

Workflow Using IPAT-S

by

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1 Introduction

IPAT-S is a scripting language (a special-purpose computer programming language) for quantitative scenario analysis. This document assumes that the reader is already familiar with IPAT-S and the suite of IPAT-S software. All IPAT-S software and documentation is available for free from the IPAT-S web site, <http://ipat-s.kb-creative.net>.

This document lays out a series of steps for initiating the quantitative analysis for a serious scenario study using software from the IPAT-S suite. It also suggests how the process can be applied iteratively over the life of the project.

2 The Process

Note that this is just one possible process. Modify it as you see fit. Also note that although the process is written out in a linear fashion, some tasks can be done concurrently. For example, while one team member is preparing the data file and filling it with provisional data, other team members can work on documenting the sub-models.

1. Quantification Consultation (whole team with narrative team)

The *Quantification Consultation* procedure is an invention of the “Scenarios for Sustainability” consortium. It is available on the consortium’s web site.¹ The process results in an overall strategy for quantifying the scenarios and generating indicators. It also results in a set of concrete first steps – the first sub-model or sub-models to be delivered.

2. Create project folder (one team member)

A sample project folder is shown in Illustration 1.

- a) Create a new folder for the project.
- b) In the folder, add a file “Main.ips”.
- c) Create a sub-folder called “Init” (to hold dimensions and data exported from IPAT DX).
- d) Create a file to hold dimensions in the “Init” sub-folder.
- e) Create one sub-folder for each sub-model and add a main file in each (e.g., a folder called “GDP” with a file in it called “GDP_main.ips”).
- f) Create a sub-folder called “Output” to hold any HTML, RTF or other report templates.
- g) Create a sub-folder called “DX” to hold IPAT DX templates and data files.

¹ http://scenariosforsustainability.org/howto_recipes.php

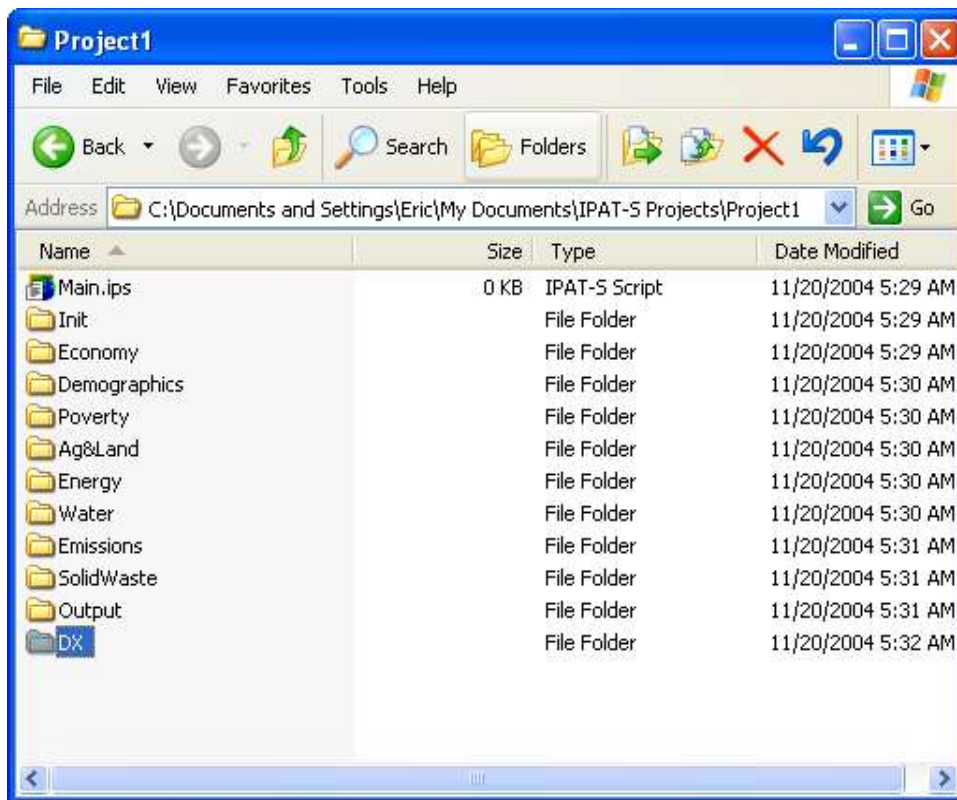


Illustration 1. Files and folders for a new project

3. Edit the file “Main.ips” using IPAT Studio (one team member)

Enter the base year and scenario years, read in the dimension file and read in the main files in each sub-model folder.

4. Create an initial IPAT DX template (one team member)

In most cases, the initial template should only include the *minimum required data* to create the first sub-models. This increases the likelihood that the approved data for the first iteration will actually be available.

5. Fill the data structure with provisional values (one team member)

Use off-the-shelf values. Do this very quickly, and comment liberally. The idea is that: a) the client will have something to react to and; b) the modelers will have something to work with.

6. Export the data to IPAT-S format (one team member)

The exported data should go in the “Init” sub-folder. Also, Main.ips should be modified to read in the data file.

7. Send IPAT DX and the provisional data file to the responsible person (one team member)

Someone – the client, narrative team member, intern, modeler – will be responsible for supplying the “official” data for the project. Let this person know where to get the IPAT DX program (the download page on <http://ipat-s.kb-creative.net>) and supply them with the provisional data file so they can fill it with the official figures. Give a realistic date by which the data must be available. Make it clear to them that these are the data required for the initial sub-models, so timeliness is important.

8. Create a new CVS repository for the project (one team member)

This should be done whether one person is working on the script or many. If several are working on it then this will allow them to work simultaneously on the project without worrying about overwriting each others' work.

It is highly recommended that you use CVS or another system to manage different versions of your files. A very useful program for Windows is **Tortoise CVS**.² Using Tortoise CVS, the files can be added to the repository easily from Windows Explorer, as shown in Illustration 2.

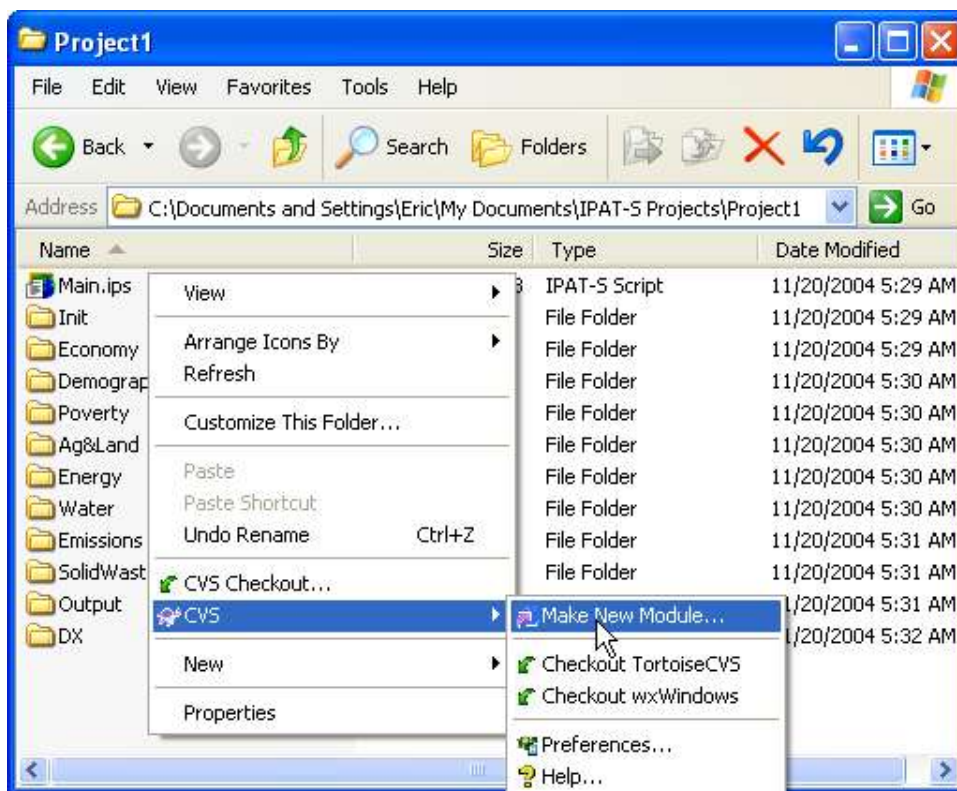


Illustration 2. Adding files to the repository using Tortoise CVS

9. Check out the CVS repository (every team member)

Do this so each team member can work on his or her sub-model in his or her own CVS “sand-box.”

10. Research and document the sub-model (every team member)

Do this before coding it. A sketch of the modeling approach should appear on the card produced during the Quantification Consultation, but details will need to be filled in. It is important to do this *before* building the model, as any decisions and uncertainties can be thought through. Some considerations:

- If any research is necessary by the responsible team member, it can be done at this stage.
- If any questions arise during this process, it may be necessary to consult with one or more narrative team members before continuing.

² Available from <http://www.tortoise cvs.org/>.

- This process may benefit from regular whole-team meetings to discuss the approaches taken for different sub-models.
- The team may want to create a consistent template for model documentation.
- If necessary, team members may need some brief training in using the equation editing features of the word processor or text formatting system that the team has chosen to use.

11. Develop initial sub-models (every team member)

Create the script for the initial sub-models in IPAT Studio, working from the main files in the relevant sub-folders. When doing this:

- Try to have a running script nearly all the time. (That is, one that will run without interpreter errors.)
- Create indicators to track progress.
- Keep “debugging” indicators separate from the client’s indicators.³
- Review indicators frequently to check the reasonableness of the calculations.
- Mark key inputs with angle brackets for later reference.
- Refresh your own CVS sandbox as other modelers submit their changes, whether their changes impact your work or not.
- Submit your changes to the CVS repository frequently. (Decide among the team on a reasonable frequency – perhaps twice a day, or even more frequently, depending on the timetable.)

12. Develop a simple user interface (one team member)

Use the interface development features of IPAT Studio to create a simple UI. (Note that all UI elements must be in Main.ips.) Choose the key inputs from the sub-models that are most useful to the narrative team, adding new inputs if necessary to make the UI easy to use.

UI development should probably be done by one person, who will need to coordinate with the team to make sure that the UI inputs (sliders, etc.) fit well with the structure of the sub-models. This can be supported with frequent CVS check-ins.

Test the UI within the team (and people in the hallway) before sharing it with the narrative team.

13. Incorporate the client data (one team member)

If the official data are available, export them from IPAT DX to replace the provisional data and re-run the scripts, making sure everything behaves reasonably.

The team member who does this should check in the new data so that everyone can work with it in his or her sandbox.

³ One way to do this is to add a flag at the top of the subfile that is the main file for the sub-model. For example,

```
logical devel_version = true
```

Then for your indicators, put

```
if devel_version then
    report expr1 as "Indicator 1"
    report expr2 as "Indicator 2"
endif
```

14. Test the script in IPAT Scenario Navigator (one team member)

IPAT SN will be used in the first instance to share the script with the narrative team (although they may also want to look in more detail using IPAT Studio). Before showing it to them, make sure the script works smoothly in IPAT SN.

15. Edit the sub-model documentation if necessary (every team member)

If any new issues came up during the construction of the sub-models, make sure those are documented while the ideas are still fresh.

16. Share the current script and documentation with the narrative team (all team members with narrative team)

Hold a second round of quantification consultation and also a mutual critique of the narrative and quantitative analyses.

17. Decide on goals for the next iteration and iterate (all team members with narrative team)

3 Further Iteration

This document focuses on the initial stages of scenario quantification using the IPAT-S software suite. This section lists some considerations for later iterations.

- It is often best to request only the data required for the current iteration. This keeps each data request small, making it easier for the person supplying the data to meet the request in a timely way. However, if it is known that some data will take a long time to gather, or the person responsible for supplying the data is only available for the initial stages of the project, send the request in an earlier iteration than the one in which it will be used.
- With each iteration, the UI will need to evolve. Most likely, some UI elements will remain from iteration to iteration, while others are removed. The sub-models that are new in the iteration should probably get an extended set of UI elements so the narrative team can explore them thoroughly.
- The team may wish to make stand-alone models in IPAT-S to show the narrative team. For example, this may be done if there are questions about the implementation of a model and it is felt that interacting with a sample can help resolve the questions.
- The narrative team should be working on a report. Preferably, this will include embedded calculations and can be exported to a text-based format like RTF.⁴ In this case, the team (or a member of the team) will need to work to make sure the embedded expressions use the appropriate variable names, units, etc. in the evolving script. As the project approaches completion, each iteration might finish by producing the final products – one or more reports, a Dashboard file, a GIS ASCII file, a MAGICC/SCENGEN input file, etc. – rather than an interactive script in IPAT SN.

⁴ See the document “Generating Reports with IPAT-S,” available from <http://ipat-s.kb-creative.net>.