Defining Requirements for a Business Architecture Standard

As enterprises continue to deploy business architecture capabilities, the need for a consistent, cohesive understanding of business architecture is growing increasingly critical. Frameworks, methodologies and tools will continue to evolve, but practices and technologies must be based on a solid foundation. This white paper promotes a common understanding of business architecture. The discussion defines the essence of the business architecture, how it relates to IT architecture, the importance of business architecture standardization and a roadmap for achieving standardization. These efforts are being coordinated by the OMG Business Architecture Working Group.[1]

Change Log Note: Two changes were applied between version 3 and 4. Figures 2 and 4 were modified to more clearly articulate the business / IT ecosystem relationship. Additional changes are pending.

Background

The nature of business architecture requires a common approach to representing the essence of the business. In the absence of this common approach, the methods, tools and business architecture itself will flounder and deliver suboptimal solutions. Based on numerous discussions with business architecture professionals; reviews of common practices; examination of professional training programs; and an analysis of published articles and presentations, it is clear that there are many views of business architecture. Fortunately, best practices are continuing to mature and these best practices are considered essential to the formation of a business architecture standard.

Much of the low hanging fruit associated with streamlining processes within business units has been addressed in recent years. As organizations increasingly seek to solve more far-reaching, high-payback horizontal initiatives, management will require common views to address the nature of cross-functional, cross-disciplinary projects. Unfortunately, business units and functional silos view their piece of the enterprise in inconsistent and irreconcilable ways. Coordination and communication are essential to projects that cross functional silos and this drives the need for business architecture to deliver a cohesive, consistent understanding of the business.

Use Case Alert → For example, assume that you have several customer call centers servicing an overlapping customer base across several business units. Now further assume that the enterprise, as a whole, has been steadily losing customers – for unknown reasons. Management will want to diagnose the situation in order to craft a solution. This requires understanding which business units, across certain divisions, are supporting certain customers for various products and services. It also requires identifying common processes that each call center uses, the semantics that define their understanding, the rules that govern their actions, and where processes begin and end from a cross functional perspective.

The business architecture provides the means for organizing previously disparate and poorly connected capabilities, organizational structures, processes, semantics, customer views and other aspects of the business into a readily accessible knowledge base. Common views of the factors and challenges at hand, abstracted from the business architecture, allow management to rapidly ascertain the root cause of a problem and objectively discuss ways to address these issues.

If there is no agreed upon approach for representing a business in a way that facilitates understanding how the organization functions, then management, analysts and planning teams will talk in endless circles, struggle to come to a common understanding and be unable to craft solutions to outstanding challenges. Horizontal challenges are not only highly common, but are particularly difficult to articulate

and address. The inability to view the business from a cross-functional perspective blinds project teams from the root causes of an issue and from recognizing the full range of possible solutions.

Visualizing Enterprise Ecosystems

Business architecture ties together a diverse ecosystem that represents an enterprise from a wide variety of perspectives. These include goals, strategies, and tactics; subsidiary entities, business units and teams; semantics and rules; capabilities, value chains and processes; initiatives, programs and project; and customers, partners and suppliers. These business "artifacts," along with the relationships among these artifacts, are the essence of business architecture. The complexity of most organizations is such that the business ecosystem cannot be readily visualized by the individuals managing and working within that ecosystem. By utilizing a common approach to represent the various business artifacts, business architecture makes visualizing complex business ecosystems a reality.

Many organizations are concerned about visualizing their as-is and to-be business architecture. The path from point A to point B can never be clear if there is no agreed upon view of where you are or where you are going. The as-is business architecture allows management to envision the root cause of critical business issues while the to-be business architecture creates a clear vision as to how to correct these root cause issues. The transformation plan to move an organization from point A to point B establishes a roadmap of initiatives and projects essential to achieving that vision. But how can an enterprise accomplish this when there is no common view of an enterprise? To accomplish this, a diverse business environment must be crystallized into a cohesive, normalized and generally agreed upon representation.

First, we should examine just what management and analysts want to see. Executives like simple pictures. Directors and managers want more detail. Project planners and architects require even more detail. The key here is that regardless of how you want to zoom in and zoom out of the business architecture and which parts need to be visualized at a given point in time, the underlying structure must support the requirements for a wide variety of business scenarios.

Executive views, typically pictures, remain more art than science, but are evolving. These pictures are abstractions that summarize the underlying details. Every business architecture team should have someone that has the ability to help executives see the big picture. But even in this case, the details provide the foundation for the executive view.

Vice presidents, directors and managers are more likely to want to see techniques that they have worked with previously. This may include balance scorecards, capability models, operational views, organizational and supply chain models, and so on. For these techniques to be able to deeply impact an organization, however, they need to be built upon a comprehensive set of business artifacts that link across all the levels of the organization and this is where business architecture comes into the picture.

Defining the Business Architecture Ecosystem

In order to support this kind of analytic view tool vendors must step up to provide visualizations of the business architecture ecosystem. To date, few vendors have taken up the mantle to tackle this visualization challenge. Part of the reason for this is that there is no agreed upon metamodel of how all of the business artifacts tie together. A metamodel is an explicit model of the constructs and rules needed to build specific models within a domain of interest.[2] The domain of interest in this case is business architecture. While a consistent metamodel that tools can build upon is not in place today, best practices are in place that can provide a basis for the creation of a business architecture standard.

A review of the best practices in use today suggests that there is a common foundation of business artifacts that can be used to provide business professionals with a wide variety of views of how an enterprise is organized and how it functions. These artifacts create a representation of the real world that facilitates the capture, analysis and visualization of the essence of the business. Figure 1 depicts categories of business artifacts that form the foundation of the business architecture.
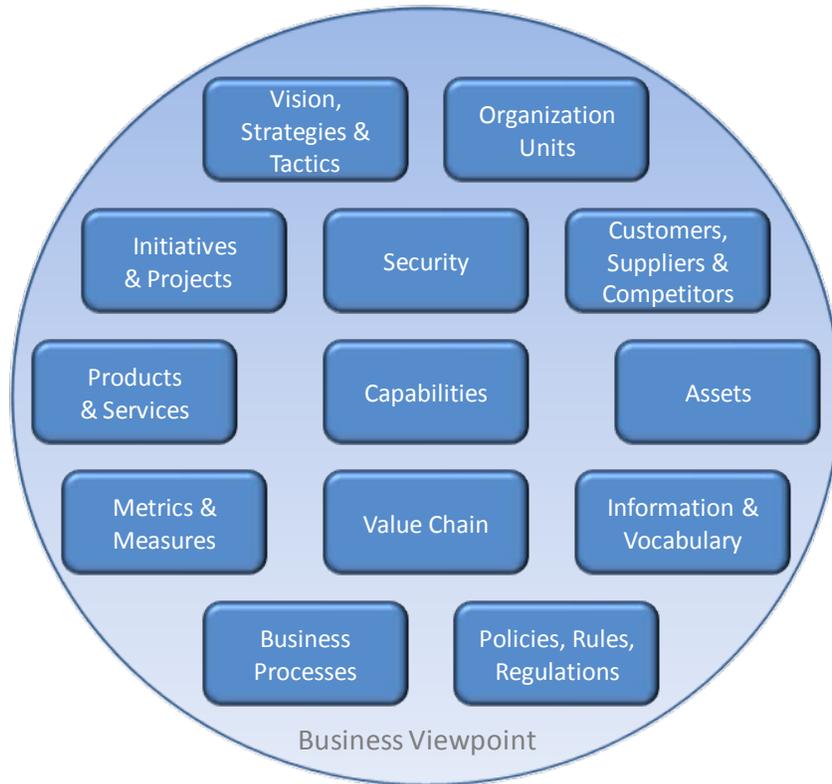

Figure 1: Business Architecture Ecosystem

The business artifact categories listed in Figure 1 represent the business architecture ecosystem from an internal and external perspective. For example, the concepts of capability, value chain, business process, semantics and rules, and decision rules define what a business does and how a business does it. Organization unit, customer and supplier define who does what inside and outside the enterprise. Motivations define why something is being done or should be done while the things being done include initiatives and projects. Metrics and measures provide a way to assess progress towards goals and to track performance. Products, services and assets define what an enterprise produces, what is delivered to customers, what is received from suppliers and the assets used internally to accomplish certain tasks. Security permeates all aspects of the enterprise but is defined separately because of its importance to organizational viability and competitiveness.

Certain categories in Figure 1 decompose into subcategories. For example, organization unit includes various enterprise structures, such as division, agency or business unit, as well as the concept of a role. Motivations decompose into categories such as vision, strategy and tactics. Generally, however, the concepts defined in Figure 1 strive to take a coarse grain view of the enterprise. Business architecture is not focused on micro management of individuals or tasks, but is more akin to a Google Earth view of the enterprise. As users of the business architecture zoom in to a certain area of focus, other disciplines take over.

Use Case Alert → For example, consider an executive team planning to align, streamline and automate supply chain processes that are currently carried out across many organization units. The business architecture provides a method of capturing the set of unique capabilities that an organization values and the mapping information and related drilldown capability to identify that there are multiple redundant processes, using similar yet conflicting information, servicing the same supplier base and relying on multiple backend applications and user-developed shadow systems. Mapping these artifacts provides management with the information needed to construct a roadmap for consolidating and automating these processes.

Business Architecture and IT Architecture

In many organizations, the relationship between business and IT is closely intertwined so that any discussion of business architecture must be able to address how these business artifacts relate to the IT architecture. IT data, applications and technology automate the business. As various business and / or IT artifacts are transformed, interdependent artifacts in adjacent architectures must be similarly transformed.

For example, if a set of business processes are being consolidated and streamlined, user interfaces, shadow systems, information semantics and data, and other business and IT artifacts must be aligned accordingly. If interdependent artifacts become out of synch, business professionals will encounter problems that could impact an organization in negative ways. The relationship between the business architecture ecosystem and the categories of artifacts that make up the IT architecture ecosystem is shown in Figure 2.
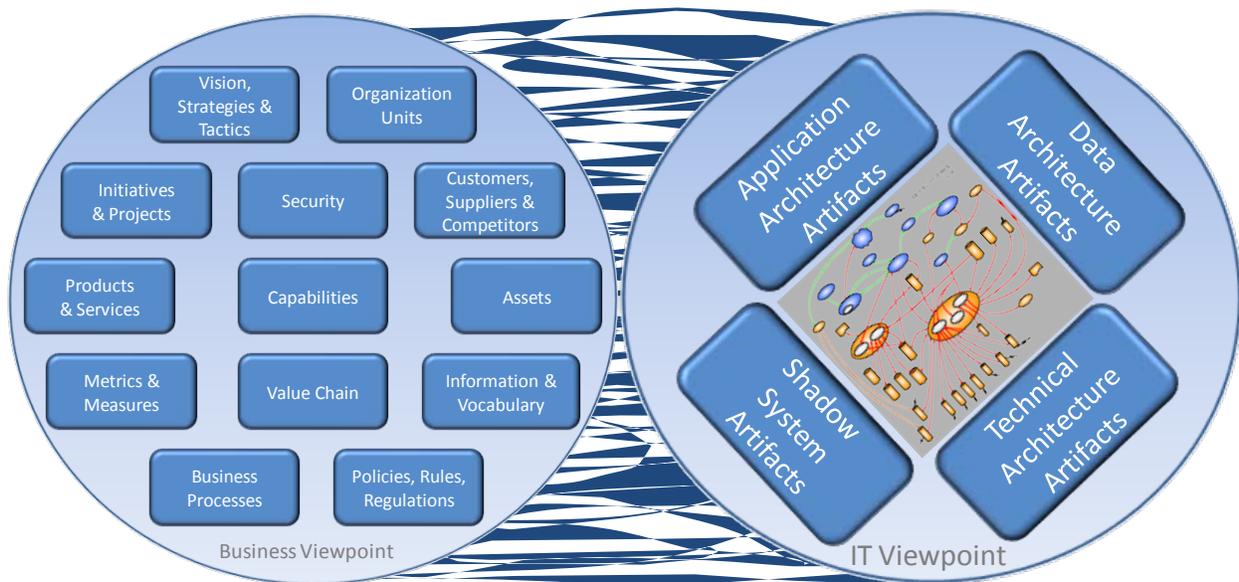

Figure 2: Enterprise Ecosystem – Business & IT Views are Inextricably Woven Together

Application Architecture Artifacts include all of the business systems and services under the control of the IT organization that are used to deliver value to the business. Shadow System Artifacts, on the other hand, represent desktop and other business-developed and business-owned systems that exist in that shadowy area between formal IT interfaces and the business. Data Architecture Artifacts include all aspects of the data environment including abstracted representations of data, data usage and data relationships.

The Data and Application Architecture Artifacts have direct, ongoing and essential relationships to business architecture artifacts. Therefore, the business architecture must provide ways in which business and IT artifacts can be related as necessary to support a given set of objectives for a customer. Ultimately, business and IT architecture ecosystems can be interconnected in ways that facilitate analysis, planning and evolution of these ecosystems through visualizations and simulations that are unavailable today.

While business domain standards have been evolving over the past few years, these standards have targeted selective and sometimes narrow slices of the business architecture. In addition, business domain standards have not been aligned with each other or with IT-related standards. For example, the Semantics for Business Vocabulary & Rules (SBVR) standard has not been aligned with the Business Process Modeling Notation (BPMN) standard. Further, attempts to connect IT-based metamodels and domains to these standards have offered narrow point solutions such as the Knowledge Discovery Metamodel (KDM) to SBVR mapping.

This point-to-point approach to linking standards has constrained customers and vendors from creating and integrating accurate representations and visualizations of the business architecture ecosystem. These silo-based, business and IT modeling standards have actually had a detrimental effect on the business, IT and the vendor community by feeding the notion that point-to-point solutions can serve as the basis for a viable business / IT strategy. In the end, these kinds of solutions don't provide the comprehensive approach that allows organizations to have an integrated view of all the factors involved in a particular business effort.

One example of this is the common scenario where a set of business process models are handed to an IT project team which is expected to create an SOA based target architecture and a functioning set of systems. This is not a viable strategy because it ignores critical portions of both the business and IT architectures – such as information, capabilities and decision structures and thereby fosters misalignment between business and IT artifacts which will later have undesirable implications for both.

Addressing business / IT alignment requires a holistic view of the enterprise and a holistic view of the relationship between the business and IT architecture ecosystems. This concept has been missing from tools, vendor strategies and architectural disciplines in general. A business architecture standard addresses these issues and provides significant benefits by helping enterprises achieve:

- Consistent representation of the business architecture ecosystem that enables a multitude of tool vendors to deliver more useful, standardized business and IT solutions

- Automation of the creation, integration and updating of a wide variety of management analytics and reporting

- Synchronization of business / IT transformation efforts

- Automated simulations of various planning scenarios that allow management to visualize and plan for the impact of changes on business and / or IT architectures

- Improved capacity for planning, analysis, design and development of tools that interact seamlessly across business and IT ecosystems

The formalization of business architecture, along with the subsequent alignment between business architecture and IT architecture, provides a powerful foundation for enabling a variety of business

scenarios, vendor solutions and new and improved technologies.

The Business Architecture Metamodel

To facilitate the visualization and synchronize the evolution of business and IT ecosystem, tools supporting these efforts must share a common view of business and IT artifacts. To this end, we propose the creation of a business architecture metamodel that ties various business views together into a comprehensive business architecture. In addition, this same metamodel should provide a way to connect and align business architecture artifacts to related IT architecture artifacts.

The metamodel can be deployed in many forms depending on tool availability and usage. The important point is that the metamodel support a variety of views of the business ecosystem at any given point in time. Business artifacts must be organized in such a way as to allow the greatest degree of flexibility for the largest audience without compromising the integrity of the information that is shared. In addition, the metamodel should share a common set of semantics when deployed across different business units.

Best practice derived metamodel views have been provided to support discussions in the OMG standards community. Industry best practices provide a foundational set of artifact categories, artifact names and relationships that offer guidance as to how a business architecture metamodel can evolve. It is the role of standards organizations such as the OMG to synthesize these best practices into a unified view to free organizations from the need to create and evangelize their own in-house metamodels and provide tool vendors with a common target.

Use of the metamodel varies depending on your requirements, plans and in-house tooling. Some organizations have customized tool repositories using best practices-based, metamodel representations.[3] This approach has facilitated customers' ability to customize existing architecture tools – some of which come with over 250 artifacts and an endless number of relationships. Other organizations have deployed the metamodel in a database, in anticipation of the time when vendors begin to offer off-the-shelf solutions for business architecture. Business architecture tools should ultimately provide prepackaged business architecture metamodels along with visualization options that allow business professionals to understand the business architecture ecosystem from a variety of perspectives.

For example, a tool with a populated repository based on the business architecture metamodel should be able to produce capability and heat maps, value chain depictions, balanced scorecards and various other management analytics and reporting.[4] Ensuring alignment with and support for commonly employed management analytical models and maps must be a major consideration as a standards body seeks to validate a business architecture standard. This is true during the initial deployment of a standard and as that standard evolves.

Finally, understanding and transforming the business ecosystem requires a multitude of holistic views to be assimilated and presented in a wide variety of ways. This cannot be accomplished in spreadsheets, Word documents or Visio where information is lost and cannot be assimilated or managed in useful ways. Rather, sophisticated modeling tools must be employed over the long-term to support these needs. A business architecture standard provides a common mapping of the information required to accomplish this so that business modeling tools can provide the most value to executives and managers requiring information about their business.

Business Architecture Ecosystem & OMG Standards

In order to create a business architecture standard, we propose aligning existing or proposed OMG business domain standards to create a complete view of the business architecture ecosystem. The OMG Business Architecture Working Group (BAWG) is leading this effort, in conjunction with the OMG Business Modeling & Integration Domain Task Force (BMI).[5] The OMG BAWG is also coordinating efforts with the Open Group Business Architecture Working Group.

The artifacts and relationships among those artifacts within the business architecture ecosystem are, to a great degree, defined in existing or planned OMG business standards. Figure 3 depicts a number of the standards under consideration by the OMG Business Architecture Working Group that are most likely to play a role within the business architecture standard.
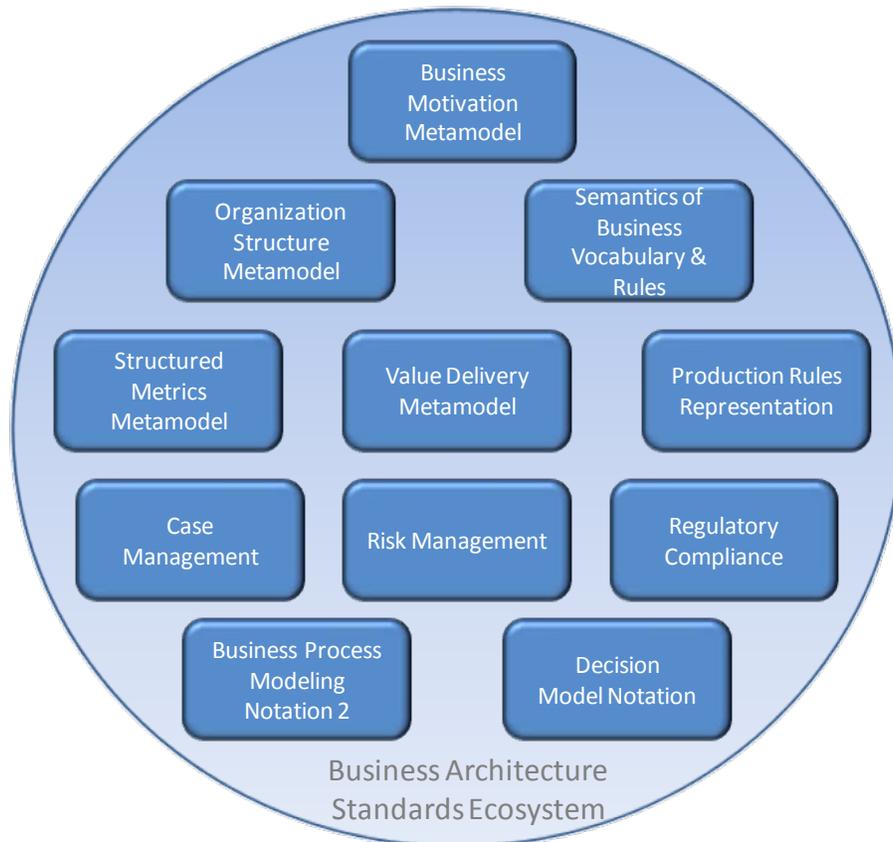

Figure 3 – Existing or Proposed OMG Standards in the Business Architecture Ecosystem

While some of these standards have been adopted, others are at various stages of discussion or planning. Much work has yet to be done, but we anticipate that the combination of these standards can form the foundation for a business architecture standard. Creation of a business architecture standard is based on the following assumptions.

- Many of the artifacts contained within the business architecture ecosystem are defined in existing or planned OMG standards.

- These business architecture artifacts can be found within metamodel defined by each of these standards.

- A business architecture standard can be created by aligning, synchronizing and / or combining

selected artifacts from existing or planned OMG standards.

- This alignment process envisions a "loose coupling" of coarse grain artifacts from various standards.

- A standard with no metamodel and only notational definitions would not support the metamodel portion of a business architecture standard.

- Non-OMG standards may be included in this list if they are defined using an OMG compliant metamodel (i.e. MOF-based[6]).

- Existing practitioner techniques can be mapped to and represented using one or more of the identified standards

Each of the OMG standards referenced in Figure 3 is briefly summarized below. Unless specifically noted, the following standards were or are being created under the auspices of the Business Modeling & Integration Domain Task Force (BMI DTF).[7]

Business Motivation Metamodel (BMM): BMM provides a structure for developing, communicating, and managing business plans in an organized manner. Specifically, BMM identifies factors that motivate the establishing of business plans; identifies and defines the elements of these plans; and indicates how related factors and elements inter-relate. BMM is methodology-neutral and supports a range of approaches for creating and maintaining a motivation model for the enterprise. BMM-related artifacts appear to readily have a home within the business architecture ecosystem.[8]

Organization Structure Metamodel (OSM): This specification defines a metamodel for describing the different facets of an organization structure. Organization structures require handling descriptions for both hierarchical dependencies and functional dependencies. The OSM provides support for capturing a description of how people in the organization are managed and organized. The OSM includes support for functional structures, organizational structures, related dependencies and roles. This standard is currently under development at the OMG and has not yet been completed. OSM is an essential and foundational aspect of the business architecture ecosystem.[9]

Semantics for Business Vocabulary & Rules (SBVR): SBVR provides a standard notation for defining a business rule and related terminology or semantics. This standard notation has been used for defining other OMG standards. SBVR also has an underlying metamodel. Research is needed to determine if SBVR can support the informational aspects of the business architecture ecosystem or if other standards must be included or considered.[10]

Business Process Modeling Notation (BPMN 2): BPMN 2 is the next incarnation of OMG's original business process modeling notation standard – BPMN. While processes are clearly central to any Business Architecture model, the existing BPMN standard focuses on automatable workflow rather than dealing with the broader picture of business processes. This is reflected in its existing metamodel which doesn't provide a foundation for integration with any of the related existing standards. Discussions are underway to adopt a more general metamodel that would allow for the kind of interrelationship that would be required for the standard to be used within a Business Architecture constant but these discussions are preliminary and previous attempts have failed to gather the necessary support to pursue this objective.[11]

Value Delivery Metamodel (VDM): The VDM provides support for high level abstractions that meet the

needs of top management. The standard defines a framework for integrating the analysis of various value-based analytic approaches to support the association of market differentiators with the capabilities that achieve those differentiators. This includes identification of business capabilities and the establishment of hierarchical relationships between capabilities. In addition, VDM supports the relationship between a capability and its usage as a value-related activity; the existence of variations for a capability; and the association of capabilities to the comparative differentiators that they create. This standard is currently under development at the OMG and has not yet been completed.[12]

Decision Model Notation (DMN): Decision notation is a new concept that is just coming under consideration and discussion at the OMG. Early goals for this concept include filling a perceived gap within the business community for specifying business requirements in a business-friendly notation. As with other OMG standards being considered within the business architecture ecosystem, the DMN would require an underlying metamodel.[13]

Structured Metrics Metamodel (SMM): The SMM is an all purpose metrics and measurement standard that was created by the Architecture-Driven Modernization Platform Task Force (ADM PTF). The standard is relevant to the business architecture ecosystem because businesses require metrics (e.g. Balanced Scorecard) in understanding the business. The SMM is going through finalization and can be adjusted as required to accommodate business architecture requirements.[14]

Production Rule Representation (PRR): PRR provides a standard production rule representation that is compatible with rule engine vendor definitions, delivers a standard production rule representation that is readily mapped to business rules as defined by business rule management tool vendors, and encourages system vendors to support production rule execution and offers a MDA PIM model with a high probability of support at the PSM level from the contributing rule engine vendors.[15]

Case Management: "Case management is a collaborative process of assessment, planning, facilitation and advocacy for options and services to meet an individual's health needs through communication and available resources to promote quality cost-effective outcomes."[16] The Case Management standard is at a discussion stage at this point in time.

Risk Management: The OMG is in early discussion stages of determining options for developing a standard to support risk assessment and risk management.

Event Metamodel and Profile (EMP): EMP defines a metamodel and profile for extending UML with capabilities applicable to the sensing and interpretation of events, such as monitoring, filtering, aggregation, and correlation. THE EMP will achieve the following: clarify semantics concerned with modeling events; establish event modeling best practices utilizing OMG technologies; develop a MOF-compliant event metamodel to be used either standalone or via extending the existing UML metamodel with event modeling capabilities; and enable event model interchange between tools via XMI. This standard is currently in the RFP stage.

Other standards may be included in this list from time to time. Additional standards fall outside of the business architecture ecosystem but are also important in order to support business / IT mapping requirements. These standards are addressed in the next section that discusses how to tie IT architecture standards into business architecture standards to support the relationship between the business architecture and the IT architecture.

Tying IT-Related Standards to the Business Architecture Ecosystem

As the business architecture ecosystem evolves, the need to relate and align business architecture with IT architecture becomes even more pressing. A standards-based approach to business / IT alignment requires that standards across business and IT ecosystems be aligned and synchronized. Such an approach must be addressed from a holistic perspective – and sooner versus later. In the absence of a holistic approach to business architecture / IT architecture mapping, point to point solutions (e.g. KDM to SBVR) will emerge that mistakenly lead the industry to believe that business / IT mapping is in place.

Figure 4 shows IT ecosystem standards superimposed over the business ecosystem standards. Each of the IT-related standards in Figure 4 represent some aspect of the IT architecture from an as-is and / or from a to-be perspective. The Knowledge Discovery Metamodel (KDM), for example, represents the as-is IT architecture from an application, data and technology perspective. UML2, on the other hand, typically represents a to-be view of systems. Although KDM can represent any deployed system, UML representation is limited to well defined architectures that have been built using model driven architecture based disciplines.
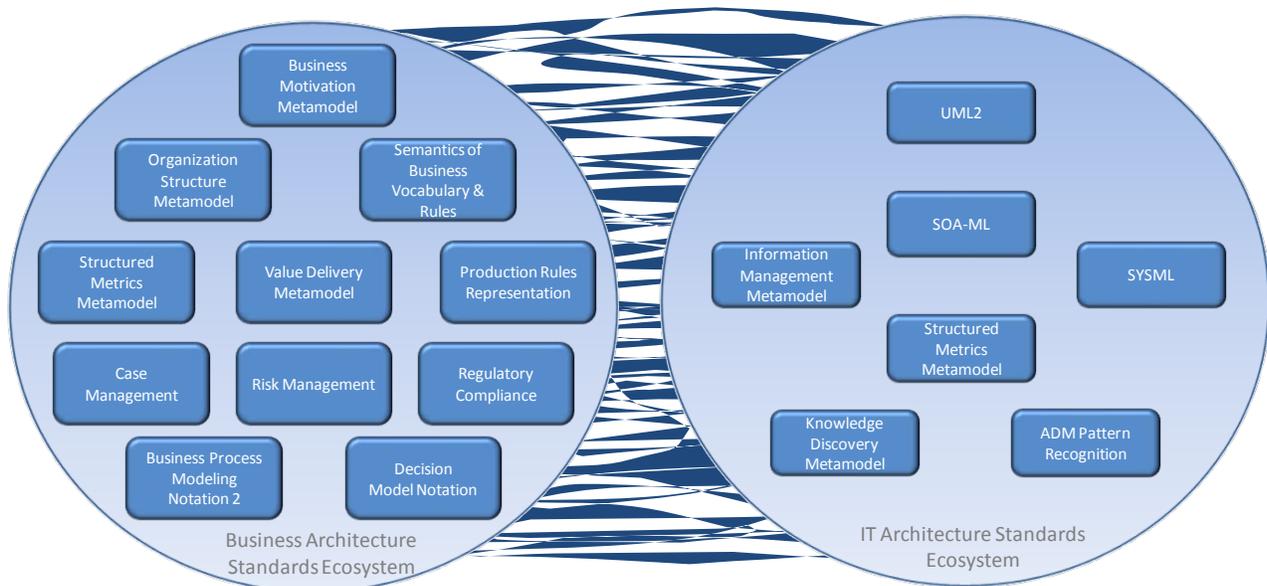

Figure 4 – Business Architecture Standards Loosely Coupled to IT Architecture Standards

Figure 4 depicts the IT standards that are most commonly associated with existing and target IT architectures. These four standards are discussed in more detail below.

Unified Modeling Language (UML 2): UML, along with the Meta Object Facility™, also provides a key foundation for OMG's Model-Driven Architecture®, which unifies every step of development and integration from business modeling, through architectural and application modeling, to development, deployment, maintenance, and evolution.[17]

Knowledge Discovery Metamodel (KDM): The KDM, created by the ADM PTF, is the foundation for understanding existing IT architecture. KDM allows tool vendors to exchange a wide variety of representations of the existing IT architecture for any number of language and platform independent environments. KDM has been deployed as an OMG standard for a number of years and is on its way to being adopted by ISO.[18]

Information Management Metamodel (IMM): The IMM provides a way to exchange metadata about

information in various forms and at various level of detail. The IMM, a direct descendant of an earlier standard called the Common Warehouse Metamodel (CWM), is the next incarnation of a metamodel for representing the data used by IT environments.[19]

Systems Modeling Language Modeling Language (SysML): SysML is a general-purpose graphical modeling language for specifying, analyzing, designing and verifying complex systems that may include hardware, software, information, personnel, procedures, and facilities. In particular, the language provides graphical representations with a semantic foundation for modeling system requirements, behavior, structure, and parametrics, which is used to integrate with other engineering analysis models. SysML represents a subset of UML 2 with extensions needed to satisfy the requirements of the UML™ for Systems Engineering RFP.[20]

Services Oriented Architecture Modeling Language (SoaML): SoaML is a general-purpose graphical modeling language for specifying, analyzing, designing, and verifying SOA based applications.[21] This standard describes a UML profile and metamodel for the design of services within a service oriented architecture.

ADM Pattern Recognition: The pattern recognition concept is still at the discussion stages for the ADM PTF, but we believe that it can provide a model for analyzing existing IT domains to determine modernization opportunities and requirements. In addition, the pattern recognition approach can be expanded across business / IT ecosystems to determine alignment requirements as driven by various business and IT scenarios and requirements.[22]

Additional standards are likely to be added to this set over time to facilitate mapping between the business architecture ecosystem and the IT architecture ecosystem.

Business Architecture Standard Roadmap

The roadmap to achieving a business architecture standard involves phased approach on multiple fronts. Proposed steps are as follows.

1. Finalize and obtain buy in to the overall approach and strategy as defined within this white paper.

2. Gain support from the tool vendor community as to the desirability and viability of these concepts.

3. Finalize a first draft list of artifact categories, artifacts and relationships among those artifacts.

4. Validate various artifacts and relationships against existing techniques already being used in the field.

5. Come to a common agreement on the incorporation and requirements for various work-in-progress standards.

6. Define additional white papers and / or RFPs for certain standards (e.g., OSM, Decision Modeling, Value Chain Delivery) to ensure that they incorporate requisite artifacts from the business architecture ecosystem.

7. Discuss alignment approaches for loosely coupling these standards together under the business architecture.

8. Draft a subsequent white paper and / or RFP for aligning each of these business domain

standards to create a cohesive view of the business architecture.

9. Establish additional phases of the business architecture standard as appropriate.

10. Develop alignment approaches between business architecture and IT architecture standards.

11. Refine and promote these efforts as required.

This roadmap and this white paper may be updated as required to reflect the current thinking. In addition, this document will be circulated broadly to the BAWG, other relevant OMG bodies, the Open Group BAWG, vendors, industry associations and business architecture practitioners. This will ensure that the broadest range of input will be incorporated into the approach. This paper and subsequent versions will be posted at http://bawg.omg.org. Contact the principal authors to submit comments.

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[1] Object Management Group, Business Architecture Working Group, http://bawg.omg.org

[3] Sample Business Architecture / IT Architecture Mapping Metamodel, http://www.omgwiki.org/bawg/doku.php?id=businessarchitectureitalignmentmapping

[4] Note that a tool would not need to follow the metamodel format for its internal representations but would rather rely on the metamodel as an interchange mechanism and to inform the tooling on the artifacts and relationships among those artifacts that are most useful for business architecture.

[5] Business Architecture Working Group, http://bawg.omg.org

[6] MOF – Meta Object Facility, http://www.omg.org/mof/

[7] Business Modeling & Integration Domain Task Force, http://bmi.omg.org/

[8] Business Motivation Metamodel, http://www.omg.org/spec/BMM/

[9] Organization Structure Metamodel, http://www.omg.org/docs/bmi/06-11-02.pdf

[10] Semantics of Business Vocabulary & Rules, http://www.omg.org/spec/SBVR/1.0/

[11] BPMN 2, http://www.bpmn.org/Documents/Introduction%20to%20BPMN.pdf

[12] Value Delivery Metamodel, http://74.125.155.132/search?q=cache:3y3jdoQJhAoJ:www.omg.org/rfp-rfi/e.htm+OMG+%22Value+Delivery+Metamodel%22&cd=3&hl=en&ct=clnk&gl=us

[13] Decision Notation Metamodel, http://74.125.155.132/search?q=cache:wzJaUdoel90J:www.omg.org/oceb/OCEB-WhitePaperforPRR1.1.pdf+OMG+%22Decision+Model%22&cd=2&hl=en&ct=clnk&gl=us

[14] Structured Metrics Metamodel, http://www.omg.org/techprocess/meetings/schedule/Software_Metrics_Metamodel_RFP.html

[15] http://www.omg.org/spec/PRR/1.0/Beta1/index.htm

[16] "Case Management: A Review of Modeling Approaches", Henk de Man, Cordys, BPTrends, http://www.bptrends.com/publicationfiles/01-09-ART-%20Case%20Management-1-DeMan.%20doc--final.pdf

[17] UML, http://www.uml.org/

[18] Knowledge Discovery Metamodel, http://www.omg.org/spec/KDM/1.1/

[19] IMM Wiki, http://www.omgwiki.org/imm/doku.php

[20] Systems Modeling Language, http://www.omgsysml.org/#What-Is_SysML

[21] SoaML, http://www.omg.org/docs/ad/08-08-04.pdf

[22] Visit http://adm.omg.org for future updates on ADM Pattern Recognition