**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