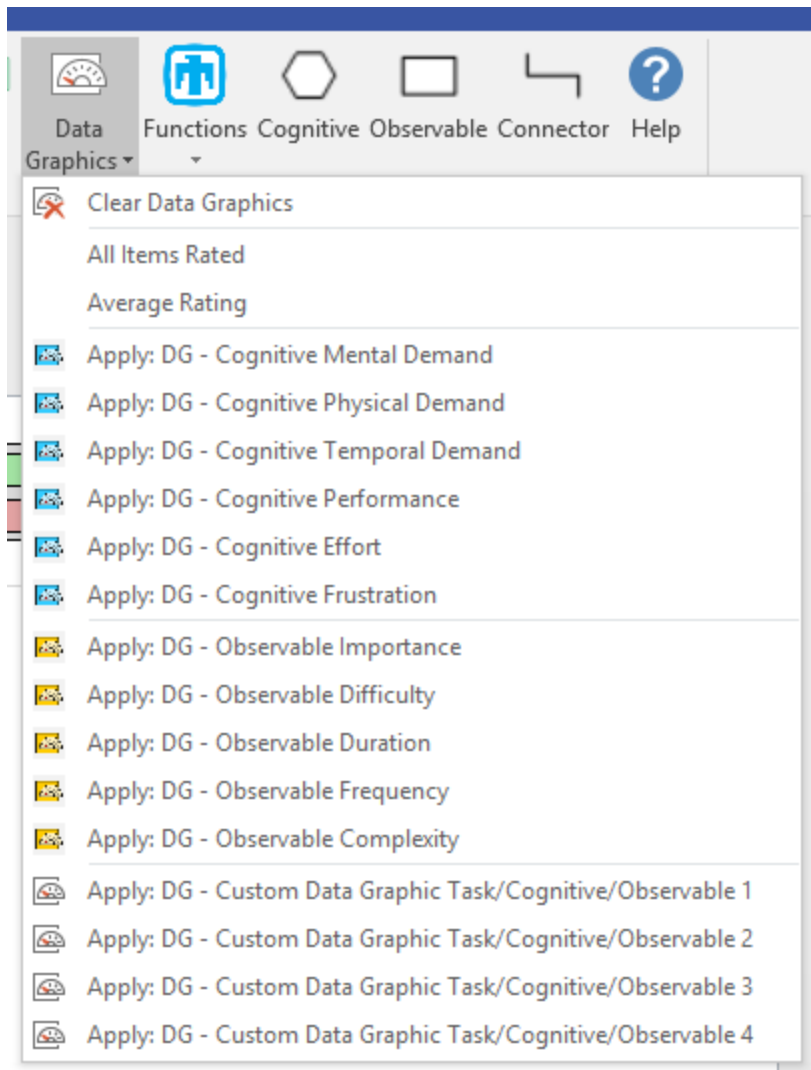
For example, if an item only applies to observable tasks, like *Apply DG – Observable Difficulty*, then only observable-task-shapes will receive that data graphic. Similarly, if an item applies to both observable and cognitive tasks, like *All Items Rated* or *Average Rating*, then both shape types will receive datagraphics.

You can define custom datagraphics in Visio, and assign up to four of them to this menu. Use the Options dialog to specify these names. If the datagraphics item is to apply only to cognitive tasks, rename the datagraphics (in Visio) so that its name contains "cog" or "cognitive". Similarly for observable tasks: include "obs" or "observable" in the name. If the datagraphics should apply to both types of tasks, include "task" in the name.

Examples might include:

- DG – Some Obs Metric
- DG – Some Cognitive Metric
- DG – Stoplight Icons for Tasks

You can then use these names in the four custom data graphic fields in the Options dialog.

By convention, all prebuilt datagraphics for this solution (in the Visio template) have names starting with the prefix "DG – ". This mostly aids in behind-the-scenes development, but also will help in identifying the built-in datagraphics.

Note: you can find pre-built datagraphics, hover over them to see their names, and right-click then to rename them from within the Visio interface:

- For Visio 2013, go to: Data > Display Data > Data Graphics drop-down list.
- For Visio 2016, go to: Data > Advanced Data Linking > Advanced Data Graphics drop-down list.

Here we hover over a pre-build datagraphics in Visio 2013:
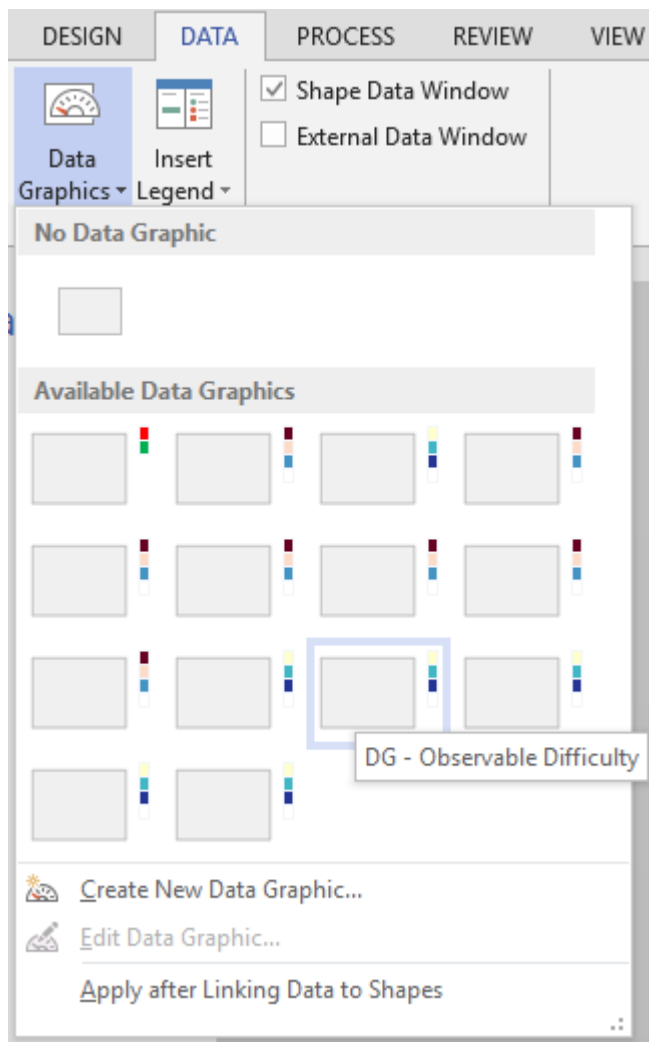
In the same window above, you can right-click on a datagraphic to rename it. So if you create your own datagraphics, go back to this drop-down, right-click your new item, and rename it using the prefixing and naming conventions described above.

DataGraphic Legend

When datagraphics are applied via the CTA commands, the title in the diagram is updated, so that the current cognitive- and observable datagraphic names are updated.

Below, we can see that the currently applied datagraphics are **None** and **None** ☺

The pre-built datagraphic are all color-by-value visualizations that key off of rating values, or aggregate rating values. They are all built to use the same two unique color scales: one for cognitive tasks and one for observable tasks. These are shown beneath the title, as shown above. The coloration ranges from blues (low values) to either red or yellow for higher values.

Functions

When the add-in is in design mode, you'll have the potpourri drop-down list **Functions**. This has lots of nerdy stuff that will help you work faster and analyze what you've done. Take a peek:
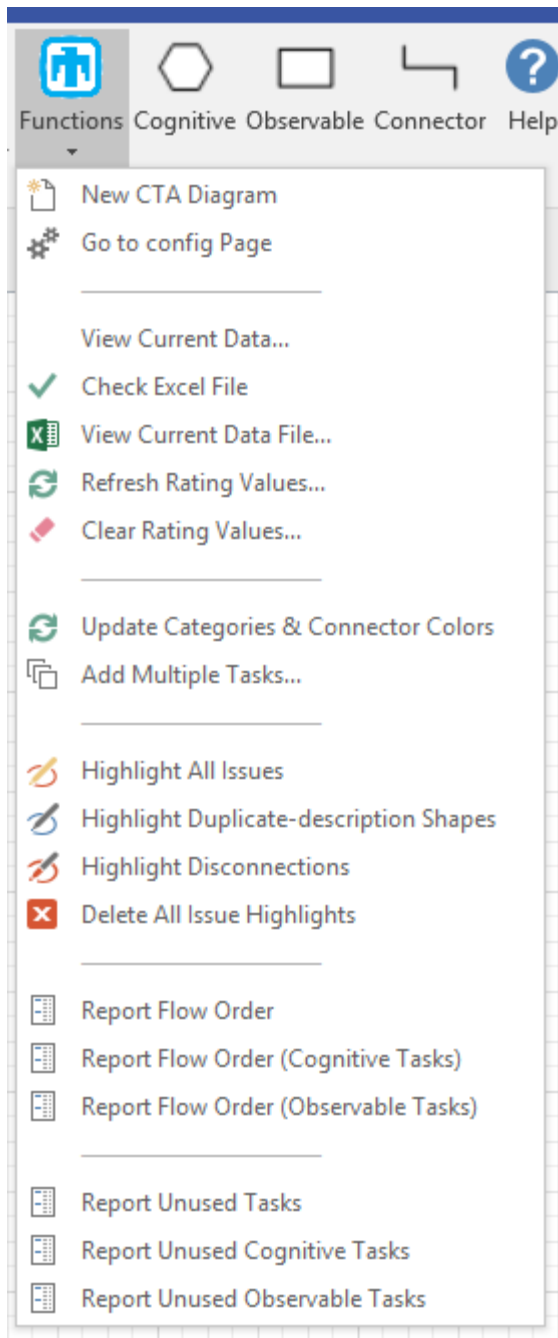
New CTA Diagram

Opens a new, empty, unsaved Visio document for you to populate with task shapes.

Go to config Page

Jumps to the config page, in case it is hidden.

Another function, which belongs to the design-mode/run-mode feature set, but isn't well integrated, is the ability to hide the config page tab. If you right-click a blank area on the **Diagram** page, you can choose whether to show or hide the config page tab:
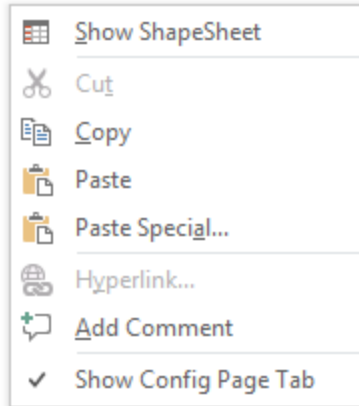
If the page tab is hidden, then of course, it is hard to get to the page! Go to config Page helps you get there! And if you switch to run mode, the users won't have this function available! So they won't be able to "get distracted" by the config page at all.

View Current Data…

Shows a fusion of data in a pop-up form. First, all the data in Excel is read. Then the data in task shapes in the Visio file is read. The Visio data supplants the Excel file data (keying off of the Description field), but there are also check boxes that show whether the data is In Visio and/or In Excel.

This function was largely used for developing the add-in, but can be useful, for example, to find tasks that are in Visio but not in the Excel data source.

Check Excel File…

This is the same function as on the config page. It checks the current data source for existence, if it has the correct two tasks worksheets, and if each worksheet has the correct column headers.

View Current Data File…

Same as the button shape function on the config page. Opens the data source file in Excel.

Refresh Rating Values…

If you've been playing around with the TLX pane, you may want to reset the data in your task shapes so that they again reflect the values stored in Excel. If a task is in Visio, but is not in Excel, then no change to the ratings will be affected, of course.

Clear Rating Values…

This function is great for preparing a document to be filled out by a user. With one click, you can erase all the rating values for all of the task shapes in the document!

Update Categories and Connector Colors

Some of the attributes of task shapes and connectors need to be updated by the add-in. Rather than have the add-in watch the user's every move, which is expensive in both coding and performance, there are commands to update these characteristics, explicitly.

Task shapes have additional category attributes that depend on layers, containers, and nearest observable tasks. Connectors can have gradient colors that blend the "from" and "to" task shapes' coloration.

The *Update Categories & Connector Colors* command sets this information with a single mouse click. It analyzes the current diagram and sets the various shape category Shape Data values, according to layers, containers and connected task shapes. For the nearest-observable-task category that cognitive shapes have, a semi-colon-delimited list will be created if there are multiple "nearest" tasks. The command also sets connector formulas so that they take the colors of the "from" and "to" shapes. This coloration is "live", so to speak. Changing the colors of task shapes thereafter (say, by applying a heat-map datagraphic) will result in the connectors changing colors automatically. The refresh does not need to be re-run.

Note: you don't have to nervously click this command all of the time. To save time, this function is also automatically called whenever *Save Data* (to Excel) is clicked as well as when *Functions > View Current Data…* is summoned.

Add Multiple Tasks…

If you are mapping a lot of data from Excel, double-clicking each shape to assign a record to each shape can become tedious. Use this function to select multiple cognitive and observable records, and insert them into the diagram in one fell swoop. The shapes will be arranged in vertical columsn, and will have a connector automatically attached to save you even more time!

Highlight All Issues, Highlight Duplicate-description Shapes, Highlight Disconnections

Use these highlighting functions to find disconnected shapes and connectors, task shapes with duplicate names (Description fields), or both.

Below, we can see cognitive tasks with the same descriptions highlighted with purple rectangles, and shapes that are not fully connected highlighted with red ovals:
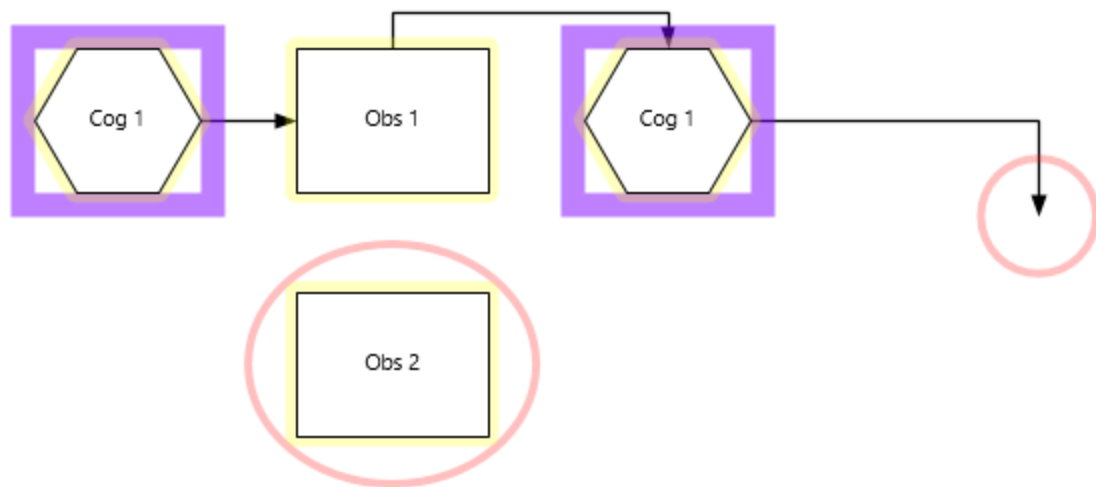
Delete All Issue Highlights

Simple deletes all highlight shapes created by any of the highlighting functions.

Report Flow Order, Report Flow Order (Cognitive Tasks), Report Flow Order (Observable Tasks)

Reports the flow order of a diagram, with options to show only cognitive or observable tasks. The sorting order logic is roughly as follows:

- Groups of connected shapes, from top-left to bottom-right
- Left/top-most "start" shapes first, following to left/top-most successor shapes

Hopefully that makes some sort of sense!

Report Unused Tasks, Report Unused Cognitive Tasks, Report Unused Observable Tasks

Compares the task shapes on the page (by Description) to the task records in the data source. Records that have no representation in the diagram are reported.

There is no reporting of shapes that are used in the diagram but do not exist in Excel, however.

Cognitive, Observable, Connector

Although the task shapes are available in the Document Stencil for the CTA template, you don't need to have that window open. Just click these buttons to insert the appropriate shape in the center of the current window.

If you leave a task shape selected, then insert another one using the button, a connector will be created automatically between the previous and next shape. This can save you a lot of time.

Note: there is no pop-up to choose a data record from Excel to associate with the shape. This can be done later by double-clicking or right-clicking task shapes.

Help

Well, you know what that does, because you're reading this document!

Options Dialog

Click the Dialog Box Launcher for the CTA group to get the options form. That is the little square with the arrow pointing at 4:30 in the lower-right corner of the ribbon group.
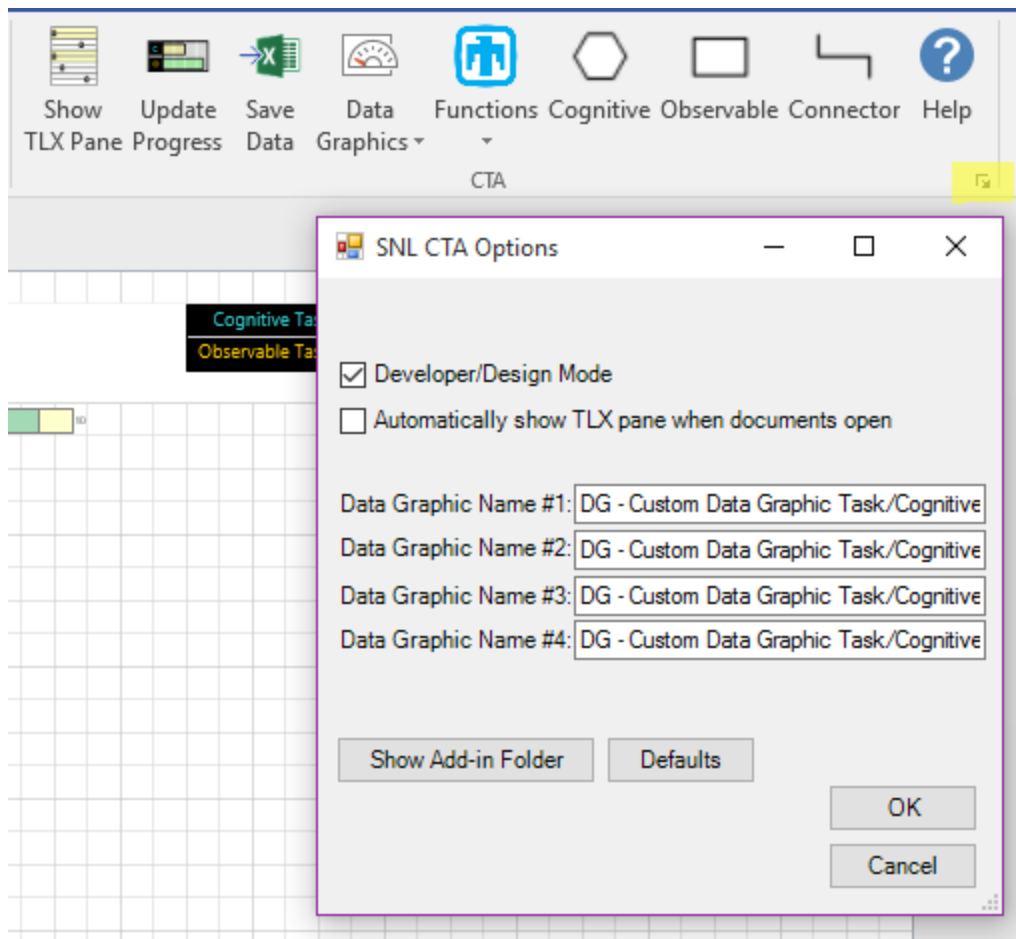
- Reports
- Reports – Send to Shape
- Right-click diagram page to hide config page
- Config page – setup, "buttons", it's a background, won't print
- Resizing the page

- Updating the progress bars
- Double-click tasks: add/rename/delete items (delete doesn't work), categories (rename all in page on change)
- Must use the template connector, not just "any old line", shapes must be glued, etc.
- DataGraphics: gray = N/A, white = not set, otherwise color gradients.
- Options
- Run Mode vs. Design Mode
- Setting Up the Data Source
- Fill out a path
- Use the "buttons" on the config page to get up and running quickly…
- Copy an empty
- Copy a sample
- Shape data panel from Visio