

Paper LI04

Leading a migration project

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ABSTRACT

Change is an inevitable part of business with industry standards and technology continuously evolving. As a result, the upgrading of an operating environment is an occasionally necessary but disruptive requirement. We will explore the leadership and management steps taken to control the transition and review the challenges faced and lessons learnt from an example real-life situation. Examining both the technical and human requirements, we present the views of the change management project to migrate PPDs reporting and analysis environment from PC SAS to SAS Grid on virtual PCs. Providing details from those responsible for preparing training and migrating in house tools, we will look at steps taken to ease the transition for end users both during and post the migration process.

INTRODUCTION

Since SAS was initially developed by Jim Goodnight at North Carolina university in the 1970s we have seen several advancements and the software is now used throughout many industries. My first introduction to SAS was with version 6.12 on PC, over the years I have worked with later version on several platforms. Whilst at PPD I have progressed through different roles, and for several years I have been involved in the development and management of programming activities which overlap both data management and biostatistics tasks. In addition, I have a lead role for the support, development and training of a reporting suite of macros for TLFs known internally as ArtZ. I was asked to join the initiative to migrate PPD systems from using PC SAS to SAS Grid with specific responsibility for ensuring the successful migration of the ArtZ macros. This paper is the result of that experience.

Within the paper I will highlight key elements of the overall migration processes and more specifically detail the tasks required for the migration of a specific tool (ArtZ). We will explore the leadership and management steps taken to control the transition and review the challenges faced and lessons learnt from the migration project, both overall and for the ArtZ tool.

THE BIG PICTURE

Significant changes to a company's processes and technical infrastructure are not taken lightly. Much time and effort is invested in initially establishing the benefit of implementing changes. This initial effort may incur costs to the company and may be dependent on availability of key resources. Evaluating the impact of making changes against continuing with the current state enables senior management to make an informed decision on whether to implement changes.

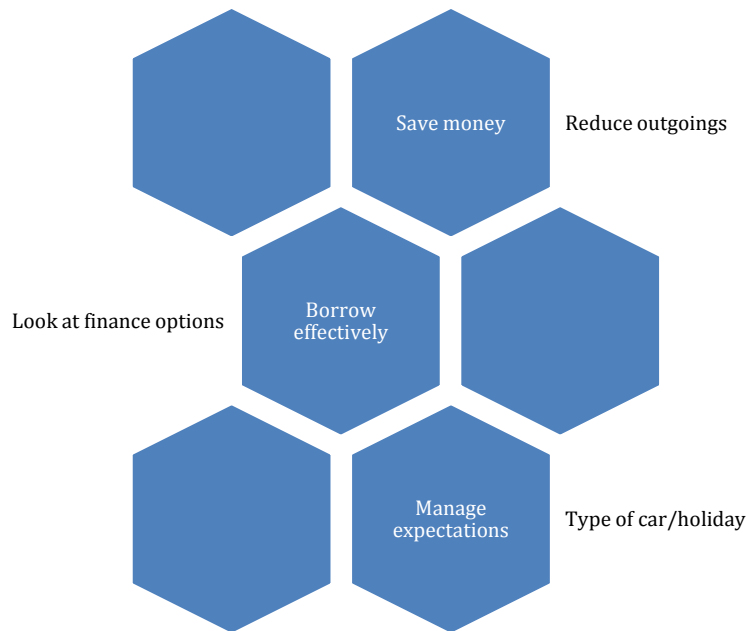
You may not realize it, but we all perform the same evaluations in everyday situations such as buying a car, moving to a new house or buying an outfit for a special event. Things that you may take into consideration such as your budgets for the purchase and yearly bills such as servicing, tax and insurance, can be compared with the thought process for significant IT infrastructure changes: initial outlay followed by ongoing maintenance costs.

We give weighting to the different outcomes to establish the potential impacts of the different routes.

- If I buy a new car this year, can I then go on holiday later in the year



- Which is more important?
- If both are equal, then you may spend time working out what you need to do to enable you to have the finances in place to achieve both.



Within a business environment we can associate the decision process above within financial management and business and user needs.

FINANCIAL MANAGEMENT AND BUSINESS AND USER NEEDS

Prior to any change being implanted within the working environment, technical management will have performed analysis and provided justifications for the introduction of new tools and technologies. Things that may be considered include:

- Performing evaluations of the estimated time required by development teams to migrate tools, develop new tools and generate training materials and potential evaluating the impact on study teams as they migrate to use the new systems/tools.
- Identification of the impact on other departments, e.g. Data Management, PVG, Project Management, Finance.

- Do other departments need to provide approval for change or is notification of the upcoming changes enough?
- Establishing current needs of the company/department, and key requirements for the business and end users are identified to set parameters for that the new tools or system needs requires to meet.
- Impact of not implementing the change. Note this can be used to aid the justification for the update to proceed.

Changes to a company's operating environment/SAS® platform will require architecture design requirements to be established, these may include requirements such as:

- Environments to be created within the new system
 - for example, Test and Production SAS Grid environments.
- SAS versions
 - What do ongoing projects/tools require
- Operating system/platforms
 - existing and new
- Interactions required with other software
 - for example, the format of import data and outputs

The way in which users use the current SAS reporting system to complete tasks will also be reviewed, things to consider may include:

- Use of scheduled jobs, user of defined job scripts
 - tools to schedule jobs at a set date/time or a standard interval, thereby easing the burden of repetitive tasks on studies.
- Specific characteristics of the SAS environment
 - Use of version control software
 - Directory structure requirements, e.g. production and development areas.
- Ability to control access to study areas
 - Control of user's ability to update data and programs, including differing levels of access for developers and study leads.

PRESENTING THE CASE FOR CHANGE

Once the scope of the change has been established, approval for the change to be implemented is required. As an initiative lead, I was requested to provide input for the ArtZ tool, to confirm if the existing toolset could be migrated or if a new tool would need to be developed. I provided input into estimates for the following elements of the migration and projected a timeline for the steps to be completed within:

- To update macro requirement plans and accompanying validation documentation
- Implement programming updates to original macros and validating code
- Revise training documentation will be made by development teams

The details from each tool development team were collated and an overall timeline for the SAS Grid migration was projected.

As the saying goes 'Less is More'. Providing a high-level summary of hours required in the proposal may be preferable as it allows a quicker grasp of the salient details especially for those who lack the technical knowledge. This should be provided in addition to having the breakdown available as an appendix to support questions will be more efficient for those examining the detail. There may also be managers who wish to review the details relating to differing options for development, testing and release.

Approval of hours is important for the migration to have a clear definition, and for the financial impact to be understood by all stakeholders. It also provides a reference for future discussions should initial estimates of work

prove inaccurate. Support from senior management for the initiative is essential to ensure that development teams are supported throughout the migration process. Methods employed to gather support from key stakeholders may include:

- Demonstration of how a new tool would work
- Analysis of time/cost savings of implement the change
- Quality improvements from implementing the change
- Highlighting strategic business needs, new tools, new areas of revenue streams

The timing of implementing a change may also be impacted by outside factors, such as the company's book of work may have an influence on the timing of allocating resources to complete the migration steps as this activity may be seen as 'non-billed' activity within the world of CROs, or infrastructure maintenance within Pharma and may have an impact on the financial returns. For some initiatives, approved hours may be off-set against a selection of projects that will benefit from the upgrade, but internal migrations in a CRO such as this example cannot be billed directly to sponsors.

The timing estimates enable senior management to monitor progress, therefore it is useful to set up additional timesheet codes so that time spent on specific tasks can reviewed in detail.

AFTER MANAGEMENT APPROVAL

The co-ordination of the development work and information release are key to the success of any new development project. Within PPD the SAS Grid Core team provided oversight of the migration process, and initiative leads were responsible for the management of the testing of their toolset. Each tool had a development team assigned, and there was some cross over of personnel within the development teams.

In everyday life we perform change management processes. For example, the process of buying a house may take several months to complete. The initial phase of identifying a preferred location, and type of house, establishing key requirements. such as number of bedrooms, size of garden. If relocating, then you will have looked to gain stakeholder approval during the initial stage; requesting opinions of family and friends to gain their tacit approval of the location. You may dispose of old furniture and paperwork before you make the move. All of this prepares the ground for when you make the move.

COMMUNICATION

Communication is critically important in managing the expectations of end users, not forgetting the impact on sister departments and externally affected partners. Each study team had to be made aware of what impact the system migration would have to them.

The level of communication provided may depend on several factors including method of communication, audience, timing and desired impact.

Method	Pros	Cons
Email	Can be used to provide detailed information to a wide audience simultaneously. Can contain information that can be reviewed at a later timepoint.	Key information may be missed if desired recipients don't read the email.
Townhalls/ Departmental Briefings	Key information is delivered in person, spoken words often accompanied by graphics Meetings can be recorded and made available to those not able to attend.	May leave the attendee wanting more details Q&A, may result in challenging questions being raised and no-one likes to be put on the spot.
Focused meetings	The audience can be selected to contain key functional leaders.	Others may feel left out.

CROSS FUNCTIONAL

There were functions outwith Biostats and Programming that were impacted by the migration of tools associated with SAS. Sister departments which interact most frequently with Biostats and Programming are Data Management, Pharmacovigilance and Project Management. For Data Management the processes for importing, extracting, reporting and reviewing data were updated, Pharmacovigilance were impacted due to updates to the process of reporting Serious Adverse Events, and Project Management were also made aware of the estimated hours that would be billed against the project as a result of the migration to the new systems to allow them to estimate the impact on the financial status of the project. Note: the hours billed are to reflect the effort required by the study team(s) to complete the required tasks but the activities themselves would not be billed to the Sponsor.

SITE AND DEPARTMENTAL OVERSIGHT

Regular communications relating to migration timelines were provided to site and department oversights to enable them to provide updated details at a local level.

CLIENTS

Standard communication guidelines were provided to project teams to ensure consistent messaging around the migration process to Sponsors as performing the migration may result in a period when project teams may not be able to respond to ad-hoc requests due to any associated down time.

USER SUPPORT

The success of the migration and smooth transitions for studies required end users to openly adopt new processes with little resistance, and for there to be adequate provisions of support to enable this. The migration team considered how users could be encouraged to migrate to using the new tool, processes and system, and what level of support would be required prior, during and post migration.

Often people fear the unknown and when they start to work with new tools/environment their concerns are eased. Providing regular emails outlining the status of the migration and timeline for rollout was useful for end users so that they could plan for the change(s). Changes to a working environment can be challenging, and the impact of a change can vary significantly amongst end users. You may be surprised on the level of impact different changes have. Consider the impact of different changes you have experienced throughout your career, and on reflection some may appear more significant than appreciated at the time. Some examples are listed below.

Change	Benefit	Concern
New seating plan within office	No change to how you complete your job.	Change to your environment, the view from your seat may have changed and you have a new neighbor. Can be unsettling.
Moving from desktop to laptop	Increased flexibility; opportunity to work remotely if required.	Increased stress as users may feel that they are taking work home with them, reducing ability to switch off.
Moving windows environment	New tools to play with such as snipping, OneNote, etc.	Users discombobulated and not as efficient.
Moving from PC SAS to SAS Grid	New interface SAS Studio/EG Job processed differently Improved performance/parallel processing	Discombobulated users: No command line, no DDE Retraining required. Those who use SAS irregularly feel unable to work.

TIMELINE

The timeline for the migration of individual studies was driven by several factors, including business needs, the timing of the initial release of the SAS Grid environment and the associated tools. Formal testing of the tools could only be completed after the formal release of the production SAS Grid environment. However, initial testing was performed within the test SAS Grid environment so that only the test scripts were required to be rerun within the production environment, thereby reducing the time pressure on the tool development teams.

Management reviewed existing studies and identified a pilot group of studies to be migrated first, targeting studies that were in start-up or initial development stages which can absorb delays caused by unexpected issues easier. Thereafter study teams discussed with their oversight directors to choose the appropriate time to migrate their studies within the predefined timeframe communicated by the SAS Grid management team.

One issue we did encounter was a delay to a subset of tools due to ongoing investigations and resolution of issues. To avoid any impact to individual study migration and discouraging teams from migrating, study teams were able to complete existing tasks by accessing the former environment while these tools were awaiting formal release.

A SAS Grid migration support team was established to provide initial support to study teams as they worked through the migration process. This team consisted of members of the tool development teams so that it contained a wide knowledge base and could be contacted by several different methods. We found it was important for the engagement of end users that each site felt they had a personal contact within the support team they could contact, even if they were not actively required.

TRAINING

There are multiple elements to be considered in relation to training requirements in respect to the migration from PC SAS to SAS Grid; from how end users work within the environment to how end users can work with the standard tools within the environment. Within PPD we used the train the trainer approach. Initial training was provided by SAS® to key individuals from the migration team to enable these leads to support the tool development teams. Specific individuals also attended advanced SAS Grid Admin training.

For end users, foundation level training was developed by a sub team to provide end users with an overview of the concepts behind SAS Grid, how this can be used to best effect, and providing details of key differences to PC SAS.

The training requirements for individual tools were reviewed and assigned a category level. The process for providing the training was based upon the level assigned. Training which was considered fundamental for users to be able to

work within the SAS Grid environment was made mandatory and tracked within PPD's Learning Management System (LMS). This included standard tools as well as SAS training.

Category	Training Requirement(s)
Foundation and Project Core Training	Mandatory Items • Live/Virtual Training with Q&A • Video(s)/Demos • Job Aids, Wiki
1 – High Change	Just-in-Time Modules • Live/Virtual Training with Q&A • Video(s)/Demos • Job Aids, Wiki
2 – Medium Change	Just-in-Time Modules • Video(s)/Demos • Job Aids, Wiki
3 – Low Change	Just-in-Time Modules • Job Aids, Wiki

Trainings continued to be developed after the migration occurred in response to concerns or identification of specific items. For example, Senior Reviewers typically have a seniority level which results in limited exposure to the SAS environment and so a training video was created as a step-by-step guide for their typical requirements as an aide memoire.

LEADING THE MIGRATION OF A TOOL

The ArtZ macro suite contains over 70 macros that were classified into the grouping: Analysis, Developer, Listing, Graph, Reporting, Summary and Utility. The macros can be used to perform distinct tasks and combined to generate output for tables, listings and graphs in a standard format.

As PPD migrated several tools over to the SAS Grid environment, I took responsibility for the management of the migration of the ArtZ macro suite from PC SAS to SAS Grid. The ArtZ team were a sub-team of the larger migration project. The ArtZ macros utilises additional PPD tools such as a reference title and footnote file which is generated from the example shells for a study.

The task that the ArtZ development team had was to re-validate the macros within the SAS grid environment and address any updates required due to the new environment. The ultimate aim was to ensure there was minimal impact on the study teams as to how they used the macros, and that existing study code would produce the expected results.

As part of the larger migration initiative, key leads from the ArtZ team were involved in meetings with the other PPD development leads to review progress of the different groups and updates to the supporting training materials. This was to ensure that the go live date for the new environment would be met or assess any delays to a supporting tool to determine the impact on the go live date. Co-ordination of the migration and testing of the PPD tools suite was required due to interdependencies; as noted above the ArtZ macros utilized PPD in house tools. Therefore, teams required to access the latest version of the tools within formal testing.

When migrating tools between SAS platforms/operating systems, the key aim is for the tools to achieve the same output using the same processes. As the aim for the ArtZ team was to show that nothing had changed, the migration

initiative did not appear to be an interesting challenge. By nature, programmers are inquisitive and want to explore and develop, rather than perform repeated tasks.

The migration of the macros involved more than just a re-run of pre-existing scripts. As the ArtZ macro suite was an established tool there were existing validation scripts that had been previously utilized to review the macro execution between earlier SAS version upgrades, e.g. from version 9.2 to 9.3. Testing macro execution between SAS version within different environmental conditions were required within this instance. Items which the team had to consider are noted below:

- Method for running the test scripts within the new SAS Grid environment.
 - The established process for re-validation required updating to review the macro execution between SAS versions. The existing script files required to be revised to execute the validations programs within the SAS grid environment. A new script file was developed for execution within the SAS Grid and the pre-existing scrip files were used to review the macros within the previous environment within SAS 9.3 and SAS 9.4 and comparisons could be made within the environments across the SAS versions. These were required to be updated to enable execution under the appropriate versions of SAS within the SAS Grid environment.
 - During the validation process distinct .log and .lst files were generated for each SAS version/environment and validation results were written to a central dataset for reporting.
- Were there any other hidden issues?
 - Yes -- many test scripts are written to test for invalid parameters/data being provided to a macro, which means that when a macro fails SAS goes into ERROR mode, the future steps don't execute and validation results are not written to the output dataset. An additional option 'NOERRORSTOP' had be added to the validation code to enable the results of the validations to be recorded. Other issues with the execution within the grid were also feedback to the SAS Grid Admin team so that they could be evaluated and, if required, updates made to the config or autoexec files.
- What about the logs? Will teams see the same information being presented when programs are run within the new system?
 - As part of a deliverable, reviewing the log to confirm successful execution is required within PPD. This is assisted by using another tool, Log Check, which parses the .log file generated by a program and generates a check file reporting different level of messages: informational, restricted, conditional and prohibited and generates a output report. Comparing these messages between the log files to review the execution of the validations within the different platforms was possible. This enabled teams to identify any new issues, differences where SAS reports messages slightly differently between environments or messages were appearing in a different order.
 - Assigning the task of setting up the process for this enabled the migration team an opportunity to develop their knowledge of the tool – which is what programmers enjoy most!
- What about the output?
 - Comparing the RTF output generated from the validation process between environments enabled the development team to verify the results would be the same. The team were also required to develop a process to automate this comparison due to the process used to review the number of pages within a word file did not working within the SAS Grid environment. Output files were named to include details of the environment that they were produced within and the file comparison tool RTF Compare was then used to verify that the content of the outputs was the same. The results from this were saved as the results from the validations and compares formed part of the documentation required for the release of the macros under SAS Grid.

- Additional development opportunity?
 - As the macro suite would be re-released, additional available time could be used from tools existing development budget to review and address known bugs within the current macro suite. This enabled team members to review and enhance existing macros and offered an opportunity to develop additional validation test cases, providing a break from purely re-reviewing results of existing test scripts.

LEADERSHIP OF THE TEAM

The leadership of an initiative team is very similar to that of leading a study team. The processes you follow are the same: Planning activities, resourcing, motivation and project tracking. The client in the case of the initiative is the end user and not a sponsor. Many of the challenges faced, ensuring that resources were in place at the required times, ensuring that key information was shared within the team, and looking for opportunities to allow team members to support new tasks.

Timelines were established for the initial review/update and validation of the macros within the ArtZ suite and progress was monitored and reviewed within regular team meetings which were held during the migration process and adhoc meetings were held post release as required.

Meetings for the initiative leads were held through development stage and post release of the SAS Grid Environment. All information from the migration initiative meetings regarding tools on which ArtZ had a dependency was fed to the ArtZ team during the team meetings. As some of the macro and validation processes had dependencies with other tools, it was important that all initiative leads fed into a centralized meeting so that activities relating to the migration process could be managed centrally and information progress and any risks were shared.

Programming resource was not assigned full-time to the validation of ArtZ because they had additional study commitments. Getting support from ArtZ team members and their corresponding resourcing leads was key to enable continued support to be provided for activities associated with the migration of ArtZ and developing and presenting training to support tools and environment.

In addition to the updates and revalidations of the macros, the associated training materials required to be reviewed to establish if updates were required, and team members were involved in performing cross checks for the release package.

RELEASE

The ArtZ macros were released ahead of the roll out of the SAS Grid environment to study teams. The ArtZ macros are accessed via a compiled macro catalog. SAS 9.3 and SAS 9.4 versions of the macros were made available to study teams, and the access to these were controlled by the SAS environment set-up applied on a per study basis. The SAS environment set-up is a standardised macro used across all studies within PPD.

As the ArtZ macros were considered within the category 3 grouping (as detailed earlier), the updates required to the existing training materials were minimal. Only macros that were updated as part of the migration process had reference materials updated if the update required a change to the existing process for using the macro. The corresponding functional requirement document and/or validation plans were also updated if appropriate.

Timelines were established for all study teams migrated to the SAS Grid environment. A migration support team was set-up to provide general support to teams, and if issues were identified with specific tools then these were communicated to the appropriate teams for evaluation. Within the ArtZ team, resource was forecasted for members of the ArtZ team to enable post release issues to be evaluated and addressed. After release of the ArtZ macro catalog, there were only 2 issues raised that resulted in updates to the ArtZ macros:

- Management of SAS macro catalogs within SAS EG differs from batch execution, within interactive EG sessions the compiled SAS macros are written to the SAS macros \$SASMACx-\$SASMACy rather than \$SASMACR. References to SAS macro catalogs required to be updated within the clean and reset macro – this macro is used to preserve the data within the work library before and after the execution of an ArtZ macro, and control if intermediate datasets are retained for debugging purposes.

- The presentation of data within listings required a small update to allow the study team to define the maximum percentage width available for a listing output. This percentage is used in parallel with the maximum number of characters that could be presented within a page to aid in the dynamic adjustment of column widths based on available data. Slight differences were detected due to the migration to Windows 10/Office 365.

PPD made use of Yammer and One Note to enable study teams to communicate with the SAS Grid Migration and tools leads of issues that they encountered. This enabled study teams to see issues that other teams had encountered and aided speedy resolution. As a global company, additional site level trainings were held to enable individuals to provide feedback, raise questions and to demonstrate how issues could be resolved informally. This aided in the engagement of the end-users and their support of the process.

CONCLUSION

Users of the SAS system are a fundamental part of the migration. Ensuring the best interactions with the users of the system is as important as migrating programs.

The takeaways I have from being directly involved in the migration initiative are:

- Information sharing is key
 - between initiative teams
 - For example, how to resolve issues seen during testing. One issue that we saw was the handling of comments within macros. If these were not preceded by %** but only ** then this caused SAS an issue interpreting the code. Caught early and disseminated created a lot of efficiencies and helped prepare team members.
 - to end users
 - If there are issues that impact the ability of end users to complete their standard tasks, the earlier that you inform users of the issue the better. This can allow them to revise plans, communicate to a wider audience of impact of issues and reduces their frustrations.
 - to senior management
 - Providing regular progress updates allows management to recognize successes and provide support when there are issues or delays to activities.
 - and external departments.
 - Providing regular updates to external departments allows for better working relationships.
- Listening to concerns from end users and responding within an appropriate timeframe is vital
 - Providing a mechanism for end users to raise questions is a starting point. As noted, we used Yammer and a support email distribution list, however providing responses in a timely manner reduces the negative feelings towards the new process. Being able to obtain support direct from development teams reduced the time to resolve issues.
- Everyone learns at different rates, and training plans need to cater for this
 - Training was provided via recorded trainings, these training could be re-reviewed at any time.
 - End users would could raise concerns with their line managers and additional time could be allocated to enable additional training to be completed.
 - Additional training material could be requested to be generated to support tasks not covered within existing materials
 - Users were encouraged to share learnings, as users may have referenced materials generated out with PPD, performing google searches for certain tasks.
 - End users should be encouraged to ask questions.

- Leading technical projects are as challenging as leading study reporting
 - Oversight tasks are similar
 - Customers are closer
 - Provide increased interaction with other technical leads within the department

CONTACT INFORMATION

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