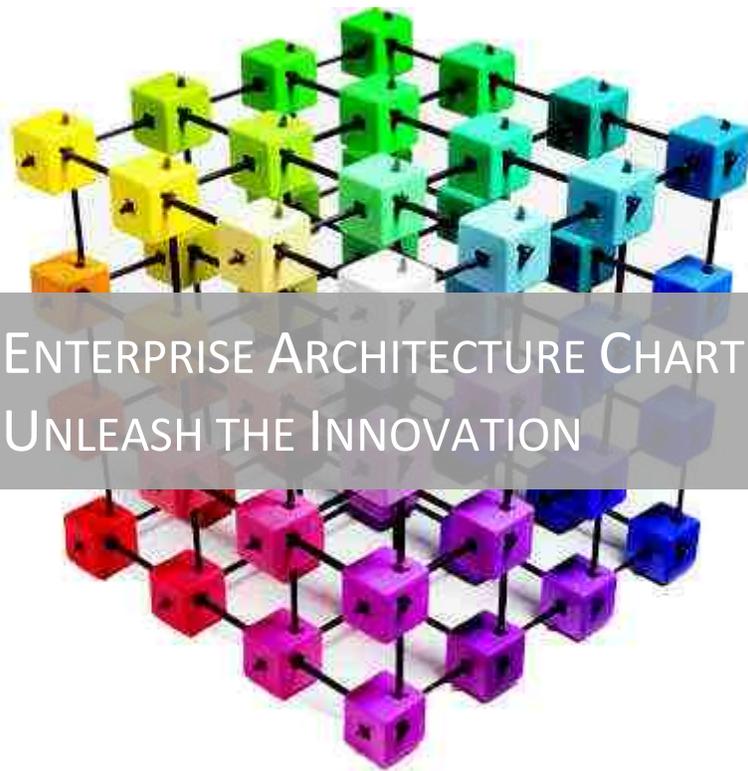UNIVERSITY OF MICHIGAN

ENTERPRISE ARCHITECTURE CHARTER

UNLEASH THE INNOVATION

Version 1.1

Contents

Executive Summary

In 2010, the University of Michigan undertook a multi-year IT strategy called NextGen Michigan, with the objective of "developing a world-class 21st century information technology infrastructure in support of the academic, research, teaching, and learning missions of the University." The NextGen web site lists several high-level objectives including:

- Propel innovation

- Manage technology investments with enhanced efficiency and effectiveness

- Focus on IT as a strategic/shared asset

- Deliver IT in new, less costly ways across campus

One of the critical components of the NextGen initiative is a strategic technology roadmap that will help ensure that the overall IT direction and investment progresses in a common direction. Enterprise Architecture (EA) is a discipline that collaborates with IT across campus to provide that strategic roadmap.

Michigan's decentralized environment fosters a high-degree of departmental innovation, but many times that innovation is trapped within the original environment and not exposed to the rest of the university. In those cases where innovation is spread to the rest of the university it is often through an inefficient ad-hoc process. Via the IT roadmap, Enterprise Architecture is a guiding hand that both fosters innovation and provides a consistent methodology for the flow of that innovation from its origin point. At the same time, EA helps move technology commodities to a shared service so schools and departments can spend a greater percentage of their IT effort on mission-specific projects and innovations. The net result is more innovation at the departmental level, and a stronger technology infrastructure at the central technology core.

Enterprise Architecture is a strategic capability that provides the University of Michigan with a common vision for information technology initiatives, trends and direction across all of its various communities.

Enterprise Architecture Overview

The University is a decentralized organization with many discrete Information Technology groups. These vary in size from 1-3 person departmental groups to a few groups with hundreds of staff (ITS, MCIT). Many groups believe in sharing innovative ideas, good practices, and processes. Given our numerous IT groups, University-wide systems and supporting processes— crafted specifically to support this sharing – are needed. Today those systems and processes are insufficiently developed, or missing altogether and there is considerable friction in the organization that impairs this sharing.

In the current IT environment:

- Schools and departments spend effort working on technology infrastructure and commodities – effort that could be spent on mission-specific items instead.

- Innovations can remain trapped within departments and other departments may not even be aware that technology exists to solve a mission need.

- When departments implement new technology, they "re-invent the wheel" because existing solutions are difficult to share, or groups lack awareness of what other units have done.

- There is not a good understanding of when a system should be implemented as a joint effort of several departments, and no standard procedure to follow when candidates for community projects are identified.

- When technologies become well-enough adopted to be converted to a university-wide service, initial solutions have often been implemented with a given technology, while a different technology may be needed to meet the new scale requirements. The original developer may have to choose between discarding their technology in order to use the common system or supporting their own now-non-standard version.

- IT organizations can create and deploy applications before the supporting infrastructure is sufficiently scaled, resulting in overloaded resources such as network or storage capacity.

The goal of Enterprise Architecture (EA) is to help minimize these disadvantages by providing a road map for technology, and enabling communication of that roadmap to all departments at the university.

Scope

The long-term scope of the Enterprise Architecture group is intended to be all IT effort at the University of Michigan. EA's duty is to help manage the fundamental organization of the information technology embodied in its components, their relationships to each other and to the environment, and the principles guiding its design and evolution.

Within this broad statement, EA's scope can be broken down into three major functions:
- Provide and communicate a technology road map to all interested parties.

- Recommend implementation strategies for specific technologies and products.

- Function as a conduit to move IT related information between the various IT departments at Michigan.

Since Enterprise Architecture is new to the university, EA will begin with targeted projects and departments and then expand to include more IT effort over time as the EA process matures.

Positioning

To describe the target position of the Enterprise Architecture it is helpful to reference two famous buildings.
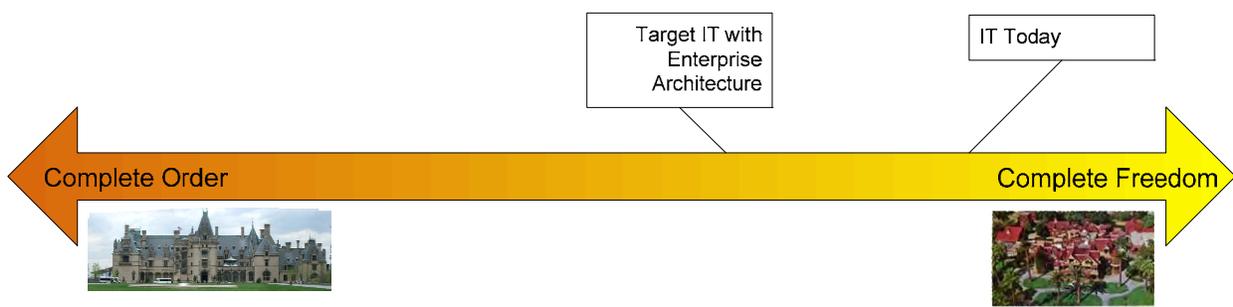
Biltmore House. Biltmore was built by G.W. Vanderbilt over a four year period in the 1890s. It is the top-ranked non-government building on the American Institute of Architects' *List of America's Favorite Architecture*. Biltmore was completely designed by R.M. Hunt and, since everything was architected before the groundbreaking began, all of the components of the building fit together in a beautiful and pleasing fashion.

Winchester House. Winchester House was built by the heiress to the Winchester rifle fortune over a 38-year period centered around 1900. There was no master building plan and the only rule was that construction take place 24 hours a day. According to their web site, it contains "a window built into the floor, staircases leading to nowhere, doors that open onto blank walls".

EA's goal is to allow the flexibility of the Winchester House, but to provide a master plan so that when someone builds a doorway, there is another room waiting at the opening. We do not aspire to have everything architected before the building begins, as we believe that would limit the innovation which is a critical part of the Michigan mission and culture.
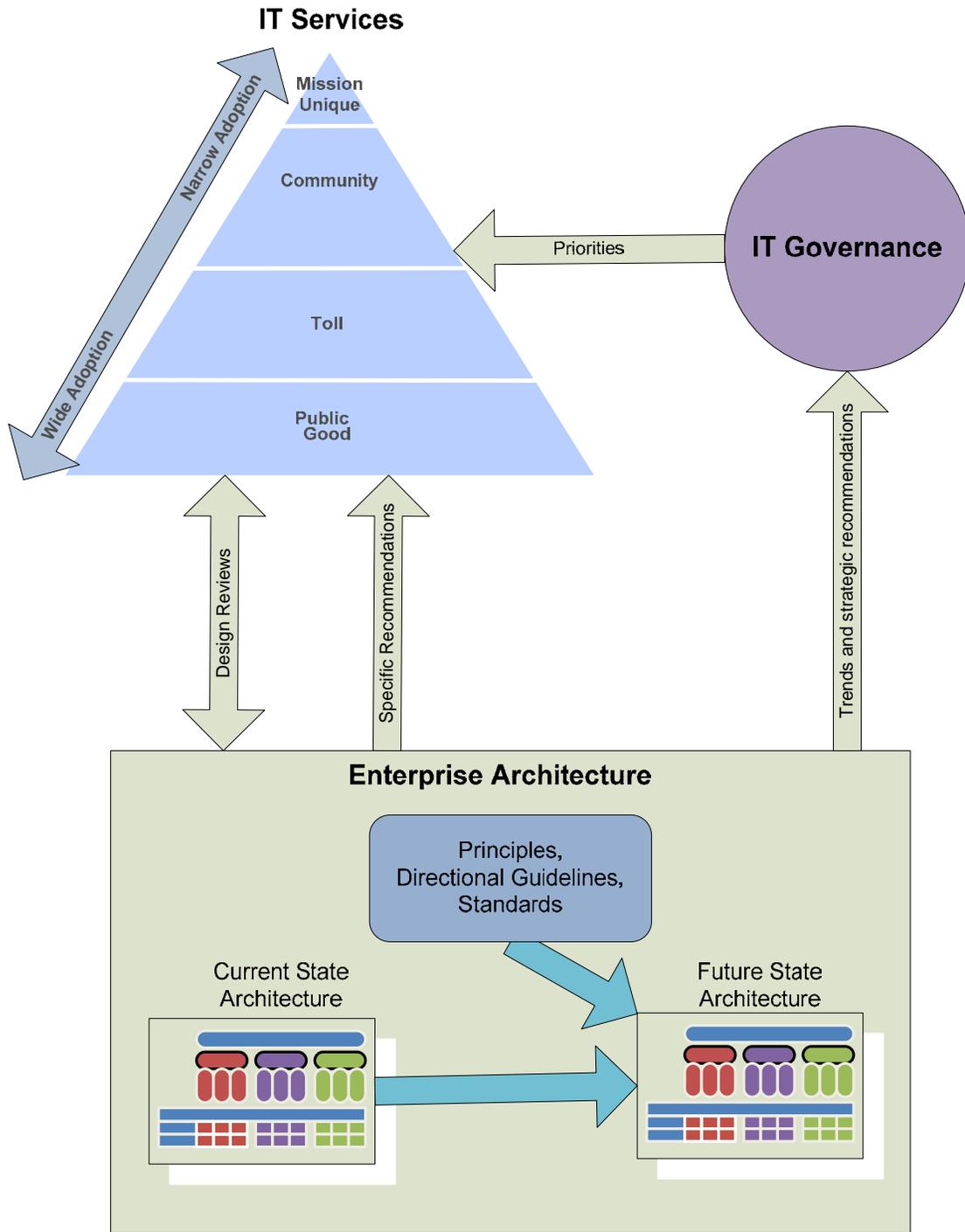
Approach

The process of maintaining and communicating a technology vision and roadmap can be distilled down to a small number of touch points with the rest of the technology community. These touch points are shown in the following diagram.

IT Services

Mission
Unique

Community

Toll

Public
Good

Narrow Adoption

Wide Adoption

IT Governance

Priorities

Design Reviews

Specific Recommendations

Trends and strategic recommendations

Enterprise Architecture

Principles,
Directional Guidelines,
Standards

Current State
Architecture

Future State
Architecture

- **Design Reviews**

  Every IT project campus-wide will be asked to provide basic information about their project to the EA team. If the project is deemed to be architecturally significant (e.g. creates or uses enterprise data or is of a certain scale in dollars), EA will offer a design review. Many projects will be purely departmental and will not require a review. But even for these projects that don't require a review, the knowledge of their basic details will help EA stay close to the pulse of emerging technologies, better identify when technologies that are thought to be unique are in fact being used in multiple projects, and help put the principals of those projects in touch with each other.

- **Specific Recommendations**

  Projects that receive a design review may receive recommendations based on the EA roadmap and the architectural standards. They may also receive feedback regarding the scope of the service, e.g. EA may recommend that several departments working on similar projects join them into a single community project. EA will also recommend technology building blocks that already exist elsewhere that can be leveraged for the project.

  The entire IT community will also be periodically informed of emerging trends, shared and community projects that are being planned or underway, and existing services that are beginning to be phased out.

- **Trends and Strategic Recommendations**

  On a regular basis, the enterprise architecture group will collaborate with informed parties to gather up-to-date information and publish updates to its main artifacts. EA will present these new artifacts, with a summary of the changes in them, to all interested parties. The main artifacts maintained by the EA group are:

  o Recommended shared services.

    One of the most important benefits of EA is the ability to recommend when services should formally move down the service-level pyramid. Services moving into the bottom tiers are often campus-wide and are good candidates for ITS projects, which can provide project management and coordination. These technologies tend to already be pretty well established, have been known to the architecture community for some time, and have already been incorporated into the relevant architectures. Ideally, the architectural risk for these technologies has already been mitigated higher in the pyramid.

    The real opportunity for EA to provide architectural direction comes when a technology is just emerging from the departmental to the community level. This is the time when the campus-wide view of EA can help combine several projects from several departments into a single community project. Community projects benefit from the ability to leverage resources, involve departments who would like the service but weren't able/willing to create it on their own, and increases the

likelihood that the specific technology chosen will be able to be incorporated into a university-wide service if it gets that low on the pyramid.

EA will periodically look at the inventory of existing services and services that have been proposed or are underway and make a list of those services that should be implemented with some level of departmental sharing. The level of sharing will span the range from two or three departments all the way to common good services used by the entire Michigan community.

This process will also examine existing shared services that are in declining use and identify those that are candidates to be shared amongst less units, or retired completely.

- o Current State Architecture

  The current state architecture shows the current IT architecture for the campus. It is used as a reference for how new projects fit into the existing architecture and/or how the architecture must change to accommodate new projects. This document will also detail important changes to the architecture since the last current state document.

- o Future State Architecture

  The future state architecture shows where IT is expected to be at some future state. At this time, it is expected that the future state will represent 3-5 years into the future.

  Upon publication of this document, EA will also present a summary that has a "where are we going" analysis. It will include major changes that are underway, as well as expected changes and emerging technologies that are expected to make their way into the architecture in the upcoming 3-5 years.

- o Technology Strategy Recommendations

  The future state architecture will reflect a number of discrete technology strategies that permeate many aspects and layers of the architecture. For example, the movement away from desktops and laptops towards tablets and other mobile devices likely requires a strategy that impacts (at least) Applications, Network, and Information Assurance. Where a need for these strategies has been identified, EA will coordinate the creation of the strategy, document the strategy, and present it along with the Future State Architecture.

- **Enterprise architecture principles, directional statements, and standards**
  - o Principles

Principles embody the overall philosophy of the architecture of IT. They are intended to be long-term visionary items that are aligned with the university mission and not subject to change unless there is a major directional change within the university itself.

Principles also help EA focus on what's important. The principles give both EA and the projects that use EA a range of criteria that are deemed to have the greatest significance at the University. There may be some substantial design considerations that are not included within the principles; projects will continue to manage these according to their needs.

In order for technology to move towards a common architecture, these principles must be embedded within the culture of the university as a whole.

o   Directional Statements

Directional statements are derived from one or more principles and reflect the current direction for the architecture. They are not as stable as principles and are expected to change as new technologies and approaches become mainstream. Examples of directional statements are "Prefer virtualization" or "Minimize complexity and technological diversity."

o   Architectural Standards

Standards express which technologies are preferred for a given solution. They provide a way to turn principles and directional statements into actionable tasks. Standards encompass specific technology recommendations (Oracle over DB2), as well as full-solution models ("here is the entire technology suite recommended for an internal web portal").

Benefits of Enterprise Architecture

The benefits of a well-established Enterprise Architecture at U-M include:

- **Lower total cost of service ownership**
  Services designed with an architecture roadmap will be better aligned with mission direction and architectural standards. This will result in longer service life, less maintenance and changes, and lower support costs.
  The periodic review of systems that have decreased use will allow systems to be phased out quicker, again reducing their lifetime cost.
- **Less duplication of effort and services**
  The early determination of when innovative departmental technologies are candidates to be converted to a shared service results in more synergy and less duplication across the university.
- **More reuse of existing systems and system components**
  The communication aspect of EA helps make projects aware of building blocks that they may not have otherwise considered. Following architectural standards means that when departmental

services grow into shared services, that the technology already in place can be converted to the new service, instead of being orphaned.

- **More time for local IT to work on supporting mission-unique needs**
  Anytime that a local IT department can avoid creating a service or building block, and instead satisfy the requirements with one that exists elsewhere, it frees up their time to work on services that are unique to their department.
- **Reduced risk and exposure**
  Running all projects through a standard review process helps ensure that appropriate consideration is given to Information Assurance issues, such as Security and Privacy, early in the project lifecycle when such issues can be addressed in a cost effective manner without introducing project delays.
- **Better ability to define benefits of an IT service**
  Because IT services will be mapped back to the mission needs they satisfy, it will be easier to assess if the needs were actually met.
- **Better planning and coordination across departments**
  IT projects will be better coordinated both within ITS and across campus due to better communication of similar, related, or dependent projects that are happening elsewhere.

Enterprise Architecture Philosophy at Michigan

Since Michigan has a decentralized ecosystem, EA has some specific challenges that may not be present at more top-down organizations.

- Architecture must guide rather than dictate. At the end of the day, many departments are free to implement technology how they see fit. The architecture process must be seen as something that brings intrinsic value to projects and is accepted on its own merits, not by fiat from above.

- Architecture must foster innovation. Departments need to provide mission-differentiated services, and the EA philosophy and processes must be defined in a way that does not constrict creativity, elegance, or specific-use.

In order to achieve the benefits listed above and still function within these challenges, Enterprise Architecture at Michigan will operate under the following guiding principles.

- **M**ission - Technology solves one or more mission needs

- **I**nformation - Information is the lifeblood of the university

- **R**euse - Use or extend what already exists

- **S**tandards - Use architectural standards whenever possible

Enterprise Architecture

Principle	Description	Value Enabled
1. Mission - Technology solves one or more mission needs	• In addition to ensuring that the design meets the explicit mission and business needs of the project, it also considers implicit operational needs such as support, training, information assurance, business continuity, expected lifecycle, and financial model. • This requires a service and component oriented philosophy as opposed to a technology view. It implies increased reliance on customer relationship management, business analysis, and service management.	• Improved alignment to the mission and to customers • Longer service life with less maintenance and changes • Lower support costs
2. Information - Information is the lifeblood of the university	• All information should be managed consistently, with one source and one owner. • Applications and data should be accessible by authorized parties from anywhere. • The above point infers information assurance standards, such as those related to authentication and the protection of sensitive data at rest and in transit. • Applications should support accessibility standards	• Improve decision making quality through the use of accurate, up-to-date information • Increase customer and user satisfaction • Reduce delivery costs by using existing data services
3. Reuse - Use or extend what already exists	• Whenever possible, use or extend an existing service or building block. • When no existing university service exists, prefer to acquire a service rather than build a new one. • EA will help projects identify reusable assets within the university and, when no asset is available, point them at any appropriate third-party solutions.	• Less duplication of effort and services • Reduce delivery costs • Enable reusability and extensibility • Reduce operating cost
4. Standards - Use architectural standards whenever possible	• Standards include specific technologies as well as complete models for solutions that are not unique (such as a web site). • The process of maintaining useful standards requires input and collaboration from many parties. • Standards will be updated, published, and changes publicized on a regular basis.	• Provide more consistent user experience • Enable reusability and extensibility • Reduce risk and exposure • Reduce operating costs