State Portals: Empowering E-Government via Software Engineering

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ABSTRACT

In an effort to deliver efficient and effective e-government services State portals are playing a prominent role. Software engineers are able to facilitate the convergence of politics and administration. On November 8, 2000, U.S. voters received conflicting media projections, but the Secretary of State's Office in Florida was able to provide them with that state's most timely election counts. With this example, software engineering factors, such as the use of dynamic web programming, can suddenly spring to the forefront of attention. For almost all federated entities, the establishment of state portals has become an advanced stage of e-government. Most states now have them and they can provide a wide variety of public services. Portals can be used as a gateway or central access point, but to appear coordinated, they should be based on a sound software engineering framework. This article presents the convergence of advanced software engineering practices with the empowerment of public administration standards and the swift enabling of public policy via state portals.

INTRODUCTION

Years ago many government agencies progressed from simply republishing forms on a front-end website. However, fewer have advanced to developing back-end web applications. Advanced portal features can now be extended and implemented to include more file-intensive processing. Because software is a form of organizational memory, it has been called a type of federated governance (Strassmann, 1995). E-government portals now include self-service applications and may enable the ability to initiate government contacts, interactivity and consultation (Curtin, Sommer & Vis-Sommer, 2003; Sharma & Gupta, 2003; Thomas & Streib, 2003; West, 2004; Aitkenhead, 2005). Further, citizens will demand more of these interaction capabilities in the future (Thomas & Streib, 2003). It is prudent for the chief executive, or his/her designee, to take control of such developments. Factors to consider among agencies would include the quality, accessibility, privacy and security of their website functions.

In theoretical terms, the concept of a state provides for a framework for analyzing the organizational and ethical complexities of life. Further, a state can provide a unity of attention amid a diversity of details and speculation (Farr, 1993). Using software engineering principles, a new focal point of contact can be achieved. As a minimum, a government-wide portal should provide links to various applications on the Internet "…organized in a way that makes the site easy to navigate and desired links easy to locate" (Edmiston, 2003, pp. 23-24). A state portal is a specific form of government portal. In almost all instances, there are one-to-many states, and within those states there may be one-to-many disparate functions. Yet, a government portal should be fully executable with integrated online services offering considerable convenience to its visitors (West, 2004). This attribute is desired for most of the organizational entities, even those at a peer level. In short, government portals are "…the entry point for business and citizens to access information or services that are for the good of the community" (Aitkenhead, 2005, p. 214) and, like with software engineering, state portals should attempt to have replicate functionality.

Various types of portals have been categorized (Tatnall, 2005) and a state variety could be thought of as being a General/Mega type. While vigilantly considering the needs of state constituents, these portals try to be a "one-stop" source for services, thus the mega description. It is also hoped that the user would return to the same portal for yearly government renewals. Examples may include intermittent visits, such as the payment of parking tickets, or yearly visits, like the payment of taxes or motor vehicle fees (Johnson, 2002). A uniform belief is that these fee-based interactions would be considered encroachments on a constituent's time and resources. As such, states do their utmost to make the experience politically acceptable.

A common goal for state portals is for the web-enabled services to have a similar look and feel. The front-end graphical user interface (GUI) should not be a source of client frustration. This goes for both functionally specific and centralized processing agencies. Resources may vary from state to state as each provides a wide variety of services. However, most want their constituents to be comfortable with the use of their website. Factors of consistency and application reuse are primary among the various organizations of a state. A well-designed enterprise framework, similar to those crafted by software engineers, may be the best way to ensure that consistency.

PUBLIC ADMINISTRATION

The Weberian notion of a bureau maintaining files is at the crux of public administration. Very publicly, a state's web portal has the ability to greatly increase agency efficiency. Standardization, a form of coordination, was identified by Weber as a form of rationalization and is still essential to bureaucracies. Most agencies are rule bound, but presenting their regulations via the web is transformational. Due to information and communication technology (ICT), it has been said how the implementation of law has been virtually perfected (Bovens & Zouridis, 2002). Inter-organizational exchanges are now quite commonplace and state portals provide a focal point for individual government entities to provide their services and information.

This is especially so if one or more agencies have the same types of files or database management systems (DBMS). The software engineers for those agencies play a huge role. For a front-end developer in a functionally specific agency, it may be easy to post regulations in a hypertext markup language format. However, in more file-intensive bureaus, and to incorporate conditional processing, sophisticated back-end programmers or engineers may be required. Regardless of agency size, client views of agencies are more likely now to originate from the web.

Shrewd public administrators may obtain or borrow parts or wholly functional enterprise frameworks while striving to develop greater efficiencies. For instance, e-payment options may be transferable within a state between various state agencies. In much less frequent (but notable) instances, entire software engineering frameworks have been ported to other state jurisdictions. The enabling factor may have been the ability of the designers to distinguish between functionally specific attributes of a state and core features when the base-classed functions appeared to be the same. Ask seasoned programmers and, if they have worked with government projects, see if they are aware of adaptations involving intra- or interstate endeavors.

POLITICS

For the usability reasons above, the chief executive of a state may want a prominent role in the portal's capabilities, development and content. This is because e-government "…is as much about politics as it is about government…" (Curtin, Sommer & Vis-Sommer, 2003, p. 14). That individual should be able to enlist (or coordinate) staff from executive branch agencies. It is less likely that a software engineer would reside in peripheral agencies as these entities usually hire specialists and/or programmers. However, without proper planning, the developers would still need to converge to ensure that their efforts yield a uniform look and feel. Thus, the administration of software engineering and standardization between agencies becomes key.

Exceptions may pertain to autonomous elected officials positioned below the chief executive. They may choose to be less standardized. These offices often have links from the main portal, and those officials may or may not follow standardization attempts as closely. They may try to look similar if they are from the same party as the chief executive; if not, they may try to differentiate themselves. In some instances, the autonomous offices employ their own programming, networking and/or outsourced staff. The degree of uniqueness may be an attempt to contrast with the chief executive's site, but seldom is an elected official's website less usable. Sometimes, due to the nature of those elected offices, they may have less budgetary oversight and more specialized features.

INFORMATION TECHNOLOGY STANDARDS

The technical standards regarding web development have evolved a great deal. This pertains to both hardware and software engineering. In terms of telecommunications and networking techniques, it has been recognized that lesser developed states often borrow standards from others. However, in a collaborative way, they too must provide input to achieve full participation (Chauvel, 2003). This includes interactions with other federated entities. In terms of e-accessibility, the state portal host and sponsors will not want any weak or inconsistent links.

In contrast to modular software and programming practices, which have been in place for decades, the most popular client services often have links originating directly from a state's homepage. Facilitated by the portal, this is often the case regardless of government entity. By utilizing cascading style sheets (CSS) and other common techniques, the same GUI can be achieved. Large and established software frameworks such as Microsoft's .Net and Java Community Process' J2EE may be utilized. Regardless of the state's framework of choice, the standards of web services need to be employed to achieve a common communications infrastructure (Williams, 2003). This may facilitate greater inter-organizational exchanges, whether they originate publicly or privately.

INFORMATION RESOURCE MANAGEMENT

Some have recognized how "[m]ulti-organizational collaborations need an institutional framework" (Dawes & Prefontaine, 2003, p. 42) and it is the state's portal that provides one. Teams within a state, regardless of executive department, may be enlisted in the development of a state's portal or web architecture. This is also an overseeing function of information resource management (IRM) entities. The teams that participate early may have greater influence as their ideas and practices would be foundational. However, if the back-end programs are long-linked and/or lack modularity, the ability to extend and reuse the code may be limited. It may be necessary to have software engineers and object-oriented programming experts as part of a design team(s) as they begin to discern the capabilities (or restrictions) of such code.

For instance, one agency's programming staff, having more technical skills than others, may provide an interface to a back-end DBMS. This is commonly referred to as middleware and some database vendors can provide it. Once those interfaces are achieved, the success may be disseminated among state entities, and soon implemented by the agencies. If agencies use the same DBMS, such as those with centralized systems, they may be able to reuse the code objects, segments or libraries. Thus, the encapsulation, extensibility and documentation of such code becomes key. Through the use of secure web services, units may also gain the ability to seamlessly access and display other agency's data.

CONTROL AND COORDINATION

Both control and coordination should occur when administering state portals. For some staff, a state portal may be their first attempt at information technology (IT) and/or front-end application development. With the use of electronic templates, the scope of administrative discretion has been reduced (Bovens & Zouridis, 2002). A simple web page has content, but when forced to integrate that information into the format of a state portal, some advanced software engineering techniques may be required. An IRM entity may be responsible for coordinating that integration. Even the use of CSS may be beneficial when considering simple application code reuse. The dissemination of at least some documentation should occur in preparation for agencies to assimilate clients from the state's portal (Oliveira, Alencar, Filho, Lucena & Cowan, 2004), and many states provide that guidance.

More so than in the private sector, state representatives must be aware of the digital divide or how some individuals are either new to computing or have no access to networked systems. Broadband versus dial up modem accessibility is a common issue. In the private sector, an unavailable website means lost sales, whereas in the public sector, it could mean lost votes. According to one researcher, most state and federal government sites had not made much progress at incorporating democracy-enhancing features (West, 2004), although lower level browser versions try to be accommodated. For instance, agencies should be aware of the browser capabilities of Internet Explorer, Netscape, Navigator, Mozilla, Firebird, Camino, OmniWeb, Opera, Lynx and others. This is because constituents may be using Windows, Macintosh, Unix/Linux or other operating systems. Further, they should encourage technologies that facilitate Internet use by the handicapped. State representatives may require a minimum level of quality, accessibility and privacy as a prerequisite to having an agency's website linked to the portal.

BUDGETARY BENEFITS

By charging convenience fees and reducing staff, state agency revenues and expenditure savings can be substantial. As mentioned above and if enabled by law, convenience fees may be charged. Waiting lines could be reduced, and in areas where population growth is occurring, capital expenditures may be saved. Although constituents can usually find and download forms without a state portal, as advertised by the agency or documented in correspondence, more personalized documents with agency planning can sometimes be obtained.

In public organizations normally known for growth, increased staffing can be curtailed. Along with the development of seemingly personal information, the agency can develop a queuing sequence of events for whenever the client arrives or connects. In some instances the client interfaces the information, not a clerk. For instance, with pre-assigned access numbers or barcodes, an efficient delivery of services may result. Such numbers would originate from a holding table or database, ready to initiate a set of processes when the client keys, swipes or pays. Be it a web, interactive voice response, e-payment or web service transaction, a pre-established number would be anticipated and foreknown by the originating agency.

It may seem to the client that delivery is different, but deep within the back office processes, the sequential numbering of transactions is very likely the same. This, along with stringent DBMS table designs, could reduce the likelihood of redundant data and, as a result, promote more efficiency. With pre-established information the clients can be better prepared before accessing a government website, and the portal support staff can be better prepared (if necessary) to serve them. To the casual user, this might not be entirely evident; however, in a well-designed system, hidden access codes can provide a great deal of functionality, security and personnel savings.

COMMON ELEMENTS

Beyond a search engine and a gateway to sites of a jurisdiction, a state portal should provide access to all network-accessible resources. These include intranets, extranets and the Internet. Table 1 lists a few of the most prominent state portal features.

FUTURE TRENDS

Future trends include facilitating web-enabled voting, the use of inter-organizational transactions and vigilant security. As opposed to yearly transactions, voting periodicity may be as needed, biennially or once every four years. So timed, the stakes and risk can be quite high. To prevent duplicate votes, at least some association should be done between the interfacing voters, their domains and electoral choices. Jurisdictions may be overwhelmed with the coordination of electronic voting systems, and systems would need to be certified by the state (Deutch & Berger, 2004). Even though e-voting may be routed through the state portal, a specific office may head up this responsibility. To instill confidence in voting, the level of transactional integrity needs to be high as well as secure. As such, verifications of voter registrations may be increasingly been done between agencies.

As in the past, state organizations will try to integrate the Internet services of subunits within and between each other. It has been recognized how this trend will require oversight institutions to use more horizontal forms of management (Fountain, 2001). But web-enabled transactions usually start under the domain of a single agency and are not fully integrated into the holistic government structure (Sharma & Gupta, 2003). An example of these types of transactions may be found

Table 1. Common state portal features

    Alphabetic list of executive departments and agencies[1]
    Links to the legislative branch
    Links to judicial entities
    Lists of councils, committees and boards
    Lists of political organizations outside of the executive domain
    Executive press releases
    Maps of government service locations
    State phone/e-mail directories[2]
    Links to peer level states[3]
    Access to the other states entities[4]
    Links to laws
    State calendars
    Language translations
    Business
    Education
    Employment
    Public assistance
    Tourism
    Emergency and safety

[1]   The names of the departments and common abbreviation often follow in parentheses.
[2]   A central payroll entity may maintain employee phone numbers and e-mail addresses.
[3]   The sub-domain suffix or domain extension will be similar (such as *.gov.uk).
[4]   For example, Germany has all of portals listed, accompanied by supporting maps.

with the need to process bad debt payments and their subsequent collections. Transactionally, one agency may attempt to encumber a client's interaction with another. The use of sequentially assigned numbers, as described above, could provide needed tracking. This is so regardless of service delivery technique and may be inter-organizational as long as the jurisdictional boundaries and accountability remain clear. Data intensive collaborations, such as those associated with state portals, usually face issues of data ownership (Dawes & Prefontaine, 2003) and this becomes increasingly so as one or more agencies access or process the data of another. The privacy of constituents, whether election-related or not, is of primary importance. State portals should collect, store and redistribute private information only to the extent required for their proper application (Felten, 2005). Although all agencies must be vigilant in terms of security, the use of a state portal can have a focusing effect on those efforts.

Of the utmost importance to each state, now and in the future, is security. An IT, IRM or public safety agency may be directed to control and coordinate this effort. Because a state portal is often associated with an IRM agency, they usually take the lead. This is especially so with the establishment of firewalls and other advanced security. Intranets are often established to allow access within and between agencies. Users accessibility may be the same within a portal, but restrictions may reduce the hazards of full Internet access. By having an IRM agency as the state's lead, the portal usability trends and security may be forecast, budgeted and planned.

CONCLUSION

Software engineering innovations represent challenges to organizations when they consider IT standards, IRM and the need for coordination and control. But opportunities can exist with a state portal as they have been known to influence government budgets, public administration and public policy. As software engi-

neering innovations are developed, communicated and subsequently discovered by the sub-agencies of a state, they may be shared between entities within a state framework. Inherently, they are borrowing from core software engineering and object-oriented principles. Code reuse, especially in the form of accessing a large DBMS, could help agencies bring more transactional and inter-organizational applications to the web. This interlacing enables sound public administration standards and the timely implementation of public policy. State portals can encourage a vibrant development environment, facilitated by an extendable software engineering framework, for the creation, maintenance and accessibility of secure websites.

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