

Use of an extensible, agile web development platform supports decision-making about grants and programs in autism research

Leon Rozenblit, JD, PhD¹, Owen McGettrick¹, David Voccola¹, Charles Tirrell¹, Matthew Peddle¹, Henry Agnew¹, Ben Lawlor¹, Naralys Sinanis¹, Stephen Johnson, PhD²

(1) Prometheus Research, LLC, New Haven, CT, (2) Public Health, Weill Cornell Medical College, New York, NY

Background: Public health administrators are increasingly required to make decisions about scientific direction including funding of research and wellness programs. Administrators require knowledge of multiple internal and external grants and publications sources. However, access to a wide range of systems can increase costs and reduce the speed of decisions. Attempts to create dashboards to summarize relevant information usually fail. By the time the dashboard is delivered, decisions and data have changed. We produced a platform for rapidly configuring decision support dashboards that can be delivered in days or hours.

Methods: We designed a data warehouse with an extensible data model for storing a wide variety of data about scientific research, and defined lightweight methods for extracting and loading data from internal and external sources. Next, we added a robust, web-native data-access layer (HTSQL), a rapid web-application development framework (HTRAF), and, finally, a visual application builder (the HTRAF VAB). The first pass at semantic search was handled via AlchemyAPI web service.

Results: We developed the platform using an agile methodology over 10 weekly iterations. We configured the prototype in two weeks to produce a decision-support tool suite: a set of interconnected dashboards for reviewing grants and grant applications and making decisions about their status. The prototype included a total of 21 different screens covering 5 use cases for usability review. After receiving feedback, we were able to cover 5 additional use cases and deliver user training within 3 weeks.

Discussion: A well-designed generic platform can facilitate inexpensive and rapid delivery of tools to support a wide range of decision-making tasks. We expect to make the results of this project available to the research community and believe the tool can potentially aid public health administrators to make informed funding decisions about health services and programs.

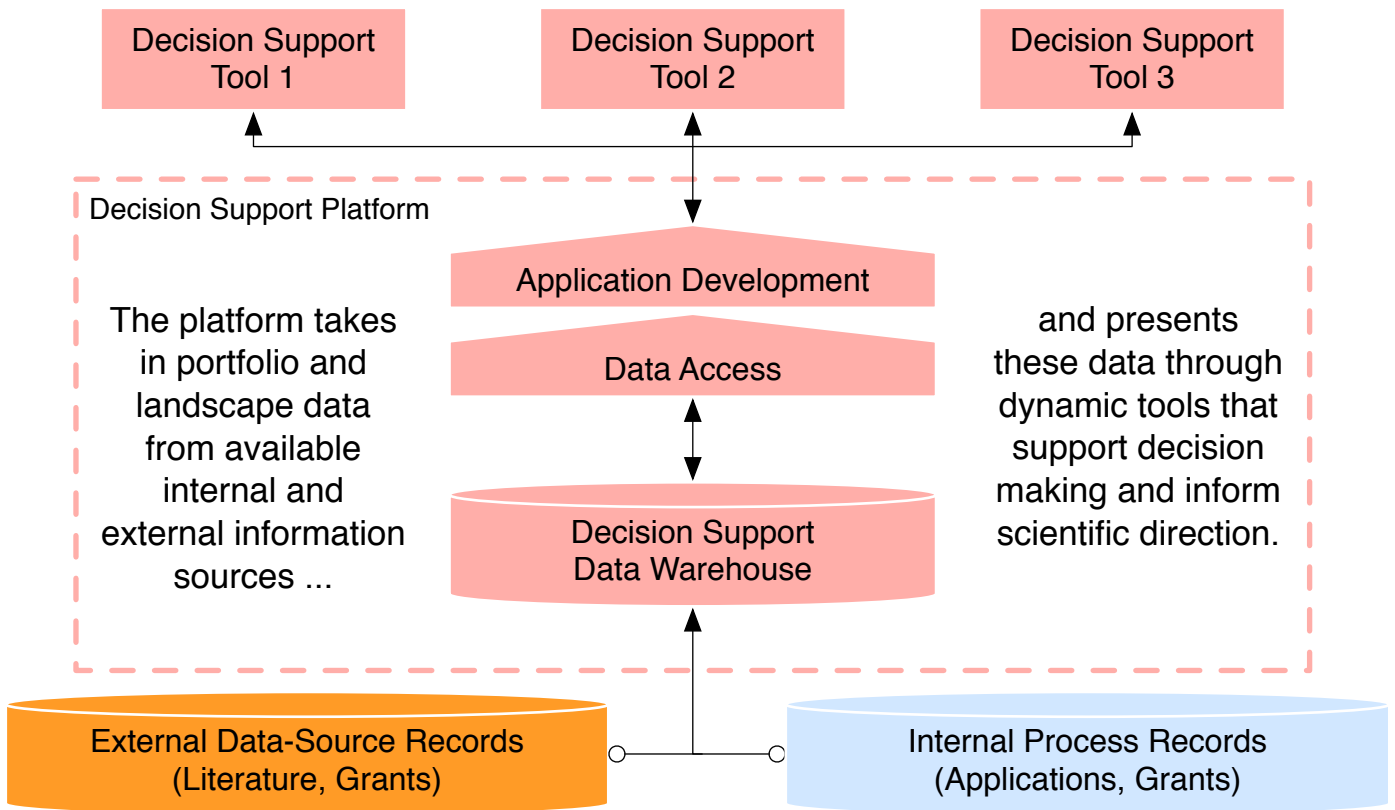
Process Metrics

- Developed platform over 10 weekly iterations
- Created 21 prototype screens to support 5 use cases
- 3 weekly development iterations following prototype feedback to support 5 new use cases
- Once in production executed weekly releases with an average development turnaround of 3 days
- Executed 10 releases over a 3 month period incorporating user feedback and feature requests

Data Metrics

- 191,000 total records in database
- 136,000 NIH Records & 39,800 PubMed Publications
- 7,800 Scientists across 1,300 Institutions
- 2,400 Internal Records stored
- 22,000 Collaborations Identified

Decision Support System Architecture



HTRAF Development Framework

1. Construct HTSQL queries to serve as data sources for HTML elements:

```
/nih_grant{region, count(grant), sum(amount_awarded)}?year='2012'&domain='autism'
```

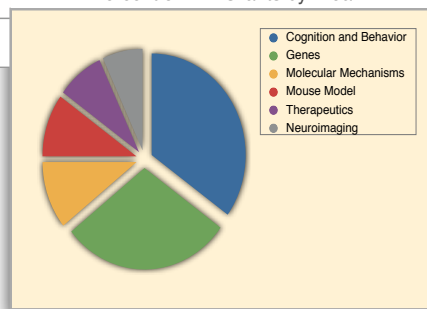
2. Attach HTSQL to HTML Elements

```
<table data-htsql="/nih_grant{region, count(grant), sum(amount_awarded)}? year='2012'&domain='autism'></table>
```

3. HTML Element Display and Interaction between Data

region	count(grant)	sum(amount_awarded)
Northeast	47	\$18,341,392.00
Southeast	16	\$2,045,890.00
Northwest	25	
Southwest	8	

Percent of NIH Grants by Area



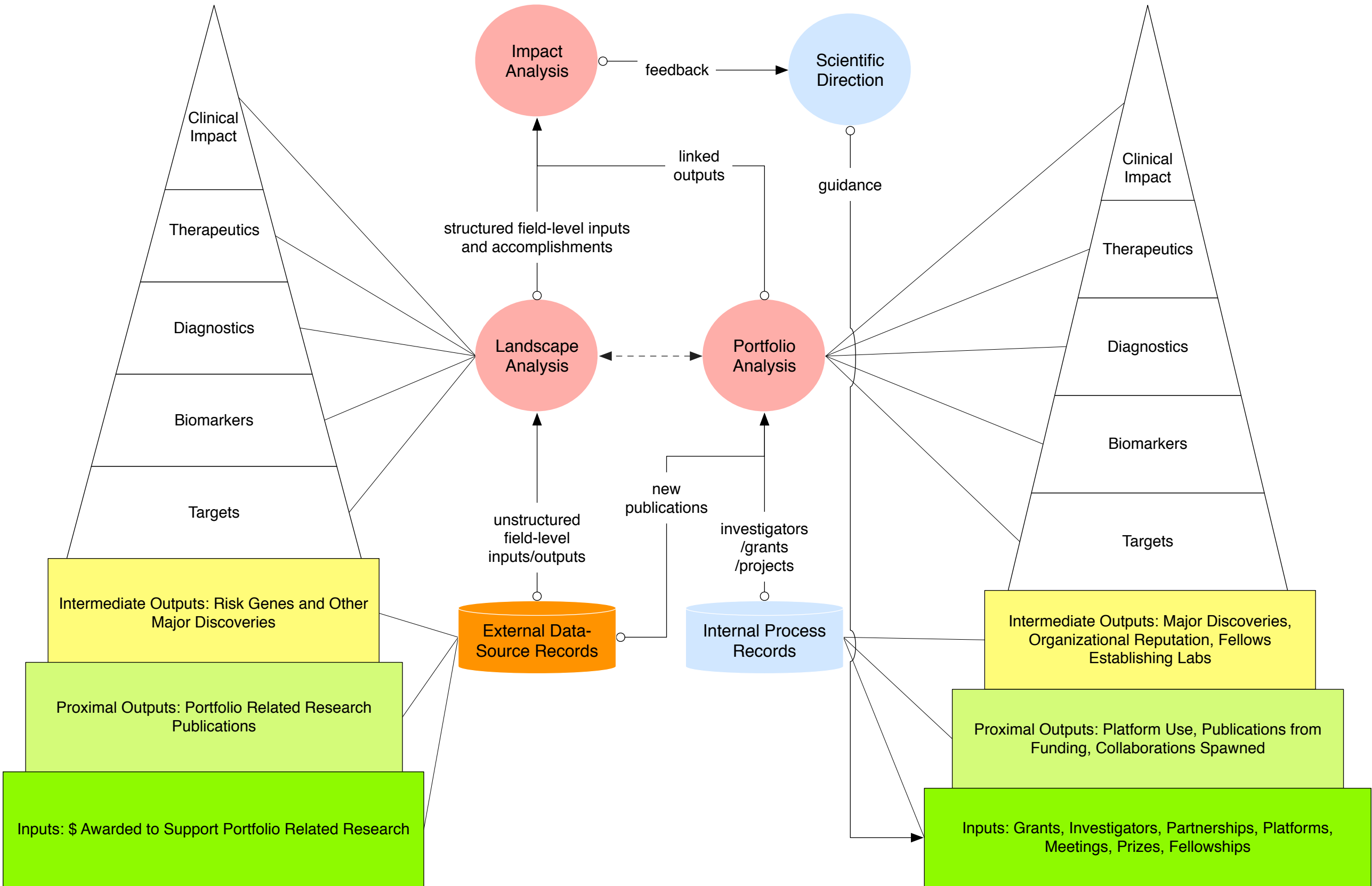
selection of a record automatically updates chart display

```
<select id="region" data-htsql="/region{code,name}"></select>
<div style="width: 500px; height: 350px;" data-htsql="/area{name,count(grant)}?region.code=$region" data-ref="region" data-widget="pie-chart" data-title="Percent of NIH Grants by Area"></div>
```

Field-Level Accomplishments

Decision-Support Platform

Organizational Accomplishments



Visual Application Builder Example

Edit Pane

selectable drag and drop UI widgets

Property: data-htsql

/run_query('sims.application-list')

HTSQL retrieves data

form layout and screen elements

HTML element attributes



HTML page

Output Preview

HTML page

Output Preview

data-driven screens

* Output blurred for confidentiality purposes