

# **Bringing the User into Sustainable Software Development for Science**

**Dan Gunter  
LBNL**

# What is needed to develop sustainable software?

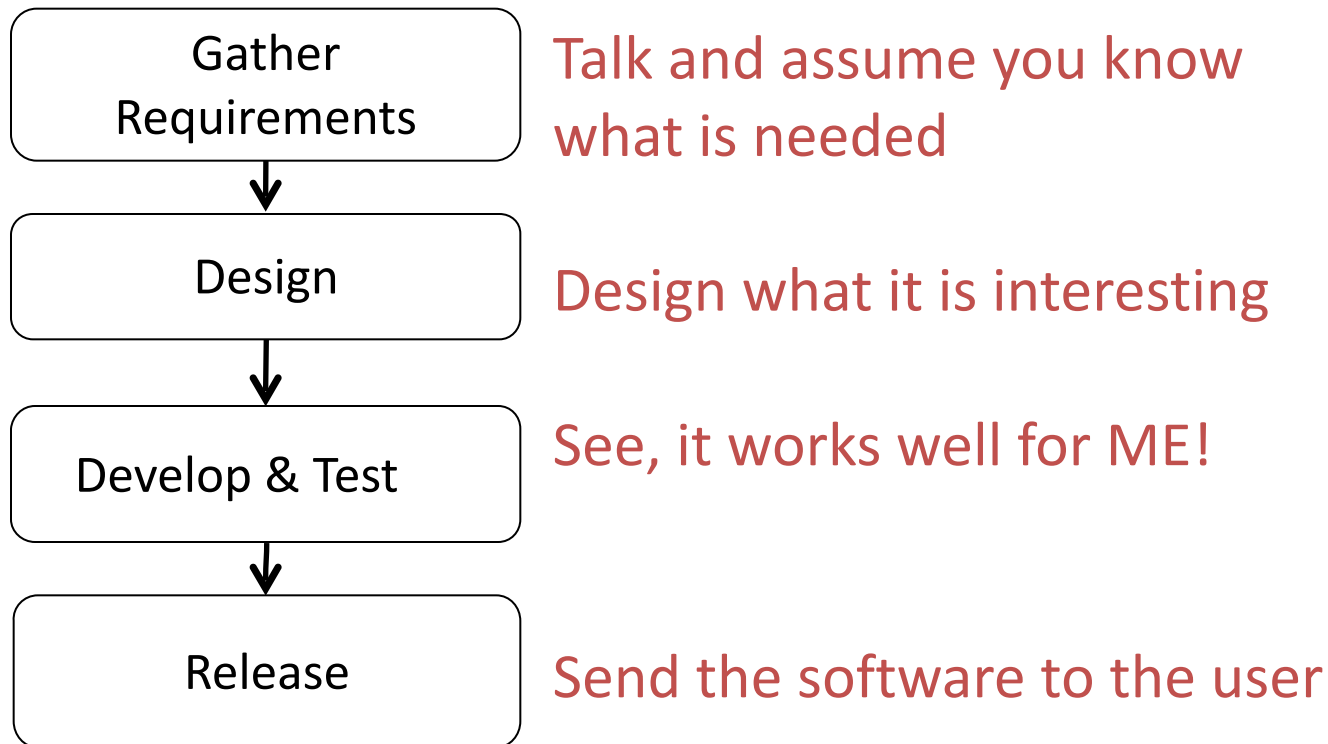
- \$\$
- Great developers
- Good design
- Software engineering practices
- ....

# What is needed to develop sustainable software?

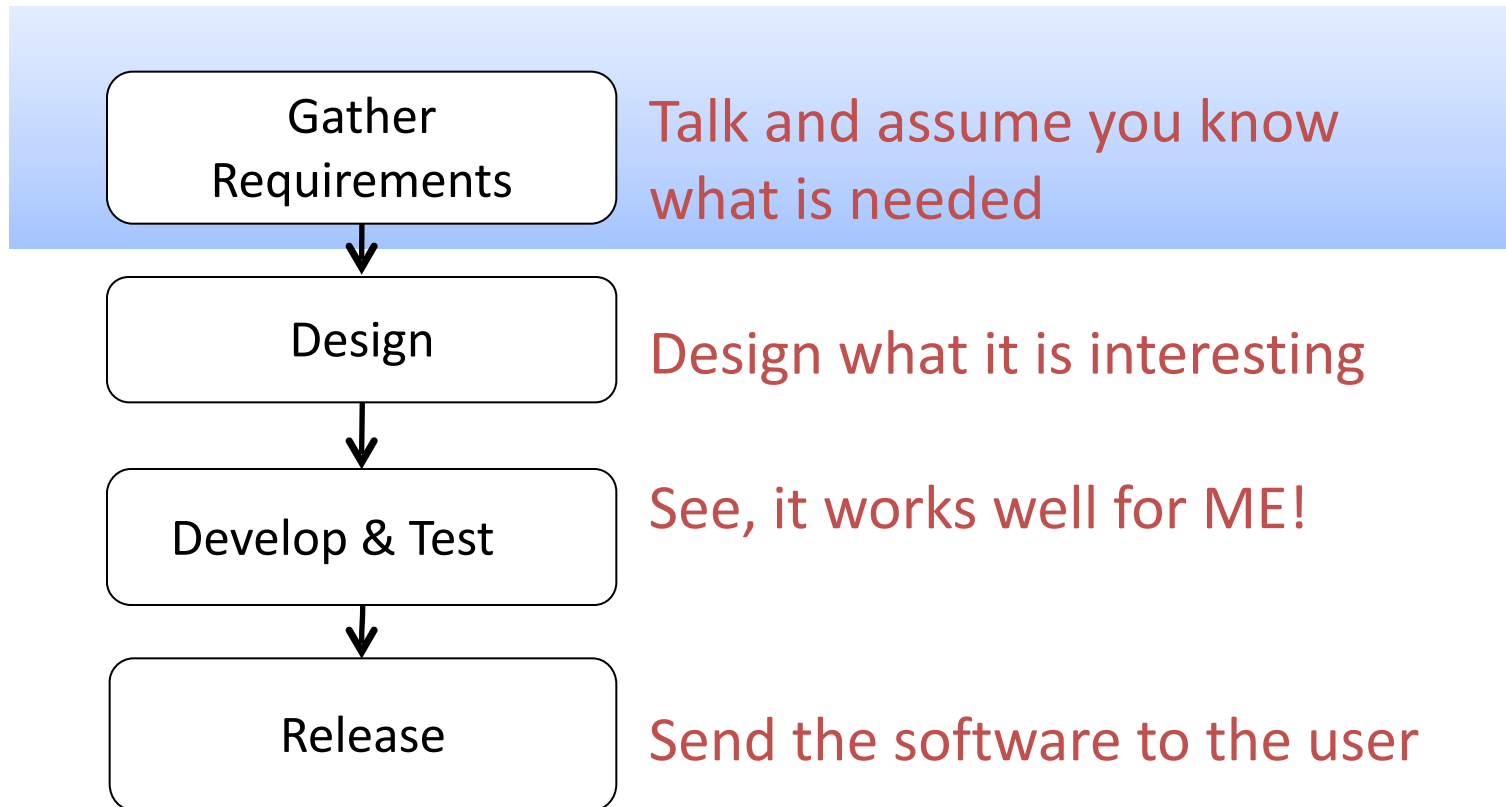
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**USERS**

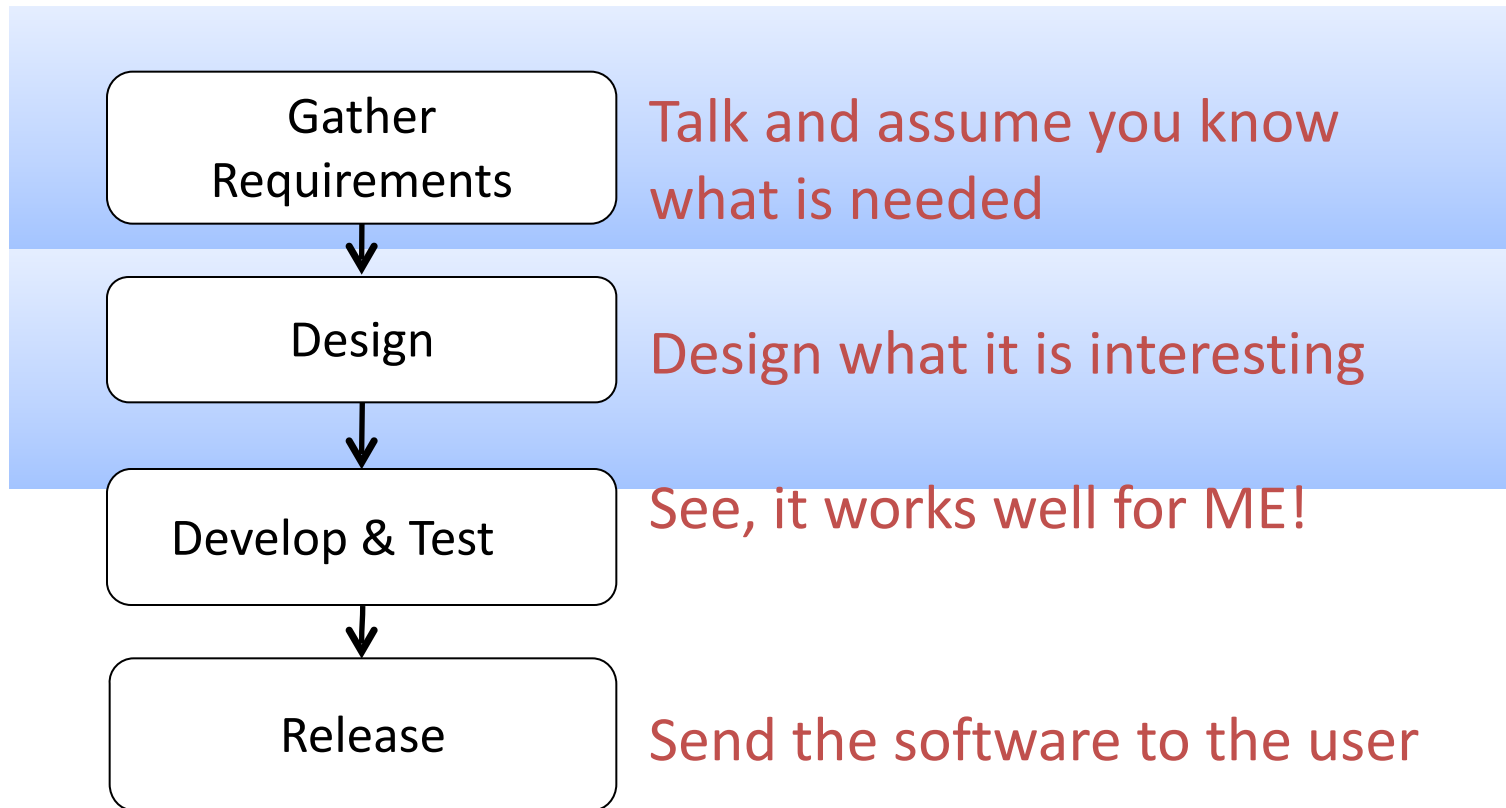
# How do we build software for science?



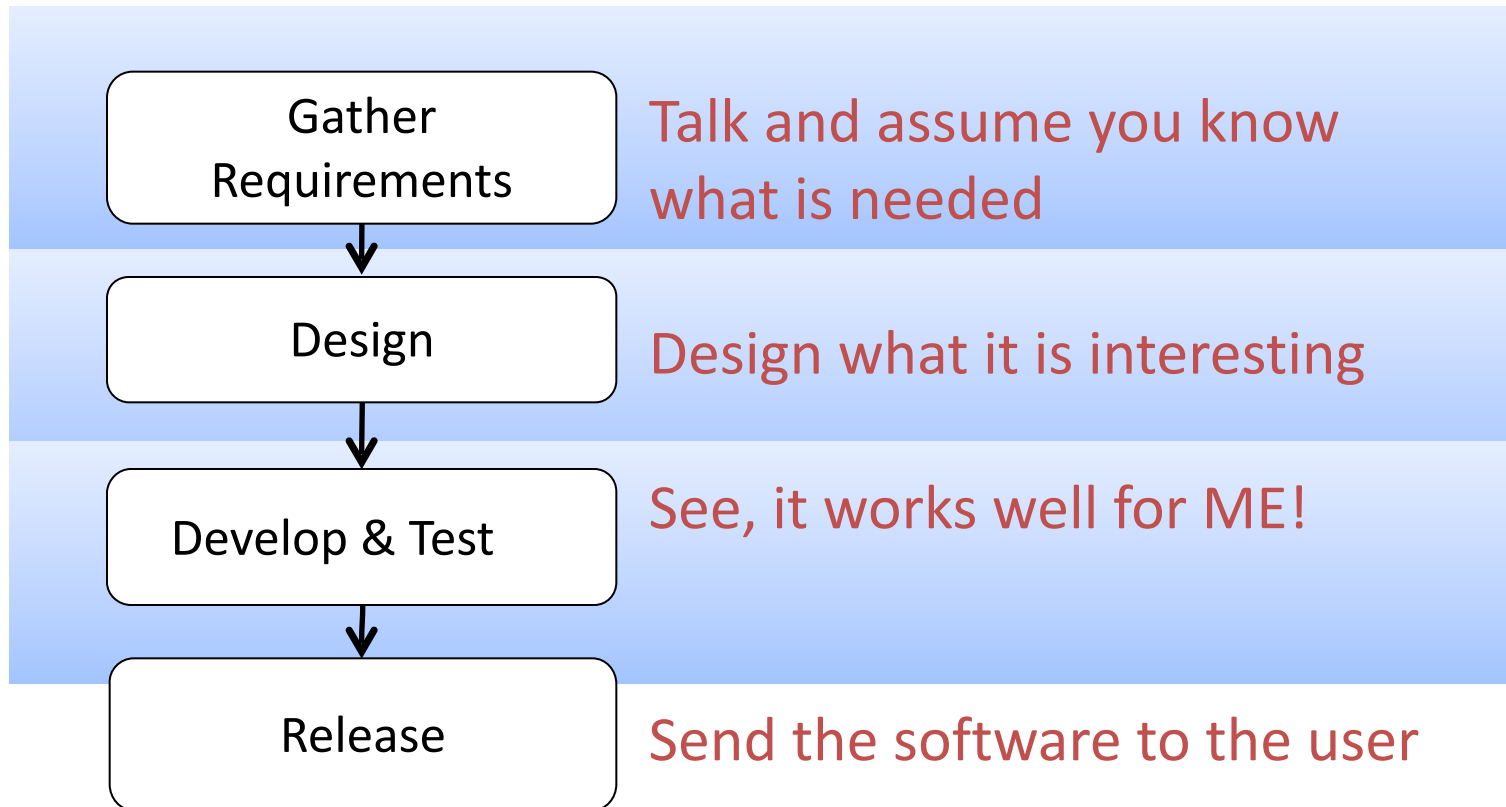
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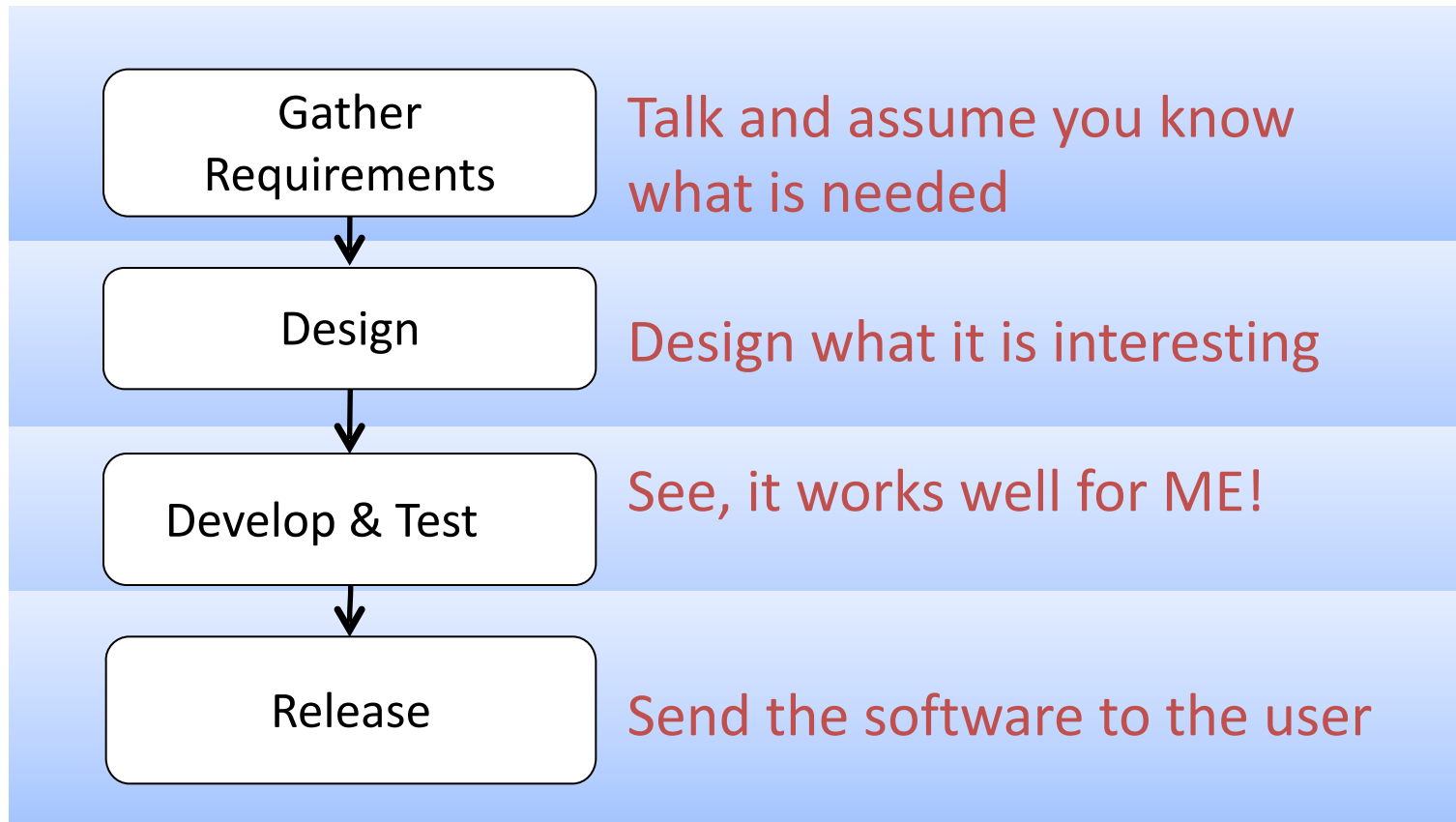
# How do we build software for science?



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# "Build it and they will come?"



The power to be your best  
Get a computer, a television, and a CD player.  
All in one desktop system.

**\$2079** 1 year warranty

**New! Macintosh TV**

At last, there's a computer that makes it perfectly legitimate to do your work and watch TV—all on the same screen. Macintosh TV combines the convenience of an all-in-one Macintosh system with all the versatility of a classic perfect television, a built-in CD drive, and high-quality stereo sound. So whether you're watching, playing, or casually combining the new—Macintosh TV is all you ever wanted to do.

Everything you need is a Macintosh software license, a television, a flat disk, an external hard drive (optional), and an Apple Keyboard. Super-tilt drive—so look over Macintosh TV, or you can read work with only powerful applications and multimedia programs. In fact, a host of productivity software and CD-ROMs like content loaded with the system.

CD-ROMs can be used to watch or listen to CD, while you use your Macintosh to edit your flat disk, rather than your laptop, or update your software. The TV connects easily to a wide variety of video sources—VCR, VHS, camcorder, or Satellite or other game players. It easily captures screen content through built-in and computer functions. In conference rooms, board rooms, or home rooms, Macintosh TV blends computing power and media versatility in one open software package. **EPN01**

**At a Glance**

- Processor: 60 MHz PowerPC
- Memory: 64 MB of RAM (expandable to 128 MB)
- Disk Storage: 100 MB hard drive
- Monitor: 15" color LCD screen (display optional)
- Keyboard: Keyboard

**Your Macintosh TV comes with:**

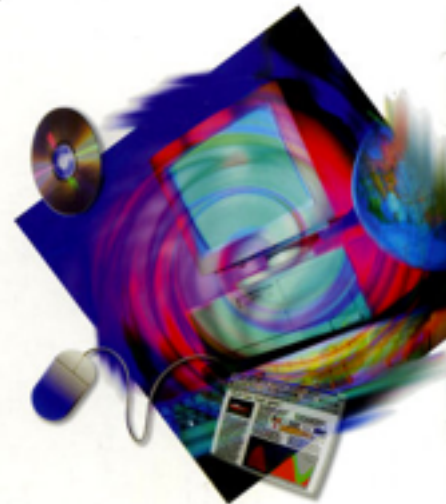
- PowerPC software
- Macintosh TV software
- Apple Keyboard
- Apple Mouse
- Apple Keyboard
- Apple Mouse



The totally cool way to run your computer



**New!**  
Plus  
**BonusPak**  
INTERNET, FAX,  
IBM WORKS,  
MULTIMEDIA & MORE



**OS/2 WARP**

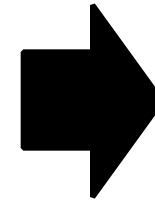
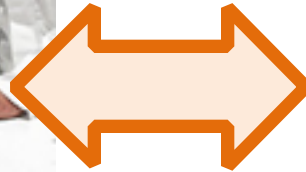
Version 3 3.5" Disks  
Uses your existing DOS and Windows

# User Research

Scientists



User Research



\*\*

Product



R&D

Software



UX Designer

Image by Chris Gash

\*\* Images copyright the Walt Disney Company

# User Research Methods

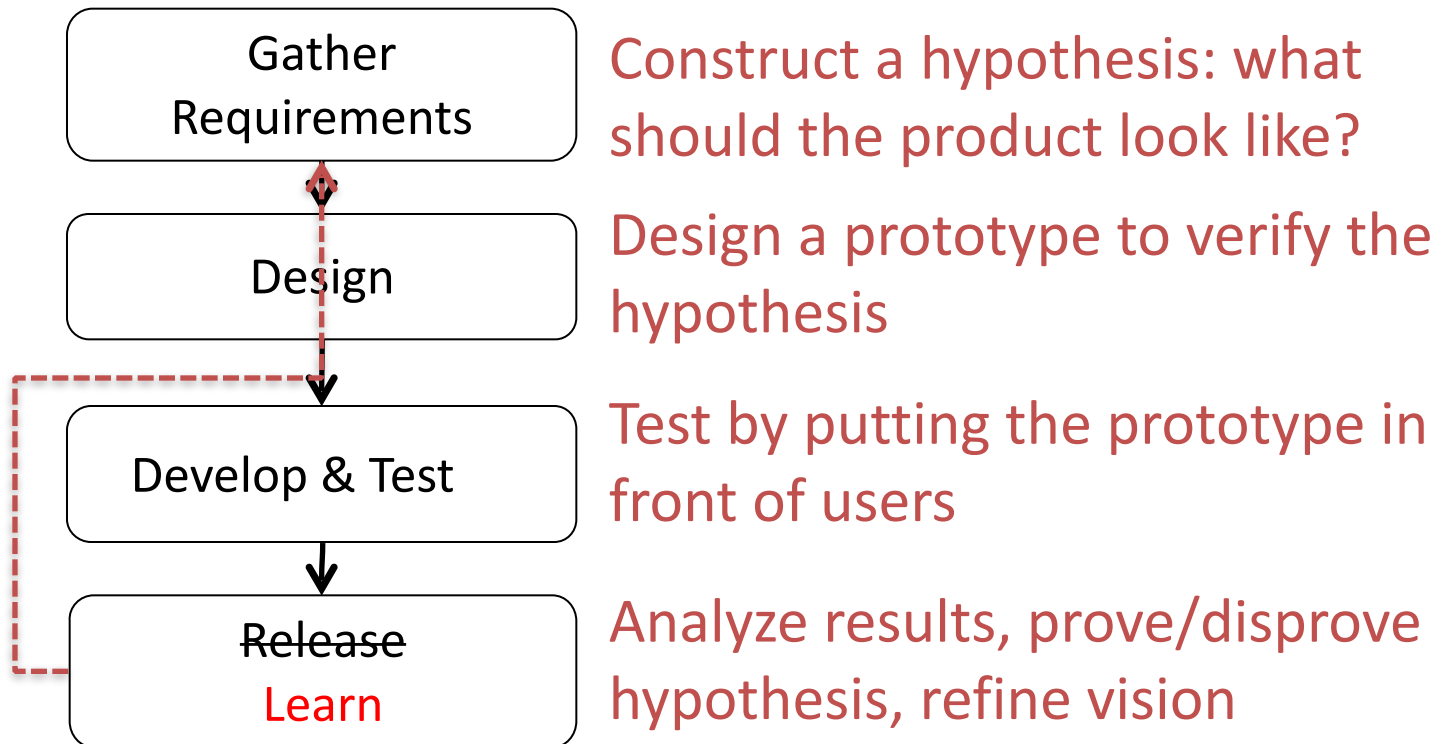
## Ethnography



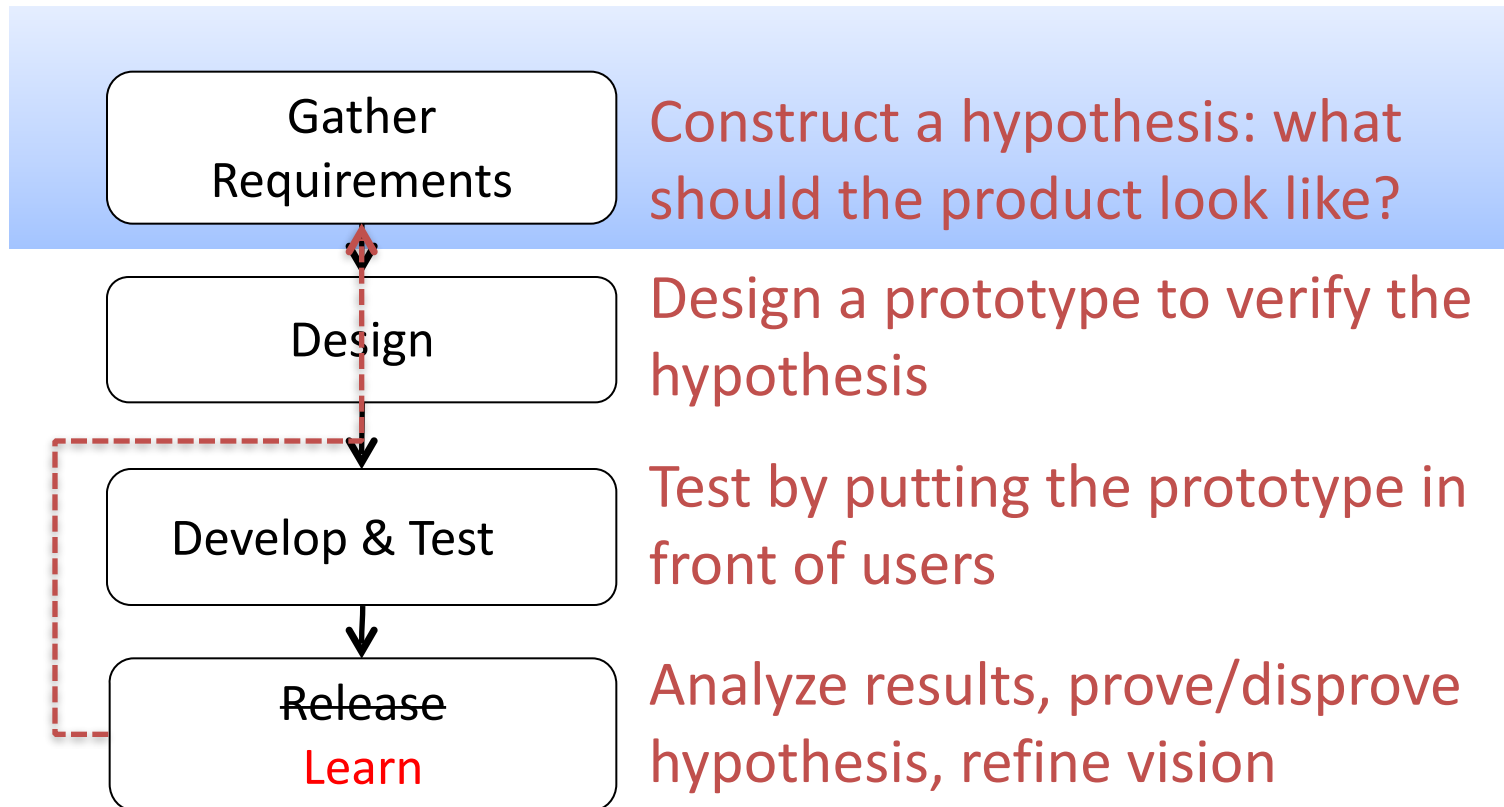
## User Analytics



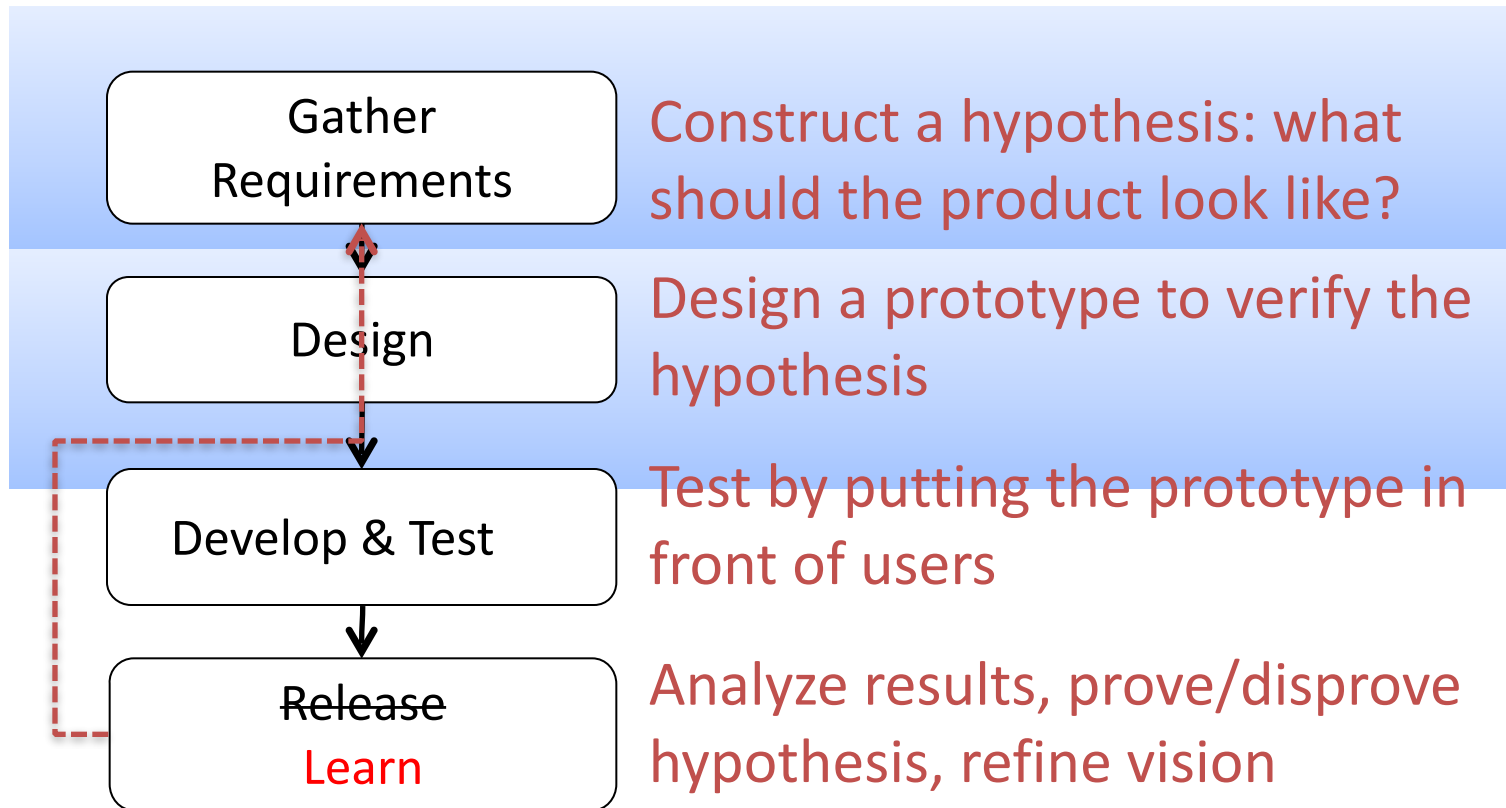
# How should we build software for science?



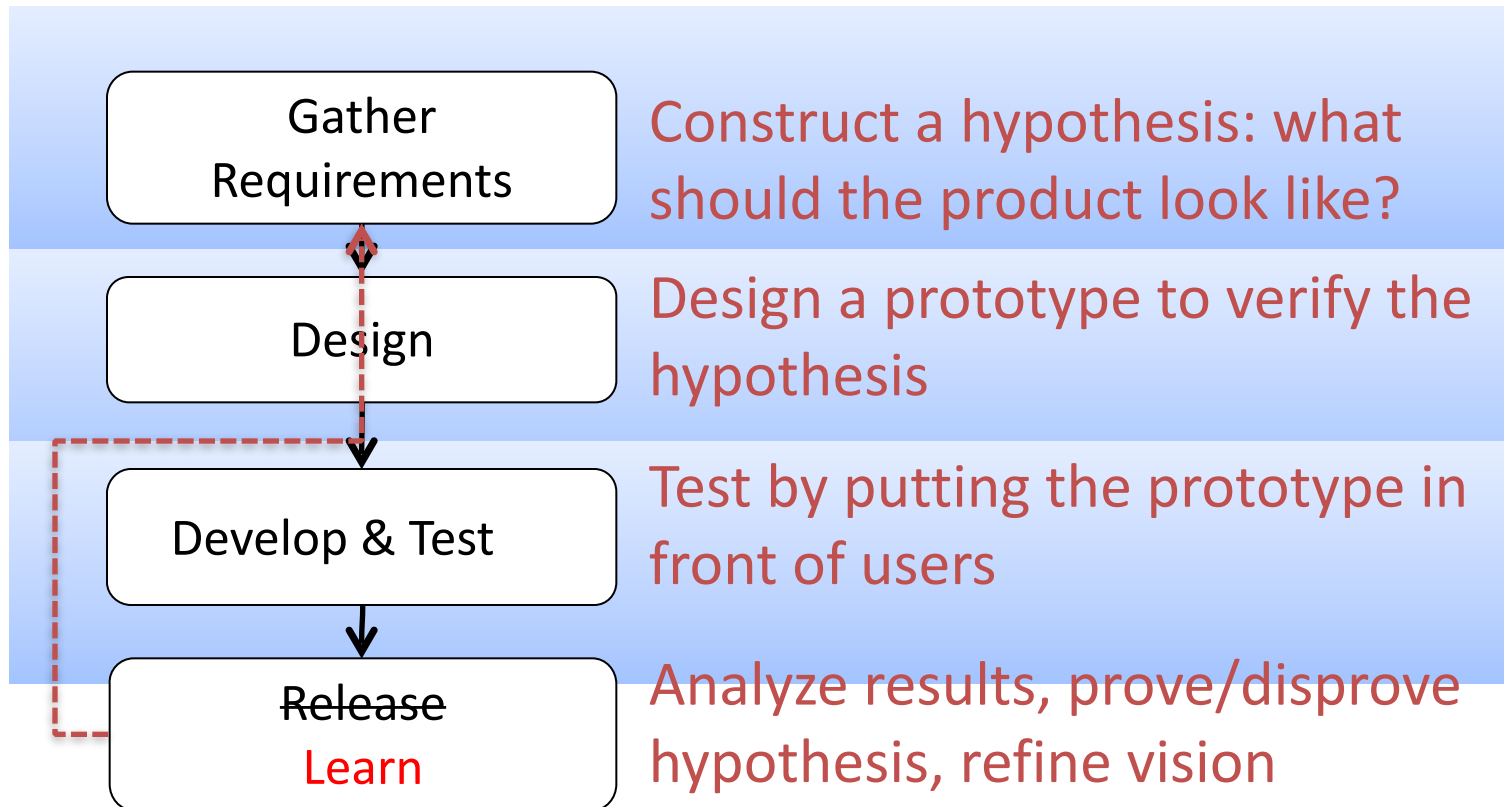
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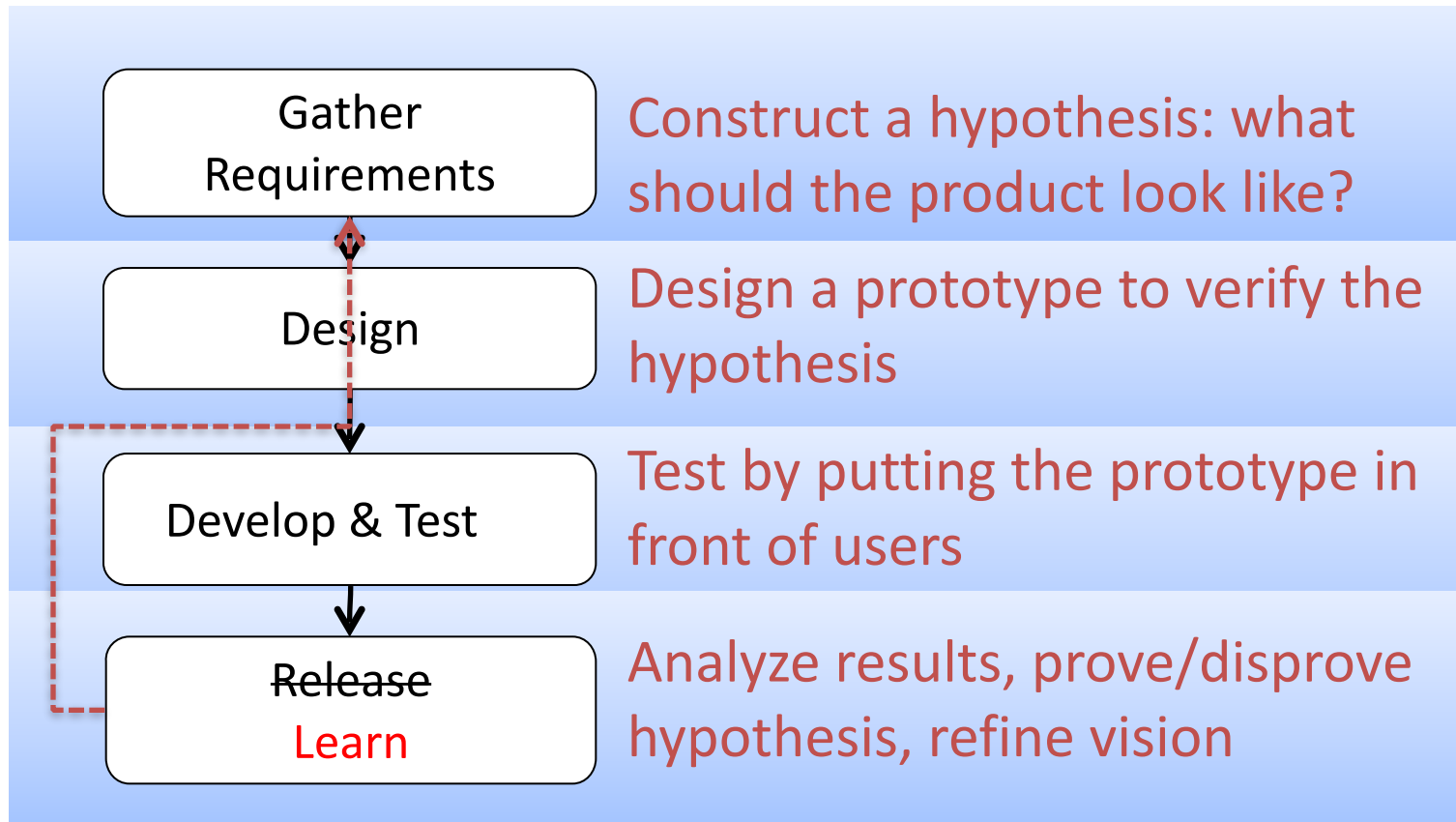
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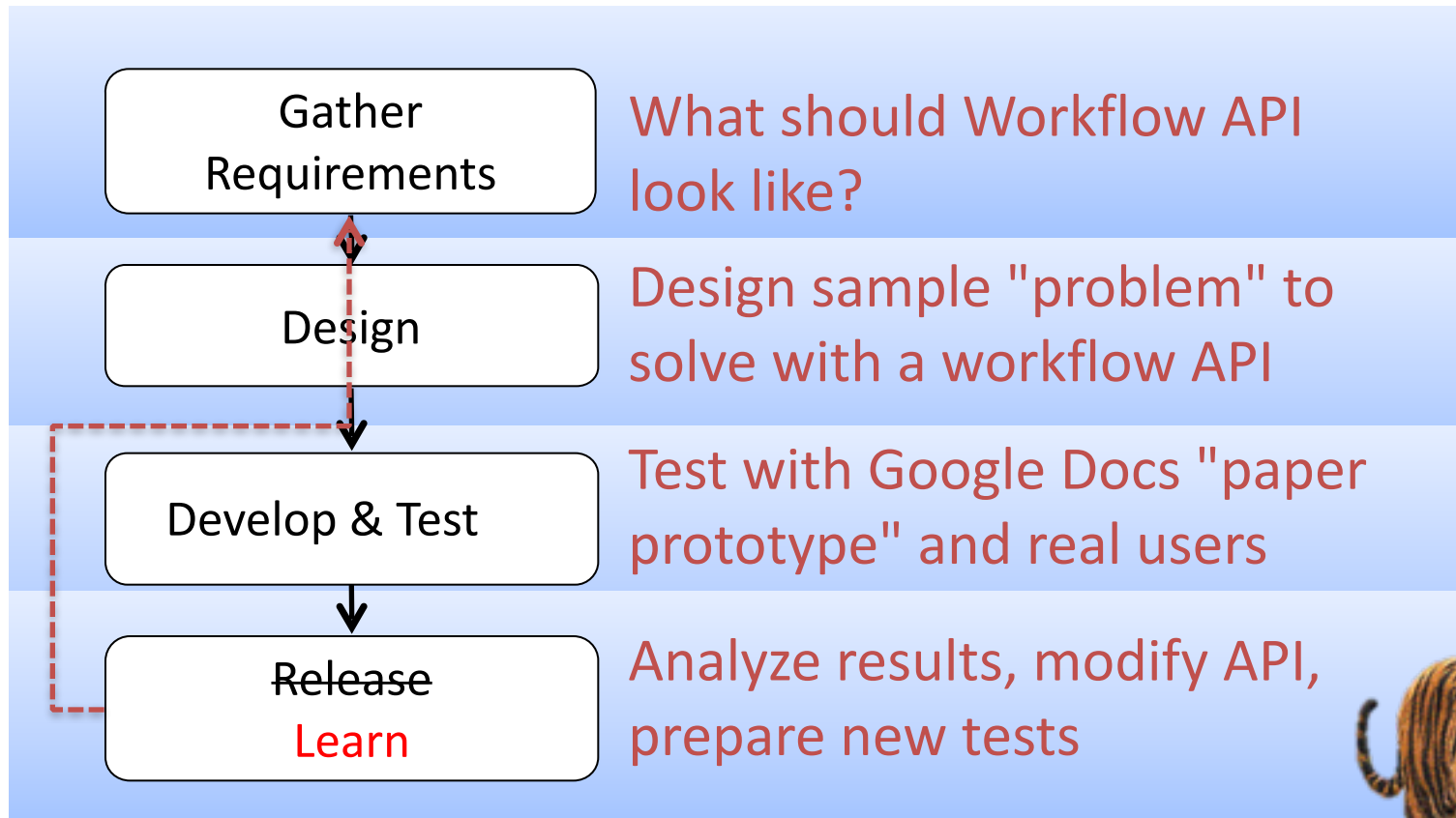


# How should we build software for science?





# Example: User research to improve Workflow APIs (Tigres project)



# Conclusions

- Sustainable software **needs** users and giving users what they want **needs** better processes and empirical studies (ethnography)

Tigres



- Javier Rojas Balderrama, Matthieu Simonin, Lavanya Ramakrishnan, Valerie Hendrix, Christine Morin, Deb Agarwal, Cedric Tedeschi, "Combining Workflow Templates with a Shared Space-based Execution Model", WORKS, 2014.
- Lavanya Ramakrishnan, Sarah Poon, Gilberto Z. Pastorello, Daniel Gunter, Valerie Hendrix, Deborah Agarwal, "Scientist-Centered Design for eScience:A Tigres Case Study", IEEE eScience, 2014

<http://tigres.lbl.gov>



"a holistic approach to the development of tools and interfaces [for HPC] .. by employing a user-centered design process .. [and] empirical usability and ethnographic studies"  
<http://uda.lbl.gov>

Extra

# Usability



Usability is the ease of use and learnability of a human-made object.

Merriam-Webster

<http://www.merriam-webster.com/dictionary/usability>

A user interface is well-designed when the program behaves exactly how the user thought it would.

Joel Spolsky.

<http://www.joelonsoftware.com/uibook/fog0000000249.html>