City of Austin  
Enterprise Architecture  
Year End Report

01/02/2015

# Executive Summary

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| Figure 1: Align IT to Business |

Enterprise Architecture (EA) is the process of translating business vision and strategy into effective enterprise change by creating, communicating, and improving the key requirements, principles, and models that describe the enterprise's future state and enable its evolution and transformation. This transformation process entails the analysis and design of an enterprise in its current and future states from a strategic, organizational, and technological perspective. The goals of EA are to improve the organizational efficiency, effectiveness, and agility by delivering business-aligned enterprise systems. Best managed is our City's vision - we can provide effective leadership leading toward best-managed citizen perceptions. However, information technology provides leadership better insight, knowledge, paperless workflows, and effective coordination to make informed decisions truly delivering best-managed principles.

This paper summarizes Enterprise Architectures findings, associated risks, and recommendations for the City of Austin's information technology business and infrastructure services. As shown in Figure 1, the purpose of Enterprise Architecture is to align the strategies, projects, principles and standards leading to effective business capabilities delivering the desired goods and services considered best managed.

# Purpose of Enterprise Architecture

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| Figure 2: Business and IT Goal Alignment |

Enterprise Architecture aligns information technology (IT) services to the business needs of the city. Largely, this process involves business goal understanding relevant to the business capabilities that produce important business outcomes to city stakeholders such as its citizens. The enterprise architect identifies business goal patterns (i.e., shared goals) relevant to IT. These patterns immerge as application service needs - i.e., the "kinds" of software business services accomplishing the business mission. Once understood, the enterprise architect works closely with IT departments to ensure IT service goals align to the application services needed to accomplish the required business goals (see Figure 2). It should be observed that the figure represent only a sample set of city departments. However, a sampling of business goals of similar function has historically proven to reveal similar business service patterns. As our EA matures, we'll reveal additional results - however, the current metrics reveal some useful analysis.

Through analysis, the architect determines the number (count) between IT business goals and their relationship to important business outcomes (i.e., business capabilities). For the example shown on Figure 3, the bar graph reveals some interesting results. First, it's evident that providing business intelligence delivers the largest contribution to business outcomes compared to the business goals. This reveals that business intelligence is the single most important IT business service for our enterprise (at least from the sample-set analyzed). For each business service revealed pattern, we'll discuss its relevance to various technologies.

# Architecture Revelations

The business analysis reveals the following important business service needs required to accomplish the business goals to improve the relevant business capability. They include the following:

* Mobilize the Work Force
* Manage Assets
* Provide Business Intelligence
* Provide Geographical Information
* Manage Case Files
* Manage Official Documents

From an architectural point of view, let me share some general thoughts. We've enacted these elements through governance as Essential IT Capabilities. However, they're actually not capabilities at all. They're essential business application services - they're a "kind of" application not an application in itself. Capability is the people, processes and technology delivering value for a specific purpose. It's the quality of being capable; to have the capacity or ability to do something, achieve specific outcomes, effects or declared goals and objectives. Capability is, therefore, the business outcome, not the business application service that enables them - a business application is technology; and therefore, "part of" a capability. Using this architecturally derived understanding allows us to make some important strategic decisions.

## Provide Business Intelligence

Refer to the graph on Figure 3. The analysis supports a significant need for business intelligence, because understanding business data is instrumental in the decision-making process. However, as we pursue business intelligence solutions, IT must focus on accomplishing important business intelligence goals and understand the relevance to the capabilities (i.e., business outcome) supported. We can't just do business intelligence for business intelligence sake; we must understand and prioritize our business intelligence engagements with business stakeholders establishing the priorities.

## Provide Geographical Information

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| Figure 3: Goal and Capability Analysis |

Second in priority, geographic information business service is clearly an important need. Business users need the ability to geospatially monitor and track assets. However, a reoccurring business goal is to integrate case and asset management with emphasis on geographic information system (GIS). This implies emphasis on the use of our enterprise service bus for GIS services. In addition, some GIS business goals where shared with business intelligence, in that, some business intelligence reports require geographic presentation – best accomplished with ESB.

## Manage Assets

Asset management is a critical city management element and as good stewards of taxpayer money, we're responsible to track and monitor city managed assets to ensure proper accountability, care, maintenance, and upkeep. Currently, we're using IBM Maximo as our enterprise asset management system. The City of Austin manages infrastructure such as pumps, pipes, wires, poles, etc. using IBM Maximo; however, Maximo is not well suited for real estate properties and their lifecycle needs. There's an additional IBM component to Maximo called [TRIRIGA](http://www-03.ibm.com/software/products/en/ibmtrir) - we should explore this product for our real estate needs. It is likely to provide badly needed real property lifecycle management capabilities - see [Real Estate Asset Management Audit](http://austinea.org/arch/realEstate/au12125.pdf). Finally, there are many mobile workforce needs associated with managing assets.

## Mobilize the Work Force

Mobilizing the work force, albeit identified as a significant business need and hence an application service need, is actually a function of technology selection. Today we use tools such as Citrix, Go to My PC, virtual private network (VPN) connections, etc. However, these approaches are clunky and don’t work well using today's lightweight mobile devices such as Droids and iPads. They're also device specific, in that, a solution might work on a laptop, but not a Droid or iPad and vise-versa. Therefore, device independence is very important. Lightweight, PC pads are immerging such as the MS Surface Pro, which solves the lightweight portability issue, but still a Windows PC solution. Real opportunity for mobility exists with Cloud computing discussed later.

## Manage Case Files

Considered a case, case management is the coordination of services on behalf of an individual person. Case management is a significant business application service need. Permit management, municipal court, law enforcement, code compliance and many other business processes require some form of case management to ensure proper coordination of various workflows throughout the city. We are likely to provide multiple solutions for case management - one size doesn't fit all. From an enterprise viewpoint, Amanda is our enterprise case management tool. Although a very capable tool, Amanda requires significant knowledge of PL/SQL (Procedural Language/Structured Query Language) an Oracle Corporation procedural language. With limited PL/SQL support, business need for case management solutions are exceeding our ability to deliver case management solutions. Therefore, we require alternative solutions to keep pace with demand.

### Cloud Computing

[Cloud computing](http://en.wikipedia.org/wiki/Cloud_computing#Services) is a terminology or metaphor referring to the utility and consumption of shared computing resources. Cloud computing involves deploying groups of remote networked servers and software that allow centralized data storage and online access to computer services or resources. Cloud supports public, private or hybrid approaches. Cloud computing is a complete paradigm shift from traditional computing concepts. Instead of running expensive data centers with privately managed servers and other information technology infrastructure, Cloud provides an economy of scale by sharing IT infrastructure with other consumers with similar need. Over time, Cloud computing offers significant cost savings as we gradually outsource (thru Cloud services) IT infrastructure. Cloud causes concern for many IT employees as they view this change a threat to their job positions. However, employing Cloud computing services will take many years allowing reduction through attrition or retraining to focus on important business outcomes rather than back end IT services. Security is another concern, because you don’t have apparent control of your data – in that, it's in the trust of a third party. Industry is demonstrating, however, that the benefits outweigh the risks. To demonstrate the potential for Cloud computing, we piloted a model driven architecture (MDA) with [Salesforce.com](https://www.salesforce.com/). The results were much better than expected.

Enterprise Architecture wanted to prove a theory that Unified Modeling Language (UML) use case models could deliver business software specifications with enough detail that a solution provider could deliver an effective result with little to no business engagement outside of specification development. Therefore, working closely with business stakeholders, EA developed [Employee Safety Database Use Case Specifications](http://austinea.org/arch/arr/) using our MDA approach. Once approved by the business stakeholder, EA delivered the use case specifications to Salesforce.com. Saleforce.com developed a fully functional application (including mobile work force features) in just 48 hours. The only interaction with the solution provider involved a 20-minute discussion regarding forms used in the process and the modeled objects relevant to the forms. The business user was elated with the results. One would think we would move forward - then enters city politics and funding issues.

Although Austin Resource Recovery (ARR) fundamentally led the Employee Safety Database, EA ensured a larger citywide viewpoint because we recognized the capability had a broader citywide purpose. In fact, other departments such as fire department and code compliance participated in the requirements model build per ARR guidance. The activity was a great team effort. Unfortunately, the Human Resources Department (HRD) viewed the employee safety activity as competing with their plan to rollout a new human capital management system and HRD felt the activity was sidestepping our governance process, for which, they didn't feel adequately involved. However, in reality, the requirements do not involve an HRD system capability. One use case named [Manage Worker Compensation](http://austinea.org/arch/arr/manageWorkerCompensation/) left HRD with the perception that these were HR requirements. However, even Manage Worker Compensation use case used existing HRD processes while providing some department level automation features to track employee compensation status. All this politics delayed the project for the business stakeholder. Then there's funding.

In order for a Cloud computing solution to be economically viable requires a reasonable level of participation. Cloud computing typically operates on a cost per user per year model and the cost per user gets smaller as the number of users increases. For example, ARR cannot afford the Salesforce solution on their own - should other city departments participate, the solution is affordable. However, other departments didn’t budget for employee safety capability because it was low on their priority list. So how do we eliminate these barriers to innovative progress?

Although EA views the employee safety capability as a valuable business service, EA is more interested in exploring the Cloud service as a potential technology while simultaneously delivering business value. We selected the employee safety problem because it provided a representative technology, i.e., mobility, reporting, case management, etc. useful to evaluate the technology's potential. The solution also didn’t require a high degree of interfaces to existing data sources reducing initial project risk. The pilot provides better understanding of the technology for future venues and opportunities. For example, the Salesforce model could provide HRD a relatively low cost interim solution to replace the MS Access databases currently used to manage employee information, which is a current high-risk technology item. Cloud computing also includes other risk factors to include identity management requiring further exploration.

### Identity Management

Those annoying passwords - yet passwords are important to secure our IT environment. If we wish to employ Cloud computing as a future success strategy, we must employ some form of federated identity. A [federated identity](http://en.wikipedia.org/wiki/Federated_identity) is the means of linking a person's electronic identity and attributes, stored across multiple distinct identity management systems. Related to federated identity is single sign-on (SSO), in which a user's single authentication ticket, or token, is trusted across multiple IT systems. SSO is a subset of federated identity management, as it relates only to authentication on the level of technical interoperability. Most of us know the challenges associated with multiple passwords - as a result, there's a tendency to reuse passwords across application domains, which causes added security risk. Not to mention the operational problems associated with forgotten passwords, requiring system administrator assistance to make password resets. The password problem can get quite complex for a large organizations with many password access points. SSO helps to solve this problem; however, implementation brings on new challenges to include Microsoft Active Directory.

### Active Directory

[Active Directory](http://en.wikipedia.org/wiki/Active_Directory) (AD) is a directory service that Microsoft developed for Windows domain networks and is included in most Windows server operating systems as a set of processes and services. An AD domain controller authenticates and authorizes all users and computers in a Windows domain type network - assigning and enforcing security policies for all computers and installing or updating software. For example, when a user logs into a computer that is part of a Windows domain, Active Directory checks the submitted password and determines whether the user is a system administrator or normal user. Active Directory makes use of Lightweight Directory Access Protocol (LDAP), Microsoft's version of Kerberos and Domain Name Services (DNS). Due to our enterprise's organic growth, we currently operate seven AD forests (as they're referred) - ideally, we should have just one. In addition, there are no standards to ensure AD information is consistent across domains, which complicates future AD management. Not to mention the potential for improved self-service for password resets made easier with one AD. There are commercial tools to emulate, for identity management purposes, a unified LDAP environment for SSO; however, this is a technology Band-Aid and complicates a more unified enterprise solution.

### Microsoft Exchange

Currently, the City of Austin operates seven email forests (includes 35 instances of Exchange server), which is an inefficient use of city resources. There's a direct relationship between AD and MS Exchange. As a strategy, recommend consolidating our AD and Exchange email services to a singular forest. This approach greatly simplifies our future SSO strategy and positions us to better exploit Cloud computing opportunities such as MS Office 365, Microsoft's Cloud offering for MS Office. Email today is an important part of our business; however, in the future this may not be the situation.

### Social Media

[Social media](http://en.wikipedia.org/wiki/Social_media) is proving an alternative to email as a means to collaborate and follow important business items of interest. I don’t know about you, but my family and I use Facebook and I've noticed a dramatic reduction in my personal email as a result - my email is almost all spam these days except for a few security notifications from my Web applications. I've been using LinkedIn for quite some time and my enterprise architecture network followers provide worldwide collaboration on architecture discussions - again, no email. Social media may not replace email; however, it will substantially reduce email use in the future along with all the large email attachments reducing storage cost.

Social media are computer-mediated tools that allow people to create, share or exchange information and ideas in virtual communities and networks. Social media is a group of Internet-based applications that build on the ideological and technological foundations that allow the creation and exchange of user-generated content. Furthermore, social media depend on mobile and web-based technologies to create highly interactive platforms through which individuals and communities share, co-create, discuss, and modify user-generated content. Social media introduce substantial and pervasive changes to communication between organizations, communities, and individuals. These changes are the focus of the emerging field of [technoself](http://en.wikipedia.org/wiki/Technoself) studies. However, for social media to be successful it must be accessible via personal devises and mobile solutions.

Yammer, Inc. is an enterprise social networking service purchased by Microsoft in 2012 and Microsoft incorporated Yammer into SharePoint version 2013. From an IT viewpoint, collaboration with business is essential in order to increase customer satisfaction through understanding and improve customer relationships. Therefore, we should pursue Yammer as a collaborative instrument to increase communication with important business stakeholders, which brings us back to Cloud computing and our ability to mobilize our workforce. The inherent nature of Cloud computing includes mobility and device independence. In order for our business social media to be successful, it must be at our fingertips and it must be in direct reach of our personal devices. The architecture to do this already exists; we just need to pursue it.

## Manage Official Documents

Also referred to as [information management](http://en.wikipedia.org/wiki/Information_management) (IM) is the collection and management of information from one or more sources and the distribution of that information to one or more audiences. This sometimes involves those who have a stake in, or a right to that information. Management means the organization of and control over the planning, structure and organization, controlling, processing, evaluating and reporting of information activities in order to meet client objectives and to enable corporate functions in the delivery of information. The City of Austin uses multiple sources for official information - each serving its own purpose. The most common include Enterprise Document Imaging and Management System (EDIMS) and SharePoint. SharePoint is the less formal of the two while EDIMS typically contains well controlled, meta-data standard official city documents. Currently, EDIMS integrates with Windows Explorer; however, meta-data must be hand entered for each managed item. In the future, however, we can use our enterprise service bus (ESB) to create a standard interface to both store and retrieve EDIMS documents using standardized XML meta-data. These technologies allow for our enterprise applications such as Maximo or Amanda (among others) to automatically store and retrieve official documents in EDIMS. SharePoint is our challenge - I believe we are not effectively using SharePoint as an information management technology - not to mention its tight coupling with Yammer social media. Recommend pursuing professional outside assistance to employ our SharePoint and Yammer environment from an enterprise perspective.

# Enterprise Architecture Summary

The root to our architecture problem is our fragmented Active Directories - we should consolidate to one AD. In turn, consolidate our email Exchange services. Once this environment is healthy and stable, migrate to MS Office 365 Cloud computing and exploit Yammer (social media) with a well thought through SharePoint environment. Establish single sign-on and exploit Cloud computing services such as Saleforce.com. These technologies inherently provide a mobile workforce, business intelligence, and case management infrastructure. The following technology recommendations either directly or indirectly support business customer needs to include:

* Understand and prioritize our business intelligence engagements with business established priorities
* Emphasize use of our ESB for GIS services
* Explore TRIRIGA for real estate asset management
* Pilot Cloud computing enterprise solution as potential case management alternative
* Consolidate Active Directory and Exchange email services
* Employ Cloud compatible federated identity management
* Move to Office 365
* Employ SharePoint and Yammer from an enterprise perspective
* Develop and exploit ESB interface with EDIMS