

Modernise your SAS Platform

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ABSTRACT

Organisations find SAS upgrades and migration projects come with risk, costs and challenges to solve. The benefits are enticing new software capabilities such as SAS Visual Analytics, which help maintain your competitive advantage. An interesting conundrum. This paper explores how to evaluate the benefits, plan the project and how the cloud option affects modernisation. The author presents with the experience of delivering numerous migration and modernisation projects from the leading UK SAS Implementation Partner.

WHY MODERNISE YOUR SAS PLATFORM?

We work in a time of rapidly evolving technology and growing sets of data. There is a necessity to deliver analytics from which organisations gain or at least maintain competitive advantage and efficiency. This creates a need for improving data management, accessible statistics and inspiring visualisations. These are not the only reasons for modernising. Consider the following:

- Business requirements change. New regulation is introduced or your business diversifies. For example, the European insurance industry responds to the requirements of Solvency II capital adequacy, or your company creates new goods or services.
- New software features. Technology innovations, small or significant, are regularly released by SAS Institute. Those new features offer enhanced analytics, better functionality making analytics accessible and their interpretation simplified. Enhancements to software are factors in an organisation's systematic process improvement. This contributes to competitive advantage and profit over your competitors.

SAS Visual Analytics is rightly becoming the default presentation layer across all SAS solutions. This integrates the building blocks from the Enterprise Business Intelligence platform (EBI) of OLAP, Web Reports, BI Dashboards and a portal to surface everything. The EBI platform is perfectly capable, but comparing the collective skills required for maintaining EBI compared to Visual Analytics is a direct efficiency that will be recognised when training both SAS users and administrators.

- Methods and techniques emerge which become both valuable and fashionable. For example, as I write the subject of Big Data saturates technical blogs and sales person's literature and this is being overtaken by the Internet of Things. Any competent SAS programmer knows the ability to analyse vast quantities of data is nothing new – but the technology to use appropriate analytical methods quickly and easily becomes possible with high performance and in-memory technology. What this really means is that analytical tasks previously requiring complex SAS programs or macros, which run over lengthy periods, are now readily accessible and execute extremely rapidly.
- Invest in employees. Your employee's careers depend upon continuous professional development. By migrating SAS to newer versions and solutions with appropriate knowledge transfer, your organisation will recognise improved motivation and performance from your teams. Your organisation will benefit from productivity gains and in the long term, recruitment may be aided by staff retention and marketplace reputation.

- Generation Y. Graduates leave university with skills tailored to analytical software and technology. With SAS University Edition being adopted well, we expect to see increasing SAS proficiency amongst graduates. Modernising the analytical capabilities of your organisation will allow you to recognise the potential of those Gen Y skills. There are excellent texts to help you prepare your business Gen-Y (reference 1). With a lack of analytical skills in the marketplace, Gen Y can add excellent skills to your organisation.
- Hardware and operating system advances. The recent end of product support for Microsoft Windows XP illustrates this well. Desktop clients from SAS 9.1.3 (now off Level A support) are not directly compatible with Windows 7 or newer. Running an operating system without support from its vendor exposes unacceptable risks, triggering migration.
- Analytical modernisation. In the 1990's our industry wrote of Management Information and Enterprise Information Systems (recall SAS/EIS). These were great tools for reporting. Since the early millennium the term Business Intelligence became prevalent and with it an ability to provide timely information to inform decisions. With Business Analytics, solutions are targeted to your industry and decisions are guided. Google Trends illustrates the changing pattern of Internet searches from Business Intelligence to Business Analytics:

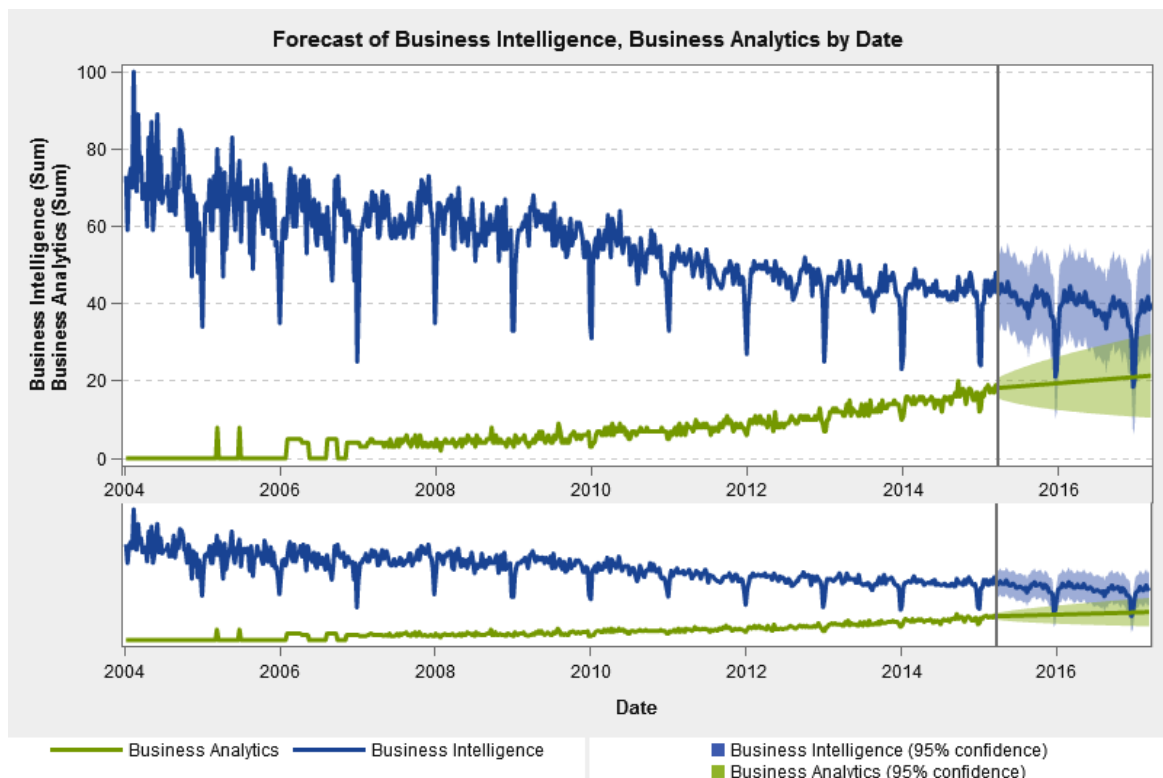


Figure 1: Forecast Google searches for Business Intelligence and Business Analytics

A Visual Analytics forecast (figure 1) suggests “Business Analytics” is will become more prevalent than “Business Intelligence” within years. There are relatively few observations for Business Analytics; hence, the linear forecast we fitted may be understating its growth!

Overall, searches for these terms is increasing following a slowdown during the challenging economic period between 2009 and 2013.

UPGRADING, MIGRATING OR MODERNISING?

We observe these terms are used interchangeably. For the purpose of this paper, these tasks are differentiated as follows:

- **Upgrading.** Applying a maintenance update, point release or major version update for the same set of software products. Knowledge transfer level is “What’s New”.
- **Migrating.** Moving an operational SAS platform between architectures, moving between SAS products or moving existing processing between upstream or downstream interfaces. This may include upgrading the version of SAS. Knowledge transfer is of a moderate technical level and may include new data structures.
- **Modernising.** Implementing software technologies that enhance capabilities or reduce the time and effort required to achieve existing functionality. For example, classic SAS programming to Data Management solution or SAS/IntrNet to SAS Visual Analytics. Knowledge transfer is required to inform and train on the new capabilities.

With certainty, the terminology overlaps and different organisations refer to these terms with different meaning. A modernisation project will certainly require software upgrades and may require a platform migration.

WHY DO ORGANISATIONS PUT OFF MODERNISING?

Upgrading with a maintenance release is a trivial undertaking for a single machine. On a multi-machine, multi-environment platform, this should be planned, communicated, executed and quality assured.

Modernising has a wider impact again; consequently, there is a greater involvement from your stakeholders, requiring their time and commitment, before the direct costs and risks are considered.

We observe the following to be the most common obstacles to modernising:

- **Resources.** Forming a project team of stakeholders from IT, business users, procurement and so on needs time and a commitment. Even when the majority of effort is assigned to Amadeus, we insist on a nominated point of contact and for your stakeholders to read status reports and act on issue logs.
- **Total cost of migration.** SAS Institute provide upgrades to software within the cost of your license fee. Organisations are therefore free to use the latest available release of SAS Software. The costs of hosting or hardware, time from internal departments, external Consultants and project management must all be measured against the benefits gained in addition to the benefits lost by not undertaking modernisation.
- **Risk.** Every organisation will have the need to use their SAS environment within a defined timescale. Whether it be within the same day or perhaps a week is an acceptable window for an outage. Mitigating the loss of data, metadata a platform outage must be planned.

Migrating and modernising leads to new processes producing old outputs. Reconciling the results from two platforms frequently leads to questioning and refinement of business rules or algorithms. Knowledge of why rules were derived can be lost through turnover of staff. Reproducing algorithms against new data sources can lead to discrepancies between results. Various other risks are identified on a project-by-project basis. Identifying and mitigating those risks must be performed during the planning stage of a project.

- **Scale.** SAS customers may have centralised implementations, accessed globally. The impact of universally modernising hundreds or thousands of users is not to be understated. Further, such organisations tend to operate in highly regulated industries. This obstacle is a form of resource and risk issue.

- Resistance. Whilst there will be benefits from upgrading and modernising SAS platforms, with such projects may come a cultural change. There is a dependency on business users to adopt new solutions and capabilities. However, there may be other projects with higher priority.
- If it ain't broke, don't fix it. Continuing with an existing solution avoids resourcing challenges and short term risks. After all, the software may be fit for purpose as it is. This is frequently a conclusion reached when insufficient resources are available in the short term to complete an upgrade or modernisation. Ask the question: Should the solution be providing better returns to the business?

Our observations appear to be reasonably in line with independent research (reference 2).

With the rate of data growth and advancing technology, agile methods of modernising “little and often” are relevant to maintaining competitive advantage.

AS A SAS ALLIANCE PARTNER, HOW DO WE MODERNISE SAS CUSTOMERS?

SAS partners bring to the following strengths to modernisation projects:

- Economies of scale. By repetitively providing upgrade, migration and modernisation services we introduce agility, certainty and best practices to projects.
- Cumulative knowledge. Amadeus have been performing software upgrades and modernisation projects for over quarter of a century. We bring cumulative knowledge and experience to plan projects, foresee pitfalls and set expectations for success. SAS Institute enable partners for new versions and solutions, we interact with the SAS community, develop and adopt best practices.
- Reduced future cost of maintenance. Implementing best practices, performing system and post configuration tasks prevents future remedial tasks. Understanding the present and future use of SAS allows a partner to provide the appropriate knowledge transfer to your administrators and end users.
- Quality management. System testing, including IQ/OQ test suits should be performed and documented as part of all SAS upgrades. Appropriate functional testing is necessary to ensure the platform and environment is fit and robust for its intended purpose. Finally, documentation of the post configuration tasks performed, values set and configuration files modified. This document (we refer to it as SAS Administrators System Manual) must be retained for future administration.
- Challenge the stereo type. It is the role of SAS Consultants to showcase the expanded capabilities of your solutions and software. Partners challenge practices to bring efficiency, simplification and productivity.

Partners size your platform for CPU, memory, storage and resilience before procuring infrastructure or hosting. We plan the distribution of SAS processes within and between machines. That is a well documented subject and beyond the scope of this paper.

If the sizing requires no further hardware than any existing deployment, you have the most options for delivery:

- Deploy onto new hardware, either virtualised or physical. This allows the concurrent execution of original and modernised environments whilst users test and adopt. Plan to decommission the original environment at an interval after revoking access.

- Coexistence. Point releases of SAS Software, for example 9.3 and 9.4, are distinct versions of SAS and can coexist on your servers. This reduces infrastructure costs and may simplify data synchronisation if tables are stored in a non-shared environment. Care is required when configuring a second SAS version on the same environment. Be certain to use separate software home folders and avoid port number clashes that could render the environments inoperable.
- Blue-green deployments. This method applies to sites with separate machines for individual environments, such as Development, Test and Production.

Deployments are executed by placing a change freeze in Development and Test before configuring the Development server as the new Production environment. This is repeated for each set of server in turn.

The result is modernised solutions are implemented without affecting business as usual. The hardware changes roles, hence if physical machines are used specifications must be identical, or plan for hardware components to be moved between devices.

Preparing multi-machine environments for SAS 9.4 follows a similar set of tasks, varying only by specific hardware sizing and solution configuration. The Appendix presents a sample set list of tasks and that may aid your project planning.

ARE YOU CONSIDERING THE CLOUD?

Today, every organisation at least considers cloud as an option for SAS Software. Amadeus first deployed SAS into a hosted environment referred to as “cloud” in 2012. Since then, it has genuinely proven to be a way of rapidly delivering SAS platforms. What benefits can we expect?

- Start-up speed. From contracts to the availability of the operating system can literally be minutes. This allows the tasks of software installation and configuration to be completed even before network integration is completed.
- Resilience. Select a cloud vendor with multiple data centres throughout which your virtual machines are replicated. This colocation can address disaster recovery. With Grid Computing platforms, we have configured compute, clustered metadata and mid-tier nodes to be active in multiple data centres. This builds in redundancy, protecting against a failure in one machine, or an entire data centre. Specific considerations such as shared file systems with real-time synchronisation between data centres are required. Appropriate planning is necessary and architecture input from your cloud provider (or their partners) may be required.
- Scalability. The brilliance of virtualised environments is the flexibility to adjust memory, CPU, storage and networking. This means (subject to software licensing) you can easily scale up or out a SAS environment to meet your evolving requirements.

What are the pitfalls to watch for? Here are our observations:

- When processing data for analytics with financial or customer identifiable data, security over that data is the principal consideration. Therefore, in practice the cloud is exploited as *Infrastructure* or readymade *Platforms* rather than *Software* as a service.
- The geographical location of your cloud providers data centres may need consideration. Legislation in some countries grants authorities to access to your data. Typically, we observe financial institutes prefer to host data within the country of its origin.

- Network integration. Establishing securely integrated networks between your cloud and existing infrastructure is not necessarily trivial. Consider authentication, how will your users authenticate from a SAS metadata server hosted in the cloud to your existing active directory? This is not a technological constraint; however, your IT security policies may prevent such cross network requests, resulting in multiple authentication domains. This means multiple usernames and passwords for end users. Equally, we have customers whose internal active directory is replicated to their virtual data centre, allowing authentication from the SAS Metadata server without latency.
- SAS is frequently used to extract and analyse data from operational systems. The proximity of a data source and SAS compute servers directly influence performance. Hence, locating a DBMS in a different data centre to your cloud solution could introduce latency.
- Desktop clients. SAS Enterprise Guide is one of the most frequently used client applications for the SAS Intelligence Platform. This Windows client works best when local to its metadata and compute server(s). This principal applies to other desktop clients such as SAS Data Integration Studio or the SAS Add-In for Microsoft Office. Virtualising desktops in the cloud alongside your SAS servers is a solution increasingly available from cloud service providers.

If desktop clients are installed locally and connecting to SAS in the cloud, be sure to understand bandwidth for speed. Also, your firewall behaviour. We have seen firewalls cut the connection between Enterprise Guide and the Metadata Server if the two do not communicate for more than an hour. This appears to be a default firewall setting. Recent releases of Enterprise Guide are more sophisticated as reconnecting to servers if the connection is dropped.

- Additional SAS dependencies. Solutions such as SAS Customer Intelligence or Enterprise GRC require a DBMS for transactional data. Those databases require an additional virtual machine in the same data centre as your SAS deployment. If those databases are hosted in a different location to your SAS cloud, latency may be introduced.

Over the long term, the direct cost of cloud hosting will be higher than on premise hardware options. As such, your organisation should plan to review cloud options periodically. The total cost of hosting should be defined for your organisation, including SAS Administration, IT skills, and so on.

Can customers give SAS partner's data and expect analytics? Absolutely. SAS Institute and partners offer this service. It appeals to organisations desiring rapid start-up and return on investment.

WHEN IS THE TIME TO MODERNISE?

Appropriate timing of upgrading and modernising projects varies between organisations. One guideline certainly does not fit all. Consider the following:

- SAS deployments have often been dictated by the lifecycle of hardware. Upgrades or modernisation projects are planned to coincide with hardware refreshes. Virtual machines are easily moved between physical host machines, making server infrastructure transparent to SAS administrators. Therefore, the *Why Modernise* reasons described earlier in this paper will increasingly be the trigger for modernisation projects.
- Plan to conclude upgrade and modernisation projects before either operating system or SAS releases roll off support.

- Some organisations run an “n-1” version policy. Software vendors are adopting agile development practices meaning new features and capabilities are regularly introduced. For example, SAS Visual Analytics is updated twice per year. Enhancements are not just progressive capabilities. For example, beginning with SAS 9.4, SAS/SECURE is integrated into Base SAS facilitating encrypted communication and storage.

Rather than n-1, a pattern of n+45 days is discussed in some forums. That is, adopting a point or maintenance release after 45 days assuming there are no significant issues. This duration is selected as IT policies often schedule operating system restarts following patching every month. A further two weeks allows ample time for hot fixes and maintenance releases to be obtained and applied.

Modernisation projects are naturally less frequent than upgrade projects. Cost benefit analyses may assist organisations to evaluate when to undertake modernisation projects. However, empirical evidence to measure such projects is often imprecise, resulting in this practice being rarely used.

EVALUATE THE MODERNISATION

Like any other project, objectives and success criteria should set. Expect to set criteria for measuring success against several milestones throughout the project lifecycle and beyond.

Work with the project sponsor to set specific measurable objectives for the outcome, such as:

- Basket analyses can be performed every day, for all branches, guiding promotional offers
- Enquiries and Sales analytics are refreshed in intervals of x minutes with a refreshed pricing model.

Work with those implementing and utilising the SAS platform to define objectives such as:

- Operational SAS platform. The software is installed, configured and quality assured. Functional tests demonstrate the platform manages data loads and peak numbers of concurrent users. The platform is resilient to host restarts and metadata restores are proven. Integration with upstream and downstream data sources is established. Your security model is tested. The platform is self-monitoring and reports its performance and capacity.
- Knowledge transfer. End users are enthused and empowered towards an upgrade, change in client application or expected delivery from a new solution. Showcases and instructor-led training courses are completed. The ability to repeat or transfer this knowledge to new starters is enabled.
- Clients are accessible. End users have access to your SAS clients. IT groups or local administrators have proven their capability to repeat the client deployment and configure access.
- Continued mentoring. Maximising the capabilities of SAS solutions in the shortest timescales with mentoring. Plan tasks for goal seeking, forecasting, optimisation or other model desired by the business.
- Self-sufficiency. Your organisation can maintain, operate and exploit the SAS platform without external support. Alternatively, when you select to outsource functions, define the service level agreements and process for the organisations interact.

CONCLUSIONS

Seven reasons are presented which describe why an organisation modernises its SAS platform. Evolving business requirements are observed as the most common reason a modernisation is triggered.

Organisations most frequently postpone upgrade and modernisation projects due to a lack of resources and appropriate skills. Organisations who update regularly have smaller skill and technology developments to bridge. This allows productivity benefits to be recognised more rapidly.

It is perfectly feasible to upgrade, migrate and modernise SAS platforms with internal resources. However, SAS partners bring benefits that offset the resource and skills gaps most frequently found to prevent projects from beginning.

Using the cloud for SAS platforms is a mature option. Platform (PaaS) and Infrastructure services (IaaS) work well. Network and security integration must not be overlooked in the planning and execution phases of a SAS migration project.

Factors influencing the timing of upgrade and modernisation are changing. Virtualisation technology removes the common trigger of expiring hardware leases or warranties. The trigger for upgrading or modernising is increasingly new business requirements that maintain competitive advantage. This appears to be corroborated with the uplift in internet search activity for the Business Analytics term.

Define deliverables and measure benefits of modernisation projects throughout and beyond their implementation lifecycle. This is beneficial for both communicating and recognising progress within the organisation. Deliver short, regular showcases to end users in advance of new software becoming available. This benefits end user adoption confidence.

A while ago, I read a whitepaper published by SAS Institute on the subject of modernisation (reference 3). The subtitle is “Standing still means missing out!” I would go further and argue that in the analytical business: Standing still is as going backwards.

MODERNIZE OR MODERNISE?

Before this paper was published at SAS Global Forum 2015, peers quite rightly queried my choice of UK spelling for the words “modernization” and “organization”. Although this paper is published in the United States, the UK spelling was retained from where this paper will probably be referenced more often. I hope this did not cause any frowning!

REFERENCES

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APPENDIX: SAMPLE PLATFORM IMPLEMENTATION TASKS

Task	Description
Prerequisites	
Hardware	Verify hardware tuning and storage configuration. Consider SAS papers on best practices for file system configuration, Windows registry tuning for file cache and even BIOS setting for CPU power management. Ensure domain users, security policies and SMTP integration are available. Ensure antivirus on-access scanning recommendations are applied.
Assess metadata migration	Collaborate with stakeholders to understand what metadata is changed regularly and will need to be synchronised. Use the SAS Migration Utility to analyse the repository.
Migration strategy	Develop strategy to migrate and synchronise SAS data and other objects that reside outside the metadata repository.
ESD Validation	Validate the software depot contains all the expected products and has downloaded correctly by running the depot checker utility. Download hot fixes into the depot.
Plan file	Create the plan file to match the architecture and distribution of software. Have an expert review this if in any doubt as it guides the rest of the deployment. Do not overlook configuring the PC File Server if you license SAS/ACCESS to PC Files.
Showcase	
Software showcase	Present solution capabilities to end users. Develop a short series of 30-45 minute presentations that show before and after uses of SAS. Show new capabilities that satisfy the business sponsors success criteria.
Install & Configure	
Install binaries	Use a response file. Test DMS runs as expected on the server.
IQ tests	Verifies binaries are not corrupted. Store the report generated.
Configure Logical Environments	Use a response file.
OQ tests	Verify products are operational. Store the report generated.
Backup/Restore tests	Verify metadata & content server backups execute automatically overnight. Test a restore before populating with live metadata.
Client deployment	Use a response file. Deploy the client applications to sufficient machines allowing

Task	Description
Post configuration tuning	Default configuration, Metadata, Application Server and Web application configuration settings. Define users, security groups and any custom roles. Configure clean work utility.
Server reset tests	Verify servers resume after server restart without untoward messages in metadata, object spawner, stored process server or Event logs (Windows).
Functional Testing	
Client-server combinations	All SAS servers are operational from all clients.
Scheduler integration	Appropriate clients can deploy scheduled jobs. Verify the job executes.
Data load I/O throughput	Measure performance of WORK and file storage. Use the SASIOTEST utility. Scheduled this to capture results periodically, e.g. once per week when no other use of the server is expected.
SAS/ACCESS integration	Verify integration with designated DBMS and PC File server (subject to licensed products)
Concurrent use	Verify functionality under load of many concurrent users. Ensure Workspace and Stored Process server facilitate requests for sessions without queuing.
Security model	Verify roles and access is granted appropriately.
Documentation	
SAS Administrators System Manual	Document for future reference
1. Your platform	Software URL's, server names, etc.
2. On-going admin tasks	Daily, weekly, administrator tasks
3. Post configuration tasks	Settings applied by the install team
4. Certificate of quality	Certification of completed tasks
SAS Administrator handover	Mentor SAS administrator on deployment guide tasks
Training	
Instructor-led product training	Provide/schedule formal training for business users
Migration	
Synchronise SAS objects	SAS metadata, SAS data and objects
Regression tests	Validate scheduled jobs/programs/projects produce matching results.

Task	Description
Parallel Run	
Batch jobs	Ensure scheduled jobs run robustly over time. Plan to observe behaviour over a several scheduled events.
Open up user access	Commence user access to support UAT.
UAT	Ensure users have a set of tasks that covers all functions and use cases of the platform. Support user acceptance testing with a presence to take ad-hoc questions.
Training	
Mentoring	Continue training and mentoring to maximise return from SAS solutions
Decommission	
Rescind access	Commence rescinding access to original environment
Disable services/daemons	<i>x</i> days after last user access rescinded
Rescind hardware	<i>x</i> days after last service/daemon stopped.