IT@UMN
Enterprise Architecture Program

Guiding Principles

Enterprise Architecture Guiding Principles

Enterprise architecture guiding principles must be considered for all academic and administrative technology decisions at the University of Minnesota system. These principles should be considered for research and non-enterprise technology decisions at the University as well. Applying these principles will provide consistent IT solutions and services across the University. These guiding principles align resources and solutions with the University business needs by encouraging both stable and efficient solutions while maximizing return on investment. In addition, they foster solutions that are simple and transparent while promoting compliance with required standards. Although the guiding principles are not mandated policies, they are meant to be considered and applied to all academic and administrative technology decisions.

1.0 Guiding Principle: Align across the University

The enterprise architecture process must be driven by the University's core missions and specific business needs. It must include the requirements for all organizational units throughout the University system. A common approach will ensure more reuse of technology, ease of integration across domains, and results in lower costs. The enterprise architecture must be broadly communicated and promoted across all business and technology units. The work of building and supporting these solutions needs to be a concerted effort of the entire University system.

Efforts should be coordinated across IT groups to minimize redundancy to be more cost and resource efficient.

1.1 Be mission driven

Rationale

The process of designing enterprise architecture solutions must be driven by the core mission and specific business needs of the University system. This principle is established to ensure maximum alignment with the University's teaching, learning, research, and outreach missions; as well as other strategic objectives of the University.

Implications

1. Enterprise architecture decisions need to be made with an understanding of the overall organizational model, high-level business processes and information requirements.
2. The technology recommendations and roadmaps must be able to be directly linked to specific business needs.
3. All business requirements must be gathered from all affected parties.

Obstacles

1. Translating high-level business requirements into technical solutions.
2. Prioritizing potentially diverse business needs.
3. Ensuring full input from all affected parties.

Key Actions

1. Need direct communication channels within all campuses and areas of the organization.
2. Use established processes for evaluating business benefits and detriments.

1.2 Be coordinated

Rationale

The enterprise architecture must include the requirements for all organizational units within the University system. A common approach will ensure more re-use of technology, ease of integration across domains, and results in lower costs.

Implications

1. Includes system campuses.
2. The enterprise architecture roadmap must take account of current, short term and long term requirements, influences and opportunities, covering business and technology.
3. A non-unified approach will create islands of non-standard technology and duplication of effort and functionality which may prove difficult to integrate in the future, therefore strong governance is required to ensure that solutions conform to the unified architecture.
4. The effectiveness of the architecture governance processes should be reviewed with the business owners on an ongoing basis.

Obstacles

1. Disparate groups who are responsible for the end to end architecture must work together to ensure that solutions conform to a single consistent enterprise architecture.
2. There may be an unwillingness to share information across the institution.
3. The University may be obligated to use systems provided by external bodies that are often not compliant with the architectural standards of the University system.

Key Actions

1. Create and facilitate an enterprise wide architecture community which must include both business and technology stakeholders.
2. Define enterprise architecture with a complete enterprise-wide view of business requirements.
3. Create architecture roadmap incorporating current, short and long term views.
4. Activate and complete architecture governance process.
5. Review effectiveness of governance process with business owners.
6. Implement exception management process for non-compliant 3rd party systems and solutions.
7. Create a technology inventory that includes central and distributed investments.

1.3 Be communicated

Rationale

The enterprise architecture must be broadly communicated and promoted across all business and technology units, ensuring that the enterprise architecture values are publicized to all affected parties. The communications must be timely and cover major technology decisions that are both open or closed for discussion.

Implications

1. Agreement on values across the University system.
2. Need full support from senior management.

Obstacles

1. Identifying all necessary parties.
2. Involving all necessary parties.
3. Using common language and definitions.

Key Actions

1. Establish a communications strategy.

1.4 Follow a common data model

Rationale

All data stored in systems and exchanged between components in systems must be mapped to the enterprise wide logical data model. This standard approach will assist in the identification of duplicate data and authoritative sources across the enterprise, allow common naming standards and descriptions to be defined for each data entity, and facilitate business intelligence.

Implications

1. A comprehensive entity-relationship data model (Enterprise Data Model (EDM)) will need to be developed and maintained.
2. Data definitions or metadata covering key data entities need to be produced.

Obstacles

1. Capacity and competency.
2. Sign-off from the business.
3. Determining ownership/responsibility for the data model.
4. A detailed data model can make it difficult to develop or integrate applications that don't need that level of detail. Offering an additional "simplified" or abstracted model of the data

could help mitigate this.

Key Actions

1. Architecture Group to identify a single working group or community to identify, define and describe agreed data entities.
2. Map the physical implementation of data across all systems.

1.5 Promote common functionality

Rationale

Limiting duplication of functionality decreases costs and implementation time, creates consistent customer experiences, and increases quality and effectiveness of solutions.

Implications

1. The business must standardize business process.
2. Business processes must be documented and published across the University system.
3. Existing solutions, available functional components and business services must be cataloged in such a fashion that makes it easier to determine their reusability, initially focusing on services which are likely to be reused frequently.
4. A case may be made to build up the catalog of reusable components and services to justify an internal build or Service Based Architecture implementation.
5. Governance processes, supported by appropriate tools must be put in place to ensure that common services and components are created, used and reused.
6. Solution designs should be modularized.
7. Solution components must communicate via standard interfaces.

Obstacles

1. Not all processes are owned and under the control of the University, e.g. other stakeholders or partners.
2. Currently siloed organization makes it difficult to identify how much common ground there is for business processes.
3. There is a risk of change fatigue, it becomes too hard.
4. Capacity (resources) to do this may be limited.
5. It can be tricky to balance the efficiency gains of locally-optimized processes with the increased overhead of having differing processes across units.

Key Actions

1. Document and publish business processes.
2. Address the silo mentality.
3. Identify existing services and components (focus on components which are most likely to

be re-used).
4. Create and publish service catalog.
5. Specify existing catalog and future capabilities in PeopleSoft.
6. Establish and activate service governance processes and tools.
    a. Review existing projects to ensure they are compliant.
    b. Ensure architecture governance processes are in place to ensure ongoing compliance.
7. Define and publish University wide interface standards.

2.0 Guiding Principle: Seek stability and efficiency

Solutions should be appropriately engineered to meet the business requirements to minimize cost and maximize value. When possible, the University should reuse existing resources to support business requirements. Stability, scalability, and efficiency must be at the foundation of the design and implementation of these solutions. These principles seek to maximize the performance and consistency of provided services in all circumstances, while allowing for innovation.

Preference toward utilizing existing resources.

2.1 Leverage existing business applications

Rationale

The University should reuse resources to support business requirements where the existing solutions meet all mandatory requirements, and are within the purchase lifecycle.

Implications

1. The enterprise architecture needs a good understanding of the capabilities of existing Peoplesoft functionality and the capabilities of additional modules.
2. The enterprise architecture needs a good understanding of the Peoplesoft technology roadmap.
3. To support this strategy the enterprise architecture needs to develop an integration architecture to facilitate.
4. Architecture governance needs to be involved in the decision making process because “mandatory requirements” is open to interpretation.

Obstacles

1. Existing system capacity.
2. Limited IT capacity to understand existing capabilities - it may just be easier to pick a new system.

Key Actions

1. The functionality of the University Peoplesoft (ERP) system needs to be cataloged and communicated effectively in business terms.
2. This principle needs to be communicated to all senior business managers.
3. The enterprise architecture needs to develop integration architecture.
4. Architecture governance needs to be put in place.

2.2 Maximize existing infrastructure

Rationale

The University has invested heavily in its enterprise infrastructure (including network, platform, collaboration, integration), and capabilities to support that infrastructure. Leveraging the infrastructure capabilities will help to maximize return on the University's investment.

Implications

1. Infrastructure design must consider requirements across the University System.
2. We must ensure that solutions make best use of capabilities provided by the enterprise infrastructure.

Obstacles

1. Could potentially conflict with Technical Principle Three, Industry Standards.

Key Actions

1. Review the infrastructure architecture to ensure that it has considered requirements across the University.
2. Review all solutions to ensure that they make best use of capabilities provided by the enterprise infrastructure.

2.3 Advocate flexibility and interoperability

Rationale

Using open protocols and interfaces increases options for integration with other components, systems, or platforms. Avoiding tight coupling decreases complexity and improves agility, as well as minimizing cost and risk. Applications and solutions should avoid dependency on components from a single vendor when possible.

Implications

1. Architecture should be based on open standards.
2. The architecture must not create interdependencies between layers (no tight-coupling) - the lack of inter-dependencies will allow layers of the architecture to be replaced independently of the other services.

Obstacles

1. May be difficult to persuade users to give up their old systems.
2. Vendor products may require particular components or vendor's other products in order to be considered a supported configuration.

Key Actions

1. Ensure that the architecture (enterprise and solution level) is based on open standards.
2. Ensure that the architecture and solutions does not introduce tight-coupling between components.

2.4 Be designed to meet business requirements

Rationale

Solutions should be engineered appropriate to the business requirements to minimize cost and maximize value.

Implications

1. Business owners must define expected levels of service for their applications and services from which the overall solution design can be created.
2. Need to define levels of resilience, availability, performance, usability, manageability, etc.
3. In the one instance the degree of resilience may not meet business requirements with potential impact upon the quality of service, while alternatively; over-engineering results in additional unnecessary costs which may never be recovered.

Obstacles

1. Lack of understanding of criteria to be used when making business decisions.
2. Dependencies on infrastructure and other systems which may not support desired goals.

Key Actions

1. Create guidelines for making business decisions.
2. Define levels of resilience, availability, performance, usability, management, etc. and associated costs.
3. Identify dependencies between systems and infrastructure and ensure they can support the desired service levels.

2.5 Consider Scalability

Rationale

Solutions must be able to scale over time and increases in demand during their lifetimes, based on current understanding of business strategy and project requirements, in order to maximize return on investment.

Implications

1. A formal capacity planning process need to be embedded within the development lifecycle of all applications and services.
2. We need to use technical solution to provide flexibility.
3. We should implement and manage IT solutions as services.
4. Systems need remote monitoring capabilities.

Obstacles

1. Existing systems may not be able to scale appropriately.

Key Actions

1. We need to implement ITIL capacity management process.
2. Ensure all solutions are reviewed to ensure they meet scalability and performance requirements.

2.6 Support business continuity

Rationale

Technology is critical to the business and mission of the University, so critical business solutions should provide service consistency and recoverability in the face of unexpected events.

Implications

1. Business continuity requirements need to be defined and agreed with the business and then published.
2. Business architecture must support business continuity requirements.
3. IT architecture must support business continuity requirements.
4. IT must prepare for disaster or other unforeseen situations.
5. Plans for technology change should strive to minimize downtimes, and the IT architecture should support this.

Obstacles

1. Cost may outweigh the business benefits.
2. Unrealistic business expectations.

Key Actions

1. Establish business case for continuity.
2. Define and publish business continuity requirements.
3. Review business architecture to ensure that is compliant.
4. Review IT architecture to ensure it supports business requirements.
5. NOTES: scalability, transition to new or different systems.

3.0 Guiding Principle: Strive for simplicity

The University prefers to buy services rather than develop solutions ourselves when the technology is well-defined and/or mature. Using the existing product allows the University to focus effort on the mission rather than developing a custom solution. In-house development should be reserved for emerging technology. The proposed architecture and constituent technologies must support industry standards. The University should use strategic suppliers and leverage existing relationships. The simplicity principles promote transparency in design and process that allows for supportable systems and services.

Preference for parsimony and transparency in design.

3.1 Leverage strategic suppliers

Rationale

To develop and provide technical solutions, the University should use strategic suppliers and leverage existing relationships. This will streamline purchasing and support processes and maximize return on investment.

Implications

1. Strategic suppliers must ensure that all proposed solutions are aligned with the University architecture principles and standards.
2. The Technical Architecture Group reserves the right to review any proposed solution to ensure overall conformance to standards and alignment across architectural domains and to ensure that any inter-domain dependencies are taken into account.
3. Strategic suppliers must attend and participate in regular Domain meetings which will provide the forum for the discussion of new and strategic requirements.
4. Strategic partners should ensure that there is a collaborative approach to technology solution selection for service provision.
5. Strategic suppliers will provide the single interface into the University for the provision and on-going support for new services. Strategic suppliers will directly manage relationships with any other suppliers of the service.
6. When strategic suppliers are not able to provide proposals the University will follow industry best practice and select a technology solutions based on fit to business requirements and total lifecycle costs.
7. Leverage consortia purchasing to provider greater cost savings via economies of scale.

Obstacles

1. Capacity, both in terms of specifying provision and change management.
2. Tension with avoiding vendor lock-in.

Key Actions

1. Ensure that business and IT is aware of this requirements.
2. The Domain Architects will need to work more closely with strategic suppliers to ensure service requirements are understood and met.
3. Regular Domain architecture meetings will be arranged to provide the discussion forums for all new and strategic requirements.
4. All proposals, where possible, will be provided in terms of both a service charge (e.g. cost per user), and a standard capital and operating cost.

3.2 Prefer buy versus build

Rationale

The University prefers to buy services rather than develop solutions ourselves when the technology is well-defined and/or mature. In-house development should be reserved for emerging technology. This allows the University to focus resources on our mission rather than developing custom solutions, while enabling innovation.

Implications

1. Strategic suppliers must ensure that all proposed services are aligned with the University architecture principles and standards.
2. When strategic suppliers are not able to provide proposals the University will follow industry best practice and select technology solutions based on fit to business requirements and total lifecycle costs.

Obstacles

1. Capacity for service specification is limited.

Key Actions

1. The Domain Architects will need to work more closely with strategic suppliers to ensure service requirements are understood and met.
2. Regular Domain architecture meetings will be arranged to provide the discussion forums for all new and strategic requirements.
3. All proposals, where possible, will be provided in terms of both a service charge (e.g. cost per user), and a standard capital and operating cost.

3.3 Use industry standard interfaces

Rationale

The proposed architecture and constituent technologies must support open, industry standards

and Application Programming Interfaces (APIs), and avoid proprietary interfaces. This will reduce development cost, integration costs, and the time required to implement new functionality.

Implications

1. Enterprise architecture needs to create a set of patterns covering approved integration standards.
2. Systems which do not conform to standards may need to be wrapped to enable integration.
3. Where this is not possible all interfaces must be implemented through published APIs.
4. Using industry standards provides a large pool of IT professionals qualified to support the solutions.

Obstacles

1. Compliance of existing systems and services.
2. Visibility – it may be difficult to establish which existing systems and services are compliant.

Key Actions

1. Create integration standards.
2. Review existing system to identify which components may need to be wrapped.
3. Develop roadmap for compliance.

3.4 Prefer existing solutions over internal development

Rationale

In a mature market, a company specializing in a particular solution will have an existing product with a wide range of functionality. Using the existing product allows the University to focus effort on the mission rather than developing a custom solution.

Implications

1. The total cost of ownership for any solution includes not only development and implementation costs, but subsequent maintenance, development and support costs which must be considered.
2. Self-build needs to be considered in the following circumstances:
    a. In a new market where commercial products do not currently exist.
    b. In-house development may be necessary to build competitive edge.

Obstacles

1. Lack of skills within the business community to specify requirements at system and service level.
2. Capacity to do this.
3. Culture, within some specific areas of the organization.

Key Actions

1. The Technical Architecture Community should participate in all product selection processes to ensure architectural principles are being adhered to.
2. Ensure that the business community is aware of the requirements for buy not build and that this is clearly communicated.

4.0 Guiding Principle: Ensure regulatory compliance

The compliance principles require that solutions or practices meet legal, regulatory, and safety requirements. All solutions must be risk assessed to ensure that they can be implemented and operated without introducing unacceptable risk. The security standards implemented must align with the University Security Framework. Adherence to regulations helps protect the University's reputation and minimize legal liability.

Solutions or practices are compliant with regulatory requirements and industry best practices.

4.1 Comply with health and safety guidance

Rationale

Not following health and safety guidelines will introduce risk to University personnel and may result in legal action being taken against the University.

Implications

1. The architecture group needs to be aware and regularly updated about new regulations which may impact the design of IT systems.

Obstacles

1. Budgeting for compliance work for new/unexpected requirements.

Key Actions

1. Create guidelines for health and safety conformance for solutions and services.

4.2 Conform to security framework and standards

Rationale

Security standards are specifications for how a particular technology is to be configured and deployed. All technologies specified must be risk assessed to ensure that they can be implemented and operated without introducing unacceptable risk. The implemented solutions must align with the University Security Framework, including Data Classification.

Implications

1. Changes in individual technologies must be tracked and the accompanying security standards updated.
2. Governance processes must include the auditing of systems against the security standards.

3. Change management processes must include checks against applicable security standards.

Obstacles

1. The architecture might require technologies for which University security standards do not yet exist, e.g. Data Classification.

Key Actions

1. Ensure that the governance process allows for the timely risk assessment of new or changed technologies.
2. Ensure that the governance process allows for the time limited and risk assessed dispensation of compliance with security standards.
3. Maintain a list of “approved” and/or “recommended” security-assessed technologies to simplify architectural decisions.

4.3 Meet legal and regulatory requirements

Rationale

Not conforming to legal and regulatory requirements may result in legal action being taken against the University, which will both damage the institution's reputation and potentially result in compensation payments.

Implications

1. The architecture group needs to be aware and regularly updated about new regulations which may impact the design of IT systems.
2. The relevant requirements must be analyzed to determine what impact they have on architecture standards
3. Standards need to be defined and published.
4. Enterprise Architecture governance needs to be put in place.

Obstacles

1. The global nature of the organization may result in conflicts for compliance.

Key Actions

1. Should become part of scope of the security domain group.
2. Define and publish standards.
3. Ensure that all solutions are reviewed to ensure compliance with standards.