Good Practices

Chris, ~~Chris~~ & Karina do Data Science

DAP
Capability
And
Training
Support

Agenda

DAP Capability And Training Support

- Introduction to Good Practices (why and what)
- Key Themes
- Walkthrough Levels of Good Practices
- Anything Else? – Your Questions.

Why Good Practices?

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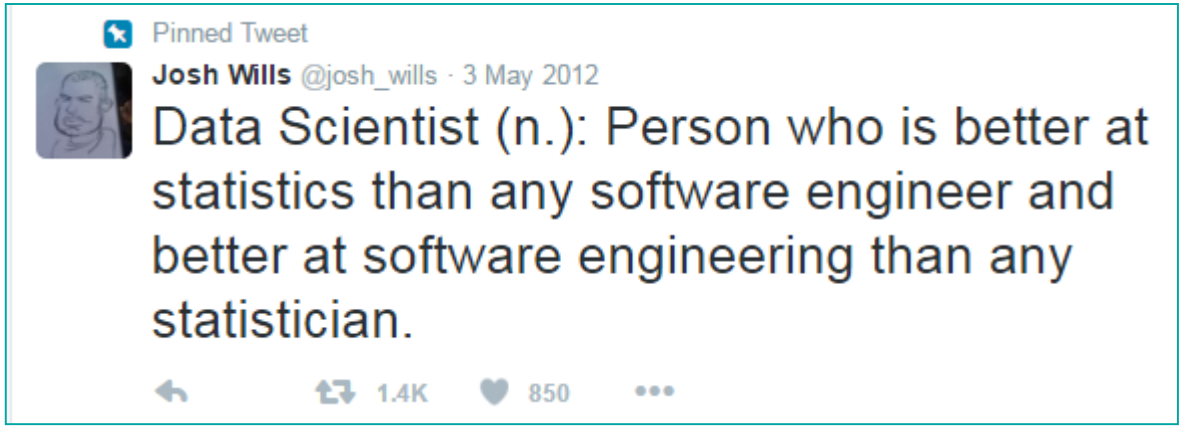
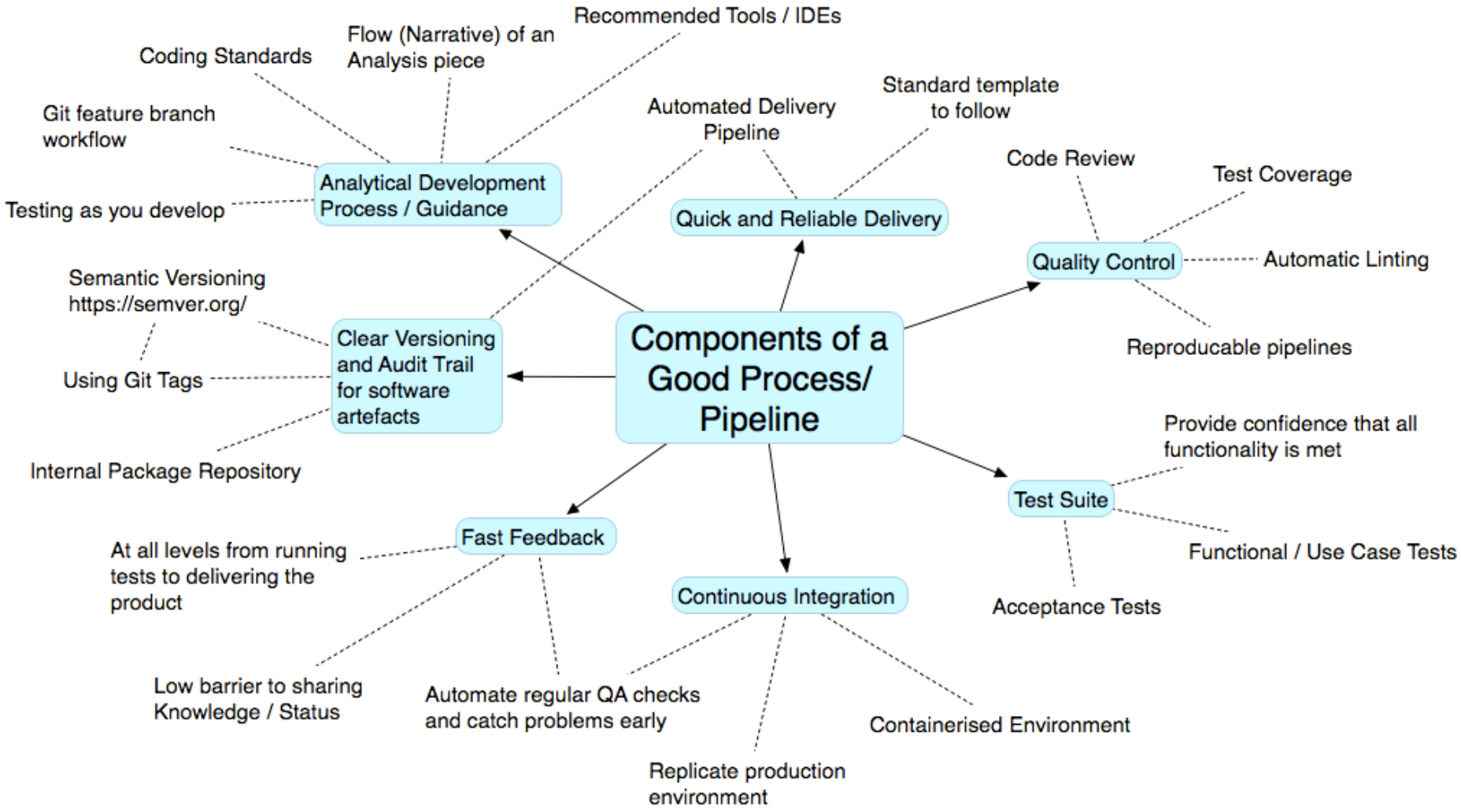
- Help inform more effective ways of working to reduce the friction in collaborative working and boost productivity.
- Provide guidelines and advice born from hard earned experience.
- Many programmers/analysts are self taught. Lots to learn on that journey.



What is Good Practice?

- It can cover **a lot** of things all working together!
- An end goal to iterate towards.
- No one size fits all, and doesn't come for free.
- We will focus on a few of the key themes, and show how to build up to them.



Key Themes

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Consistency in Process

- A standard workflow to provide a common high level language and understanding.
- Easier collaboration & communication of ideas, reporting progress etc.

Consistency in Code

- Writing “Good Code”:
  - Works as intended, and comes with proof that it does so (tests).
  - Clearly structured so that it is easy to comprehend and maintain.
- Also: following conventions, peer reviewing code, good layout, regular refactoring.

Key Themes

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Reproducibility

- Quality assurance and confidence building as you develop.
- Managing and tracking changes in:
  - Source code,
  - Data,
  - Dependencies,
  - Parameters / Configuration

Reusability

- Building reusable tools / components that others can use or build upon.
- Documentation and packaged releases, writeups of analysis, plan for ongoing development and contributions.

Levels of Good Practices

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Reproducible Analytics Pipelines in DAP

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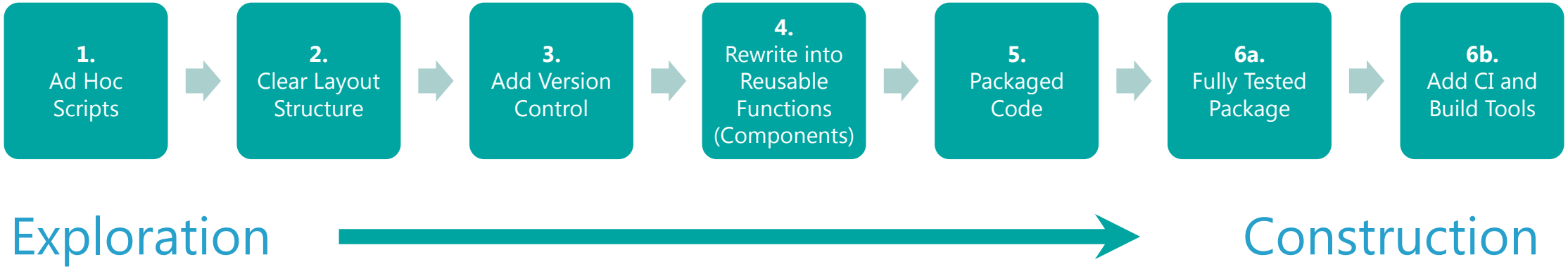
- Reproducible Analytical Pipelines (Article Link)
  - Wider GSS initiative to streamline the production of regular statistical reporting
  - Focused on R tooling and free to use external infrastructure (GitHub / Travis etc.)
- Adapted below to be more general and DAP compatible



1. Ad Hoc Scripts

- Everything starts somewhere
- In exploratory mode, investigating, building familiarity.
- Focus is on learning and reducing uncertainties
- Code may not be well named or organised.
- Certainly not ready for sharing!

```
|- project_name/
   |- myscript.py
   |- myscript2.py
   |- eda.py
   |- untitled.py
```

2. Clear Layout Structure

- Use meaningful folder/filenames
- Separate inputs, code and the outputs.
- Separate stand alone scripts from 'ad hoc' exploratory code.
  - `analysis/` for experiments and ad hoc work
  - `scripts/` for scripted repeatable jobs / tasks
- Have one place to go to:
  - Find out more about the project
  - Be able to rerun the analysis
- Begin to implement good coding standards

```
|- project_name/
   |- analysis/
   |- data/
   |- scripts/
   |- results/
   |- run.py
   |- README.md
```

3. Add Version Control

- Encouraged to have all code under version control from the start.
- As project is now much more suitable for sharing with others, version control is a must.
- Allows use of GitLab for collaborative development.
  - Tracking Issues
  - Raising merge requests
  - Peer Reviewing code

```
|- project_name/
   |- analysis/
   |- data/
   |- scripts/
   |- results/
   |- run.py
   |- README.md
   |- .gitignore
```

4. Re-write to Reusable Functions

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- Refactor analysis scripts to a higher level
- Lower level implementation wrapped into functions and called by analysis scripts.
- Benefits:
  - More Reusable
  - More Testable
  - Easier to reason / follow analysis scripts
  - More space to focus on documenting the analysis performed.

```
|- project_name/
   |- analysis/
      |- experiment.py
   |- data/
   |- scripts/
      |- __init__.py
      |- load.py
      |- clean.py
      |- plot.py
   |- results/
   |- run.py
   |- README.md
   |- .gitignore
```

5. Package up the Code

- Packaging is about wrapping up the set of functions and scripts into a standard format.
- Makes it possible to:
  - Track library dependencies and versions
  - Easily install code + dependencies onto another system
- Different Languages have different structures and tooling
  - R Packages
  - Python Packages

```
|- project_name/
  |- analysis/
     |- experiment.py
  |- data/
  |- package/
     |- project_name/
        |- __init__.py
        |- load.py
        |- clean.py
        |- plot.py
     |- setup.py
   |- results/
   |- run.py
   |- README.md
   |- .gitignore
```

6a. Tested Package

- Develop a set of tests to provide a proof that your functions work as intended.
- Testing framework libraries:
  - Pytest in Python
  - testthat in R
- Tests should be:
  - Fast
  - Independent
  - Repeatable (deterministic)
  - Self-validating (no manual steps)
  - Thorough (How much do you trust they cover everything?)

```
|- project_name/
  |- analysis/
     |- experiment.py
  |- data/
  |- package/
     |- project_name/
     |- tests/
        |- test_load.py
        |- test_clean.py
     |- setup.py
   |- results/
   |- run.py
   |- README.md
   |- .gitignore
```

6a. CI and Build Process

- Use a continuous integration tool to automate the running and reporting of tests as you develop.
- Combined with merge requests in GitLab, provides a robust, automated QA check for the code.
- Can also automate follow on deployment tasks using CI tools.
- Not yet available in DAP, several teams are currently looking at the best way to add this.
- Build recipe kept alongside the code.

```
|- project_name/
  |- analysis/
     |- experiment.py
  |- data/
  |- package/
     |- project_name/
     |- tests/
        |- test_load.py
        |- test_clean.py
     |- setup.py
   |- results/
   |- run.py
   |- README.md
   |- .gitignore
   |- Jenkinsfile
```

Levels of Good Practices

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Level	Description	Output Produced using R/Python	Coding Standards	Version Control	Peer Review	Documentation of Functions	Automated Data QA	Dependency Packages Managed	Unit Testing of Functions	Unit Testing Guaranteed
1	Ad hoc Scripts	✓	✗	✗	✗	✗	✗	✗	✗	✗
2	Clear Layout Structure	✓	✓	✗	✗	✗	✗	✗	✗	✗
3	Add Version Control	✓	✓	✓	✓	✗	✗	✗	✗	✗
4	Rewrite into Reusable Functions (Components)	✓	✓	✓	✓	✓	✓	✗	✗	✗
5	Packaged Code	✓	✓	✓	✓	✓	✓	✓	✗	✗
6a	Fully Tested Package	✓	✓	✓	✓	✓	✓	✓	✓	✗
6b	CI and Build	✓	✓	✓	✓	✓	✓	✓	✓ (+75%)	✓

Questions?

References

- Data Explorers Support Page for Good Practices
- RAP Paper
- Slides to be made available on Data Explorers Support Page

- General enquires mailbox: DAPCATS@ons.gov.uk
- Feedback survey to follow.