**Measurements and Metrics**

**Product Metrics**

* Comment Density
* Avg. LOC per feature
* Avg. Population(count of all classes and methods) per feature
* Total number of features
* Software Maturity Index(SMI = [MT - (Fa + Fc + Fd)]/MT)

 where

MT = #modules in the current release

Fa = #modules in the current release that have been added

Fc = #modules in the current release that have been changed

Fd = #modules from the preceding release that were deleted in the current release

**Process Metrics**

* Delta Work = (Hours per Week - Avg Hours per Week) / Avg. Hours Spent per Week \* 100
* Avg. Time between cycles
* Avg. added features per release
* Avg. LOC per release
* Avg. Comment density
* Delta Risk = (Risk Exposure - Avg Risk Exposure) / Avg Risk Exposure \* 100
* Delta Work Breakdown of time spent in Requirements, Design, Construction, Testing & Maintenance
* Avg. time spent per feature
* Delta SMI

**Release 1.0(11/29/2014)**

# of features: 22

included features:

 -Artifact Features-

* Grants
	+ LOC: 673
	+ Population: 36
	+ Time spent(effort):
* Media Interviews
	+ LOC: 693
	+ Population: 36
	+ Time spent(effort):
* Research Articles
	+ LOC: 651
	+ Population: 36
	+ Time spent(effort):
* Journal Articles
	+ LOC: 656
	+ Population: 36
	+ Time spent(effort):
* Presentations
	+ LOC: 707
	+ Population: 36
	+ Time spent(effort):
* Other
	+ LOC: 669
	+ Population: 36
	+ Time spent(effort):

-Functionality(per Artifact)-

* + Add Artifact
	+ Edit Artifact Information
	+ Add file to Artifact
	+ Add file revisions to Artifact
	+ View all revisions for Artifact
	+ Delete file from Artifact
	+ Add url to Artifact
	+ Update url
	+ Delete url
	+ Remove Author from Artifact
	+ Delete Artifact

 -Infrastructure Features-

* Researcher
	+ LOC: 390
	+ Population: 20
	+ Time spent(effort):
* Url
	+ LOC: 83
	+ Population: 6
	+ Time spent(effort):
* Attachment
	+ LOC: 183
	+ Population: 8
	+ Time spent(effort):
* LazyList
	+ LOC: 185
	+ Population: 19
	+ Time spent(effort):
* Database Facade
	+ LOC: 80
	+ Population: 7
	+ Time spent(effort):
* Authentication Controller
	+ LOC: 131
	+ Population: 6
	+ Time spent(effort):
* Artifact
	+ LOC: 93
	+ Population: 3
	+ Time spent(effort):
* Affiliation
	+ LOC: 93
	+ Population: 6
	+ Time spent(effort):
* Author
	+ LOC: 165
	+ Population: 9
	+ Time spent(effort):
* Programs
	+ LOC: 375
	+ Population: 8
	+ Time spent(effort):

 -System Features-

* Create Research Program
	+ LOC: 48
	+ Population: 5
	+ Time spent(effort):
* Show Artifacts Associated with Program
	+ LOC: 26
	+ Population: 6
	+ Time spent(effort):
* Add Artifacts to Program
	+ LOC: 26
	+ Population: 5
	+ Time spent(effort):
* Delete Program
	+ LOC: 20
	+ Population: 5
	+ Time spent(effort):
* Sign up/Register
	+ LOC: 37
	+ Population: 4
	+ Time spent(effort):
* Sign in/Logout
	+ LOC: 16
	+ Population: 3
	+ Time spent(effort):

LOC: 6042

Lines of source: 5283

Comment lines: 143

Blank Lines: 616

Comment Density: 2.36%

Added Features: 22

Changed Features:0

Risk exposure: 16.01

Avg. LOC per feature: 273

Avg. Population per feature: 15

SMI: N/A (first release) 0 = [22 - (22 + 0 + 0)]/22

**Time spent at this time on:**

Requirements: 20 hours

Design: 8 hours

Construction:

Testing: 5 hours

Maintenance: 0 hours

**Release 2.0(4/8/2015)**

# of features: 29

included features:

 -Artifact Features-

* Grants
	+ LOC: 673
	+ Population: 36
	+ Time spent(effort):
* Media Interviews
	+ LOC: 693
	+ Population: 36
	+ Time spent(effort):
* Research Articles
	+ LOC: 651
	+ Population: 36
	+ Time spent(effort):
* Journal Articles
	+ LOC: 656
	+ Population: 36
	+ Time spent(effort):
* Presentations
	+ LOC: 707
	+ Population: 36
	+ Time spent(effort):
* Other
	+ LOC: 669
	+ Population: 36
	+ Time spent(effort):

-Functionality(per Artifact)-

* + Add Artifact
	+ Edit Artifact Information
	+ Add file to Artifact
	+ Add file revisions to Artifact
	+ View all revisions for Artifact
	+ Delete file from Artifact
	+ Add url to Artifact
	+ Update url
	+ Delete url
	+ Remove Author from Artifact
	+ Delete Artifact

 -Infrastructure Features-

* Researcher
	+ LOC: 390
	+ Population: 20
	+ Time spent(effort):
* Url
	+ LOC: 83
	+ Population: 6
	+ Time spent(effort):
* Attachment
	+ LOC: 183
	+ Population: 8
	+ Time spent(effort):
* LazyList
	+ LOC: 185
	+ Population: 19
	+ Time spent(effort):
* Database Facade
	+ LOC: 80
	+ Population: 7
	+ Time spent(effort):
* Authentication Controller
	+ LOC: 131
	+ Population: 6
	+ Time spent(effort):
* Artifact
	+ LOC: 93
	+ Population: 3
	+ Time spent(effort):
* Affiliation
	+ LOC: 93
	+ Population: 6
	+ Time spent(effort):
* Author
	+ LOC: 165
	+ Population: 9
	+ Time spent(effort):
* Programs
	+ LOC: 375
	+ Population: 8
	+ Time spent(effort):
* Activity
	+ LOC: 16
	+ Population: 3
	+ Time spent(effort):
* Notification
	+ LOC: 16
	+ Population: 3
	+ Time spent(effort):
* Subscription
	+ LOC: 16
	+ Population: 3
	+ Time spent(effort):

 -System Features-

* Create Research Program
	+ LOC: 48
	+ Population: 5
	+ Time spent(effort):
* Show Artifacts Associated with Program
	+ LOC: 26
	+ Population: 6
	+ Time spent(effort):
* Add Artifacts to Program
	+ LOC: 26
	+ Population: 5
	+ Time spent(effort):
* Delete Program
	+ LOC: 20
	+ Population: 5
	+ Time spent(effort):
* Sign up/Register
	+ LOC: 37
	+ Population: 4
	+ Time spent(effort):
* Sign in/Logout
	+ LOC: 16
	+ Population: 3
	+ Time spent(effort):
* Activity Logging
	+ LOC: 16
	+ Population: 3
	+ Time spent(effort):
* Modal Displays
	+ LOC: 16
	+ Population: 3
	+ Time spent(effort):
* System Notifications
	+ LOC: 16
	+ Population: 3
	+ Time spent(effort):
* watch/Unwatch Artifacts to receive notifications
	+ LOC: 16
	+ Population: 3
	+ Time spent(effort):

LOC: 7175

Lines of source: 6,351

Comment lines: 208

Blank Lines: 616

Comment Density: 2.89%

Added Features: 7

Changed Features: 2(Researchers, Artifact File uploads)

Risk exposure: 12.50

SMI: 0.69 = [29 - (7 + 2 + 0)]/29

**Time spent at this time on:**

Requirements: 20 hours

Design: 10 hours

Construction:

Testing: 8 hours

Maintenance: 3 hours

**Release 3.0(4/8/2015)**

# of features: 32

included features:

 -Artifact Features-

* Grants
	+ LOC: 673
	+ Population: 36
	+ Time spent(effort): 5
* Media Interviews
	+ LOC: 693
	+ Population: 36
	+ Time spent(effort): 5
* Research Articles
	+ LOC: 651
	+ Population: 36
	+ Time spent(effort): 4
* Journal Articles
	+ LOC: 656
	+ Population: 36
	+ Time spent(effort): 4
* Presentations
	+ LOC: 707
	+ Population: 36
	+ Time spent(effort): 5
* Other
	+ LOC: 669
	+ Population: 36
	+ Time spent(effort): 5

-Functionality(per Artifact)-

* + Add Artifact
	+ Edit Artifact Information
	+ Add file to Artifact
	+ Add file revisions to Artifact
	+ View all revisions for Artifact
	+ Delete file from Artifact
	+ Add url to Artifact
	+ Update url
	+ Delete url
	+ Remove Author from Artifact
	+ Delete Artifact

 -Infrastructure Features-

* Researcher
	+ LOC: 390
	+ Population: 20
	+ Time spent(effort): 2
* Url
	+ LOC: 83
	+ Population: 6
	+ Time spent(effort): 2
* Attachment
	+ LOC: 183
	+ Population: 8
	+ Time spent(effort): 2
* LazyList
	+ LOC: 185
	+ Population: 19
	+ Time spent(effort): 2.5
* Database Facade
	+ LOC: 80
	+ Population: 7
	+ Time spent(effort): 3
* Authentication Controller
	+ LOC: 131
	+ Population: 6
	+ Time spent(effort): 1.5
* Artifact
	+ LOC: 93
	+ Population: 3
	+ Time spent(effort): 1.5
* Affiliation
	+ LOC: 93
	+ Population: 6
	+ Time spent(effort): 2
* Author
	+ LOC: 165
	+ Population: 9
	+ Time spent(effort): 2
* Programs
	+ LOC: 375
	+ Population: 8
	+ Time spent(effort): 1
* Activity
	+ LOC: 16
	+ Population: 3
	+ Time spent(effort): 2
* Notification
	+ LOC: 16
	+ Population: 3
	+ Time spent(effort): 2
* Subscription
	+ LOC: 16
	+ Population: 3
	+ Time spent(effort): 2

 -System Features-

* Create Research Program
	+ LOC: 48
	+ Population: 5
	+ Time spent(effort): 1.5
* Show Artifacts Associated with Program
	+ LOC: 26
	+ Population: 6
	+ Time spent(effort): 1.5
* Add Artifacts to Program
	+ LOC: 26
	+ Population: 5
	+ Time spent(effort): 1.5
* Delete Program
	+ LOC: 20
	+ Population: 5
	+ Time spent(effort): 1
* Sign up/Register
	+ LOC: 37
	+ Population: 4
	+ Time spent(effort): 2
* Sign in/Logout
	+ LOC: 16
	+ Population: 3
	+ Time spent(effort): 1
* Activity Logging
	+ LOC: 16
	+ Population: 3
	+ Time spent(effort):10
* Modal Displays
	+ LOC: 16
	+ Population: 3
	+ Time spent(effort): 8
* Receive Notifications
	+ LOC: 16
	+ Population: 3
	+ Time spent(effort): 4
* watch/Unwatch Artifacts to receive notifications
	+ LOC: 16
	+ Population: 3
	+ Time spent(effort): 6
* Search
	+ LOC: 16
	+ Population: 3
	+ Time spent(effort): 7
* Program IRB status
	+ LOC: 16
	+ Population: 3
	+ Time spent(effort): 5
* Form Validation
	+ LOC: 16
	+ Population: 3
	+ Time spent(effort): 15

LOC: 8129

Lines of source: 5283

Comment lines: 346

Blank Lines: 616

Comment Density: 4.26%

Added Features: 8

Changed Features: 1(Programs for IRB status)

Risk exposure: 11.38

SMI: 0.875 = [32 - (3 + 1 + 0)]/32

Delta SMI: 67.6% = (0.875 - 0.522)/0.522 \* 100

**Time spent at this time on:**

Requirements: 20 hours

Design: 10 hours

Construction: 117.5 hours

Testing: 8 hours

Maintenance: 12 hours