Science Priorities for the VO

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http://wiki.ivoa.net/twiki/bin/view/IVOA/IvoaSciencePriorities

European Space Agency

IVOA Interop, Santiago, 27/10/2017

1. Motivation

2. What do users need (science)

3. What can the IVOA provide (technology)

4. Current scientific priorities

5. Final recommendations
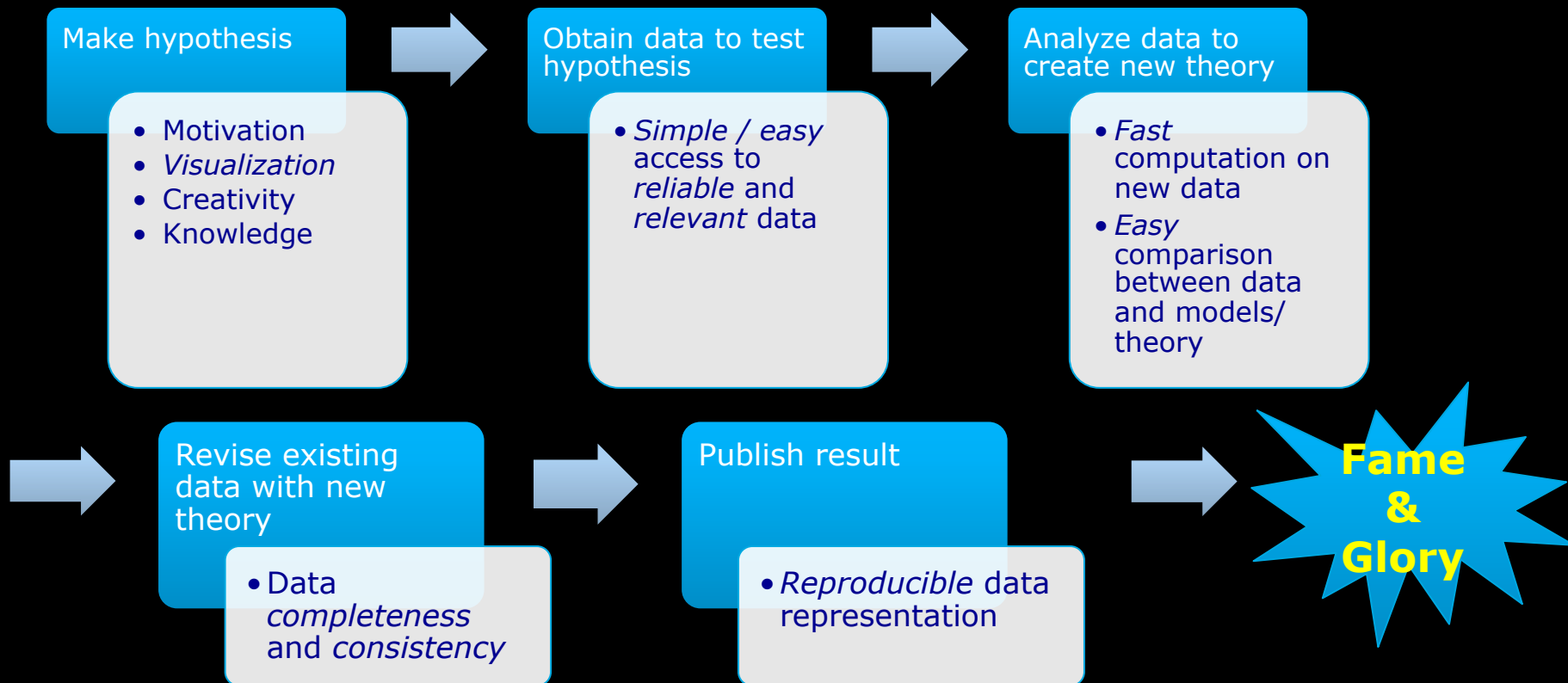
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What we do here has the potential of improving human's knowledge about the Universe

How do we do it? By understanding in detail our users.

Timeline of a scientific paper

Make hypothesis

- Motivation
- *Visualization*
- Creativity
- Knowledge

Obtain data to test hypothesis

- *Simple / easy* access to *reliable* and *relevant* data

Analyze data to create new theory

- *Fast* computation on new data
- *Easy* comparison between data and models/ theory

Revise existing data with new theory

- Data *completeness* and *consistency*

Publish result

- *Reproducible* data representation

Fame & Glory

re-search
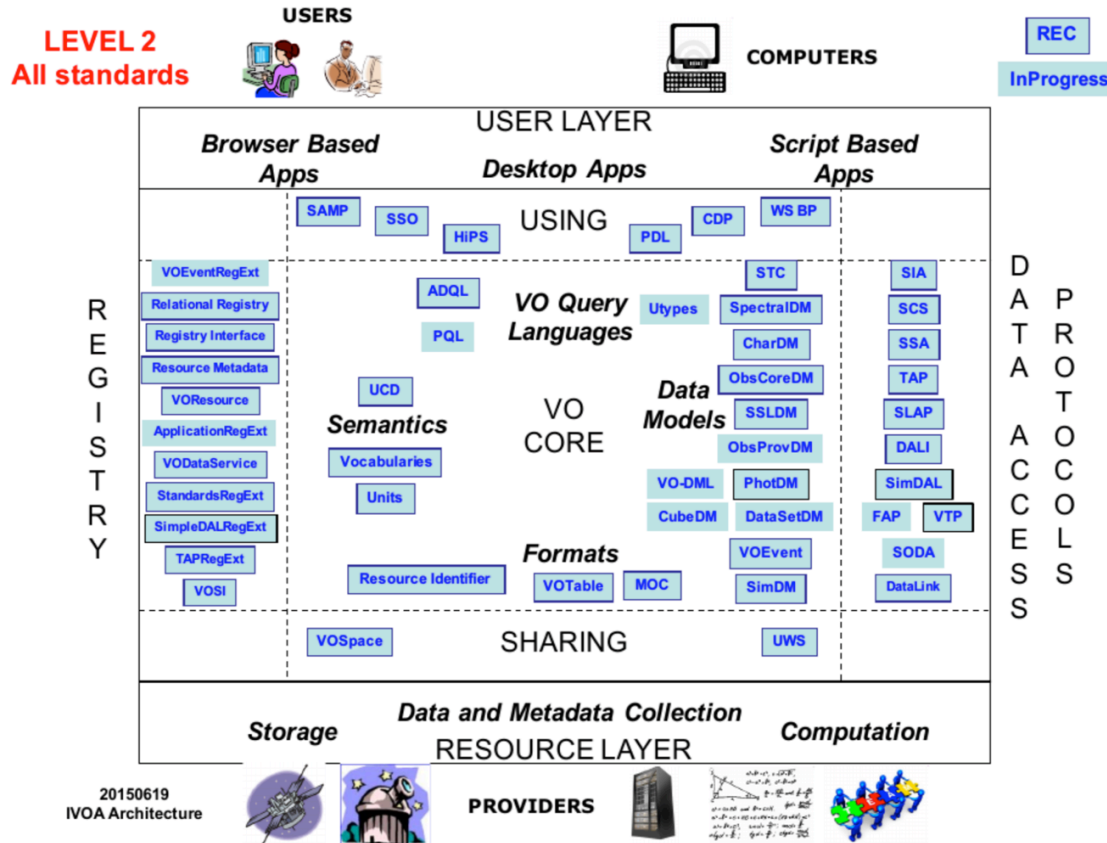
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So what do scientists need?

1. *Visualization tools*

2. *Simple / easy* access to *reliable* and *relevant* data

3. *Fast* computation on new data

4. *Easy* comparison tools between data and models/theory

5. Data *completeness* and *consistency*

6. *Reproducible* data representation

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What does the IVOA provide?

Technology

P. Dowler
TCG Report
IVOA Shanghai interop

What does the IVOA provide?

1. *Visualization tools* -> SAMP, HiPS

2. *Simple / easy* access to data
-> registry, ObsCore, SAMP, TAP, SODA, SIA/SSA

3. *reliable* data
-> DataModels, Semantics

4. *relevant* data
-> ??? (missing, links to papers?, data ratings?)

5. Fast computation on new data
-> ??? Computing resources close to the data, VOSpace
interface for distributed storage

6. Easy comparison tools between data and models/theory
-> SimDAL, but models usually created by users..

7. Data *completeness* and *consistency*
-> Registry complete and consistent?

8. Reproducible data representation
-> Scripting interfaces, ADQL, TOPCAT

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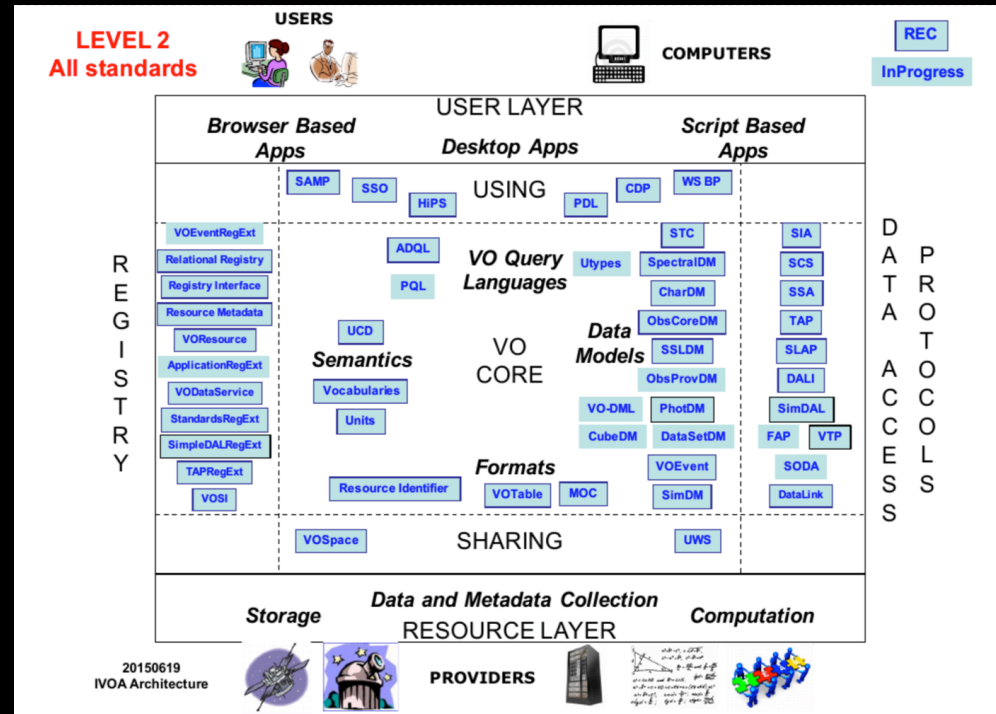# Which other things any user wants?

1.   Easy to use

2.   Robust

3.   Works on mobile devices

4. Fast
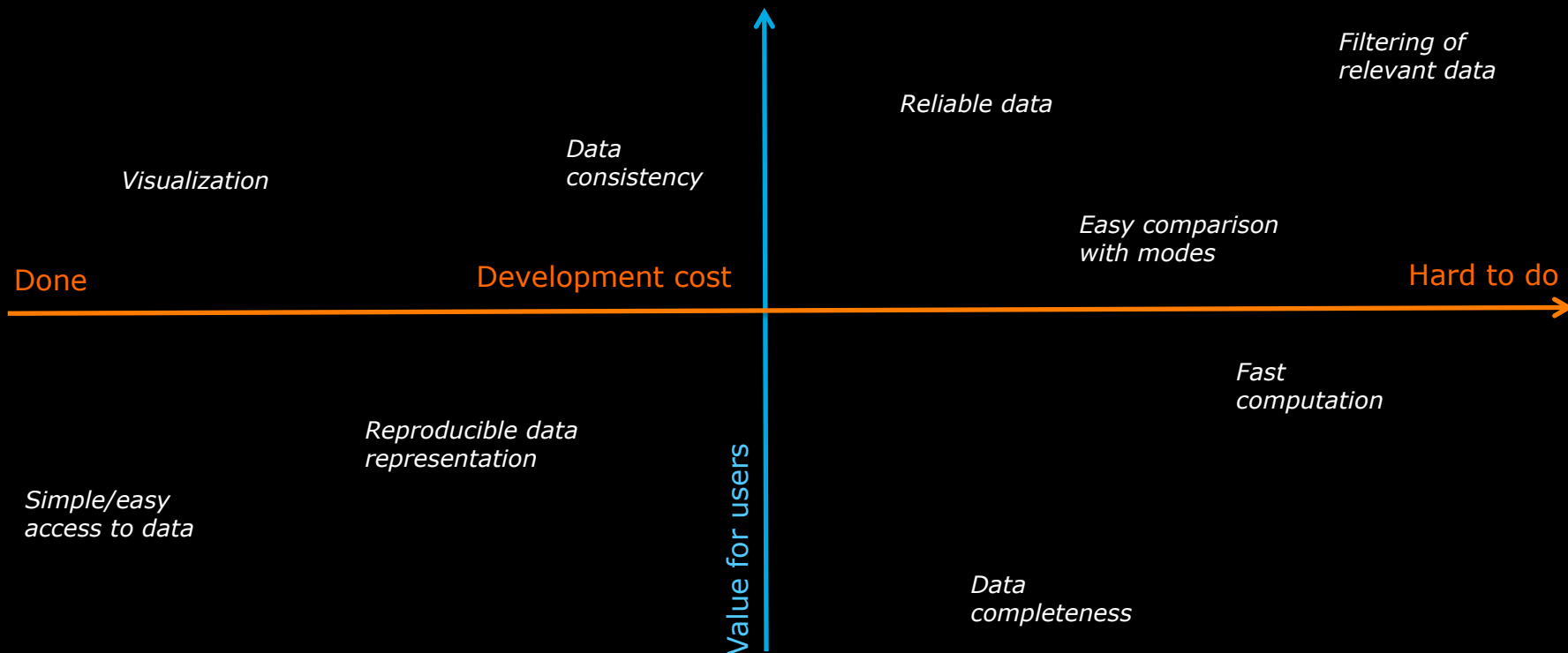
5. Programmable

6. Customizable

What's the mapping between science and technology?

1. *Visualization*

2. *Simple / easy* access to *reliable* and *relevant* data

3. *Fast* computation on new data

4. *Easy* comparison between data and models/theory

5. Data *completeness* and consistency

6. *Reproducible* data representation

7. Easy to use

8. Robust

9. Works on mobile devices

10. Fast
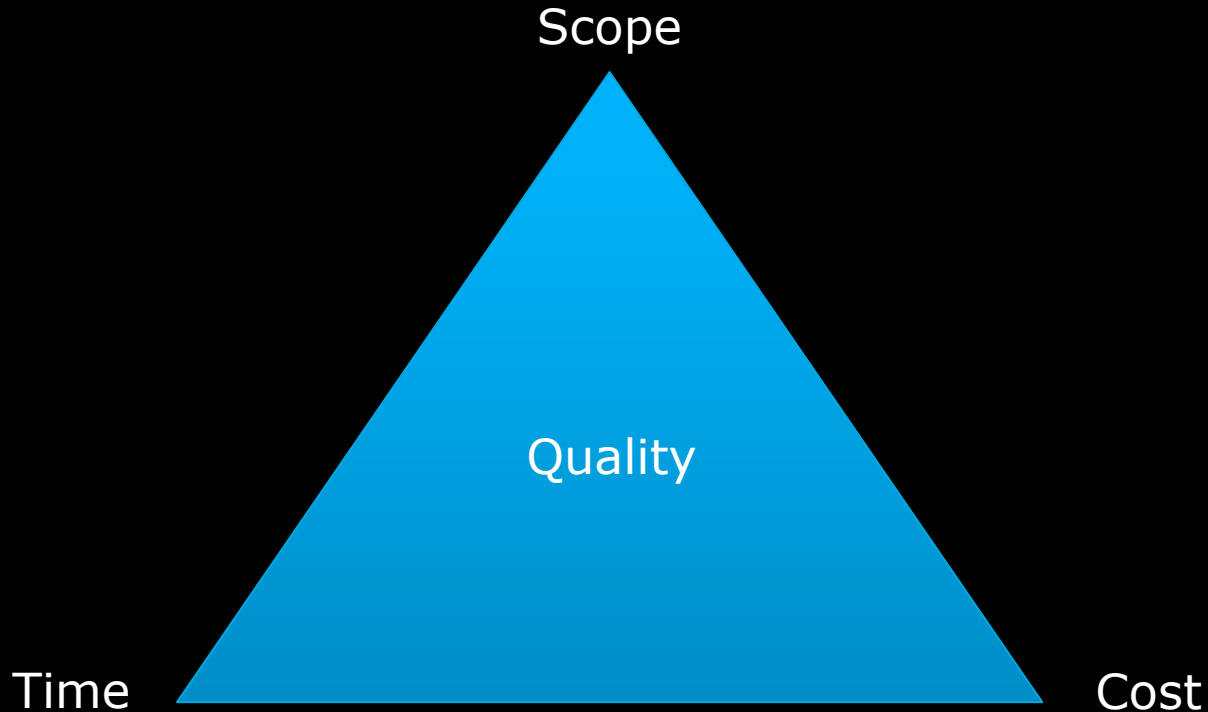
11. Programmable

12. Customizable

So what should we focus on?

Filtering of relevant data

Reliable data

Visualization

Data consistency

Easy comparison with modes

Done — Development cost — **Hard to do**

Fast computation

Reproducible data representation

Value for users

Simple/easy access to data

Data completeness

The best way to make progress is via a constant dialogue:

science ⟷ *technology*

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We should focus on high-value developments

Scope

Quality

Time

Cost

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Current scientific priorities at IVOA

- Time-domain astronomy: light-curves -> VOEvent and Data Models
- Multi-dimensional data: spectral or time cubes (sky + wavelength/frequency or sky + time)

- New priorities:

  - An IVOA portal : one single place where users will find **all** data

- More suggestions:

  - Standard for science platforms? (check scienceplatfoms.slack.com)
  - Virtual Reality/Advanced Reality standards?
  - Other growing areas/priorities?

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Final recommendations

- Always ask the question: how is the user going to use this?

- Always follow the user workflow to the paper and keep the big picture (is provenance clear? Can I explain/make a plot of this?)

- Connect to the future generation of users where they are: e.g. python, github, open source projects, social media, online open fora, connected to new big astronomy projects, using mobile devices and expecting quick answers