Pennsylvania Office of Administration /
Office for Information Technology

Title of Nomination: Business Solutions Center of Excellence (BSCoE)
Category: Enterprise IT Management Initiatives
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Executive Summary

In April 2004, Governor Ed Rendell signed Executive Order 2004-8, which fundamentally reshaped the governance structure for information technology in the Commonwealth of Pennsylvania. The order created an Enterprise IT Governance Board responsible for advising and counseling the Governor on IT matters, providing oversight and direction on critical IT initiatives; defining the Enterprise IT strategic vision; helping to govern the Commonwealth's IT expenditures; approving IT Plans and directing IT investments; and helping to facilitate interagency cooperation on IT projects. In May of 2007, an amended version of this executive order was issued. This version strengthened the Commonwealth's commitment to reducing IT expenditures through a stronger focus on the consolidation of IT across the Commonwealth.

The *Keystone Technology Plan* was published in 2004 to serve as an information technology blueprint for the Commonwealth and to set forth the strategy for achieving the goals of the Executive Order. The plan was very specific in establishing the Commonwealth's strategic IT direction for the next 3-5 years. However, it explicitly afforded the governance bodies considerable latitude in the tactical implementation of this strategy. Pennsylvania's Business Solutions Center of Excellence (BSCoE) was created to assist with the realization of several facets of this strategy; most notably the establishment of a standardized application architecture and the development of reusable components and solutions.

The BSCoE project commenced in late 2004 with the goal of coordinating, enabling, and managing collaboration between the stakeholders involved in the development of IT applications within the Commonwealth. With more than $1 billion in information technology investments annually, even small improvements in Pennsylvania's IT management and asset reuse brought the promise of potentially very large savings. BSCoE's formal charge was to create a set of reusable assets - standards, processes, and application components that could be used across the Commonwealth's IT applications to increase standardization and reduce the amount of time and money the Commonwealth's projects spent reinventing the wheel.

The first year of the BSCoE project was dedicated to building the asset foundation for the Commonwealth's Agencies to use in their next generation applications. This included the creation of Java and .NET business application development frameworks, a standard software engineering process, and reference applications that demonstrated the use of the frameworks and software engineering process to build service-oriented applications in an iterative manner. Significant work was also done to proactively engage BSCoE's stakeholders - Commonwealth Agencies and their IT staff, enterprise architecture and governance bodies, as well as technology and product vendors.

BSCoE's project sponsors immediately recognized that, in order to truly implement a reuse program that would yield tangible cost savings, they had to establish a way for Agencies to tap into their already established asset base. Under this directive, BSCoE set out to stand-up an enterprise asset reuse repository that would act as a central location for the discovery, consumption, and submission of reusable IT assets.

Through the establishment of the Pennsylvania Enterprise Asset Repository (PEAR), BSCoE was able to achieve the following results:

- Engagement of 13 Commonwealth Agencies in governance activities at both the technical and strategic levels
- Creation of an enterprise asset metadata model to standardize the way assets are identified, described and related to other assets
- Establishment of an enterprise governance process for acquisition and submission or reusable IT assets
- Implementation of cost measures to calculate and quantify the actual cost savings associated with the reuse program
- Establishment of a standardized mechanisms to discover reusable IT assets across the Commonwealth
- Estimated Return on Investment (ROI) in excess of one million dollars with return expected to rise significantly as the BSCoE reusable asset pool increases

A. Description of Project

The Commonwealth of Pennsylvania's Business Solution Center of Excellence (BSCoE) provides an enterprise repository of standard software, process, and knowledge assets that enable Agencies to jumpstart their software development projects. However, BSCoE is more than a repository for reusable assets. It embodies a move toward behavioral transformation across the Commonwealth's IT human resources. It espouses a new way to approach work, a broadening of perspective, a challenge to understand the impact that each person can have regarding IT expenditures, and a call to recognize the opportunities inherent in a service-oriented architecture. BSCoE enables Agencies to share their existing assets, collaborate on the creation of new assets, and benefit from the decreases in startup time and cost commensurate with a deep and mature asset base harvested from many years of software development experience.

The Vision: Enterprise Business Asset Visibility

In 2006 The Commonwealth of Pennsylvania released an updated version of the *Keystone Technology Plan*, a three year information technology plan for the Commonwealth, establishing the goal of establishing a network of consumable business services from which citizen-centric applications could be developed. At the heart of this initiative was an enterprise reuse program. Through this program, the Commonwealth enabled the creation of standardized application development assets and the ability to harvest existing assets established throughout the Agencies. The next step in this process was to enable asset discovery. For the reuse program to truly be successful, Commonwealth IT planners across the enterprise Communities of Practice
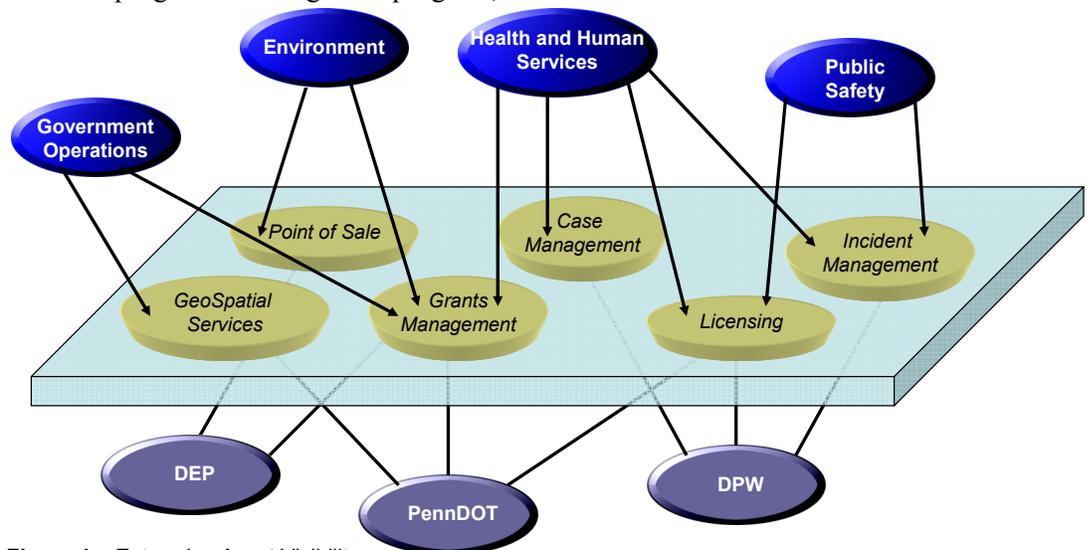

Figure 1 – Enterprise Asset Visibility

(represented in blue in figure 1) and Agency governance bodies (represented in purple in figure 1) would have to be able to identify reuse opportunities at the business level. A single unified picture of business assets was needed to promote understanding across the Communities of Practice, agency planners, and Commonwealth executives. Providing this enterprise business asset visibility became the mission of the Commonwealth of Pennsylvania's Business Solution Center of Excellence (BSCoE).

Adding Value: From Creator to Enabler

During the first year of operation, BSCoE's mission was to establish a base set of reusable software development frameworks and an enterprise software engineering process. These assets would serve as the foundation for the next generation of applications being developed throughout the Commonwealth.   To expedite the adoption of these assets, BSCoE commenced regularly scheduled meetings with Agency technical leaders and executive staff and conducted numerous technical deep-dive sessions with Agency developers. Consequently, these software

development frameworks and engineering process were adopted by an increasing number of agencies and agencies became curious about what the next phase of assets would bring.

At the same time as agencies began speculating about future reusable assets, it became evident to project sponsors that the BSCoE team had neither the funding nor the cross-fun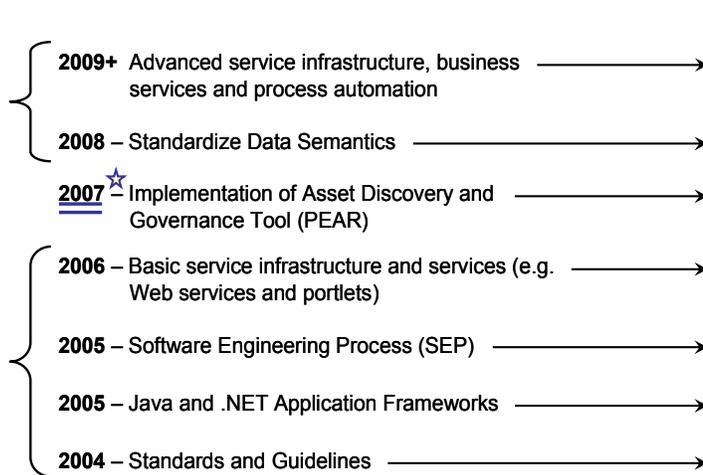ctional business expertise necessary to enable the most important level of reuse – reuse at the business level. At this point the BSCoE project began a departure from a pure asset creator to an asset reuse enabler. This strategic shift is marked by the star in figure 2, where the BSCoE team led the implementation of the Pennsylvania Enterprise Asset Repository (PEAR).

2009+ Advanced service infrastructure, business services and process automation

2008 – Standardize Data Semantics

2007 – Implementation of Asset Discovery and Governance Tool (PEAR)

2006 – Basic service infrastructure and services (e.g. Web services and portlets)

2005 – Software Engineering Process (SEP)

2005 – Java and .NET Application Frameworks

2004 – Standards and Guidelines

Figure 2 – BSCoE Strategic Evolution

PEAR

The Commonwealth began work on the Pennsylvania Enterprise Asset Repository (PEAR) in late 2005 and PEAR went live in 2007 (see figure 3). PEAR is a Web-based system built on top of the industry-leading Logidex platform offered by LogicLibrary. PEAR automates the asset discovery, acquisition, and contribution processes established by the Commonwealth. Amongst the most compelling features of the product are:

- Capability to handle custom asset capture, evaluation, and acquisition requirements for each of the Commonwealth's agencies
- Completely configurable asset structure that allowed state-specific assets such as executive orders and legislative acts to be cataloged in addition to software assets such as components, portlets, and services
- Multiple search options including simple indexed searches, model-based searches, and advanced searches
- Integrated reporting on asset reuse savings, asset contributions, usage, and other key metrics
- Web-based access for executives, planners, and managers. IDE-based access for developers and architects

PEAR allows agencies to contribute assets and for all the Commonwealths critical stakeholders to search for, discover and reuse these assets as applicable. With the enabler for enterprise asset business visibility in place, BSCoE's focus has shifted to enabling reuse of agency business assets rather than creating new assets. These

Figure 3 – PEAR

efforts include assistance with navigating the reuse process, creating reusable assets, understanding common business data conventions, and taking steps towards a Service Oriented Architecture (SOA). This shift in focus will enable BSCoE to leverage the vast pool of existing and forthcoming agency assets as a basis for enterprise reusable assets.
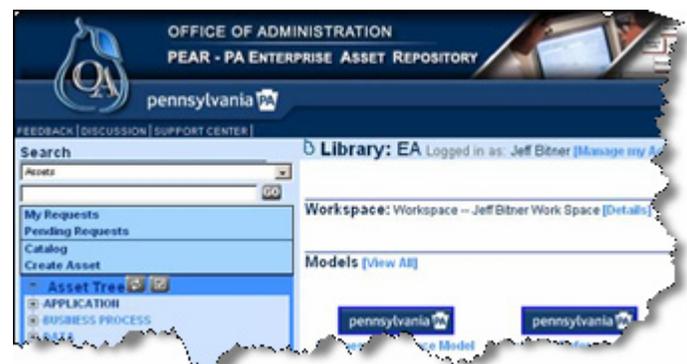
B. Significance to the Improved Operation of Government

BSCoE is improving the operation of government by working to eliminate siloed application development within the Commonwealth through the standardization of asset governance processes, asset description and discovery mechanisms, and increasing the visibility of the assets already established throughout the enterprise.

With the establishment of PEAR, the Commonwealth is moving towards its goal of institutionalizing enterprise-wide reuse and, ultimately, a service-oriented architecture. Practices that were unheard of just a couple of years ago are now becoming commonplace. Developers are using PEAR to discover and reuse assets developed either internally at their own agency or provided by another agency. IT executives can valuate reuse of the assets by generating reports based on the quantifiable measures that have been established to track and report on the effectiveness of the reuse program. Agency leads are implementing local asset governance processes based on the standardized governance processes that have been established and agreed upon for the sharing and consumption of assets within their particular agency. Figure 4 captures some of the key behavioral transformations brought about by BSCoE and the move toward enterprise business asset visibility.

	Before BSCoE	Since BSCoE
Enterprise Asset Visibility	IT planners and agency governance bodies had no clear mechanisms to identify and leverage existing application investments	PEAR provides IT planners and agency governance bodies with visual asset models that facilitate the discovery of individual assets and relationships between assets
Asset Description and Discovery	No clear asset metadata existed for agency assets. Asset reuse across projects was due to word-of-mouth. Asset reuse across agencies was circumstantial.	A common metadata scheme was implemented in PEAR. This enables a common vocabulary for describing and discovering assets across the Commonwealth.
Valuating Assets / Reuse Savings	Asset reuse was not by intention. No savings or valuation numbers were kept.	Custom cost metrics can be applied to assets on a project-by-project basis, to meet that project's cost structures. Reuse can then be measured and valuated across the enterprise.

Figure 4 – Improvements to Operations

C. Benefits

BSCoE tangibly enables the Commonwealth's Agencies to achieve cost savings through asset reuse and facilitates increased inter-Agency and intra-Agency communications. Both of these benefits have positive repercussions for other Commonwealth stakeholders such as citizens/taxpayers and the Office of Information Technology (OIT).

Prior to the implementation of PEAR, the Commonwealth did not have a common way to describe their existing asset base. Without this standardization to refer to, Agencies were left to develop their own way of describing assets. This resulted in numerous siloed metadata structures that impeded the ability for assets to be shared between Agencies.

Search

Assets

DB2   GO

Figure 5 – Keyword Search

Through the establishment of PEAR a standardized metadata schema, or way of describing assets, was borne. This schema provided a way for the Commonwealth to govern the way that assets are identified, described and related to one another. This benefit of this common understanding was immediately realized by the Agencies and resulted in a 100% adoption rate by all Pilot participants. This schema also sets the path for establishing the cost-savings associated with the ability to communicate and discover assets that exist as part of the Commonwealth's already established asset base.

Effectively facilitating the discovery of assets is another key benefit established with the implementation of PEAR. Through the use of common navigational metaphors, PEAR enables Agencies to quickly locate assets throughout the Commonwealth. There are three basic mechanisms that can be used by Agencies to locate assets: (1) A Google-like search, as illustrated in Figure 5, can be used to do a keyword search for an asset; (2) A hierarchical tree-based navigation, depicted in Figure 6, can be used if a specific asset is known; and (3) Graphical models, based on reference models established by the Federal Enterprise Architecture, shown in Figure 7, that provide a way to visually establish traceability between lines of business and technical assets.
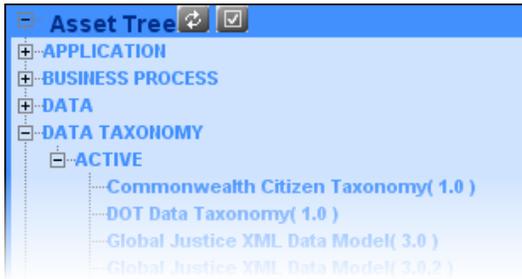
Figure 6 – Tree Search

Through PEAR, BSCoE also established standardized governance processes for consuming and submitting assets. These standard processes allow Agencies to be confident that their assets are only exposed and consumed by approved entities. They also serve as a roadmap for Agencies as they establish a presence in the PEAR by laying out common roles and workflows that must be established upon initial entry into PEAR. These processes also allow assets to be tagged with measurable criteria.

A final benefit of PEAR is realized by the Commonwealth development staff. PEAR offers the ability to take advantage of the asset discovery, acquisition, and submission processes using their current development toolsets. This benefit alone has proven to accelerate the adoption process of PEAR and results in quantifiable cost-savings to the Commonwealth by eliminating the need for training on a new toolset, and eliminating unnecessary moving between windows.
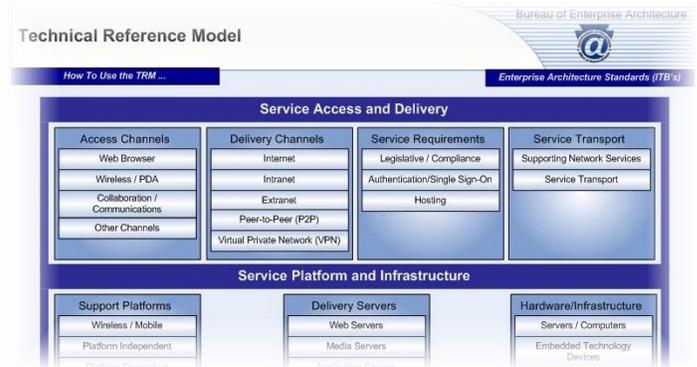
Figure 7 – Model Search

D. Return on Investment / Payback

BSCoE cost savings are realized and calculated based on the shared cost of a centralized repository and standard asset reuse measures that are established on a per-asset basis. The accrued savings will increase as more assets are entered into the Pennsylvania Enterprise Asset Repository and become available for reuse to the Commonwealth.

BSCoE enables Agencies to select from a pool of existing software, process, and knowledge assets. Even when only a small percentage of a project's needs can be met directly through asset reuse, the cost savings can be quite considerable. In essence, every asset that can be reused is one less that needs to be built from scratch. Aside from the direct cost savings, Agencies also benefit from the increased quality and risk reduction of an asset that has been through an established review process. Finally, Agencies are likely to achieve long term application maintenance cost reductions due to the pooled maintenance responsibilities associated with shared assets.

With the establishment of PEAR, the Commonwealth has a tangible way of measuring asset reuse and quantifying the actual ongoing cost savings achieved through the reuse program. While the first year savings is estimated at $1 million, this savings is expected to increase substantially as more Agencies are added to the repository. BSCoE calculates this savings based on a number of factors, including:

- The number of new Agencies added to PEAR, calculated every 6 months

- The percentage of total Agency assets that are contributed for reuse
- The median asset value for Agency contributed assets
- A mean reuse percentage per Agency, calculated based on the total number of available assets

Repository Savings Report: BSCoE
Lists assets produced and the ROI and time savings based on acquisitions.

Begin Date: 1/1/07   End Date: 4/30/07   Units: Hours   Labor Rate: $60.00

Asset	Asset Type	Owning Group	Acquisitions	ROI	Time Saved
BSCoE .NET Reference Application (1.1)	APPLICATION	BSCoE	3	$9,000	150 h.
BSCoE .NET Reference Application (2.0)	APPLICATION	BSCoE	6	$18,000	300 h.
BSCoE Java Reference Application (1.0)	APPLICATION	BSCoE	1	$3,000	50 h.
BSCoE.NET Framework (1.1)	COMPONENT	BSCoE	12	$72,000	1200 h.
BSCoE.NET Framework (2.0)	COMPONENT	BSCoE	6	$36,000	600 h.
BSCoE4J Framework (1.4)	COMPONENT	BSCoE	1	$6,000	100 h.
BSCoE4J Framework (1.5)	COMPONENT	BSCoE	1	$6,000	100 h.
Software Engineering Process (1.1)	KNOWLEDGE	BSCoE	23	$82,800	1380 h.
Code Coverage White Paper (1.0)	KNOWLEDGE	BSCoE	4	$3,600	60 h.
Data Access Block Performance White Paper (1.0)	KNOWLEDGE	BSCoE	3	$2,700	45 h.
Logidex Login Portlet (1.0)	PORTLET	BSCoE	2	$3,000	50 h.
RSS Portlet (1.0)	PORTLET	BSCoE	7	$12,600	210 h.
		Totals:	69	$311,400	5190 h.

Figure 8 – Repository Savings Report

Using an average of 3 new agencies added per period, a conservative 30% contribution rate, a median asset value of $3,000, a 15% reuse percentage per agency, and assuming away any organic growth within an Agency, the five-year savings can be estimated at $12 million, represented by the *Linear* line in Figure 9.
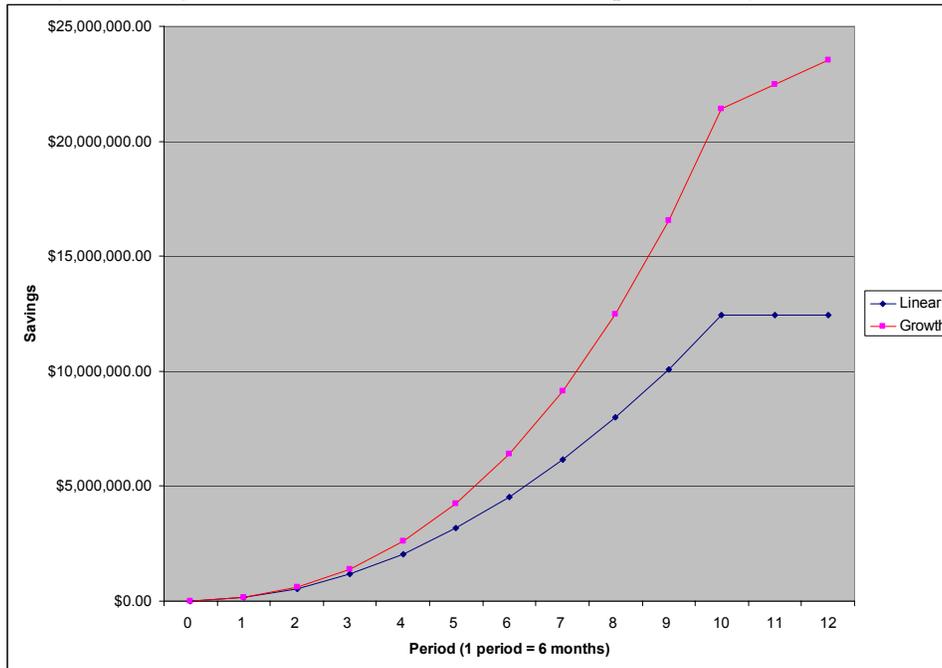

Figure 9 – Estimated Reuse Savings

A more realistic yield for future savings is represented by the *Growth* curve in Figure 9. This curve is based on the formula represented above but includes an estimated organic reuse growth percentage of 0.5% per period, and a median Agency Asset growth of 3 assets per period. This growth curve gives a more realistic picture and can be justified based on the fact that as more Agencies are brought into PEAR, the pool of available reusable assets becomes ever increasing. This along with the fact that as Agencies become more and more accustomed to using PEAR, they will take further advantage of the assets available for consumption.