

Pillars of a Successful SAS® Implementation with Lessons from Boston Scientific

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ABSTRACT

Moving a workforce in a new direction takes a lot of energy. Your planning should include four pillars: culture, technology, process, and people. These pillars assist small and large SAS rollouts with a successful implementation and an eye toward future proofing. Boston Scientific is a large multi-national corporation that recently grew from a couple desktops to a global implementation for SAS. Boston Scientific's real world experiences reflect on each pillar both in what worked and lessons learned.

INTRODUCTION

SAS is an incredibly flexible tool that can be used by large and small businesses in many industries. With that breadth and flexibility, it may be difficult to build something that is relevant, functional, and sustainable within your organization. Whether you are introducing SAS to your organization or upgrading to a more advanced SAS platform, you must have an implementation strategy. This paper walks through the main considerations for implementing SAS at your site.

OVERVIEW

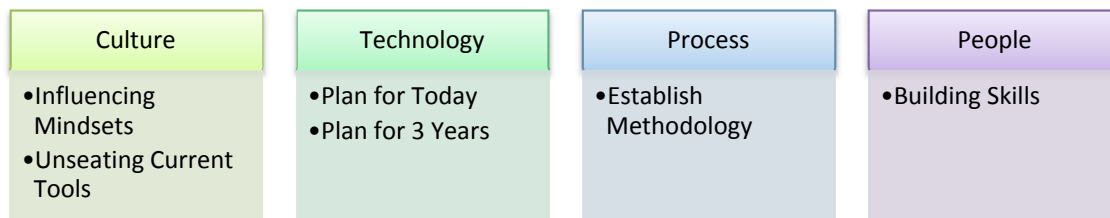
Boston Scientific Corporation is a company dedicated to transforming lives through innovative medical solutions that improve the health of patients around the world. It develops, manufactures, and markets medical device products used across a range of medical specialties including interventional radiology, interventional cardiology, peripheral interventions, neuromodulation, neurovascular intervention, electrophysiology, cardiac surgery, vascular surgery, endoscopy, oncology, urology and gynecology. BSC employees over 25,000 people worldwide.

The corporation has adopted a SAS platform that consists of a distributed SAS Visual Analytics deployment, SAS Business Intelligence, and several other SAS products, such as Enterprise Guide and Enterprise Miner. Available data are stored in a number of relational databases and in Cloudera Hadoop.

IMPLEMENTATION PILLARS

For some organizations introducing an application consists of three simple steps: install it, create user accounts, and send an email. Unless the users require the application for their jobs, for instance, to track project hours or expense reports, the event might go largely unnoticed. In worst cases the organization removes it a year later, because no one was interested in that cool time-saving application the vendor promised!

Before you start an implementation, you need to plan how the organization will adopt the application. It doesn't matter the size of your organization; each has a different challenge with applications. To assist with the introduction process, you can divide it into four general areas: culture, technology, process, and people. The remainder of this paper discusses how each of these influences adoption and how Boston Scientific approached the issues.



WORKING WITH COMPANY CULTURE

Company culture is a broad subject but is manageable in the context of an analytics system. Culture can be broken down to the state of your analytic maturity and overall mindsets with current tools.

Determine Your Analytic Maturity

Analytic maturity is how management uses information. Many organizations are data driven but it is the means of consuming data that is of interest. Below is a diagram outlining the analytic process:



To explain the diagram briefly, an organization has data *that it can get to*. From that data reports, alerts and models are built. These reports bring forward points of interest that get further analysis. The analysis then is used to take smart actions. These actions drive value in the organization.

Consider an organization with an analytic culture that uses historical reports reviewed at month's end that provide alerts on key performance indicators. Rolling out a new feature that generates an alert 2 weeks in advance of an existing metric is likely to be ignored. This culture drives the organization to look for the historic monthly report first. The early warning feature can be understood over time and get a proper process to capture it but only after the organization makes the association with the historic report. The organization will demand the old historic reports to continue, because its business process is built upon it. It will take change management and time to develop trust in the current or future measuring reports.

Here are some questions you should consider about data and culture.

- Is the data difficult or impossible to acquire?
- Are all the reports run on a monthly/quarterly schedule then reviewed?
- Do you know of any alerts to warn of impending action limits?
- Is control charting used?
- How are rare events detected?
- Are there any reports that try to predict future measures?

Boston Scientific is a huge data-driven organization. In our implementation, we found that we rely heavily on historic data. The organization even questioned if it could ever stop historic reports due to regulations. We did have most of our data available to use but only after significant transformation efforts. A new platform that streamlined the data acquisitions and historic reports with tools for faster analysis has shown to be a winning combination. We quickly learned that without tools to first replicate the historic process based reports, our culture couldn't consider features beyond them. In planning we realized our existing reports were a large effort and porting them consumed most of the first year.

When an organization brings in a new analytic tool, they aspire for a sudden shift or instant gratification. "Build me that new way of seeing the future!" and "Make our current analytical pain points go away!" Our experience shows that the replacement of current tools is more valuable and frees the analyst to do the more interesting analysis and predictive reports.

Managing Organizational Change

In changing to a larger platform or to SAS, change management is important. Take time to consider how much analysts and developers will need to change.

Questions to consider are:

- How many experienced SAS users are in the organization?
- How much exposure to each other is present in the organization?
- Do the analysts want to change?
- Is the data locked away in another tool requiring you to import flat files?

Realizing how much an analyst and report developers' skills or processes are going to change indicates how much resistance will likely be encountered. Before changing people's skills, they must be permitted to decide for themselves how they plan to continue to work. Existing tools are "easier" to use compared to developing or adopting new methods. If you have a sea of consultants, then your local population won't embrace the changes and within time the analytic paradigm erodes back to the original tools due to apathy.

At Boston Scientific, we had very few SAS users who were in a single business unit. We started user groups almost a year before going live to start building skills and interest. The change was so large that some groups decided not to participate and learn the new tools – for various reasons: the system wasn't live, not all of production data was available, no time to learn due to other priorities, and the value was not clear. One group waited until the old reporting tools were obsolete before they embraced learning. Another group continued to use a system consisting of a Microsoft Access database and Crystal Reports for over a year into SAS production because their customers did not want to change. Push back only came when the notice was sent out to retire the old Excel/Crystal Report directories. Even though for years the organization at Boston Scientific knew the change was coming, only when it was imminent and tactical did resistance show. We could have announced it in any fashion, and the organization would have "ignored" it until the change was on their doorstep.

WORKING WITH TECHNOLOGY

SAS is a very scalable tool, and with that comes the need for choices. Starting from a desktop user and moving to SAS Visual Analytics can be a challenge. You must consider all the options.

Evaluating Your Data

Before you can get helpful data analysis from any analytics software, you must have good data. Smaller organizations may not realize how much data preparation is required. Certainly, SAS Visual Analytics can import data from flat files or spreadsheets, but the data does require some cleansing and classification. This pre-analysis step may require additional software, such as SAS Studio, and some programming knowledge. If an organization uses spreadsheets to organize data, they should consider whether a database might better organize and maintain the data.

Ask these questions to assess the status of your data:

- Do you have a data lake (or large database) containing most, or all, of your data? or is it local to each generator of data?
- What transformations - time counting, aggregation, transformations, or calculations – are commonly required?
- Are there (dimension) tables or flat files that are commonly used to supplement the data (fact) source?
- Is terminology varied across the organization causing transforms for each organization?
- How big is your structured data?
- How big is your unstructured or text data?
- Do you work more with numbers or text?
- How fast does your data grow as a percentage?

Getting a feel for how analysts massage data to create reports and analysis helps decide how to set up SAS. It will also give you a feel for how much disk space and memory is needed in your current implementation and how much it may grow in the future. SAS Visual Analytics operates “in memory”. Text quickly consumes memory, so consider its impact. Each interface built to bring information from an outside system will take work and time. Your users might not want to use SAS if all the data is still in “spreadsheets” that they must import.

Data quality at Boston Scientific had both short-term and long-term challenges. In the short term when SAS went live it did not have a single defined data source. The first goal was to build those interfaces which meant writing SQL that extracted information from the back end of several systems. Only after prototypes of those interfaces were complete did interesting use of SAS Visual Analytics or Base SAS applications start “happening.” In the long term, several outside functions kept data in spreadsheets of varying schemas. Many systems would not allow back-end access. We also added a Hadoop instance to house most of the data. But, even with data centrally organized, someone had to build an interface into SAS to get that data and put it in a meaningful schema.

Planning your Environment

Purchasing or upgrading an environment for SAS can be overwhelming. The size and throughput of data can help you start the process of determining how much hardware you need. There are many servers that comprise a typical SAS deployment. Deciding if those will be clustered or single servers or grid will be factors in making hardware choices. How the organization will interface with SAS will also drive your decisions. Consider the following questions:

- Will the users interact mostly through web interfaces like SAS Studio or tools installed on clients like MS Office plugins and Enterprise Guide?
- Will data need to be prepped for VA? and how much will be moved around?
- Is the uptime of the services critical? Can the organization handle a 4-hour outage?
- In the event of a physical server room catastrophe, how long will it take to recover?
- How many concurrent users will you have in VA or Base SAS?
- Will you require distinct dev/test/prod environments?

At Boston Scientific we used two hardware sets and three metadata environments to support the software development cycle from Development to Test to Production. Regulations for our industry require validation. We knew our user based wanted both easy to work with interfaces (SAS Visual Analytics) and reports (SAS stored processes). We made sure we had enough hardware to facilitate clustering servers down the road, because a long outage would become more unacceptable over time. We avoided clustering initially to ease installation and maintenance.

Planning the Installation and Maintenance

How to install the newly built system and manage its maintenance are other key elements in the technology pillar. Consider these questions:

- Will your local IT build the equipment and/or virtual environments and operating systems?
- Will your local IT install SAS or will you have SAS Professional Services or a 3rd party help?
- Will you have an internal SAS platform administrator?

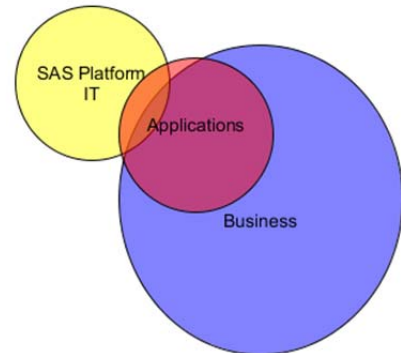
The system will need administration. A SAS administrator has a separate skill set from a SAS developer. Local IT may or may not have SAS administration experience.

At Boston Scientific, we built on virtual machines and had our local IT install the operating systems. We then had an outside vendor install the different SAS components. For administration, we have local IT resources but acknowledged a large learning gap. We supplemented with outside administration services and an admin work instruction. The work instruction detailed step-by-step processes for many SAS administration tasks.

WORKING WITH PROCESS

There is a process to developing and deploying an application in SAS. The process will depend on the particulars of your organization. Some questions to consider:

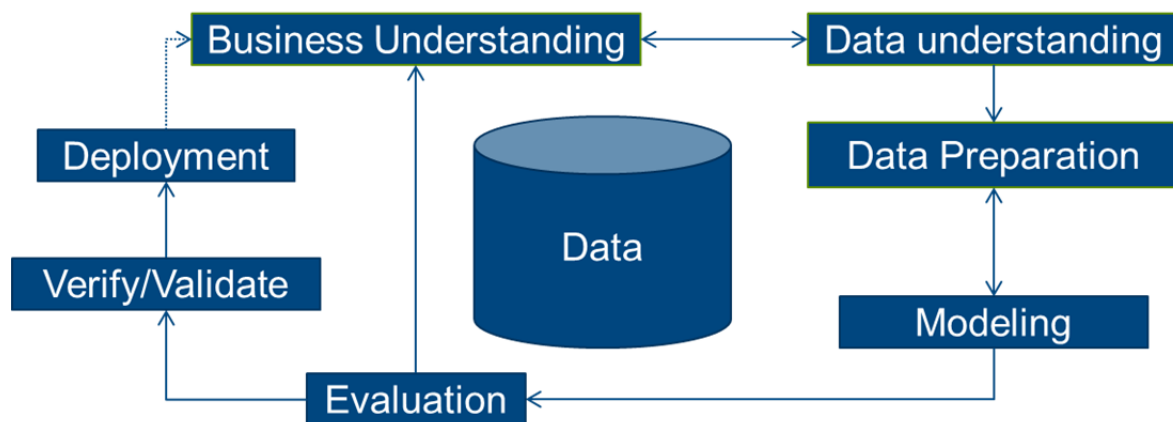
- What are the regulations associated with the reports being generated?
- Will someone review or audit the work (externally or internally)?
- What is the risk if the report calculates something wrong? Is a quick fix acceptable?
- Who is going to do what, when developing an app?
- How will the administrators interact with your developers?
- How often do reports change?
- How often do you get requests for ad hoc reports or analysis?
- How does management stay informed of the activities of developers?
- How will your developers learn the process? Will a video help?



Creating Discipline around Your Process

Figuring out how the environments interact with users to create applications will help your user base get to work. Without a clear process, people will avoid it or make up whatever works for them. If you have multiple business units involved, one could quickly not know what is happening in the environment.

For Boston Scientific we use a work instruction for controlling how apps get built. An app risk drives how much testing and other controls are put in place. For our simplest, lowest risk reports, we use a SharePoint-like site to denote its risk and notes. One key piece that was a surprise was a management approval for apps bigger than 40 man hours. We didn't want folks building a perfect solution for something that wasn't critical. A key engineering tool we used in designing our process was the below diagrammed cycle.



Care was taken in validation because we know reports always change or get tweaked and that both IT and the business would be working in the environment. The work instruction also helped with determining coding and naming standards. Since there are often many ways to accomplish similar results in SAS, standards help increase the chances that a different developer can easily understand and update code as required with minimal time wasted figuring out what was done previously. We created a development framework with a global macro for exception handling that helped raise administrators' awareness of error occurrences - making the administrators' lives easier.

WORKING WITH PEOPLE

If you don't embrace your users and customers who use SAS, then you might get into trouble. They are the developers and consumers of the new platform. Consider the following questions:

- How will developers become skilled at writing code?
- How will your consumers learn to use the new applications?
- Will the platform revolutionize all reports or will you change one application at a time?
- How will you get feedback if your users or developers run into issues?
- How will you inform users or consumers of "gotchas"?
- How will managers or different sites be heard if they need changes?
- Does management feel vested in not just getting a report but also one built on the new platform?

People are important and considering their success will be a great motivator for a new platform. Developers need training and time with experienced developers to help them avoid frustration. There are so many ways to do something in SAS that it is easy to go awry. If your customers are used to seeing Excel reports and now they will see VA, they will need some light training on how to interact. Maybe the application developers work so close to the consumers that learning how to use it happens naturally. In larger organizations, it can be hard to have enough ground troops to help all the consumers.

At Boston Scientific we had user groups for almost a year before go-live. Any consumer must watch a short 15-minute video to become acquainted with the overall platform. We rolled out new applications in a land and expand methodology such that the platform, admins, and developers could start small and learn before developing more applications. We also had one business unit use the SAS platform and prove success for several years before committing to a larger deployment. User groups have helped in collecting feedback from consumers and developers and the provide developers with a place where developers can share their successes and frustrations. Later we also found we needed a forum for managers to speak to issues and have subsequently formed a council where sites (business units) come and discuss items that seem to affect the whole site or large efforts.

We used external experts to supplement and work with developers to encourage skill-building in our internal developer population. Finally, since this was a large project with lots of management and senior leadership involvement in the beginning, there is large unwavering support for the transition to the platform as a whole.

CONCLUSION

The last and possibly most important advice is that the vision you have and the structure you build should always be viewed as a template for growth rather than a static instance. The SAS technology you are using is going to continue to evolve giving the organization more flexibility and analytic power. Certainly, the needs of the organization will change. This provides analysts different problems to solve. What you design and envision on day one is almost assuredly not where you will be in the years to come.

REFERENCES

- Willis, Kumpfmiller, and Aanderud. 2016. "Success Takes Balance: Don't Fall over with Your SAS Visual Analytics Implementation." Southeastern SAS Users Group. Available at: http://analytics.ncsu.edu/sesug/2016/RV-251_Final_PDF.pdf

RECOMMENDED READING

- *Business Process Change* by Paul Harmon
- *Change Cycle* (www.ChangeCycle.com)

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