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## **Platforms and Planning: Pennsylvania's Transition to Enterprise Computing**

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### **Abstract**

The Commonwealth of Pennsylvania's ongoing efforts to pursue enterprise computing are analyzed from two perspectives. First, historical changes over the course of a decade (1995-2004) are characterized as one state government shifts from an organizational to an enterprise perspective. From a strategic perspective, examples of information and communications technology (ICT) planning highlight the nature and roles of strategic alignment used to achieve the desired goals of the efforts, and to explicate expected activities and second-order effects of the enterprise from a platform perspective. Findings from this analysis mark the importance of strategic planning for providing a means to integrate across enterprise processes, operations, and standards, the need for bi-directional and continuous mapping of the enterprise, and the need for reflection and evaluation even after that the enterprise is engaged.

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## **Platforms and Planning: Pennsylvania's Transition to Enterprise Computing**

In this chapter we report on the Commonwealth of Pennsylvania's ongoing efforts to pursue enterprise computing. In doing this we make two contributions. First, we focus explicitly on the enterprise perspective of computing (Bernard, 2004). In doing this we look beyond particular computer applications and the needs of work groups to focus on inter-organizational systems (Markus, et. al., 2002). We characterize the Commonwealth of Pennsylvania's state-level government as an enterprise and focus on their computing changes over the past decade to provide examples of the move from organizational to enterprise perspectives (e.g., Fountain, 2001). In doing this we provide additional evidence that institutional structures and operations are intimately bound up in a socio-technical symbiosis with the technological structures and operations (Hughes, 1986; Agre, 1999; 2000)

Our second contribution is to focus explicitly on the role of information and communications technology (ICT) planning, again using Pennsylvania's efforts as the source of examples. In focusing on ICT planning, we highlight both strategic alignment (Henderson and Venkatraman, 1999) and platform (Ciborra, 1996) perspectives. The strategic alignment perspective helps focus on making explicit the ICT decisions that will best support achieving desired organizational goals. The platform perspective helps focus on the potential for the uses of ICT to lead to unexpected activities and second-order effects: those that were not at first imagined, but become possible only by having a particular ICT in place and used (e.g., Kiesler and Sproull, 1991).

While organizations in both the public and private sector continue to seek administrative rationalization and increased operational effectiveness (albeit often using different measures to define success), we know that public sector organizations differ from private sector in their take up and uses of ICT (Boyne, 2002; Danziger, Dutton, Kling and Kraemer, 1982, Bozeman and Bretschneider, 1986; Rainey and Bozeman, 2000). In particular, the concept of enterprise computing, the arrangement of computing assets in a rationalized and strategically compliant way, and embodied in approaches such as enterprise architecture (see NASCIO, 2003; Bernard, 2004), has been taken up at the U.S. Federal and state levels to some degree (see, for example, [www.feams.gov](http://www.feams.gov)). In contrast, the take up and use of enterprise systems such as those sold by SAP, Oracle and others, and often known as enterprise resource planning or ERP systems) has been a dominant computerization activity in the global, Fortune 1000 companies over the past 15 years (and is now a focal activity of many small-to-medium enterprises).

### **Enterprise Computing**

Enterprise computing marries the selection, development, and deployment of ICT tightly with organizational structure and operations (Bernard, 2004). This is done via semi-automating key organizational processes, aggregating data and information, standardizing operating systems, applications, and physical devices, integrating workers using common systems, and demanding a rationalized set of operational policies and procedures. Enterprise systems are often depicted as a "stack" or "layered" model (Spewak, 1993). In these models, computing elements are arranged by functionality with lower levels focused on transporting data and information, and higher levels engaging issues of people and organizational needs. In the five-tiered enterprise

computing model, the first layer includes the transportation media, protocols and devices as the base. The operating systems, systems software, and data structures are at the second level, above which are the devices, applications, and inter-dependencies that are demanded of software(third) followed by the fourth level, which includes work processes and procedures that are both guided by and integrated into the policies, procedures and strategies being pursued by the enterprise that are laid out in the fifth tier. In this way enterprise computing provides interconnections between functionally-based computer applications and strategic planning.

There have been, in practice, several means to achieve this vision of enterprise computing. Prior to the development of open computing platforms such as the personal computer and Internet, most organizations pursued proprietary systems (e.g., having all IBM products). This model is no longer actively pursued by most organizations. Rather, the current dominant model selects compatible systems and focuses on inter-operability among multiple vendor's products. Often this leads to where the typical enterprise has dozens, if not hundreds, of different vendors providing networking, applications, hardware, and systems that must be integrated and supported in complex, evolving and idiosyncratic webs of computing (e.g., Kling and Sacchi, 1982).

More recently, three trends in computing have helped reshape computing at the enterprise level. First, the shift of computers to be essentially commodities has led to computing purchases that are more driven by software than by hardware decisions. Second, the rapid rise of inter-networking (most visibly, the internet) and third, the relative ease of interconnection among an organization's computing assets (via virtual private networks and other networking approaches), has shifted organizational attention towards software applications that share data, engage common work practices, and provide computing functionality to workers independent of location.

### *Enterprise Systems*

As a result, several software systems vendors have offered integrated systems that support work groups, the most common of which is Microsoft's near ubiquitous "Office" suite (that includes software applications such as word processing, calendaring etc). The concept of integrated suites of software to support work has also engaged the organization. Here, vendors like Oracle and SAP offer enterprise systems that work with databases and provide accounting, payroll, sales, ordering, customer service, and other organizational-level functionality in support of business and work processes. These 'enterprise systems' are large, complex and demand extensive training to implement and maintain. In complement, there are large and steadily growing academic and professional literatures on the technical aspects, implementation issues, and strategic decisions regarding enterprise systems.

An enterprise system often has a number of integrated modules that share access to a common set of data which can be accessed via coherently-designed uniform screens. These screens are often web-based (i.e., a personal computer can gain access using a simple browser such as Netscape or Firefox). One difference between workgroup office suites and enterprise systems is scale. For example, SAP's R/3 ERP (one of the most common and comprehensive enterprise systems, adopted by Pennsylvania) is based on 1980's programming and innovations in creating a client-and-server architecture. The SAP R/3 system has four major elements: an integrated

database, a set of development tools (ABAP), a means to encode, apply and manage business, and workflow rules that guide the operations, and the collection of business modules. These modules are typically grouped into four elements: finance, human resources, manufacturing (and logistics) and sales. Within each of these elements are a range of modules (e.g., sales can include customer relationship management and distribution modules)<sup>1</sup>.

### *Enterprise Architecture*

An ‘enterprise architecture’ is a set of abstractions used to represent the integration of physical computing devices and high-level strategic aspirations via processes, data, and work organization. Exemplified in both enterprise architecture and enterprise systems, enterprise computing is an attempt to tightly align an institution’s computing and information assets with its organizational structure and operations (Spewak, 1993).

Whether they are enterprise architecture or enterprise systems, enterprise computing activities are difficult to engage successfully. In the Pennsylvania state government context, for example, engaging enterprise architecture demands that here-to-fore semi-independent agencies consider others in their planning, and they require someone to engage, sustain, and support the collaboration, coordination and communication these activities demand, all-the-while withstanding the strain on the treasuries of even well-funded units.

### **The Pennsylvania Enterprise Computing Efforts: 1995- 2004**

We focus on the Commonwealth of Pennsylvania’s efforts in enterprise computing for three reasons. First, states are complex enterprises and serve the purpose of being a revelatory case for this exploration (Yin, 1989). The U.S. Federal government is too large to engage as a singular enterprise, while regional or county-level enterprise activities are still relatively rare. Second, Pennsylvania was one of the first states to attempt an enterprise systems implementation (engaging SAP in 1999) and did so by first engaging enterprise computing principles. Third, since 2003, Pennsylvania has been actively pursuing enterprise architecture as a means to realize the values of enterprise computing and their investment in an enterprise system.

### *Pennsylvania Context*

In the early 1990’s Pennsylvania government was composed of approximately 152,000 employees (FTE), supporting an estimated population of 12 million citizens. State government revenues totaled approximately \$36.7 billion (U.S. Census, 1992). Pennsylvania’s economy was still dependent on traditional manufacturing-based industries and Pennsylvania was ranked 47<sup>th</sup> in job growth rate. Not surprisingly, even before January 1995, when Governor Tom Ridge and his administration took office, there was a widely perceived need to move the state economy and labor force toward new forms of economic development that were less likely to focus on traditional blue-collar manufacturing jobs.

While the state economy was continuing to transition away from traditional industries, state government was seemingly stuck within an outmoded technological paradigm. Pennsylvania’s

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<sup>1</sup> For more information on enterprise systems, see [www.cio.com/research/erp](http://www.cio.com/research/erp)

annual investment in electronic data processing and telecommunications was estimated to be \$275 million (IMPACCT, 1996). Within state government, the ICT infrastructure of most Commonwealth agencies had fallen behind industry standards and agencies often held firmly to a belief that each should have control of both the information that it generated and used, as well as the hardware and software used to manage it. Thus, there were 21 data centers, each operating relatively independently, with little redundancy, or oversight. Moreover, systems were failing, downtime was rising, service-levels were dropping, as was the morale of the Commonwealth's technical staff. Furthermore, Pennsylvania lagged behind other states in the establishment of a government-wide presence on the WWW and did not establish such a presence on the WWW until October of 1995 (and only West Virginia and Mississippi trailed PA onto the web).

In 1995, Governor Ridge commissioned the "Improve Management Performance and Cost Control Task Force", or IMPACCT (1996). Their report, published in 1996, recommended that the Commonwealth develop a long-range IT management strategy, improve the cost effectiveness of IT investments, better serve citizens through the use of IT, employ IT to make the Commonwealth more competitive, improve the use of IT by regulatory agencies, and improve the operations of agencies through the use of IT. The report laid out that a case that initial investments in the state's IT and telecommunications infrastructure could ultimately yield a 5-10% savings in the state's annual IT outlays. The report specifically recommended seven strategic actions in regards to state government IT investment:

- Reexamine agency policies regarding the sharing of information
- Alter personnel policies in order to provide competitive compensation for high level IT managers and technical staff
- Move toward off-the-shelf application procurement instead of in-house development
- Create an inventory for reuse of packages already developed by the Commonwealth
- Select a suite of software engineering tools for use by all agencies in developing new custom applications
- Move toward the development of relational databases
- Revise procurement standards to assure that they meet required standards, improve competition, and reduce vendor prices.

In early 1996, at about the same time the IMPACCT report was released, Governor Ridge created the Office for Information Technology (OIT) within Commonwealth's Office of Administration (OA, the administrative arm of PA state government). The deputy secretary of OIT became Pennsylvania's 'chief information officer' (CIO). The CIO was charged with engaging the recommendations of the IMPACCT report, and they laid out how they were to engage these in their 1997 strategic plan, *Breaking Through Barriers*<sup>2</sup>.

### *Enterprise computing in Pennsylvania*

During the late 1990s, the OIT staff were encouraged to innovate using ICT. They worked to take on big-ideas, to learn from mistakes, and to pursue a range of projects tied to either

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<sup>2</sup> See [www.oit.state.pa.us](http://www.oit.state.pa.us).

economic development or educational excellences. The combination of clear and active issue advocacy from senior executives, the legitimization that access to both budget and senior cabinet counsel provided, the combination of innovative ideas with analytic approach to taking on ICT projects, and the willingness to take risks all reflect both the administration's commitment to engaging ICT and the important role the OIT played in establishing both a vision for computing and standards for the Commonwealth. In doing this, OIT exemplified the enterprise computing perspective.

The OIT played a critical role in developing an enterprise perspective. Its very presence –coming from nothing to a thriving organization housed in the Office of Administration with direct access to the Governor – and willingness to engage in formal and informal actions to establish enterprise computing oversight across PA state government made it a central player.

The OIT's guiding principles were set out in a short (six page) document. These principles depicted ICT as a lever to enable economic development, reflected private-sector sophistication in developing ICT combined with public-sector ideals of service delivery and access, and laid out general principles for what ICT and the computing architecture of PA would be. This big-picture view provided a guiding frame, and not a detailed specification, for how to take on ICT. These principles helped OIT to focus on leveraging interests of constituents and emphasized negotiation and consensus. The OIT staff took an analytic orientation when engaging this work: focusing on getting evidence and using it to make their points. Their ability to develop (and provide) evidence, and their pursuit of computing tied to the guiding principles, became a potent force pushing the enterprise computing agenda.

In Table 1 and below we highlight seven projects undertaken by OIT to engage enterprise computing. These seven projects represent a subset of the more than 30 initiatives undertaken wholly or in part by OIT during 1995-2005<sup>3</sup>. They reflect the projects that have substantial enterprise computing components and our intent in highlighting these is to make two points:

- (1) Technological development of PA's enterprise computing is inseparable from the organizational and policy developed to guide and support this work.
- (2) Enterprise computing efforts made by PA and the OIT across ten years (1995 to 2004) represent a consistent planning focus that reflects both a platform approach and strategic alignment principles.

These seven projects include the effort to consolidate across the nearly 60,000 personal computers into a common desktop software and email standard (and, when PA did this, they became the first state to partner with Microsoft with a state-wide licensing agreement). Second, they consolidated the data centers and telecommunications. Third, they developed a streamlined ICT procurement process (ITQ). Fourth, they embarked on several government-to-business web portals (PA Open for Business) and developed a state portal providing a range of services (PA Powerport). Fifth, many of these projects were funded in part by an innovative technology investment program (TIP) that allowed the CIO to fund initiatives that embodied or enabled economic development or educational excellence. The money from TIP and the leadership by OIT staff made this (new) office a central node in e-government. Sixth, beginning in the Ridge

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<sup>3</sup> We do not include the public safety radio initiative and Justice Network (JNET) system development. While these are enterprise wide, they are also focused in the specific areas of public safety and criminal justice/homeland security. The nine projects we highlight engage the entire Commonwealth of PA government.

administration and continuing into the Rendell administration, PA pursued an enterprise systems implementation effort, focusing on SAP R/3 as a state-wide administrative operational platform. Seventh, early in the Rendell administration, OIT engaged in three related efforts to consolidate IT decision-making for the PA Commonwealth. First, they opened a state-wide office to support enterprise architecture. Second, OIT was able to gain authority to both review and approve the other state agency's IT planning and funding requests. At this time, the deputy secretary of OIT was given some input on hiring for the 43 agency CIO positions, providing formal organizational oversight to a process that had relied on informal interaction for the first 10 years of the CIO and OIT work.

#### *Commonwealth Desktop Standardization: Commonwealth Connect*

In 1994, agencies within the Commonwealth were supporting between 3000 and 3500 personal computers (PCs). By early 1998, this number had grown to nearly 25,000 PCs and by 2002, there were upwards of 65,000 desktop computers. As was typical in the mid-1990s, individual agencies had control over the software that operated on their PC's. In 1997, the OIT began roundtable discussions with leading software companies to explore the value of standardizing all agencies to a single software package for handling office productivity and e-mail functions. In 1998, OIT/PA selected a Microsoft desktop and e-mail software and moved over three years to a standardized desktop/ work group and email software. In addition to the savings related to the standardization initiative itself, the Commonwealth was able to obtain a commitment from Microsoft to invest \$11.9 million for economic development and educational projects in PA communities. Therefore, OIT was able to leverage its sizable purchasing and contracting power to gain additional value from the vendor in order to help important stakeholder groups.

#### *Commonwealth Data Center and Telecommunications Consolidation*

Two projects in near parallel helped PA to rationalize and consolidate its computing infrastructure. One of OIT's initial projects was to first consolidate, and then outsource to a vendor, the agency-run data centers that had been identified as sources of inefficiency and redundancy. The intent was to make better use of Commonwealth assets and to improve performance. By the mid 1990s, the Commonwealth possessed 21 different data centers that were run independently for 17 different agencies. And, only one of the centers was more than eight miles from the capital of Harrisburg. These centers created numerous redundancies in regards to the costs associated with their management and maintenance and, furthermore, made it difficult to either share information across agencies or for the agencies themselves to promote more efficient management of their ICT resources.

The Data Powerhouse project was a major step towards integrating the management of ICT across the Commonwealth's government with an eye toward cost savings and improved efficiency. After a competitive bidding process, a seven-year contract was awarded to a 10-company group led by Unisys in 1999. In doing this, the Commonwealth not only consolidated their data centers, but also was the first large state to outsource the management and maintenance of such centers.

At about the same time as data center were being consolidated, the OIT formed an office to oversee telecommunications policy for the Commonwealth. By 2000, the Bureau of Commonwealth Telecommunications Services (BCTS) was formed to oversee the consolidation

of all state telecommunications efforts into an omnibus contract and concurrently the development of a shared metropolitan area network that all state agencies used.

#### *Invitation to Qualify (ITQ)*

Invitation to Qualify (ITQ) was implemented to improve the speed and reduce the cost of selecting vendors. In the ITQ, vendors are pre-qualified to provide services and state agencies can select from this list of pre-approved companies to meet their procurement needs. The ITQ process was first piloted on the procurement of LAN services in 1996, and has since been applied to the procurement of many services, including IT consulting, computer training, computer programming, and computer systems analysis to name a few. Prior to the ITQ process, the RFP cycle could take six months or more to complete. Under the ITQ process, procurements have been completed in as little as three days. ITQ vendor lists are open for continuous enrollment and allows for pre-qualification of an unlimited number of vendors

#### *Portals: PA Powerport and PA Open for Business*

Two portals were developed by OIT in cooperation with a number of agencies. Both continue to expand. PA Powerport is the state's web site and a nationally recognized portal for government-to-citizen interactions. The PA Open for Business is a web site that provides entrepreneurs with state government forms they need to do business in PA. Both are architected using dynamic site frames (DSF), combines standard XML with proprietary structures. The DSF web standards and approach were presented as a rudimentary computing architecture. Any PA government agency that engages DSF also gets access to all other content and design done in DSF. This leveraged consistency and rewarded a PA technology company (Cimbrian) who developed and licensed the DSF framework<sup>4</sup>.

#### *TIP Program*

The Technology Investment Program (TIP) came about to help PA with the Y2K problem. Initially, a pool of money was set aside because state officials did not know which agencies would require funding. This money was a separate appropriation from the budget office, a line item in the budget that was part of the overall general fund. After Y2K, the TIP was continued for other technology uses because the 18-month budget cycle does not allow for quickly changing technological needs. This allowed the OIT to have discretionary funds that they could allocate to areas and agencies deemed in greatest need for software, hardware, or development.

#### *OIT Oversight*

Many of the projects initiated by OIT were innovations, designed to encourage PA Commonwealth agencies to engage in IT as a means of both taking an enterprise perspective and leveraging the technology to improve both internal operations and service delivery to constituents. These efforts reflected the 'boom times' of the 1990s, and by early 2000's state-level funds were squeezed. During this period, the OIT initiated more aggressively the implementation of organizational structures and policies to solidify their ability to leverage enterprise efforts for the Commonwealth.

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<sup>4</sup> For more information, see <http://www.oit.state.pa.us/oaoit/cwp/view.asp?a=172&q=146121&oaoitNav>.

Three activities during this period reflect this goal. First, the OIT opened an *Enterprise Architecture Office*. This office was charged with developing a state-wide enterprise architecture, defining and promoting standards for development, operations and infrastructure, and engaging the various IT units in the Commonwealth to participate and collaborate. In doing this PA became one of the first states to explicitly engage enterprise architecture, and was a beta site for the National Association of State CIO's (NASCIO) enterprise architecture program. Second, the deputy secretary of OIT was provided, by executive order, to *participate in agency CIO selection*. By virtue the OIT/CIO had now a formal oversight role to the 43 agency CIOs in PA state government. Third, in the same executive order OIT gained *oversight on agency IT budget and project planning*. This means that OIT had increased governance over IT spending for the Commonwealth. These actions helped to move enterprise computing from a voluntary activity pursued through informal means to be a more formalized activity across the agencies that comprise the Commonwealth's state government.

#### *Enterprise systems implementation in PA*

The largest and most visible enterprise computing efforts has been the SAP Implementation. Pennsylvania was one of the very first states to embark on the multi-year effort to link together their governmental operations through the use of an enterprise resource planning system. The decision to purchase and implement SAP reflects a long-term view of this ICT as a platform or enabler of future government opportunities.

The decision to engage SAP in particular reflects an ongoing series of discussions among the governor's office, key agency leaders, OIT and the IT leaders of many agencies. The efforts to standardize the desktop, data center consolidation, and rationalization of the telecommunications infrastructure provided venues to reflect and discuss agency and Commonwealth needs for upgrades software, systems, and processes used to support core business functions. Rather than address these requests individually, over the course of these and more focused meeting, it was determined that significant advantages could be gained by responding in a more coordinated fashion with long-range benefits. This idea became the Integrated Enterprise Systems (IES) (formerly known as, "ImaginePA")—the state's effort to streamline and standardize key business processes regarding accounting, budgeting, payroll, human resources, and procurement.

In two rounds of competitive bidding, first the software (SAP's R/3) and the system integrator (KPMG) were selected. From the SAP r/3 product suite, five SAP ERP components were selected developed to integrate and serve each of these business process and to advance the IES initiative (accounting, budgeting, payroll, human resources, and procurement).

The SAP implementation (follow the MySAP implementation approach) and concluded between in early 2005. As is typical of most large-scale information systems and of the majority of enterprise systems implementations, the effort was more complex than expected the software required more customization than was expected and the organizational resistance to business process changes was more resolute than expected. Thus, the implementation took several years longer, completing in 2005. It spanned two project managers and two gubernatorial changes (i.e., Ridge/Schweiker to the Rendell administration).

#### *Issues*

The SAP R/3 components were to be implemented uniformly across all agencies, allowing for very little customization. While this standardized processes and information across users, the designed system failed to address some agency-specific needs. For example, in procurement, employees and agencies were forced to develop “quick-fix” or work-around responses for system misspecifications. One agency noted that the SAP Procurement system did not generate the type of reports needed for their transactions. As a result, in addition to using the new SAP system for documentation, they also had to replicate their traditional method for processing reports, which led to work redundancy and the application of a parallel work process.

A second set of issues involved training and human resources. About a year prior to transition to SAP, users engaged mandatory SAP R/3 training sessions. Neither the state government nor SAP(the system manufacturer) designed the training courses for this implementation. Rather, the design and instruction of the formal training program was contracted to a third-party vendor. Consequently, the credibility of the training was challenged as this third-party vendor was perceived as being unfamiliar with both government procurement policies and the software for which it is was commissioned to develop training modules.

Moreover, while formal training was mandatory across agencies, the enforcement of training requirements varied from agency to agency. Some viewed training as a critical step to successful implementation, while others deemed it a waste of time. As a result, formal training rates varied largely across agencies, but were fairly stable within agencies (e.g., individuals within agencies that enforced training had higher rates of participation than those that did not enforce training). This led to problems early in the take up of SAP R/3 modules.

Issues with process change continued. For example, the SAP Procurement module was to be implemented in all government agencies in central and field offices across the state. The magnitude of difference between the new system and the legacy system was reported to be substantial. To this point, 95% of all organizations participating in the implementation rated the new SAP Procurement system as being “very different” from their previous work methods, which did not allow for as detailed documentation of purchasing transactions or as great of access to records filed by other offices and agencies.

Prior to SAP Procurement, the methods of conducting purchases and requisitions in agencies across the state were diverse. Some agencies used traditional paper-based processing, many others used a state-designed system of antiquated electronic spreadsheets, and one agency had an electronic procurement database that was relatively sophisticated, but it was not networked with other business components as SAP allows. For most agencies, the new SAP Procurement system introduced a medium for data entry, it required the storage of more detailed information than was previously recorded, and it provided greater access to procurement records and histories within and across agencies.

Not only did SAP Procurement introduce a speedier form of information processing and retrieval, it also changed the quality of the communicative interactions among agencies. Interfacing in a virtual work environment decreased the need for some personal interactions, and created a sense of work abstraction with elimination of more tangible hard-copy process markers,

such as documents, records, receipts, and communication logs. All of these facets of SAP Procurement system made it a unique information technology to study.

Although the system was deemed a radical change for procurement processing, some aspects of procurement remained the same throughout the implementation, namely state procurement laws and the order with which work processes moved critical information from one part of the agency to another (i.e., chain of command). These things remained relatively constant, as did the intact agency networks that existed prior to the implementation. Those agencies with a history of collaborations, shared services, and/or partnerships continued to work together, independent of the system used to for executing procurement.

There were also political aspects of implementation. For instance, two reasons initially outlined by the state for implementing the SAP Procurement system were: 1) to increase the access of information within and across agencies in an efficient effective manner in order to share knowledge and crisis manage, 2) reduce expenses associated with vendor-shopping in order to facilitate better purchasing management. Several unintended side-effects grew out of the scale and ambitious nature of the SAP implementation. One of these is that, while communication was increasing across agencies, it was often with regard to SAP system problems--not the valuable organizational knowledge-sharing that the use of the system was intended to inspire.

A second unintended result of the implementation was that long-standing relationships between the state and some local vendors were impaired, and in some cases permanently severed. The incoming Rendell administration instituted new no-bargain contracts for up to five-years. These require that the state purchase certain goods (e.g., toilet paper, sheet metal, etc) through select approved vendors only. Some local vendors with historic ties doing business with the state were excluded from the SAP-approved vendor lists. Not only were relationships damaged by these mandates, these contracts eliminated the ability to “shop” for a best exchange rate, as the system was initially intended to support and as was outlined by the former Ridge-Schweiker administration as a priority function of the ERP system. The issue of bargain management countered with no-bargain contracts left many users wondering why the ERP system was being implemented if state policies prohibited the goals the system was designed to achieve.

Another political issue that affected the implementation of the SAP procurement system was a change in gubernatorial leadership from the out-going Ridge-Schweiker administration, which initiated the IES effort (as Imagine PA), to the incoming Rendell administration. This change in leadership was thought to account for some of the implementation delays that affected agencies in the latter wave of transition. Leadership change was prevalent throughout the implementation of this system, affecting some agency structures across many state levels.

### **Planning and Pennsylvania Enterprise’s Computing Activities**

Across ten tumultuous years, the Commonwealth of Pennsylvania’s political and IT leadership made a series of decisions that showcase a pattern of enterprise thinking around the value and uses of computing. These decisions transcend three governors, two administrations, four CIOs, the rapid rise and bursting of the ‘dot.com’ boom, terrorist attacks on the U.S., and a host of less visible but significant events. The evidence is compelling: PA has made substantial progress.

In the remainder of this chapter we explore this ten year trajectory of decisions in three ways/ First, as evidence of an enterprise computing perspective, then as an example of platform planning, and, in contrast, a third perspective is as an example of ongoing strategic alignment. As we laid out at the beginning, enterprise computing is the most recent and most visible effort to engage the symbiotic relationships among an institution's structures and functions and the ensemble of computing and communications technologies (Bernard, 2004). The platform and strategic alignment perspectives on planning represent fundamentally different approaches, with platform perspectives highlighting bottom-up and strategic alignment focusing on top-down engagement (Saaksjarvi, 1997; Ciborra, 1997).

#### *Planning: An Enterprise Computing Perspective*

The current literature suggests that public sector organizations continues to engage in computing differently than do private sector organizations (Bozeman and Bretschneider, 1986; Heintze and Bretschneider, 2000; Boyne, 2002). The level of red-tape, purposes for use, and funding models make it more difficult for public sector organizations to realize the value of computing. And, evidence suggests that managing public-sector IT efforts is also different from private sector in that it is even more difficult to engage in process re-engineering (Cats-Baril and Thompson, 1995; Shalala, 1998).

More recently, enterprise computing has become a focal point in the practice of public-sector IT (NASCIO, 2003). In enterprise computing, techno-centric approaches advocated by those engaged in building enterprise architecture from the bottom-up are balanced by the strategic-institutional perspectives (Markus, et. al., 2002; Fountain, 2001). Enterprise computing provides a layered and integrated view, and focuses on ordering the strategic and operational elements of an organization with the applications, data, and infrastructure to support them.

Seen in this light, the combination of policy decisions to establish IT oversight with OIT, the rationalization of the telecommunications, desktop and data centers, and the move toward an enterprise system reflects steady progress in pursuit of a coherent enterprise computing architecture. The more recent efforts by the newly created OIT Office of Enterprise Architecture to establish standards for development environments, middleware applications, and information sharing indicate that the efforts are cohering.

From an enterprise computing perspective, PA's efforts over the past 10 years illustrate how public sector organizations can engage the policy, operational, and technical elements together. Their work provides interested observers with both an example of how to engage enterprise computing, and evidence on the types of decision, stakeholders and projects that must be involved.

#### *Planning: A Platform Perspective*

Empirical evidence on the take-up and uses of computing in organizations indicate that many new systems do not lead to the effects intended, and often lead to unintended consequences (Leonard-Barton, 1988; Sproull and Kiesler, 1991; Sproull and Goodman, 1989). Ciborra (1996, 2000) builds on this, arguing that new IT serves as a platform for innovation. This innovating and learning can only happen once the system is in place, which leads to a bottom-up view of

planning: planning for IT can only take the organization to a certain point, then bricolage (learning and doing) takes over. This results in an indeterminate IT planning approach that requires extensive coordination and communication to engage.

The evidence from Pennsylvania's efforts over the past 10 years to more effectively engage computing can also support the bricolage argument. There have been many changed directions: the Microsoft licensing deal was not renewed, the vendor providing telecommunications has nearly failed, the ERP effort took two years longer than expected, and many of the intended benefits have yet to be realized. One limitation of the bricolage view of bottom-up learning is that, over time, organizations can learn – they adapt (Leonard-Barton, 1988) and the tumult of days and weeks in transition can give way to subsequent years of viable operations.

The platform argument is also supported by evidence from Pennsylvania's efforts. The ability to share files across desktops has made it easier to share information and opened up new ways of working across agency borders. The portals continue to evolve as both citizens and government agencies devise new ways to make it easier to interact, provide additional services, and update information. The creation of OIT has led to several organizational innovations around IT oversight, enterprise computing, and IT budget planning.

For those who advocate for bottom-up planning, the evidence from Pennsylvania suggests that organizations that pay attention to constituents (i.e., by creating forums and vehicles to engage people) can learn. OIT set a model example of how to engage in their seeking to innovate, focusing on gathering data and building a business case, and providing both financial support and internal expertise in project management and contracts.

#### *Planning: A Strategic Alignment Perspective*

The strategic alignment model posits that there is a complex relationship among the components of business strategy, functional operations, and the deployment and uses of computing (Henderson and Venkatramn, 1993; Grant, 2003). Strategic alignment is a dynamic, top-down approach, where organizational leaders seek to match strategic intent with the proper development and deployment of an IT infrastructure and processes. Critics point to its complexity and see it as a static or notional view (Ciborra, 1997), though the evidence from field-work is that strategic alignment is situated and always ongoing (Grant, 2003).

The nominal position in the strategic alignment model is that an organization's strategic vision should align with its strategic vision for computing and this should drive the selection and deployment of the computing infrastructure. If decisions about the computing infrastructure drive strategic decisions, there may be alignment. But this leads to where tactical decisions are forcing strategic choices: a reactive approach. A third approach to strategic alignment is that operational pressures of the organization could lead to making operational choices in computing. In this situation, operational decisions presuppose any strategic decisions. In practice, this has the look and feel of the strategic drift that Ciborra (1996; 2000) argues is too often the case in contemporary organizations.

The evidence from ten years of work by Pennsylvania and its OIT suggests that they have been able to move from operationally-led decision-making toward a strategic-alignment model. The

ability to see through projects, such as telecommunications infrastructure rationalization, common desktop standards, streamlined IT procurement, the TIP (to support strategic initiatives), and the recent oversight controls for agency CIO and IT planning, suggests steady progress toward increased alignment between the Commonwealth's strategic vision and the ability of its computing investments to support these visions.

There is also evidence of drift. The change of administrations led to changes in strategic focus. For example, the pro-business and economic development focus of the Ridge-Schweiker administration had been replaced with a more populist approach by the Rendell administration. Combined with economic changes (the surpluses of the 1990s have given way to lean years in the early 21<sup>st</sup> century), the focus seems to have shifted towards operational issues.

Moreover, the lengthy and difficult implementation of the SAP ERP suggests that process-level changes across the Commonwealth government are slow to realize. This is not all that different from the findings from the private sector (e.g., Grant, 2003). Given the differences in how computing is engaged in public sector organizations, and some of the differences between private and public sector organizations, it may be that process changes will be the most difficult to realize (Rainey and Bozeman, 2000; Boyne, 2002).

Pennsylvania's two portal efforts provide mixed evidence of the state's ability to engage sustained process changes. The technological ability of constructing a website that allows some integration of activities (by the site's users) across agency boundaries suggests that some process change is possible. The continued agency-level boundary protection that prevents further streamlining of business processes suggests further change will be slow.

The ten years of evidence indicates that Pennsylvania's state-level government has been able to engage in strategic alignment. The effort is not without its struggles, and the timescale suggests that alignment change is neither quick nor direct. The evidence does suggest that an enterprises' strategic intent can be mapped to the development, deployment and uses of computing assets. Furthermore, this alignment can be carried on across substantial organizational and environmental change. The scale and scope of Pennsylvania's government helps to make clear that organizational size, while a considerable influence, is not a barrier to such change.

What is also clear at this time is that infrastructural alignment is easier than process alignment. However, this is a relative comparison: the efforts to align the telecommunications, desktop standards, and procurement and funding approaches to computing are complex, difficult and expensive. As Pennsylvania's state government embarks on efforts to leverage their substantial investment in an ERP, the focus will be on business process change. From both the strategic alignment and enterprise perspectives, this focus is also the link between strategy and infrastructure. Given the steady progress made to develop a coherent enterprise computing architecture and to engage in strategic alignment, Pennsylvania is well-positioned to engage this next stage in computing. Drift and bricolage are also visible in the OIT efforts. Based on Pennsylvania's experience, it appears that these are one means for people to learn about what computing can do.

For those who seek examples and evidence for how to engage enterprise computing and pursue strategic alignment, Pennsylvania's efforts from 1995 to 2004 provide both a viable template and practical lessons. For those who seek to characterize the take-up and uses of computing as bricolage and drift, or to focus on the role of platforms for post-implementation innovation, there is extensive evidence from Pennsylvania's efforts to engage computing.

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**Table 1: Pennsylvania's Enterprise Computing Projects Timeline (1995-2004)**

**1995**

- January -- Tom Ridge (R) sworn in as Governor of PA
- October – PA's first homepage was introduced (48<sup>th</sup> state to do so)  
This became **PA PowerPort** (the state's portal site) in 2000

**1996**

- Spring – IMPACCT report published

**1997**

- July – **Data PowerHouse Project** (data center consolidation) announced
- August – **Commonwealth Connect** (desktop/office and email standardization) discussions begun

**1998**

- Summer – **Technology Incentive Plan (TIP)** fund created
- June – Contract with Microsoft finalized for **Commonwealth Connect**

**1999**

- Spring – Began processes to select vendors for ERP and systems integrators for **Imagine PA** (the enterprise system effort)
- October – **PA Open for Business** portal site launched

**2000**

- June – Contract with SAP finalized for **Imagine PA** software vendor
- August – Continuous enrollment begins in **Invitation to Qualify (ITQ)**: a procurement and vendor registration program)
- October – Full transition to **Data PowerHouse** complete
- October – Official launch of the **PA PowerPort** website

**2001**

- Early - **Imagine PA** project team created
- March – Contract with KPMG Consulting (with IBM as partner) finalized as system integrator for **Imagine PA** (SAP implementation)
- July – All Pennsylvania agencies' PCs (40,000 total) standardized on **Commonwealth Connect** desktop software
- December – Lt. Gov. Mark Schweiker becomes PA Governor (Tom Ridge becomes first secretary of Homeland Security)

**2002**

- July – Beginning of implementation of **Imagine PA** software (SAP -- leading ERP)
- November – Ed Rendell (D) elected to be Governor of PA.
- End of year – The majority of all agencies' PCs (60,000 (+) ) standardized on **Commonwealth Connect** desktop software and e-mail network

**2003**

- January – Most of migration to mySAP to be complete for **Imagine PA** project
- August – OIT creates office of Enterprise Integration
- September – OIT gets oversight to agency IT budget/planning and input on hiring agency-level CIOs

**2004**

- July – SAP (ERP) software to be fully implemented for Enterprise Integration (a/ka/ Imagine PA) project

**Table 2: Pennsylvania’s Enterprise Systems Project Timeline\***

<p>Early 1999</p>	<p>The Commonwealth began two closely related procurement processes:</p> <ul style="list-style-type: none"> <li>• Select the best ERP software</li> <li>• Select a systems integrator to help State agencies manage their migration to a new ERP-based business information system.</li> </ul>
<p>June 2000</p>	<p>Selection of SAP as ERP software announced</p>
<p>Nov 15, 2000</p>	<p>Project was officially launched. Implementation to begin early 2001 and take 3 years to complete</p>
<p>July 1, 2002</p>	<p><b>Wave 1 Implementation</b></p> <p>Budget Prep – PHASE I for all agencies, Budget execution (Wave 1 agencies), Accounting, Procurement, Workflow, Business Warehouse, Travel planning, and Construction Project Administration (CPA) for:</p> <ul style="list-style-type: none"> <li>· Executive Offices OA &amp; OB</li> <li>· Aging</li> <li>· Agriculture</li> <li>· Banking</li> <li>· Emergency Management</li> <li>· Health</li> <li>· Human Relations (added February 21, 2002)</li> <li>· General Services</li> <li>· Insurance</li> <li>· Military and Veterans' Affairs</li> <li>· State</li> <li>· State Police</li> <li>· Public Utility</li> <li>· Securities Commission</li> <li>· Attorney General</li> </ul>
<p>Oct 1, 2002</p>	<p><b>Wave 2 Implementation</b></p> <p>Budget execution (Wave 2 agencies), Accounting, Procurement, Workflow, Business Warehouse (BW), Travel Planning, and Construction Project Administration (CPA) for:</p> <ul style="list-style-type: none"> <li>· Community and Economic Development</li> <li>· Conservation and Natural Resources</li> <li>· Corrections</li> <li>· Education</li> <li>· Revenue</li> <li>· Municipal Retirement</li> <li>· Public School Employee Retirement System</li> <li>· State Employee Retirement System</li> </ul>

	<ul style="list-style-type: none"> <li>· Civil Service</li> <li>· Fish and Boat</li> <li>· Game</li> </ul>
Jan 2, 2003	<p><b>Wave 3A Implementation</b></p> <p>This includes Budget Execution (Wave 3 Agencies), Accounting, Procurement, Workflow, Business Warehouse (BW), Travel Planning, and Construction Project Administration (CPA) for:</p> <ul style="list-style-type: none"> <li>· Public Welfare</li> <li>· Pittsburgh Ports</li> <li>· Liquor Control Board</li> <li>· Probation and Parole</li> <li>· Tax Equalization</li> <li>· Historical and Museum</li> </ul>
March 2003	<p>Installation of HR modules temporarily halted due to software customization, system integration testing and end-user training requirements.</p>
Apr 1, 2003	<p><b>Wave 3B Implementation</b></p> <p>This includes Budget Execution (Wave 3 Agencies), Accounting, Procurement, Workflow, Business Warehouse (BW), Travel Planning, and Construction Project Administration (CPA) for:</p> <ul style="list-style-type: none"> <li>· Environmental Protection</li> <li>· Environmental Hearing Board</li> <li>· Labor and Industry</li> <li>· Liquor Control Board</li> </ul>
July 1, 2004	<p><b>Wave 3C Implementation</b></p> <p>This includes Budget Execution, Accounting, Procurement, Workflow, Business Warehouse (BW), Travel Planning, Travel Expense Reporting, and Construction Project Administration (CPA) for:</p> <ul style="list-style-type: none"> <li>· Transportation</li> </ul> <p>Imagine PA begins transition to Integrated Enterprise Systems (IES).</p> <p>Wave 3C represents the final installment of the of the originally envisioned 4 Wave implementation and completed the transition of the five major business processes - Finance, Budget, Procurement, HR/Payroll, and Travel – from the legacy systems into SAP.</p>

\* Source: <http://www.ies.state.pa.us/imaginpepa/cwp/view.asp?a=6&Q=49472&PM=1&imaginpepaNav=|2022|>