

Programming Development and Validation Tracking Application “iTrack”

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ABSTRACT

Just like other pharmaceutical companies and clinical research organizations, ICON has been tracking programming work flows and quality review findings within a series of Microsoft Excel (XLS) files. In 2016, ICON rolled out a Programming Development and Validation Document (“iTrack”) Tracking Application to replace these Excel spreadsheets used for tracking. This paper is an introduction to the application, including the user interface and both quality tracking and reporting functionality available within the application. It will also discuss ICONs experience with designing, piloting and roll-out of the application, and continual improvements to the system.

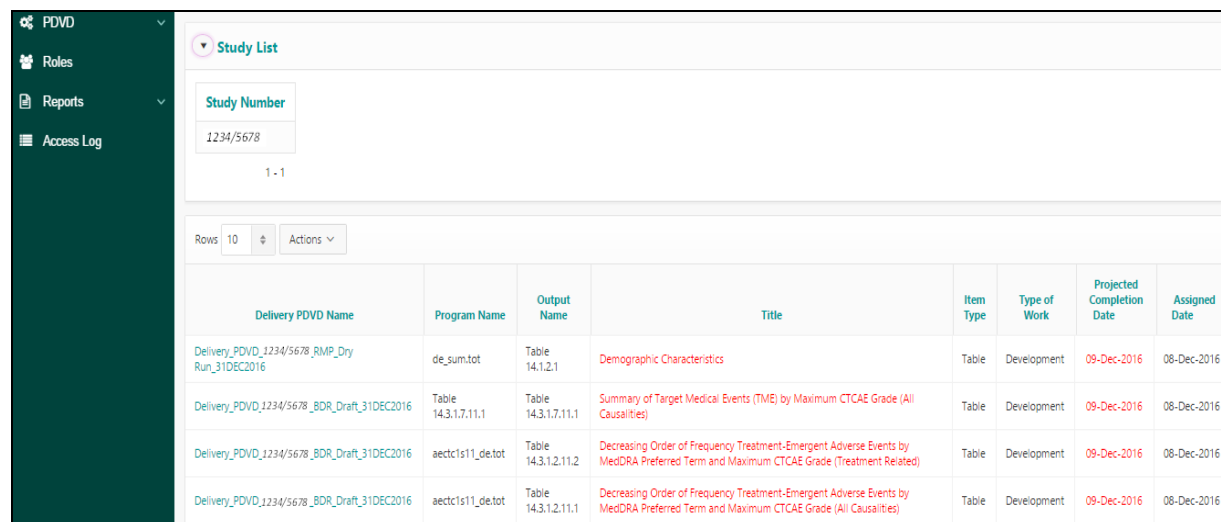
INTRODUCTION

This paper is an introduction to the ICON Programming Development and Validation Tracking Application (“iTrack”), an APEX Oracle application. The paper will provide an overview of the user interface, planning and tracking functionality, along with the current reports available. It will also discuss ICONs approach and experience with vendor selection, designing, developing, testing, piloting and rollout of the application, along with our future plans to include further quality tracking and reporting functionality.

USER INTERFACE

HOME SCREEN:

This is the home screen that an individual programmer will see. The home screen indicates the counts of Completed/Pending/Overdue tasks. The Study List will display the List of Studies assigned to the logged in Programmer. They can also view tasks that are assigned to them, but not yet completed.

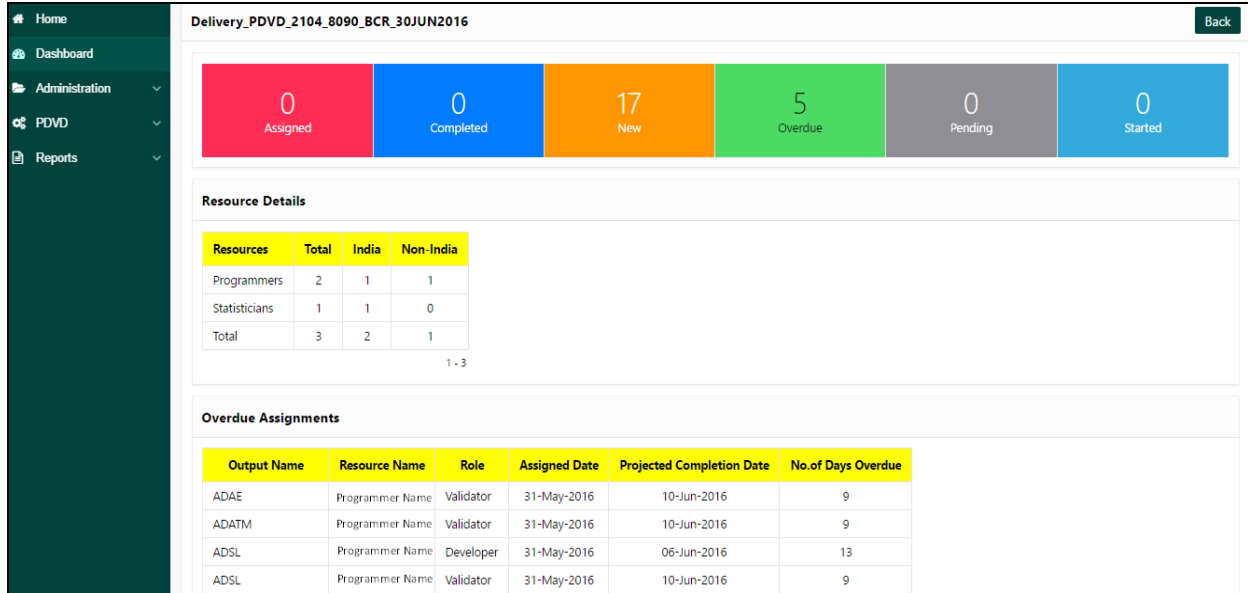


Delivery PDVD Name	Program Name	Output Name	Title	Item Type	Type of Work	Projected Completion Date	Assigned Date
Delivery_PDVD_1234/5678_RMP_Dry Run_31DEC2016	de_sum.tot	Table 14.1.2.1	Demographic Characteristics	Table	Development	09-Dec-2016	08-Dec-2016
Delivery_PDVD_1234/5678_BDR_Draft_31DEC2016	Table 14.3.1.7.11.1	Table 14.3.1.7.11.1	Summary of Target Medical Events (TME) by Maximum CTCAE Grade (All Causalities)	Table	Development	09-Dec-2016	08-Dec-2016
Delivery_PDVD_1234/5678_BDR_Draft_31DEC2016	aectcls11_de.tot	Table 14.3.1.2.11.2	Decreasing Order of Frequency Treatment-Emergent Adverse Events by MedDRA Preferred Term and Maximum CTCAE Grade (Treatment Related)	Table	Development	09-Dec-2016	08-Dec-2016
Delivery_PDVD_1234/5678_BDR_Draft_31DEC2016	aectcls11_de.tot	Table 14.3.1.2.11.1	Decreasing Order of Frequency Treatment-Emergent Adverse Events by MedDRA Preferred Term and Maximum CTCAE Grade (All Causalities)	Table	Development	09-Dec-2016	08-Dec-2016

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DASHBOARD:

The dashboard is displayed for management, and leads. It provides the status of each study delivery with respect to status count, resource details, overdue assignment and completion status.



PLANNING AND TRACKING OF PROGRAMMING

STUDY DELIVERY PLAN

This screen shows the list of all the planned deliveries for the logged in user along with other details such as sponsor identifiers, delivery dates, team list etc.

Delivery PDVD Name	Study Number	Sponsor Name	SAS Version	Operating System	Delivery Date	Unblinded Flag	Study Type	Team
Delivery_PDVD_1234/5678_BDR_Dry Run_30JUN2017	1234/5678	Sponsor Name	9.3	Windows 2003	30-Jun-2017	Yes	-	
Delivery_PDVD_5678/1234_CSR_Dry Run_20JUL2017	5678/1234	Sponsor Name	9.4	Windows 2003	20-Jul-2017	Yes	-	

PLANNING TASKS

The Lead programmer assigns various attributes to each Output which helps in setting up the criteria for any filter options. ICON filter options would include safety/efficacy designation, output type (Dataset/Tables/Listing/Graphs), unique and replicate designation etc.

☐	Item / Identifier	Program Name	Output Name	Validation Program Name	Title	Theme	Item Type	Unique Replicate Indicator	Replicate Of	Rerun	Validation Type
☐	D011	d1_adae	ADAE	v_d1_adae	Adverse Events Analysis Data	Safety	Dataset	Unique		No v	A
☐	D003	d1_adcm	ADCM	v_d1_adcm	Concomitant Medication Analysis Data	Safety	Dataset	Unique		No v	A

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The Lead programmer assigns tasks to developer and validator along with projected completion dates which makes it easier for the programmers to plan and prioritise their work.

Delivery PDVD											
Go Actions											
Study Number	Item / Identifier	Program Name	Unique/Replicate	Developer	Production Projected Completion Date	Production Status	Production Actual Completion Date	Validator	Validation Projected Completion Date	Validation Status	Validation Actual Completion Date
1234/5678	D001	ADAE.sas	Unique	Programmer Name	03-Oct-2017	Assigned		Programmer Name	03-Oct-2017	Assigned	
1234/5678	D002	ADCM.sas	Unique	Programmer Name	03-Oct-2017	Assigned		Programmer Name	03-Oct-2017	Assigned	
1234/5678	D003	ADDA.sas	Unique	Programmer Name	03-Oct-2017	Assigned		Programmer Name	03-Oct-2017	Assigned	

COMPLETING TASKS

Programmers update the production and validation status (started, pending, complete etc), along with completion dates once applicable.

Study Number	Item / Identifier	Program Name	Developer	Production Projected Completion Date	Production Status	Production Actual Completion Date	Validator	Validation Projected Completion Date	Validation Status	Validation Actual Completion Date
1234/5678	D001	ADAE.sas	Programmer Name	13-Sep-2017	Completed	11-Sep-2017	Programmer Name	13-Sep-2017	Completed	11-Sep-2017
1234/5678	D002	ADCM.sas	Programmer Name	13-Sep-2017	Completed	11-Sep-2017	Programmer Name	13-Sep-2017	Completed	11-Sep-2017
1234/5678	D003	ADDA.sas	Programmer Name	13-Sep-2017	Completed	11-Sep-2017	Programmer Name	13-Sep-2017	Completed	11-Sep-2017

VALIDATION AND REVIEW

Once a development status is set as complete, the validation programmer can enter their validation comments into the system, through the 'Add Validation Comments' screen. The error can be classified at this point.

Delivery Item - Status

Title

Subject Disposition by Treatment Sequence

Process

Validation

Status

Pending

Reason

Provided Comments

Comments

Cancel

Add Validation Comment

Add Review Comment

Save

Validator Comments

☒
☐

Validator Comment

Parent Comment

Error Type

Error Category

Developer Response

Developer Comments

Finding Status

Add Attachment

Need more clarity

Cosmetic updates

Programming

New

1 rows selected

Cancel

Save

3

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Once validation comments have been entered they are added to the development programmer's work list through their homepage dashboard.



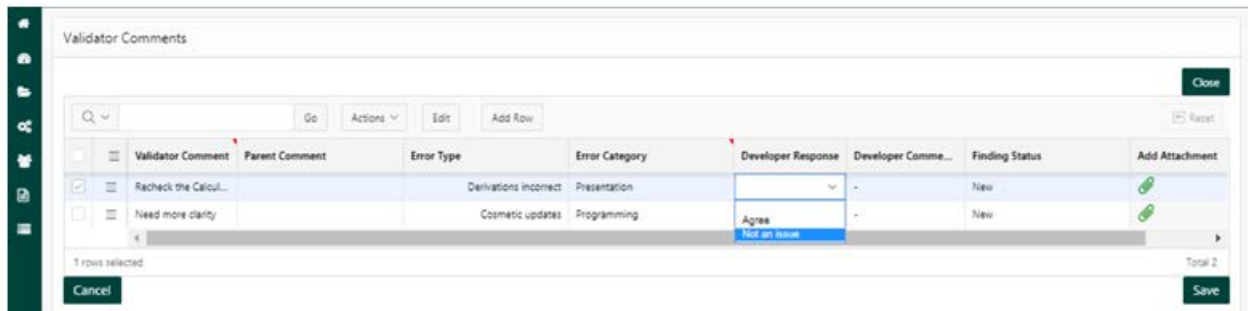
Delivery PDVD Name	Validator Comment	Review Comments	Stats Peer Review		Programming Lead Review	
			Delivery	Item	Delivery	Item
Delivery_PDVD_1						
Delivery_PDVD_2						
Delivery_PDVD_3						
Delivery_PDVD_4						
Delivery_PDVD_5						
Delivery_PDVD_6					View	View
Delivery_PDVD_7						

Within a delivery tracking sheet, the developer can also view comments, through the red 'comments' button.



Peer comments	Lead review comment

The developer reviews the validation comments, addresses the comments within their program if applicable, and responds to the comment raised.



Validator Comment	Parent Comment	Error Type	Error Category	Developer Response	Developer Comment	Finding Status	Add Attachment
☒ Reread the Calcul...		Derivations incorrect	Presentation			New	
☐ Need more clarity		Cosmetic updates	Programming	Agree		New	
				Not an issue			

1 rows selected Total 2

The validator will review the response to their original comment. If they have further comments then the cycle reiterates. Otherwise the validator marks validation as complete.

The Statistical Review, Lead Programmer Review and Peer Statistical Review follow a similar cycle as above, until all of the delivery items are complete and ready for delivery to the sponsor. The programming and statistical lead can see the status of the delivery in the dashboard also.



Delivery PDVD Name	Study Number	Sponsor Name	SAS Version	Operating System	Delivery Date	Unblinded Flag	Study Type	Team	Programming Lead Review	Peer Review
Delivery_PDVD_1	2104/0004	AMAG Pharmaceuticals Inc.	9.3	Windows 2003	27-Oct-2017	No	-			
Delivery_PDVD_2	2104/0004	AMAG Pharmaceuticals Inc.	9.3	Windows 2003	19-Oct-2017	No	-		Completed	Completed
Delivery_PDVD_3	2104/0004	AMAG Pharmaceuticals Inc.	9.3	Windows 2003	23-Oct-2017	No	-			

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EVIDENCE OF QUALITY CONTROL

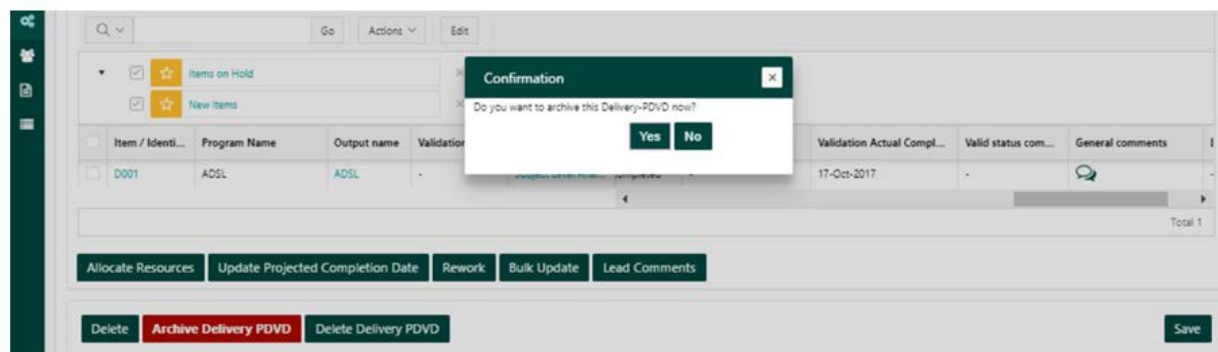
This application has lot of advantages over excel as it centralizes the data, and most of the functionalities in the tool are automated. Also there are various edit checks implemented which result in high quality of the tracking data.

Some of the edit checks within the tool are:

1. Delivery date should always greater than or equal to the system date.
2. Developer and Validator cannot be same for a single task.
3. Production completion date cannot be after Validation completion date.
4. There is no possibility of entering back date, so the system has to be current and up to date.
5. There cannot be any missing values in mandatory fields. The delivery tracking sheet cannot be saved with missing values.
6. The only section which has to be manually entered is the comment field. The rest of the fields have prepopulated drop down lists.
7. A team will be allocated and assigned in the delivery tracking sheet and only those people can view and access the study information.
8. Once the status is changed to 'Completed', the completion date will be defaulted to the current system date.
9. Some functionality is only visible to Leads. For example, only the study lead can create a new delivery tracking sheet for that study, the lead can only assign resources, change the delivery date, delete the tracking sheet, close /reopen the tracking sheet and so on.
10. Users have write access only to the tasks that have been assigned to them.

ARCHIVING & FILING

Prior to a delivery being made to the sponsor, the delivery tracking sheet is archived, downloaded, and a release form signed by the Statistics and Programming Leads, as evidence that the process has been followed. This form is per the ICON SOPs and will be filed within the study Trial Master File.



REPORTS

Numerous reports can be generated using this tool. These reports are created just by a click of a button. All reports can also be downloaded in XLS format and can be shared if required. Below is a summary of the different types of reports available within the tool:

OVERDUE ASSIGNMENT REPORT

This report provides a summary of the tasks that are overdue. This report is available to managers, leads and the individual programmers, from their home screen.

Item / Identifier	Program Name	Output Name	Title	Theme	Item Type	Production Programmer	Production Projected Completion Date	Production Status	Production Actual Completion Date
D001	d0_adsl	ADSL	Subject Level Analysis Data	Safety	Dataset	Programmers Name	31-Jul-2017		

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DELIVERY SUMMARY REPORT

This report tracks the progress of the delivery by displaying the status of each task in the delivery wrt count and percentage.

Item Type	Total	Unique	Replicate	Development					Validation				
				New	Assigned	Started	Pending	Completed	New	Assigned	Started	Pending	Completed
Dataset	15	15	0	15 (100%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	15 (100%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Table	83	68	15	44 (53%)	11 (13%)	0 (0%)	1 (1%)	27 (33%)	44 (53%)	24 (29%)	0 (0%)	3 (4%)	12 (14%)
Figure	0	0	0	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Listing	21	16	5	0 (0%)	0 (0%)	0 (0%)	1 (5%)	20 (95%)	0 (0%)	1 (5%)	0 (0%)	0 (0%)	20 (95%)
Other	0	0	0	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)

REWORK SUMMARY REPORT

This report has the data for the number of times a program was reworked/updated. There are 4 reports in total under this category

Report - 1: Displays Items count, Rework count and its percentage.

Study Number	Delivery PDVD Name	Item Count	Rework Count	Rework Percentage
1234/5678	Delivery_PDVD_1234/5678_CSR_Dry_Run_14JUL2017	8	2	25
5678/1234	Delivery_PDVD_5678/1234_Advisory Committee_Final_03APR2017	31	3	9.68

Report - 2: Displays Items count, Rework count and its percentage in accordance by Item Type (Dataset, Table, Figure, Listing, Other)

Rework Summary			
Item Type	# Items	# Items marked for Rework	% Rework
Dataset	3	3	100
Figure	0	0	0
Listing	0	0	0
Other	0	0	0
Table	2	2	100
Total	5	5	100

Report - 3: Displays Items count, Items completed without rework (Right First time), Items completed after n-occurrences of rework (First Rework Count, Second Rework Count, Third Rework Count) by Item Type (Dataset, Table, Figure, Listing, Other)

Rework Summary					
	# Total	Right First Time	# Rework 1st Time	# Rework 2nd Time	# Rework 3rd or more times
Dataset	3	0	0	0	3
Table	2	0	0	0	2
Figure	0	0	0	0	0
Listing	0	0	0	0	0
Other	0	0	0	0	0

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Report - 4: Displays Items count, Items completed without rework (Right First time), Items completed after rework by update reason (Updating Comments Rework, Data Transfer Rework, Mock Spec Change Rework, Other Rework)

Rework Summary						
	Item Count	Right First Time	Updating Comments Rework	Data Transfer Rework	Mock Spec Change Rework	Other Rework
Dataset	3	0	1	11	0	0
Table	2	0	0	6	0	0
Figure	0	0	0	0	0	0
Listing	0	0	0	0	0	0
Other	0	0	0	0	0	0

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RESOURCE PRODUCTIVITY REPORT

This report is used to measure the productivity of our team members, and summarizes the completed work per programmer

Name	Datasets			Tables				Listings				Figures			
	Unique	Rerun	Rework	Unique	Replicate	Rerun	Rework	Unique	Replicate	Rerun	Rework	Unique	Replicate	Rerun	Rework
Programmer Name	13	265	0	46	112	436	16	50	0	172	0	5	2	34	0
Programmer Name	55	31	33	29	57	49	130	1	0	16	1	5	0	6	0

A similar report is also available to indicate future assignments per programmer

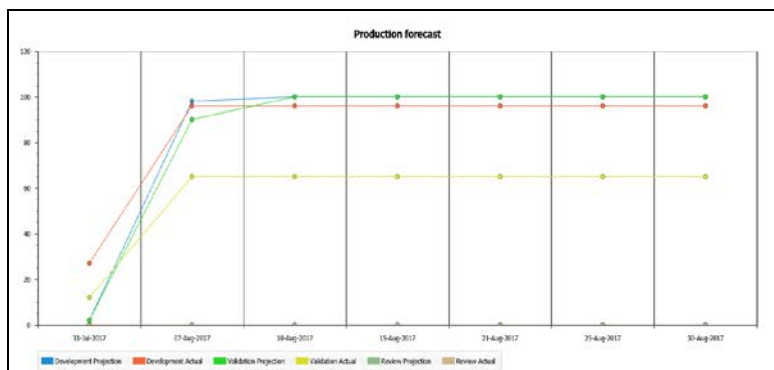
DATASETS, TABLES, LISTING AND FIGURES SUMMARY

This report provides the summary of completed units of the task per study for a given period.

Study Number	Sponsor Name	Datasets		Tables				Listings			
		Developed	Validated	Unique Developed	Unique Validated	Replicate Developed	Replicate Validated	Unique Developed	Unique Validated	Replicate Developed	Replicate Validated
1234/5678	Sponsor Name	0	0	0	0	0	0	0	0	0	0
5678/1234	Sponsor Name	51	51	55	55	21	21	20	20	3	3

PRODUCTION FORECAST REPORT

This is a graphical representation of projected work versus actual completed work. This is useful representation of work that may be off track.



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VALIDATION, REVIEWER AND SPONSOR COMMENTS REPORT

At ICON, we have 4 levels of review – Validation, Lead Programmer Review, Lead Statistical Review and Statistical Peer Review. The report below displays all Validator Comments for an individual delivery.

Item Identifier	Output Name	Title	Program Name	Theme	Error Type	Error Category	Developer name	Developer Comments	Developer Response	Parent Comment
T001	O001	T001	P001	Safety	Cosmetic updates	Programming	JayaramanSu	-	-	-
F001	O002	T002	P002	Safety	Cosmetic updates	Programming	JayaramanSu	-	-	-
T001	t_14_1_1_disp	Subject Disposition by Treatment Sequence 1	t_disp	Efficacy	ADS Non compliance	Programming	JayaramanP	No issues to work on	Not an issue	-

Similarly, statistical review comments can be viewed for an individual delivery

Title	Output Name	Program Name	Safety/ Efficacy	Cycle	Developer Id	Validator Id	Reviewer Id	Reviewer Comment	Developer Response	Validator Response
Subject Disposition by Treatment Sequence	t_14_1_1_t_disp	t_disp	Efficacy	1	JayaramanP	ParaA	ThomasKu	Document needs more clarity	-	-

Lead programmer and Statistical Peer Review also follow a similar format as above.

Sponsor comments and error types are also tracked.

Item/ Identifier	Title	Output Name	Program Name	Theme	Comments	Error Type	Error Category
T001	T001	O001	P001	Safety	test	ADS Specification or ADS Programming issues	Programming
D001	Subject Level Analysis Data	ADSL	ADSL	Efficacy	Please recheck all documents	ADS Specification or ADS Programming issues	Programming
D001	Subject Level Analysis Data	ADSL	ADSL	Efficacy	Issues with calculations	Programming Incorrect (incorrect selection, counts, derivations , populations)	Programming

QUALITY METRICS

The programming quality metric can be generated from the system to at the department, sponsor, study or delivery level.

Drill Down Hierarchy * ☒ Department ☐ Sponsor ☐ Study ☐ Delivery P0VD

Any comments that were raised and closed not due to a programming or presentation error are excluded (e.g. data issues, mock changes, queries). Our reports display a total and a break-down by programming versus presentation error.

Quality - Department level							
Department		Dataset	Tables	Listings	Figures	Others	Total
OverAll	Total	2/992 (.2%)	3/3252 (.09%)	0/1161 (0%)	1/879 (.11%)	0/185 (0%)	6 / 6469 (.09%)
	Programming	2	2	0	1	0	5
	Presentation	1	1	0	0	0	2

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Quality - Sponsor Level

Sponsor Name		Dataset	Tables	Listings	Figures	Others	Total
	Total	2/21 (9.52%)	3/105 (2.86%)	0/40 (0%)	1/3 (33.33%)	0/0 (0%)	6 / 169 (3.55%)
	Programming	2	2	0	1	0	5
	Presentation	1	1	0	0	0	2

1 - 3

Quality - Study level

Study No		Dataset	Tables	Listings	Figures	Others	Total
/0001	Total	0/0 (0%)	1/3 (33.33%)	0/2 (0%)	1/2 (50%)	0/0 (0%)	2 / 7 (.29%)
	Programming	0	1	0	1	0	2
	Presentation	0	0	0	0	0	0
/0004	Total	2/13 (15.38%)	2/101 (1.98%)	0/38 (0%)	0/0 (0%)	0/0 (0%)	4 / 152 (.03%)
	Programming	2	1	0	0	0	3
	Presentation	1	1	0	0	0	2

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Quality - Delivery PDVD level

Delivery Pdv Name		Dataset	Tables	Listings	Figures	Others	Total
Delivery_PDVD_ _BDR_Dry Run_24OCT2017	Total	1/2 (50%)	2/17 (11.76%)	0/7 (0%)	0/0 (0%)	0/0 (0%)	3 / 26 (11.54%)
	Programming	1	1	0	0	0	2
	Presentation	1	1	0	0	0	2
Delivery_PDVD_ _MDB_12354_Dry Run_31OCT2017	Total	1/2 (50%)	0/0 (0%)	0/0 (0%)	0/0 (0%)	0/0 (0%)	1 / 2 (50%)
	Programming	1	0	0	0	0	1
	Presentation	0	0	0	0	0	0

We also have a cycle-wise report, that allows us to see how many review iterations an Item type goes through before considered correct. The below is the cycle wise report is for the validation comments.

Quality - PQT

Cycle name	Datasets	Tables	Figures	Listing	Others	Overall
0	3/4 (75%)	16/17 (94.12%)	0 (0.00%)	7/7 (100%)	0 (0.00%)	26/28 (67.86%)
1	1/4 (25%)	1/17 (5.88%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	2/28 (7.14%)
2	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)
3	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)
4	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)
5	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)
>5	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)

Whereas the below is the cycle wise report for the statistical review comments.

Quality- SPQT

Cycle name	Datasets	Tables	Figures	Listing	Others	Overall
0	3/3 (100%)	59/60 (98.33%)	0 (0.00%)	N/A	0 (0.00%)	62/63 (98.41%)
1	0 (0.00%)	1/60 (1.67%)	0 (0.00%)	N/A	0 (0.00%)	1/63 (1.59%)
2	0 (0.00%)	0 (0.00%)	0 (0.00%)	N/A	0 (0.00%)	0 (0.00%)
3	0 (0.00%)	0 (0.00%)	0 (0.00%)	N/A	0 (0.00%)	0 (0.00%)
4	0 (0.00%)	0 (0.00%)	0 (0.00%)	N/A	0 (0.00%)	0 (0.00%)
5	0 (0.00%)	0 (0.00%)	0 (0.00%)	N/A	0 (0.00%)	0 (0.00%)
>5	0 (0.00%)	0 (0.00%)	0 (0.00%)	N/A	0 (0.00%)	0 (0.00%)

All of the reports built into the system can be downloaded / exported to excel or pdf, plus the associated data can be downloaded for the majority of reports also e.g. if a drill down is required.

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VENDOR SELECTION

ICON has a well-defined vendor management process, which was followed to choose a vendor to build this application. An important initial discussion before a vendor is selected is around the risk impact assessment (RIA) of the proposed system and the degree of validation required. The next is identifying a capable vendor with the desired level of experience and processes, which also met the relevant documentation standards. Our vendor selection involved liaison between IT, procurement and business operations to define the selection criteria and to ensure that the vendor met the needs of all areas to deliver the project on time, to budget and with the desired quality.

PATH TO SUCCESSFUL ROLLOUT

ICON rolled the tool out in 2 phases, the first phase was the study tracking from programming with some basic reporting functionality, and the second phase was to add the statistical review tracking and extend the reporting functionality.

DESIGNING

As this tool was the first of its kind for ICON, the designing took lot of time and effort, approximately 3 months. A document was created defining the purpose and functionality of each field, what it should look like, list of values etc. This document was discussed with vendor regarding feasibility.

DEVELOPING

Development of the tool took almost 3 months.

TESTING

User Acceptance Testing was done to test the user interface and functionalities of the tool. 2 rounds of UAT was required to confirm that all bugs were fixed.

PILOTING

We launched the tool with 4 pilot studies. Pilots were done to check the robustness of tool across different studies. Our major lessons learnt from pilot studies were:

1. There was lot of difference between the test data and actual study data, so the quality of test data should be as close actual study data as possible.
2. While designing the tool, consultation was done with the vendor and ICON operational management, however ideas and suggestions from end users should have also been considered.

ROLL-OUT PHASE I

Prior to the department roll-out, communication was shared on a frequent basis regarding the roll-out plans for the application. Mandatory department level training was also delivered prior to roll-out. Training was also a prerequisite to gaining access to the application. Roll out of the tool came with some resistance which is very common for anything new. There was a steeper learning curve for end users when compared to the excel sheets. We also recognized that there were different and unique study scenarios beyond what was identified in the UAT and pilot phase.

Within 2 months of roll-out all critical issues were addressed.

We also continued to do repeat training and knowledge share sessions with our teams. Overtime, our teams became familiar with the application and its advantages.

MAINTENANCE

ICON established an SME team responsible for answering questions and maintaining the application (coordinating bug fixes, adding /removing users etc.). This SME team also received user enhancement requests, and has consolidated these requests for inclusion into the next phase of the tool. Some example of the enhancement requests include:

1. Selection criteria by "sponsor".
2. Hiding columns in delivery tracking sheet to allow for ease of review.
3. Server date that accommodate different time zones.
4. System performance / response time

ROLL-OUT PHASE II

Similarly to Phase I, the new functionality were tested through UAT and pilot studies. Communication was shared on a frequent basis regarding the roll-out plans for the application extension. Mandatory department level training was delivered prior to roll-out for any new users (e.g. Statisticians). Training was also a prerequisite to any new users gaining access to the application, and all existing users were required to take training on the new functionality.

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Resistance was not as big an issue in Phase II, as the change was considered an enhancement; however we experienced a similar learning curve for the new users/statisticians.

Post rollout, there were some minor bugs in the system that required addressing, but within 2 months of roll-out all critical issues were addressed.

CONCLUSION

Our quality control and tracking process has become more complaint due to the standardization and controls within the application. Our study tracking data is now centralized and gives us the ability to track and report easily. The success of the tool has led to the next version (Phase III!) which will be an extension of the existing functionality to include for example

- Integration of related data from the ICON resource planning tool and the ICON costing tool.
- We have established a connection between the system and our SAS programming environment, so we plan to build tools that cross check the tracking data to data on our computing environment.
- Consolidation of forms across programming and statistics SOP/WPs.
- Reduction in administration burden through system generated forms, and linkage to our eSignature tool.

CONTACT INFORMATION

Your comments and questions are valued and encouraged. Contact the author at:

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