

## Architecture-Driven Modernization: Transforming the Enterprise

For a number of years, systems modernization has been providing benefits to organizations seeking to analyze software architectures in support of tactical systems initiatives such as software maintenance. Modernization has also delivered benefits to project teams seeking to migrate from obsolete or aging languages and platforms to more modern environments.

While success stories abound for tactical modernization projects, they merely represent the “low hanging fruit” of what modernization can achieve. Modernization efforts are now reaching into more significant and impactful business domains, extending opportunities into the upper echelons of IT and business architectures. Allowing modernization to reach its full potential requires a deeper understanding of its architectural impacts.

### Architectural Domains & Modernization

While there are numerous modernization project scenarios, they are summarized into three major architectural perspectives within two domains. Figure 1 depicts the business and IT domains comprising the business architecture, application and data architectures, and technical architecture perspectives coded B, A and T respectively.

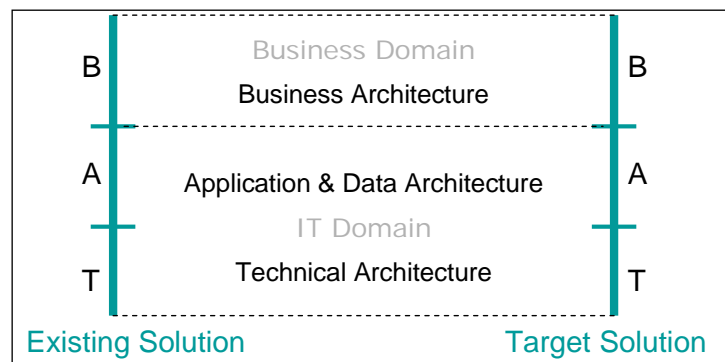


Figure 1: Business vs. IT Architecture Domains

The business domain comprises models and correspondent diagrammatic views of organizational governance, business semantics, business rules and business processes, which extend into value streams. The IT domain, on the other hand, comprises traditional data, application and technical architectures.

The existing solution, which encompasses the three architectural perspectives and the actual data and systems themselves, is represented on the left of Figure 1. The target solution, shown on the right side of Figure 1, is fluid and changes over time as incremental portions of the existing solution are migrated to the target.

Architecture transformations occur as projects incrementally migrate portions of the

existing solution to the target solution. These projects can be business driven and / or IT driven. Figure 2 depicts the transformation of the existing solution to the target solution across business and IT domains.

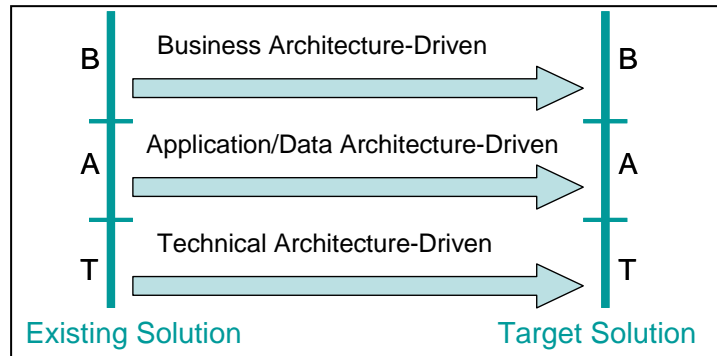


Figure 2: Modernization Drivers & Trajectories

The transformations depicted in Figure 2 are dramatically enhanced through the concept of “Architecture-Driven Modernization” or ADM, which is used to incrementally evolve the existing solution to the target solution.

Modernization projects historically focused on transforming technical architectures. As organizations realize the need for and develop the means to transform higher-level architectures across the IT and business domains, formal interoperability across these domains becomes much more critical. For organizations to successfully apply transformative concepts, modernization must be driven from all three architectural perspectives. The “Horseshoe Model” explains these interoperability concepts.

**ADM Horseshoe Model**

ADM usually involves one or more components of the IT architecture. Each component of an IT portfolio has its own trajectory of evolution from the as-is state to the to-be state (i.e. an element of the existing solution evolves into an element of the target solution). Figure 3 depicts various trajectories across the knowledge curve that reflects transformations within architectural perspectives.

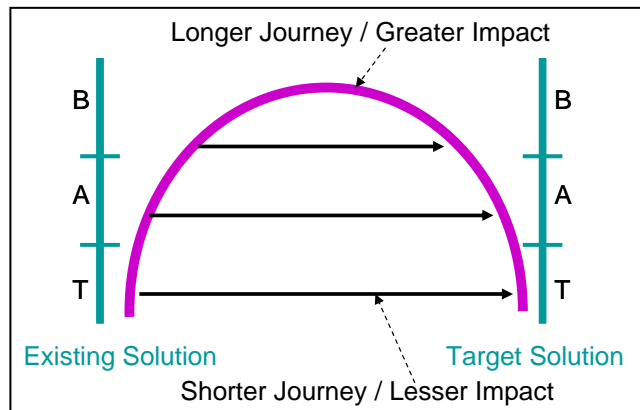


Figure 3: ADM Horseshoe Model

The diagram in Figure 3 is referred to as the *ADM Horseshoe Model* because the knowledge curve resembles an upside down horseshoe. This paradigm is consistent with the SEI Reengineering horseshoe model [1] and earlier works of the authors of this paper [2 and 3].

There are three elements to every transformational path, regardless of the level of architectural impact. These are identified as follows.

1. Knowledge discovery of the existing solution. This occurs at many levels of abstraction across varying degrees of scope as appropriate to the projects involved.
2. Target architecture definition. In order to create a transformation approach, analysts must create a target solution that serves as a framework into which existing solutions are mapped or transformed.
3. Transformative steps that move the as-is state to the to-be state. The approach ranges from the physical (e.g. a language migration) to the more abstract (e.g. business rule mapping to a rules-based environment).

These transformational paths must be synchronized both vertically (business-to-physical implementation) and horizontally (existing-to-target). The ADM Horseshoe Model for a given enterprise modernization strategy is a collection of these journeys (made up of horizontal and vertical transformations) that are combined based on business and IT requirements.

### ***ADM Horseshoe Model for Modernization Types***

The ADM Horseshoe Model defines the entire range of architecture-driven modernization journeys available. This includes the vertical views (or modernizations of specific portions of the portfolio) that begin within the business domain and move through the data, application and technical architectures of the IT domain or ripple back up through the chain.

This is an important consideration for management. Many times, application or data architecture issues prevent an organization from implementing certain changes related to a merger, acquisition, new product deployment or other business issue. IT may wrongly believe that simply migrating to a new technology will fix the problem. So it is important to place any type of modernization project into the proper perspective from an architectural standpoint. The discussion of each of these journeys that follows relates the model to some practical project scenarios familiar to most organizations.

### ***Technical Architecture-Driven Modernization***

Technical architecture-driven modernization is historically the most commonly applied type of modernization project. It is driven by risk due to platform or language obsolescence, cost of ownership, system usability or other factors that are addressed through a physical change. Figure 4 depicts the journey within the ADM Horseshoe Model for technical architecture modernization.

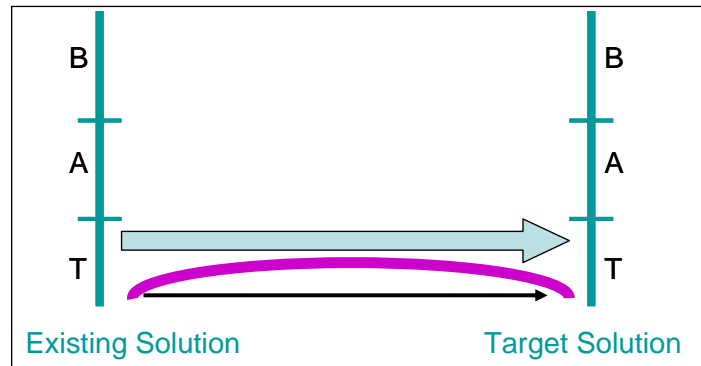


Figure 4: Technical Architecture Transformation

Organizations perform this type of work all the time. For example, IT may be moving from one platform to another and / or from one language to another. IT may alternatively be streamlining systems through various refactoring exercises such as restructuring, data definition rationalization re-modularization or user-interface replacement.

There is a fine line between a project that is only executed at the technical architecture level versus a project that crosses into an application / data architecture-driven project. That line is crossed when there is an impact on program-level, system-level or data design factors. For example, transforming from a procedural language to an object oriented language, where application design changes are involved, necessitates changes to the application architecture.

### **Application / Data Architecture-Driven Modernization**

Application and / or data architecture-driven modernization moves up the scale of the modernization paradigm. The projects in this category vary, but generally span multiple applications.

For example, a project to abstract, redesign and redeploy existing applications in a model driven architecture (MDA) falls into this category. Figure 5 provides an example of the ADM Horseshoe Model showing application and / or data architecture modernization paths.

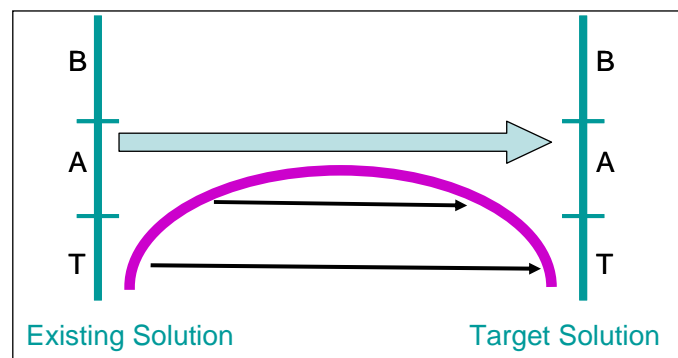


Figure 5: Application &amp; Data Architecture Transformation

Application / data architecture-driven modernization may be motivated by a variety of factors. For example, an application architecture modernization project may involve multiple applications that can no longer serve the needs of the business through incremental maintenance activity. It may alternatively involve a data architecture that is out of synch with strategic information requirements due to being aligned around an outdated application model.

Another example involves multiple applications that require redesign and transformation into a common application that uses a redesigned data model coupled with a platform migration. Such a project moves through an application, data and technical architecture trajectory on the way to the ideal target solution.

Projects like this are being undertaken by IT organizations, but do not always apply the formal disciplines required in a modernization project. In addition, the interoperability models with MDA and other standards are still evolving. In each of these cases, there is analysis and design work involved, but the IT architecture is not aligned to a revised business architecture.

### **Business Architecture-Driven Modernization**

Business architecture-driven modernization involves the most comprehensive solution and incorporates business architecture models, application and data architectures and technical architectures. Figure 6 depicts the ADM Horseshoe Model for business architecture-driven modernization.

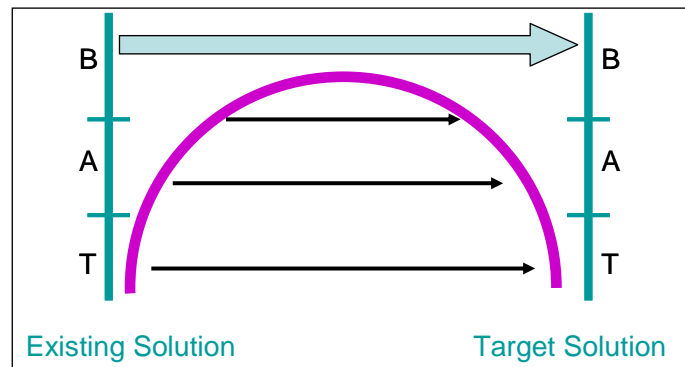


Figure 6: Business / IT Architecture Transformation

Business architecture-driven modernization formally aligns application and data architectures with business models that include a combination of governance, business semantics, business rules and business processes. Very little modernization work in this area has been effectively deployed because the mapping paradigms between business and IT lack standardization.

### **Standards Involved in Modernization**

In 2003, the OMG Architecture-Driven Modernization (ADM) Task Force issued a 7-stage ADM Roadmap to establish a series of modernization standards.[4] Four of those

standards, all of which deal with variations of modernization analysis, are either in place or underway.

Additionally, the Software Assurance (SwA) Task Force is developing a SwA Evidence Metamodel. These standards are plotted to the ADM Horseshoe in Figure 7 below.

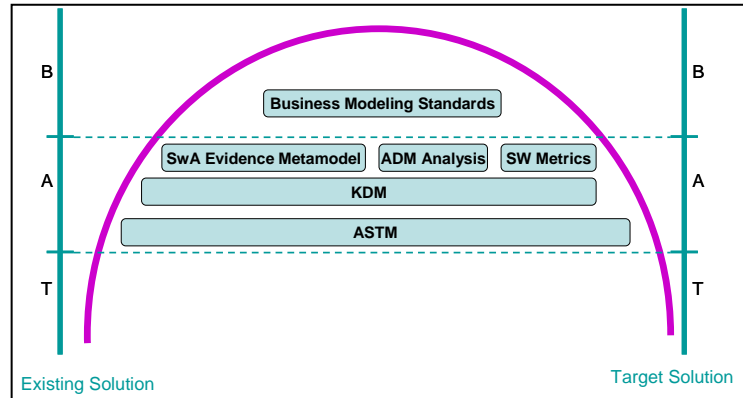


Figure 7: OMG ADM Standards and the ADM Horseshoe

The remaining portions of the ADM Roadmap deal largely with refactoring and transformation.

### ***What is missing?***

The missing links in the ADM Horseshoe Model include formal mappings between ADM models and MDA models, transformation standards to support these mappings, formal mappings between ADM models and the spectrum of business models, and interoperability across business models. This work is underway within various OMG task forces and working groups. Hopefully, this white paper clarifies the interoperability requirements of the business and IT domains.

## **References**

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