

Exploration

Nick Lauerman

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Purpose

To explore metrics options based on data collected by Software Quality Assurance in a spreadsheet for document review and approval.

Libraries used

No libriries used yet

```
library(lubridate)
```

```
##
## Attaching package: 'lubridate'
## The following object is masked from 'package:base':
##
```

date

Data

The data is presented in a CSV file (saved from an Excel workbook) with the following columns and data characteristics

SQA SQA/E Preforming the review

Project ID Unique ID assigned to the project may come from NPV or ePAS

Application Application Name (limited selection)

Doc Version Version number of the document, also known as the revision number

Doc ID, if needed unique identifier to distinguish between documents for the same deliverable type within a project

Approver or Disapprover? Approval status from the following list

* **A** Approved

* **A-FP** Approved on first pass

* **D** Disapproved

Date of Approval or Disapproval Date action was taken

Reason for Disapproval: Selected from the following list

- Inaccurate information
- Incorrect scope
- Insufficient testing
- Insufficient traceability
- N/A
- Not compliant with procedure
- Not following configuration management
- Not following document version control
- Not using template
- Other
- Requirement deficiency

Import the data

The data is read in and variables are assigned more programically useful names.

```
FPA.Raw <- read.csv(file = "../data/First Pass Acceptance.csv",
                    stringsAsFactors = FALSE,
                    col.names = c("sqa",
                                "project",
                                "application",
                                "deliverable",
                                "version",
                                "docID",
                                "status",
                                "date",
                                "reason",
```

```

                                "comments"))
FPA <- FPA.Raw

```

format the data

factors

Set the following data as factors:

*SQA

*Application

*Deliverable

*status

```

FPA$sqa <- as.factor(FPA$sqa)
FPA$application <- as.factor(FPA$application)
FPA$deliverable <- as.factor(FPA$deliverable)
FPA$status <- as.factor(FPA$status)

```

Clean up reason

convert blank fields in status to NA when status is converted to a factor

```

FPA$reason <- as.factor(FPA$reason)
levels(FPA$reason)

```

```

## [1] ""
## [2] "ADDULCD771510T"
## [3] "ADDULCD7727281"
## [4] "inaccurate information"
## [5] "Inaccurate information"
## [6] "Incorrect scope"
## [7] "Insufficient testing"
## [8] "N/A"
## [9] "Not compliant with procedure"
## [10] "Not following document version control"
## [11] "Not using template"
## [12] "Other"
## [13] "Requirement deficiency"

```

```

levels(FPA$reason)[1] <- NA
levels(FPA$reason)

```

```

## [1] "ADDULCD771510T"
## [2] "ADDULCD7727281"
## [3] "inaccurate information"
## [4] "Inaccurate information"
## [5] "Incorrect scope"
## [6] "Insufficient testing"
## [7] "N/A"
## [8] "Not compliant with procedure"
## [9] "Not following document version control"
## [10] "Not using template"

```

```
## [11] "Other"
## [12] "Requirement deficiency"
```

Date

```
FPA$date <- as.Date(FPA$date, format = "%d-%B-%y")
```

Add new fields

Month and year

From date create month and year fields

```
FPA$month <- month(FPA$date, label = TRUE)
FPA$year <- year(FPA$date)
```

deliverable UID

create an unique identification (UID) for each processed item so that each deliverable is uniquely identified accross the entire data set. to do this the UID will consist of the Project, deliverable, docID and version seperated with a dash

```
FPA$UID <- paste(FPA$project,
                 FPA$deliverable,
                 FPA$docID,
                 FPA$version,
                 sep = "-")
```

Simple count metrics

Projects worked

```
length(unique(FPA$project))
```

```
## [1] 25
```

```
as.character(unique(FPA$application))
```

```
## [1] "Groninger"           "Assay File Database"
## [3] "PCN/SCN"            "WWLIMS"
## [5] "Pulse"              "DFCS"
## [7] "DPW"                "QIMS"
## [9] "Abbott Transfusion Medicine" "Apollo/PHM"
## [11] "AFMS"               "SAS"
## [13] "Metrics Library"    "DaVinci"
## [15] "CMSNext"            "GS Reports"
## [17] "IRIS"               ""
```

Number of reviews

```
nrow(FPA)
```

```
## [1] 274
```

Number of Documents Reviewed

```
length(unique(FPA$UID))
```

```
## [1] 122
```

Number of Projects Started

```
length(unique(
  subset(
    subset(FPA,
      subset = ((status == "A" | status == "A-FP") & version == 1)),
    subset = deliverable == "Software Change Request")$project))
```

```
## [1] 3
```

Number of Projects Completed

```
length(unique(
  subset(
    subset(FPA,
      subset = ((status == "A" | status == "A-FP"))),
    subset = deliverable == "System Certification Summary")$project))
```

```
## [1] 1
```

Approval rate

probability of a document being approved when reviewed

```
nrow(unique(
  subset(FPA, subset = (status == "A" | status == "A-FP"))
))/nrow(FPA)
```

```
## [1] 0.4343066
```

First Pass Acceptance

probability of a document being approved when reviewed the first time

```
nrow(unique(
  subset(FPA, subset = status == "A-FP")
))/nrow(FPA)
```

```
## [1] 0.2408759
```

Number of deliverables by type

The number of each type of deliverable

```
table(FPA[!duplicated(FPA$UID),]$deliverable)
```

```
##
##
##                                CII
##                                8
##          1          Design Verification
##          Design Documentation
##          2          5
##          FRS          IIVP
##          5          5
##          IIVP results          Move to Production
##          9          1
##          Project Plan          Software Change Request
##          6          6
##          Software Compliance Assessment          System Certification Summary
##          4          2
##          Test Protocol          Test Protocol Results
##          37          14
##          Traceability          URS
##          9          2
##          User Acceptance Protocol User Acceptance Protocol results
##          3          1
##          Validation Plan
##          2
```

number od deliverable per application

```
table(FPA[!duplicated(FPA$UID),]$application)
```

```
##
##          Abbott Transfusion Medicine
##          1          1
##          AFMS          Apollo/PHM
##          8          9
##          Assay File Database          CMSNext
##          2          2
##          DaVinci          DFCS
##          12          13
##          DPW          Groninger
##          4          1
##          GS Reports          IRIS
##          3          1
##          Metrics Library          PCN/SCN
##          3          6
##          Pulse          QIMS
##          8          12
##          SAS          WWLIMS
##          3          33
```

distrubation of result of reviews

```
table(FPA$status)
```

```
##
##           A A-FP   D
##    98    54    67   55
```

2 way table deliverables by application

```
table(FPA[!duplicated(FPA$UID),]$application,
      FPA[!duplicated(FPA$UID),]$deliverable)
```

```
##
##
##           CII Design Documentation
##           1    0    0
## Abbott Transfusion Medicine 0    0    0
## AFMS                        0    1    0
## Apollo/PHM                  0    0    0
## Assay File Database          0    0    0
## CMSNext                     0    0    0
## DaVinci                      0    1    0
## DFCS                         0    1    0
## DPW                          0    0    0
## Groninger                    0    0    0
## GS Reports                   0    0    0
## IRIS                         0    0    0
## Metrics Library              0    0    2
## PCN/SCN                      0    0    0
## Pulse                        0    0    0
## QIMS                         0    2    0
## SAS                          0    0    0
## WVLIMS                       0    3    0
##
##           Design Verification FRS IIVP IIVP results
##           0    0    0    0
## Abbott Transfusion Medicine 0    0    0    0
## AFMS                        0    2    0    0
## Apollo/PHM                  0    0    0    4
## Assay File Database          0    0    0    0
## CMSNext                     0    0    0    0
## DaVinci                      0    1    1    0
## DFCS                         1    0    1    0
## DPW                          0    0    0    0
## Groninger                    0    0    0    0
## GS Reports                   0    0    0    0
## IRIS                         0    0    0    1
## Metrics Library              0    0    0    0
## PCN/SCN                      1    1    1    0
## Pulse                        0    0    0    1
## QIMS                         2    0    1    1
## SAS                          0    0    0    0
## WVLIMS                       1    1    1    2
```

| | | | |
|----|-----------------------------|---------------------------------|---|
| ## | | | |
| ## | | Move to Production Project Plan | |
| ## | | 0 | 0 |
| ## | Abbott Transfusion Medicine | 0 | 0 |
| ## | AFMS | 0 | 0 |
| ## | Apollo/PHM | 0 | 0 |
| ## | Assay File Database | 0 | 1 |
| ## | CMSNext | 0 | 0 |
| ## | DaVinci | 0 | 1 |
| ## | DFCS | 0 | 1 |
| ## | DPW | 0 | 0 |
| ## | Groninger | 0 | 0 |
| ## | GS Reports | 1 | 2 |
| ## | IRIS | 0 | 0 |
| ## | Metrics Library | 0 | 1 |
| ## | PCN/SCN | 0 | 0 |
| ## | Pulse | 0 | 0 |
| ## | QIMS | 0 | 0 |
| ## | SAS | 0 | 0 |
| ## | WVLIMS | 0 | 0 |
| ## | | | |
| ## | | Software Change Request | |
| ## | | 0 | |
| ## | Abbott Transfusion Medicine | 0 | |
| ## | AFMS | 1 | |
| ## | Apollo/PHM | 0 | |
| ## | Assay File Database | 1 | |
| ## | CMSNext | 1 | |
| ## | DaVinci | 1 | |
| ## | DFCS | 1 | |
| ## | DPW | 0 | |
| ## | Groninger | 0 | |
| ## | GS Reports | 0 | |
| ## | IRIS | 0 | |
| ## | Metrics Library | 0 | |
| ## | PCN/SCN | 1 | |
| ## | Pulse | 0 | |
| ## | QIMS | 0 | |
| ## | SAS | 0 | |
| ## | WVLIMS | 0 | |
| ## | | | |
| ## | | Software Compliance Assessment | |
| ## | | 0 | |
| ## | Abbott Transfusion Medicine | 1 | |
| ## | AFMS | 0 | |
| ## | Apollo/PHM | 0 | |
| ## | Assay File Database | 0 | |
| ## | CMSNext | 1 | |
| ## | DaVinci | 0 | |
| ## | DFCS | 0 | |
| ## | DPW | 0 | |
| ## | Groninger | 0 | |
| ## | GS Reports | 0 | |
| ## | IRIS | 0 | |

| | | |
|----|------------------------------|------------------|
| ## | Metrics Library | 0 |
| ## | PCN/SCN | 2 |
| ## | Pulse | 0 |
| ## | QIMS | 0 |
| ## | SAS | 0 |
| ## | WVLIMS | 0 |
| ## | | |
| ## | System Certification Summary | Test Protocol |
| ## | | 0 0 |
| ## | Abbott Transfusion Medicine | 0 0 |
| ## | AFMS | 0 2 |
| ## | Apollo/PHM | 0 5 |
| ## | Assay File Database | 0 0 |
| ## | CMSNext | 0 0 |
| ## | DaVinci | 0 5 |
| ## | DFCS | 0 1 |
| ## | DPW | 1 1 |
| ## | Groninger | 0 0 |
| ## | GS Reports | 0 0 |
| ## | IRIS | 0 0 |
| ## | Metrics Library | 0 0 |
| ## | PCN/SCN | 0 0 |
| ## | Pulse | 0 3 |
| ## | QIMS | 0 4 |
| ## | SAS | 1 1 |
| ## | WVLIMS | 0 15 |
| ## | | |
| ## | Test Protocol Results | Traceability URS |
| ## | | 0 0 0 |
| ## | Abbott Transfusion Medicine | 0 0 0 |
| ## | AFMS | 0 0 1 |
| ## | Apollo/PHM | 0 0 0 |
| ## | Assay File Database | 0 0 0 |
| ## | CMSNext | 0 0 0 |
| ## | DaVinci | 0 0 1 |
| ## | DFCS | 2 1 0 |
| ## | DPW | 2 0 0 |
| ## | Groninger | 0 1 0 |
| ## | GS Reports | 0 0 0 |
| ## | IRIS | 0 0 0 |
| ## | Metrics Library | 0 0 0 |
| ## | PCN/SCN | 0 0 0 |
| ## | Pulse | 3 1 0 |
| ## | QIMS | 0 2 0 |
| ## | SAS | 1 0 0 |
| ## | WVLIMS | 6 4 0 |
| ## | | |
| ## | User Acceptance Protocol | |
| ## | | 0 |
| ## | Abbott Transfusion Medicine | 0 |
| ## | AFMS | 0 |
| ## | Apollo/PHM | 0 |
| ## | Assay File Database | 0 |
| ## | CMSNext | 0 |

| | | |
|----|----------------------------------|---|
| ## | DaVinci | 0 |
| ## | DFCS | 3 |
| ## | DPW | 0 |
| ## | Groninger | 0 |
| ## | GS Reports | 0 |
| ## | IRIS | 0 |
| ## | Metrics Library | 0 |
| ## | PCN/SCN | 0 |
| ## | Pulse | 0 |
| ## | QIMS | 0 |
| ## | SAS | 0 |
| ## | WVLIMS | 0 |
| ## | | |
| ## | User Acceptance Protocol results | |
| ## | | 0 |
| ## | Abbott Transfusion Medicine | 0 |
| ## | AFMS | 0 |
| ## | Apollo/PHM | 0 |
| ## | Assay File Database | 0 |
| ## | CMSNext | 0 |
| ## | DaVinci | 0 |
| ## | DFCS | 1 |
| ## | DPW | 0 |
| ## | Groninger | 0 |
| ## | GS Reports | 0 |
| ## | IRIS | 0 |
| ## | Metrics Library | 0 |
| ## | PCN/SCN | 0 |
| ## | Pulse | 0 |
| ## | QIMS | 0 |
| ## | SAS | 0 |
| ## | WVLIMS | 0 |
| ## | | |
| ## | Validation Plan | |
| ## | | 0 |
| ## | Abbott Transfusion Medicine | 0 |
| ## | AFMS | 1 |
| ## | Apollo/PHM | 0 |
| ## | Assay File Database | 0 |
| ## | CMSNext | 0 |
| ## | DaVinci | 1 |
| ## | DFCS | 0 |
| ## | DPW | 0 |
| ## | Groninger | 0 |
| ## | GS Reports | 0 |
| ## | IRIS | 0 |
| ## | Metrics Library | 0 |
| ## | PCN/SCN | 0 |
| ## | Pulse | 0 |
| ## | QIMS | 0 |
| ## | SAS | 0 |
| ## | WVLIMS | 0 |

Number of Projects Started revisited

```
length(unique(subset(FPA, subset = (((status == "A" | status == "A-FP")
                                     & version == 1)
                                     & deliverable == "Software Change Request" ))
             $project)) +
length(unique(
  subset(FPA,
    subset = (((status == "A" | status == "A-FP")
               & version == 1)
               & application == "GS Reports")
               & deliverable == "Project Plan"))
  $project))
```

```
## [1] 5
```

Projects completed round two

```
length(unique(
  subset(
    subset(FPA,
      subset = (((status == "A" | status == "A-FP")
                  & version == 1))),
    subset = deliverable == "System Certification Summary")$project)) +
length(unique(
  subset(
    subset(FPA,
      subset = (((status == "A" | status == "A-FP")
                  & version == 1))),
    subset = deliverable == "Move to Production")$project))
```

```
## [1] 2
```