Paper 285-2010

Providing a central IT platform for the Irish Statistical System: Implementing SAS® BI in the Central Statistics Office, Ireland

Edward Lambe, Central Statistics Office, Ireland

ABSTRACT

In 2008 the Central Statistics Office, Ireland (CSO) moved to centralise statistical processing within the office to the SAS Enterprise Business Intelligence (SAS BI) platform. This paper outlines the IT and organizational decisions made within the CSO to deliver the solution to the office.

The paper discusses the key technical decisions made when providing the solution, focusing on data storage and management, provision for multi-location offices, choice of operating system, user and data security, and IT staffing.

The paper also discusses the methods used by the SAS BI implementation team in promoting the benefits of the SAS BI platform at an organizational level. Here we look at the use of workshops and feature presentations, prototyping, end-user training and migration planning.

INTRODUCTION

CSO began its relationship with the SAS in 1985. Since the initial installation 25 years ago, SAS has become the software tool of choice within CSO for data analysis and the production of statistics. Over this period the SAS platform has proved itself to be a stable, robust and performant application capable of adapting to the changing needs of the office.

The SAS installation within CSO remained solely on the VAX VMS platform until the early 2000's. Around this time the office began to introduce PC SAS and a Windows based SAS Server environment to work in tandem with the VAX. CSO finally decommissioned the SAS VAX VMS platform in 2008, with all users having migrated their code onto PC SAS. (By 2008, CSO had 200 PC SAS users and one Windows gateway SAS server.)

CSO IT Strategy declares centralised data management and processing as a core principle. It was clear to the office that the growth of PC SAS based processing would not allow CSO to meet this key objective. With this in mind, the CSO began the discussions with SAS Ireland in 2007 about the potential for centralising SAS processing on a server based solution. The end result of these discussions was the decision in December 2007 to implement the SAS BI platform.

ABOUT THE CENTRAL STATISTICS OFFICE (CSO)

The CSO is responsible for the collection, compilation, extraction and dissemination for statistical purposes of information relating to economic, social and general activities and conditions in Ireland. The CSO is also responsible for coordinating official statistics of other public authorities and for developing the statistical potential of administrative records. The Office exists primarily to meet the needs of the Irish Government for quality statistical information which is a vital input to the formation, implementation and monitoring of policy and programmes at national, regional and local levels in a rapidly changing economic and social environment.

The CSO also serves the needs of the wider national and international community (i.e. business, EU, international organisations, media, researchers, and the public generally) for impartial and relevant information on social and economic conditions. Particular attention is paid to the specialist needs of business and the research/academic community for more detailed and focused data.

The work of the office is structured under 6 directorates:

- Business Statistics
- Social and Demographic Statistics
- Economic Statistics

- Census of Population
- IT and Corporate Services
- Statistical Support and Innovation

The CSO is headquartered in Cork (600 staff), with offices in Dublin (150) and Swords (50). The Office also has a considerable field force in operation the size of which varies depending on the office work load. CSO staffing is split between Technical and General Grade staff; Technical Grade staff includes Statistician and Senior Statistician grades, General Grade staff consisting of the traditional civil service grades.

SAS USAGE IN CSO

The introduction of SAS to CSO, and the development of SAS code, has been driven by the Technical Grade staff within the Office. Although SAS is the most heavily utilized software within the Office it has been traditionally been seen as an end-user statistical tool. In the past, the central IT divisions did not have SAS skills available to support the wider end-user community through the provision of centrally developed SAS applications or data management assistance.

The development, testing and management of SAS code and data sets are performed by the relevant Business Units. Prior to the establishment of the SAS team at the end of 2007, the CSO previously provided a very limited function to support Business Units on issues that arose in the SAS environment. The result being that there are disparate design solutions being employed across the office for common tasks.

Another point to note is that SAS skills across the office varies; some staff have an advanced understanding of the language, while others have basic skills or simply execute SAS code with limited understanding of the processing taking place within the code unit. This has led to difficulties for the office in introducing and enforcing corporate end-user computing standards for data management and coding.

There has been significant expansion of the CSO over the last 10 years and as a result there have been large increases in the volume of data and code managed. This expansion has also led to increases in the numbers of Statisticians within the office, and consequently increased the demand for SAS skills. To cater for this demand CSO have developed an introductory course in SAS programming and data management for Statisticians which they attend on commencing work within the office.

CSO IT Strategy states that the office will look to adhere to the Generic Statistical Business Process Model (GSBPM) for the production of official statistics. This internationally-agreed model comprises nine core processes which are illustrated in Figure 1 below. (For a more detailed description of the GSBPM please see references listed in this paper.)
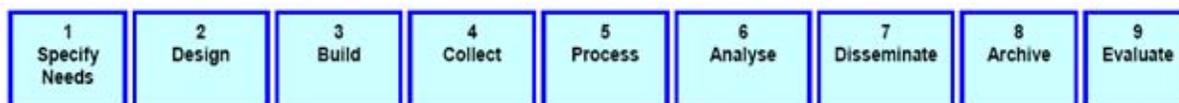

Figure 1: UNECE Generic Statistical Business Process Model – Level 1

The SAS platform is viewed as being an integral component of the CSO technology suite in working to the GSBPM. SAS is particularly important in the Process, Analyse and Disseminate processes.

PARTNERING FOR SUCCESS, PLANNING TO SUCCEED

The introduction of server based SAS processing posed significant challenges for the office. Following the introduction of the SAS BI platform, the central IT divisions within the office would be responsible for the day-to-day management and maintenance of the environment. Discussions with SAS Ireland regarding the implementation helped identify new SAS based roles within the IT divisions which would be required during and post implementation.

In light of the scale of the investment and the knowledge gap that was present within the office, the CSO felt it was necessary to engage third party consultants to assist in the installation of and migration to the SAS BI environment,

and to train the relevant CSO staff in the maintenance of the SAS BI platform going forward.

The CSO tendered for an external service provider in Q2 2008 and received 3 responses. Each response contained an alternative vision for the delivery of the solution:

- Solution A envisaged a fully outsourced project and migration to the new platform
- Solution B envisaged restructuring the offices business processes to the new functionality
- Solution C envisaged incrementally implementing SAS BI to reflect current processing patterns

Having reviewed all responses it was decided that the office would be best served by Solution C - incrementally introducing the new technology to CSO. This would allow the targeting of specific business units for migration to the new platform, providing these business units with appropriate training in the new interfaces and give time to the project team to review and assist the business unit in making the transition. It was also important that the statistical production schedule of the office would not be disrupted by the introduction of the new platform. By incrementally implementing the solution, work could be scheduled appropriately with business units with minimum disruption. To date there rollout has had no impact on the office statistical production and publication schedule.

The outcome of the tendering process was that CSO partnered with Amadeus Software Ltd. for the delivery of the solution. It was agreed that survey processing would be initially migrated 'as-is' and new features provided by SAS BI would be introduced in a controlled and phased way, thereby minimising any disruption to the day-to-day operation of the office.

An outline of the timeline involved in the project is outlined in the table below.

Date	Task
10/04/2008	Publish Request For Tender Document
08/05/2008	Closing date for Tender replies
29/05/2008	Announce winner of Tender process
21/07/2008	Project Initiation with Amadeus
15/08/2008	SAS Enterprise BI Server Platform Design
24/11/2008	Development of SAS Enterprise BI Server Test plan
31/12/2008	SAS Enterprise BI Server Platform Build
31/01/2009	SAS Enterprise BI Platform Testing
22/01/2009	Development of Knowledge Transfer Plan
07/01/2009	Development of Service & Support Plan
13/01/2009	Development of Migration Plan
31/03/2009	Amadeus led migration of two (pilot) Business Units
Ongoing	CSO led migration of Business Units

Table 1: Project Timeline

Amadeus provided consulting services with professionals specialising in platform design, software installation, software testing and user education, with the relevant expert resources provided on-site as the project progressed to meet the deadlines as set down in the project plan. A key requirement outlined in the tender process was that CSO staff would learn 'on the job', working alongside the Amadeus consultants and during each task CSO staff worked

closely with the consultants to ensure that there was a full understanding of the process involved.

The other important partnership on the project was between the SAS BI project team and the end-user community who would utilise the new environment. The ultimate success of the project would be the interaction of this community with the new product suite, and their acceptance of a central SAS processing environment. The views of this end-user community continue to be relayed to the SAS BI project team through the SAS BI Implementation Board (established in 2009) and the SAS BI project team also led a number of other initiatives that ensured the end-users had input into the overall design. These are outlined in more detail in the final section of this paper.

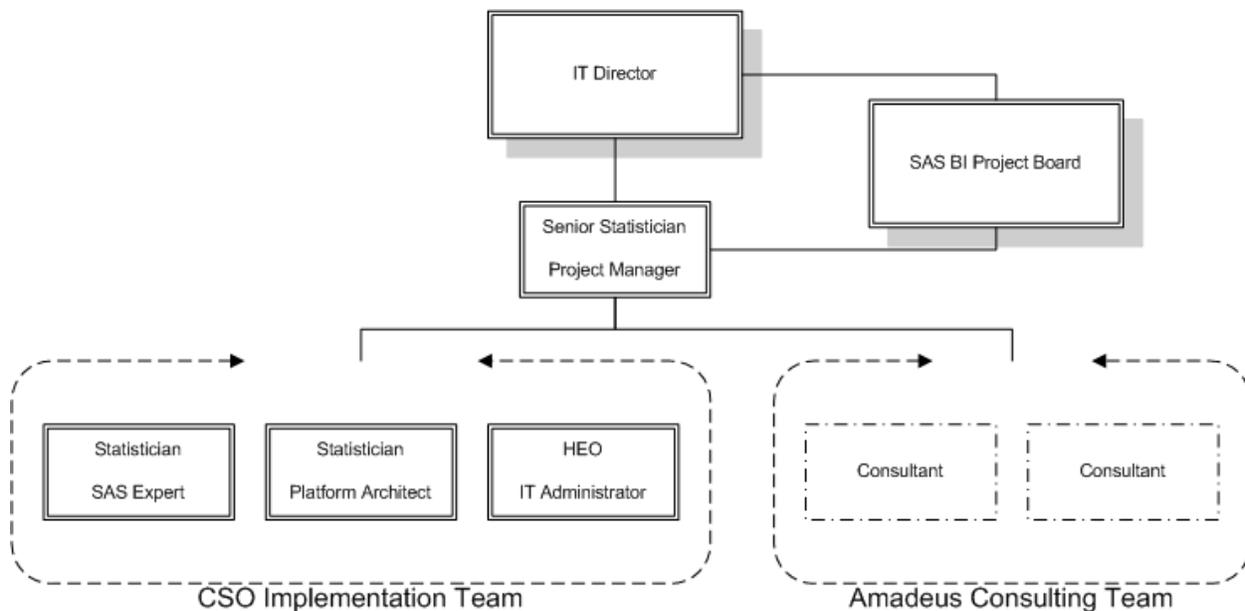A diagram outlining the project interactions is illustrated as follows.

Figure 2: CSO SAS BI Project Team Structure

The critical success factors identified for the SAS BI Project (reflected in the contract with Amadeus Software Ltd. and now forming the core functions of the CSO SAS Team) are:

- Provision of a central processing platform for all SAS code and SAS data
- Full acceptance from the end-user community of the SAS BI platform
- Support of the SAS BI platform will be supplied via the Central IT function
- The SAS BI platform will meet the performance requirements of Business Units
- The SAS BI platform will provide a secure processing environment for SAS code and data
- The SAS BI platform will scale to meet the increasing processing demands of the office
- The SAS BI platform will provide a stable and reliable processing environment
- Introduction of SAS Standards for data management and coding

SYSTEM ARCHITECTURE

When moving to the SAS BI platform the project team were tasked with providing a solution that was secure, stable, scalable and robust. The project team were also tasked with ensuring that the solution adhered to the principles of CSO IT Strategy. Key elements to be considered in the design were as follows:

- Provision for satellite office locations

- Data Storage & Management

- Operating Systems

- User & Data Security

- IT Staffing

STARTING POINTS

Initial discussions with SAS Ireland concerning a move to the SAS BI platform began in 2007. From these discussions a number of starting point assumptions were made regarding the design of the SAS BI platform within CSO. The first task for the project team was to work with the Amadeus consultants to validate these assumptions before committing to the specific platform system architecture.

These starting point assumptions were as follows:

- SAS application servers would be located in the Cork and Dublin offices

- The solutions would be delivered on a Unix platform

- Data storage would be provided in one central locations in the Cork office

- Data and user security would be provided via the SAS Metadata server

- Central IT resources would be made available for the support of the SAS platform post implementation

PROVISION FOR SATELITE OFFICE LOCATIONS

The CSO has approximately 900 staff. The majority of the staff (~800) are located in three office locations and a supplementary field force of approx 100 staff is dispersed across the island. (There is 50Mb/s connectivity between all three office locations.)

Location	Outputs	Staff
Cork (HQ)	Micro & Social Statistics	600
Dublin	Macro Statistics	150
Swords	Census	50
Field force	Various	100

Table 2: CSO Staffing

The starting point assumption was that SAS Application servers would be located in the Cork and Dublin offices, with the SAS Metadata and SAS Web Tier centrally located in the Cork office. The analysis provided by the CSO project team and the Amadeus experts confirmed that this configuration would adequately services the processing needs of CSO.

These proposals were passed to the user community for comment. Concerns were raised by the Census of Population (COP) Business Unit in Swords regarding the lack of on-site application servers for their survey processing. The Irish COP is run every five years, the next census being planned for 2011. The COP Business Unit captures and analyses large volumes of data, and are recognised within CSO as a heavy user of SAS in their day-to-day processing.

Over the last number of iterations of the COP the Office had introduced specialised technology to cater for COP processing. This technology and the associated data collected are located at the Swords office.   As a result the decision was made to locate SAS application servers in all three CSO locations rather then have to transfer data across the CSO network for processing.

This decision also went some way to meeting the disaster recovery plans of the office, whereby if there was a major outage in one office location, there would be SAS processing capacity available in other locations to cater for the impacted location.

A high-level view of the agreed network design is illustrated in the following diagram.
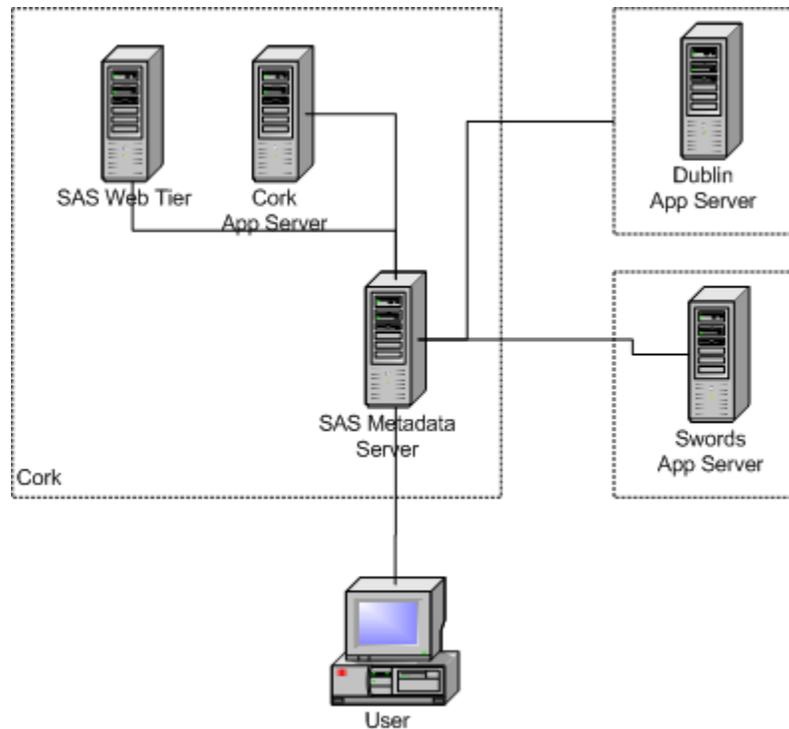

Figure 3: High-level Network Design

CHOICE OF OPERATING SYSTEM

The starting assumption for the project was that SAS BI would be delivered on a Unix platform. Preliminary investigations conducted during the evaluation phase had concluded that 2 16-core Unix servers would be sufficient to cater for the Office processing requirements.

The CSO has had little exposure to the maintenance and support of Unix server. Other technology projects had introduced Unix servers, however CSO are reliant on external consultants for the maintenance and support of these servers. The introduction of additional Unix based server infrastructure, with which the IT Division had little experience, was identified as a risk to the long term maintenance and support of the SAS BI platform.

In light of these concerns CSO and Amadeus performed a review of the processing requirements of the CSO. The review was to evaluate CSO's current processing needs and to provide estimates of processing needs within a 3-5 year window. The review also looked at providing a solution that would be sufficiently flexibility to allow additional servers be added to the platform should that future need arise. Finally, the review was to report on the possibility of using a Windows based platform for SAS BI processing.

CSO currently processes approximately 110 surveys within any business year. The surveys vary significantly in size and complexity; some surveys have small volumes of data returned for analysis <10MB, while others that retrieve

data from administrative data can be analyzing volume in excess of 10GB. On average, the data sets analysed across the office would be within the range of 50-100MB. The review also found that the majority of SAS processing is performed interactively on these data sets via the SORT, FREQ, REPORT and TABULATE procedures. The conclusion of the review was that implementing the solution on a Windows platform should not pose any significant performance issues. Also, by implementing the solution on a Windows platform the long term maintenance costs of the SAS BI solution would be reduced due to the skills available within the CSO IT Divisions.

By choosing to deploy the solution on Windows CSO could purchase significantly more processing power for each Euro when compared to the similar Unix based server solution. The Office could purchase >2.5 the processing power for the allocated hardware budget, allowing CSO to distribute the application servers across all CSO locations.

The following table details the location, quantity and specifications of the SAS application servers purchased:

Location	Quantity	Server Specification
Cork	2	Dell PowerEdge R900 2 * 2 Quad-Code Xeon X7350 (2.93GHz 8MB) 1066 Mhz FSB Processors 32 GB Memory Module
Dublin	2	Dell PowerEdge R900 2 * 2 Quad-Code Xeon X7350 (2.93GHz 8MB) 1066 Mhz FSB Processors 32 GB Memory Module
Swords	2	Dell PowerEdge 2950 2 * Quad-Code Xeon X5460 (3.16GHz 2*6MB) 1333 Mhz FSB Processors 16 GB Memory Module

Table 3: SAS Application server specifications

DATA STORAGE AND MANAGEMENT

The CSO Corporate Data Model provides a high level logical framework for the management of data and was developed to ensure that statistical data are used efficiently and managed securely at all stages of the statistical processing cycle. The model has as its fundamental premise that statistical data are a corporate asset and must be subject to corporate data management and metadata standards.

The CDM is designed to ensure that:

- All statistical data received by CSO are documented and managed in a transparent and secure way;
- All data published or issued by the Office are not only properly documented but are readily capable of being re-created should the need arise.

When implementing the SAS BI Platform the solution developed had to adhere to the principals as laid down in the Corporate Data Model.

The PC SAS environment allows users considerable freedom in data management and the CSO PC SAS environment lacked the controls necessary to enforce adherence to the Corporate Data Model. A significant advantage of the SAS BI platform for the CSO was the ability of the IT division to create an environment where users roles and privileges could be managed centrally to enforce adherence to the Corporate Data Model.

The migration of users to the SAS BI platform has allowed the CSO to create a common folder structure for SAS data and code to be used across all business units and surveys. In the PC SAS environment is was not uncommon for a business unit to have developed its own standards for data storage and management. Part of the migration to the new SAS BI platform requires users to migrate their code and data on to a new central file system (one per site location). During this migration users are required to re-organise their data and code to fit into the common folder structure.

7

The major advantage of this process is that all data and code is now centrally located, ensuring that network backups capture all important corporate data assets in each cycle. Also as users move between surveys all SAS code and data relating to that survey is in a clearly organised and familiar structure, reducing the learning curve for individuals as they move within the organisation.

The folder structure recommended to business units is described below, all survey relating to each business unit are grouped together. Accountability for users having access to a particular survey's data lies with the Statistician responsible for the survey. A clear process for allocating users access to a survey has been defined and is centrally managed through the CSO IT Helpdesk. All requests for access must be accompanied by approval from the relevant Statistician. On receipt of the approval users are granted access at a network level and also through the SAS Metadata Console.
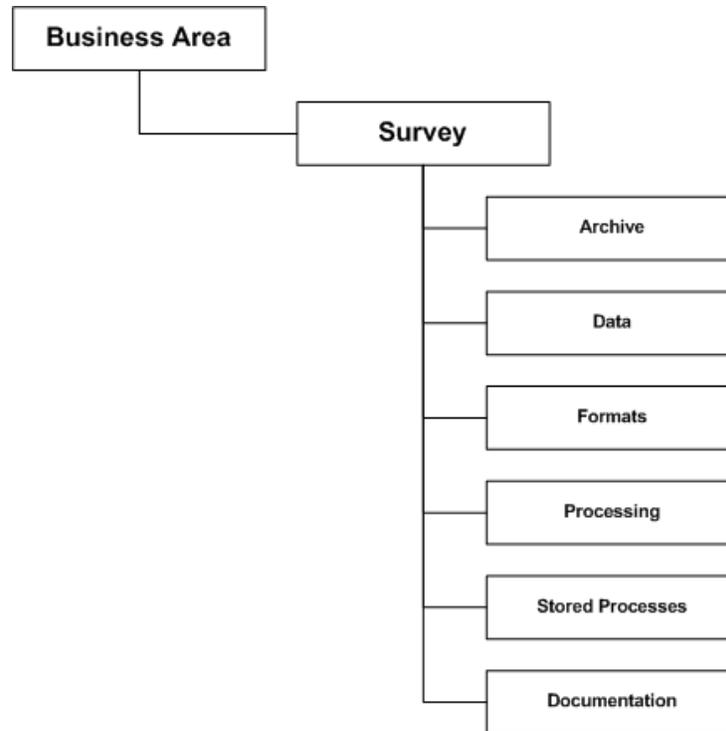

Figure 4: SAS Folder Structure

Folder Name	Purpose
Archive	The Archive folder stores all data and code elements that, while not part of current operations, should be maintained as part of the historic data and coding legacy of the survey. It is recommended to all users that any data placed in the archive folder is in a compressed (.zip, .tar, .tgz) format.
Data	The Data folder stores the SAS libraries and data sets utilised by each Business Unit. Where applicable the SAS libraries are centrally defined on the Metadata Server. Input data is also stored within this folder structure and referenced from this location in SAS processing.

Formats	Business units have been requested to consolidate formats into a central format library for the unit. As users log onto the SAS BI platform a survey-specific autoexec file is executed which places this format library in the users format search path.
Processing	The Processing folder contains all SAS code elements that are utilised in the current processing executed by a survey. Users are encouraged to create SAS Enterprise Guide Project files which link associated .sas files, and create process workflows for the survey. All output elements produced by the survey are also stored within this folder structure.
Stored Processes	The Stored Processes folder stores all Stored Processes created by the survey.
Documentation	The Documentation folder stores functional and technical specifications, test scripts, test results and system manuals.

Table 4: SAS Folder Structure Explained

The introduction of centralised data storage for SAS elements has allowed the IT section to accurately monitor the data storage requirements of each business unit (something that had been difficult in the PC SAS environment). The project team have developed a number of Perl scripts that are executed at regular intervals and which analyse the central data storage areas. The outputs of these scripts are published and it is easy to identify which users are having difficulties keeping within their allocated space.

The use of these scripts has also provided the team with an opportunity to identity users and processes that may not be executing the most efficient code. For example, a SAS data set was located which was 95GB in size and took over 150 minutes to create. On reviewing the code it was possible to reduce the size of the data set to 0.35GB and the processing time down to <1minute.

USER & DATA SECURITY

Data Security and Confidentiality are specifically legislated for in the Irish Statistics Act (1993) under which the CSO operates. An integral component for the design for the SAS BI platform was that data would be securely managed. Access to the data is only provided to those individuals who have a relevant statistical use for the data - all other requests for access to data are refused.

A requirement of the SAS BI implementation was to provide single sign-on authentication (SSO) for the SAS BI platform. User authentication to the SAS BI platform is integrated with Microsoft Active Directory and only those users with the necessary network privileges are granted access to the SAS environment. Security within the SAS BI platform is assigned at two levels; the network level and within the SAS Metadata Console.

Each business unit migrated to the SAS BI platform is assigned two network level security groups:

- Power Users Group: Modify Access (Read / Write / Alter)
- Standard Users Group: Read Only Access

Users are assigned to the relevant network group based on their individual work profile. Typically Statistician and Management grades receive Modify Access and access SAS via SAS Enterprise Guide; Clerical grades receive Read Only Access and access SAS through the SAS Add-in for Microsoft Office, or the Web Tier.

The network level security groups are replicated in the SAS Metadata adding an additional layer of access control within the SAS platform. Users are assigned to the relevant SAS group based on their individual work profile. As business units migrate into the SAS BI platform an Access Control Template is created for the business unit. The Access Control Template defines the level of access members of a SAS group will have to relevant data structures. As central libraries are defined within the SAS Metadata Console the Access Control Templates are applied; ensuring that within the SAS BI platform users have appropriate access to the data.

In all instances the network level access supersedes that granted in the SAS Metadata Console, i.e. if a user has been given Modify access within SAS and only have Read access at a network level the user will only have Read access to the data. Overall, for a user to be able to access a central data library within the platform, they must be added to the relevant group in the SAS Management Console and also be assigned to the relevant group at a network level.

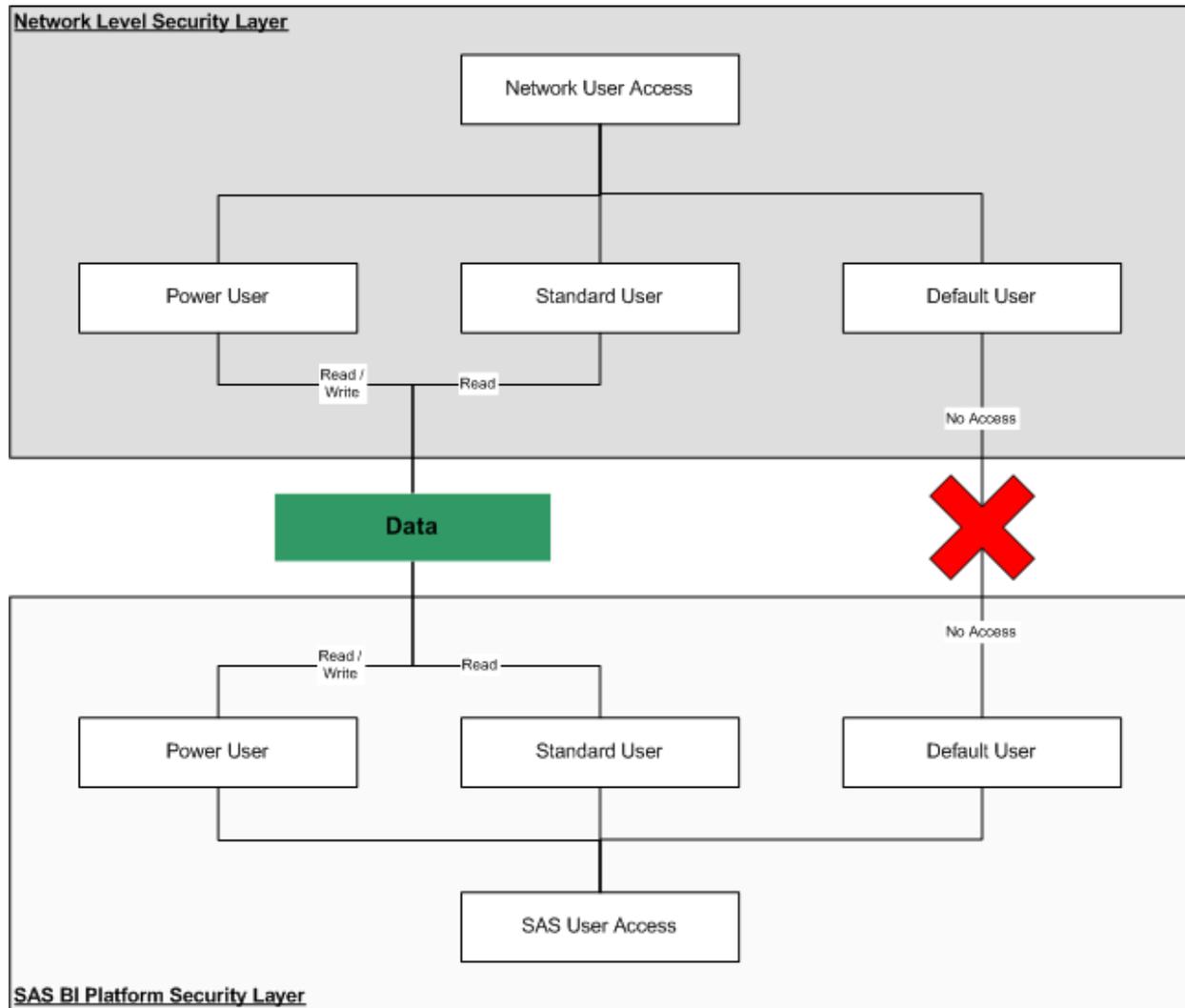The diagram below outlines this security structure:

Figure 5: Network & SAS level Security

The final point to note is that while the IT Administrator and SAS BI Team grant user access to data, the responsibility for ensuring that data is accessed correctly and securely resides with the business units. Requests for access are routed to the business unit management for approval. The IT Division also provide reports to the business units highlighting those individuals that have access to their data at regular intervals.

IT STAFFING

The management of the SAS BI platform post implementation has resulted in a number of new job roles and responsibilities within the central IT function. The day-to-day management of the platform has been split across the existing IT Service Delivery function, and through the establishment of a SAS BI Team within the IT Corporate Services function.

The new roles and responsibilities have been categorised as follows; hardware, server, client and end-user SAS coding.

- The IT Service Delivery function is responsible for the hardware, server and client applications.
- The SAS BI Team is responsible for end-user SAS coding queries, and helping users working with the new SAS BI interfaces, e.g. SAS Enterprise Guide, SAS Add-in for Microsoft Office, SAS Information Map Studio, SAS OLAP Studio, SAS Web Tier, etc.

Training for the new roles has been managed through SAS and Amadeus training services. Members of the IT Service Deliver and SAS BI Teams have attended the SAS Platform Administrator Fast Track course which gives attendees a good overview of the platform.

As part of the agreed contract with Amadeus a significant portion of time was allocated to Knowledge Transfer. Amadeus worked closely with the relevant CSO IT resources on documenting and explaining the working of the CSO SAS BI implementation (see Figure 6 below for a Detailed Network Diagram of the CSO SAS BI configuration). A number of key documents were produced, including a CSO Platform Administrator Guide, which outlines in detail the regular maintenance tasks that have to be performed for the environment and the common errors / pitfalls that can occur in the day-to-day operation and management of the system.
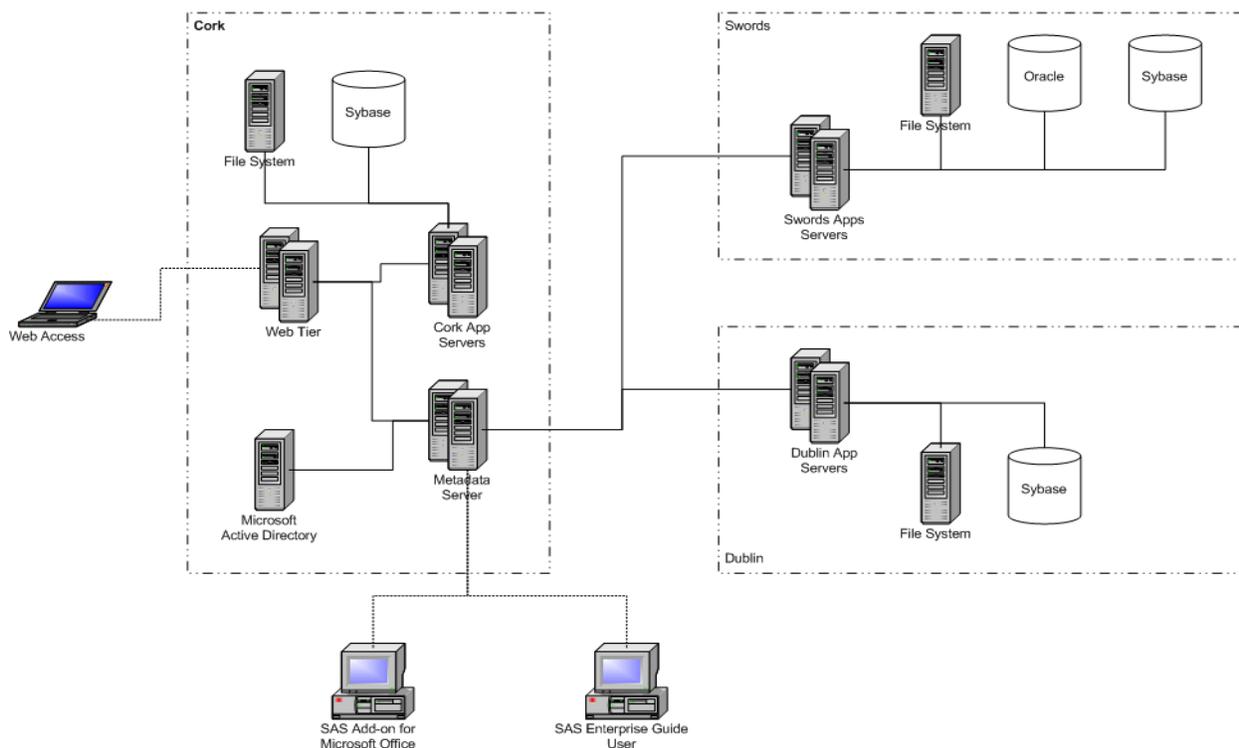
DETAILED NETWORK DIAGRAM

Figure 6: Detailed diagram of network configuration

ROLLING OUT THE SAS BI PLATFORM

From the start it was clear that the ultimate success of the SAS BI project was dependent on the buy-in of the statistical staff within the office. It was critical that the SAS BI implementation was not seen as an IT led project or the implementation of a new technology solution for technology's sake. The SAS BI Project Team understood from an early stage that without the commitment of the Technical staff to adopt the new technology and interfaces the project

would fail. In light of this concern the project team set about promoting the new platform within the office, and selling the benefits of the SAS BI platform for the office. The following are a number of the elements used in promoting the platform within CSO.

FEATURE PRESENTATIONS

As part of the discussion process with SAS Ireland during 2007, a number of SAS BI product demonstrations were run in CSO by SAS Ireland. There demonstrations were a gentle introduction to the platform and highlighted some of the key functionality in the product suite.

The contract agreement with Amadeus Software Ltd. provided for a series of presentations and workshops to run in CSO to promote the SAS BI platform. The presentations focused on:

- SAS BI Overview
- Enterprise Guide
- SAS Add-in for Microsoft Office
- Web Interfaces
- OLAP Cube Studio

The presentations were held in all three CSO locations and gave the user community an opportunity to view the new SAS BI interfaces and to ask questions or raise any concerns they may have had on the planned migration. The feedback provided valuable input into the design of the SAS BI platform.

WORKSHOPS

The next phase of the project was to hold one-to-one workshops with the business units. There workshops were led by the Amadeus Consultants with the CSO project team providing support. The workshops allowed for an in-depth review of the business unit requirements for the SAS BI platform.

During these workshops the Amadeus Consultants captured information on SAS code, data management processes and performance metrics. The Business Units also detailed how they interacted with other units across CSO and with other government departments.

Users were encouraged to raise any concerns or queries that they might have regarding the proposed solutions at the workshops, and long-term benefits of the platform were highlighted.

PROTOTYPING

Having completed the workshops, and having met with all business units, it was felt that CSO would benefit from the development of prototypes that would provide solutions to common requirements identified. The CSO project team and the Amadeus consultants reviewed the workshop documentation and identified a number of common themes that could be addressed through this process.

Prototype solutions were produced for the following elements:

SAS Enterprise Guide

- Highlight the use of the SAS Code task

- Highlight the building a process flow using the pre-defined tasks

- Highlight the benefits of the Query & Filter task

- Highlight the use of Stored Processes for the ability to package code for distribution as business intelligence elements.

SAS Information Maps

- Show ease of use of SAS Information Map Studio

- Highlight the benefits of SAS Information Maps for sharing data across Business Units

- Highlight the benefits of SAS Information Maps within a Business Unit in abstracting detailed queries from non-technical end-users.
- Highlight the benefits of SAS Information Maps with the other SAS BI components, SAS Add-in for Microsoft Office, Web Tier, etc.

SAS OLAP Cubes

- Show ease of use of the SAS OLAP Cube Studio
- Highlight the possibilities of using OLAP cubes for Macro Economic analysis

SAS XML Mapper

- Show ease of use of the SAS XML Mapper
- Highlight the use of XML Mapper to create SAS Data Set from the CSO E-Form return
- Highlight the use of XML Mapper to create SAS Data Set from the Earnings, Hours and Employment Costs Survey (EHECS) return.

SAS Add-in for Microsoft Office

- Show ease of use of the SAS Add-in for Microsoft Office
- Highlight how the BI components listed above can be referenced within MS Office Applications.
- Highlight how BI components can be refreshed within the document.

The development of these prototype solutions demonstrated in a practical way to end-users how the new SAS BI functionality could be employed within their business units. The prototypes also provided a best practice implementation that can be referenced by the end-user when looking to employ some of these techniques in their workplace.

MIGRATION PLANNING

The contract agreement outlined that Amadeus would lead the migration of two business units into the new platform (Census of Population, Crime Statistics). Following these successful migrations the CSO project team would continue with the migration process with assistance from Amadeus where required.

Prior to the migration of a business unit onto the platform, a number of detailed meetings are scheduled where the business unit can finalise which data and code elements are required post migration to the new platform. As outlined in the Data Storage and Management section, a common folder structure for the management of data and code had been agreed for the platform and each business unit was required to modify their processing to fit into this new model. Once this work was completed central SAS Libraries were created for each business unit via the SAS Metadata Console.

There were a number of common issues identified that needed to be addressed during the migration:

- The use of the 'X Command' is restricted on the new platform. The majority of users were using the 'X Command' for importing data from Microsoft Excel worksheets through the DDE process, and this code needed to be reengineered to either use the new Import Data task in SAS Enterprise Guide or to use the SAS Access to PC Files Format module and Proc Import.
- A number of Business Units used the FSEDIT procedure for data entry and editing. The FSEDIT functionality is no longer available to CSO in the SAS BI platform and those business units that required this functionality were required to use the CSO Data Management System (DMS).
- The central library definitions introduced new libname references for some business units. During the workshop process it was not uncommon for the project team to find that Statisticians within business units

had their own versions of code and autoexec files and had created their own libname references for their SAS processing. The migration to the new platform ensures that all code written for a Business Unit references the central libraries definitions and is not customised for an individual's personal use.

- The new folder structure detailed previously requires users to hold their survey outputs under their processing folder. The result is that some code modifications are required to code in order to recreate the output in the new location.
- The Amadeus Consultants provided the CSO with a useful Crib Sheet which is passed to users when they are migrated to the new platform. This crib sheet highlights those areas mentioned above, and some other features that users should be aware of in the new platform.

END-USER TRAINING

It is important that the CSO maximise the return obtained from the investment in the SAS BI platform. A key component to realise this goal is that end-user skills in the SAS product set is enhanced.

As part of the migration process each Power User was invited to attend an Amadeus developed training course on SAS Enterprise Guide. This training course gave users a hands-on introduction to the new programming interface. The course covers all commonly used features of the SAS Enterprise Guide interface and the feedback from end-users had been overwhelmingly positive.

The CSO project team is also mandated with up-skilling the SAS user community within the CSO. In response to this mandate the team has developed a series of internal presentations, including:

- SAS Add-in for Microsoft Office
- Data Design / Management
- PROC SQL
- Macro Programming

The introduction of the new platform has also allowed the CSO to introduce new SAS standards for coding and data management. As Business Units are migrated to the new platform they are being encouraged to review the standards and to apply them to their processing. A new program of quality reviews and auditing of the SAS environment is planned post the SAS BI migration to ensure that the SAS standards as developed are adhered to by the Business Units.

GOING FORWARD WITH SAS BI

There are many new components available within the SAS BI offering opportunities for CSO to analyse and process data in new and innovative ways. The introduction of SAS Enterprise Guide allows users to analyse data quickly and removes the need for users to be 'experts' in SAS syntax when building complex view of data. The task interface, and the building of process flows removes barriers that some users have had in using SAS with building and sequencing processing tasks.

A large number of users in the CSO using PC SAS would export data from SAS to Excel when creating graphical output. The task driven interface to PROC GCHART in SAS Enterprise Guide allows users to build those graphical units in SAS and removes the need for users to create Excel worksheets that then have to be managed by a business unit.

Other products that are part of the SAS BI suite introduce new concepts to CSO and as a result, require additional levels of training for end-users. As the CSO become more experienced with the new platform, the roll-out of these products will proceed across the Office.

The introduction of the SAS BI platform within CSO introduces a significant amount of change and it is important that the introduction of the new features is managed so that CSO best exploits the opportunities that the SAS BI platform offers. With this in mind the CSO had create goals for the short, medium and long term as set out in Table 5.

Short Term	• Ensure that the user base within the office is comfortable with the SAS Enterprise Guide interface • Encourage user to modularise their business processes through the use of Stored Processes • Introduce Add on for Microsoft Office • Investigate the potential for the development of central code elements that provide solutions for common business processes
Medium Term	• Introduce Information Map Studio • Introduce OLAP Cube Studio • Introduce XML Mapper Studio
Long Term	• Investigate the potential for use of the web technologies within the office • Review the CSO dissemination strategy and evaluate whether SAS BI could provide suitable technology to the CSO consumer

Table 5: SAS BI Feature Rollout

CONCLUSION

The management of large scale IT change within any organisation is difficult. The decision to implement the SAS BI platform and to move away from a PC-based solution posed significant challenges for CSO.

CSO recognised early in the process that there was a requirement to partner with an external service provider to ensure the successful delivery of the project. The successful delivery of the CSO SAS BI platform could not have been achieved without the valuable assistance of Amadeus Software Ltd. and their willingness to share their expertise with the CSO project team.

As stated earlier, the ultimate success of the project was not that the platform met or exceeded technical requirements, but that the statistical staff within the office embraced the opportunities that the new SAS BI platform offered. The feedback from users has been very positive. Though some users miss the freedom that was available to them in the PC SAS environment, they have bought into the concepts and reasons behind the move to centralise the platform.

The full benefits of implementing the SAS BI platform will not be visible for a number of years, but by choosing to implement the SAS BI platform, CSO have strengthened the data analysis and statistical processing environment and will be better placed to adapt to future needs.

REFERENCES

This paper makes reference to the following:

The Generic Statistical Business Process Model

http://www1.unece.org/stat/platform/display/metis/The+Generic+Statistical+Business+Process+Model

The Central Statistics Statement of Strategy 2008-2010

http://www.cso.ie/aboutus/csostrategy.htm

ACKNOWLEDGMENTS

Thanks to the SAS BI project team for their work in reviewing this Paper.

Thanks also to the Amadeus Software Ltd. team for their willingness to share their experience and expertise during their engagement with the Central Statistics Office.

CONTACT INFORMATION

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

Name:	Edward Lambe
Enterprise:	Central Statistics Office
Address:	Skehard Road
City, State ZIP:	Cork, Ireland
Work Phone:	+353 21 4535370
Fax:	+353 21 4535474
E-mail:	edward.lambe@cso.ie
Web:	www.cso.ie