Business First

Business-Centric Methodology
For Enterprise Agility and Interoperability

During the Spring, BeSmart Software Inc. (BS Inc.) did a good job of identifying and targeting a specific market with unmet crucial needs – there was a clear business case that was well supported by management. A brand identity was developed, a message was crafted, vendors were contacted, and a sales team was hired. The market was particularly attractive primarily because BS Inc. could simply modify their current service and re-purpose it for the new target market. With the turn-on date expected to be late fourth quarter, BS Inc. launched their marketing and sales effort. In less than three months, over 100 customers had signed on as sponsors. By any standard, the sales effort was extremely successful.

In late summer, several things became clear. Nobody had accurately scoped the development effort, the project was suffering from requirements creep, and the personnel who participated on the base service offering were no longer with BS Inc. The company responded to this dilemma by outsourcing the effort to a development firm who refused to give an estimate for building the service since the scope of work had not been clearly defined. During the fall, the development partner proceeded on a time-and-materials basis to define the scope of work. This effort was delayed due to lexicon discrepancies between the various parties. A majority of the time was spent "getting on the same page" and rehashing many of the very same issues that were previously tackled with the base service because few of the previous decisions had been documented. With the crisis in full swing, it was apparent that the rationale would not be documented during this round as well. In February, after the date the service was to go live, several critical warning signs came into focus. The team was not synchronized and lacked a common work process; complaints about design details were rampant; and the design was incomplete. Furthermore, the service-oriented architecture which the software tools supported did not leverage Enterprise efforts other than service interfaces, and perhaps more importantly, there was not a common basis from which to mitigate differences. In short, there was a serious disconnect between the vision and its implementation.

With the resulting delays and a rapidly closing window of opportunity, new markets needed to be identified requiring yet another shift in strategy and project focus. At this point in time, development was shortchanging quality and the death spiral continued until the project was simply stopped.

When the project failed, the aftermath was highly complicated and the lessons learned were difficult to assess. In the case of BS Inc. the failure resulted in financial loss, depletion of assets, facility closures, loss of shareholder confidence, job losses, bad press, and the lowering of moral. There is no doubt that the company viewed services simply as "technical projects" and neglected to build a solid base for its new business. Without a solid foundation based on integrated information; one that balances people, process, and technology; BS Inc. increased project risk exponentially.

So how can we avoid the shortsightedness and mismanagement demonstrated by BS Inc. in this example? One solution to avoiding this cascading series of missteps is to apply the *Business-Centric Methodology (BCM)*. The *BCM* is a comprehensive approach for reducing unneeded risk by providing proven techniques that result in an information architecture for Enterprise agility and interoperability. Specifically the methodology provides an organization the opportunity to:

- Provide precise communication between business users and technical experts as well as between Enterprise applications and their respective business partner systems,
- Address integration problems through pragmatic and semantic interoperability mechanisms resulting in a economical, customer-centric, mapping technique,
- Document and fully understand trade-offs and thus provide decision support to business managers,
- Hook various development disciplines together,
- Embrace expedient (ad hoc) as well as institutional business Communities of Interest (CoIs), and
- Exploit the dynamic nature of common mechanisms to adjudicate differences and mitigating circumstances.

Background

This white paper briefly describes the *Business-Centric Methodology for Enterprise Agility and Interoperability* that the Defense Finance and Accounting Service (DFAS) Chief Information Officer (CIO) is developing to improve interoperability among business users and technologists as well as between Enterprise applications and their respective business partner systems. To better understand the magnitude of the effort required to transform business operations lets first review the key factors that limit or prevent organizations from achieving the degree of interoperability that is necessary for continued growth and improvement. These factors can be characterized as follows: 1-3) Semantics, Semantics, Semantics; highlighting the importance of exchanging the meaning of what is communicated, and how difficult of a task this is for orgranizations, 4) Frameworks are complex, thus the solution needs to be simple for widespread adoption, 5) Business managers have failed to take back the "steering wheel"; now is the time, 6) One size does not fit all; be it vocabularies, architectures, or processes; we need to right-size our solution, 7) Information is power, thus solutions need to be easy to implement; there are no excuses for not providing the data the receiver can best use, and 8) Brain drain paralysis; because the real value of any organization goes home after their shift, we need to have ways to capture their institutional knowledge for the long term. These "root causes" of poor interoperability are presented in **Figure 1** in relation to the corresponding symptoms that users and developers typically experience. It is critical that any solution set needs to address the root causes and not the symptoms.

Today's Approach

The presentation of the interoperability problem would not be complete without mentioning the established methodologies for overcoming these inhibitors. Some of the relevant methodologies that attempt to improve and manage Enterprise interoperability are: DoD Architecture Framework (formally called Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance or C4ISR) Framework, UN/CEFACT Modeling Methodology (UMM), Model Driven Architecture (MDA), Rational Unified Process
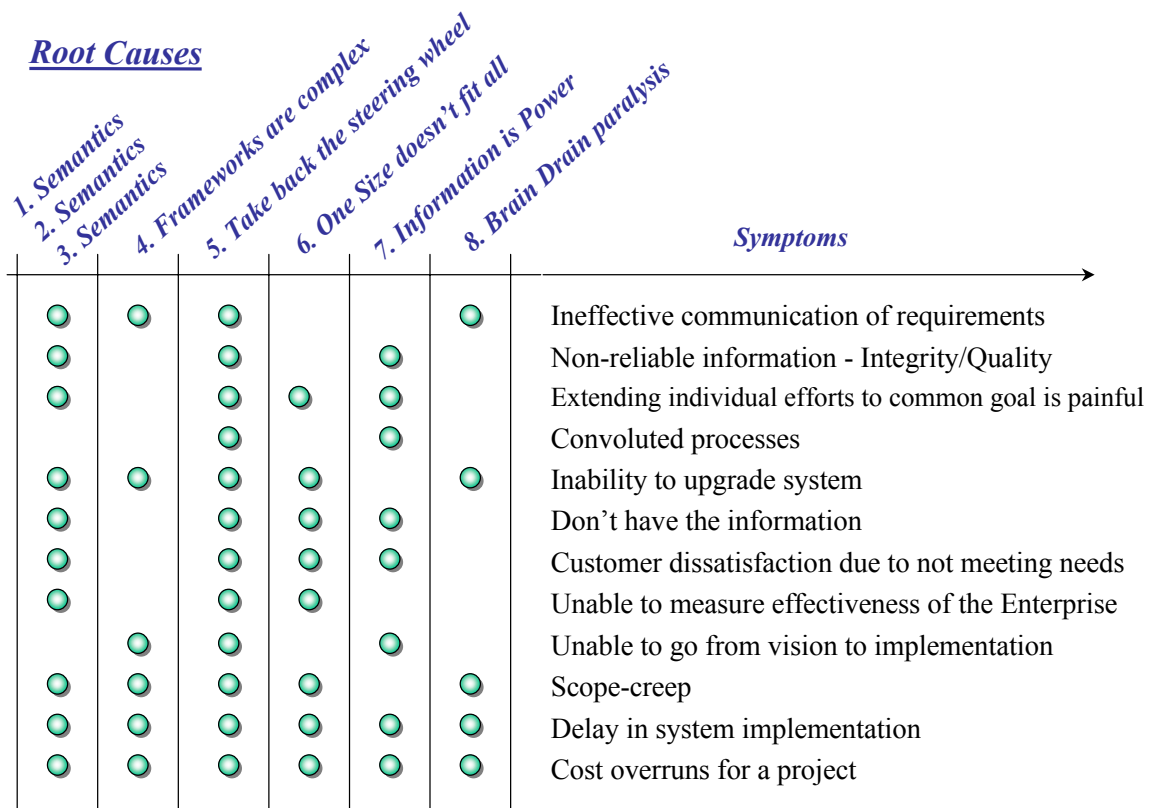
Root Causes

Symptoms	1. Semantics	2. Semantics	3. Semantics	4. Frameworks are complex	5. Take back the steering wheel	6. One Size doesn't fit all	7. Information is Power	8. Brain Drain paralysis
Ineffective communication of requirements	●	●	●	●				●
Non-reliable information - Integrity/Quality	●	●	●	●			●	
Extending individual efforts to common goal is painful	●	●	●	●		●	●	
Convoluted processes				●		●	●	
Inability to upgrade system	●	●	●	●	●			●
Don't have the information	●	●	●	●	●	●	●	
Customer dissatisfaction due to not meeting needs	●	●	●	●	●	●	●	
Unable to measure effectiveness of the Enterprise	●	●	●	●	●	●		
Unable to go from vision to implementation		●	●	●			●	
Scope-creep	●	●	●	●	●			●
Delay in system implementation	●	●	●	●	●		●	●
Cost overruns for a project	●	●	●	●	●	●	●	●

Figure 1 Addressing the Root Causes vs. Symptoms

(RUP), Integrated Definition (IDEF), E-Commerce Integration Meta-Framework (ECIMF), Open Applications Group Interoperability Specification (OAGIS), and ANSI Electronic Data Interchange (X12). Each of these frameworks has strengths, as well as weaknesses that limit their application and effectiveness. For instance, the C4ISR standard is widely applied within the Department of Defense while the X12 standard is designed to improve electronic business transactions. They are designed with interoperability objectives specific to their applied environment that are not particularly transferable between environments. While this is true, these methodologies are

transforming themselves to meet the challenges of the new century including those encountered in systems development and business operations. The required transformations can be categorized as shown in **Figure 2**, which compares the current ("As Is") state of the Enterprise to the desired future ("Can Be") state according to the designated perspectives: Business Operations, Information, Technology, and People. The wide gap between the current and future states demonstrates that the integration and migration of these perspectives to the "Can Be" environment will require an evolutionary, highly flexible, unifying, and business-focused approach to achieve success.

Perspectives	"As Is"	"Can Be' (NetCentric)
Business Operations	Long-standing, stove-piped business process	Integrated business lines; addressing the whole value-chain to extend past the Enterprise
Information	Islands of information supporting isolated solutions	Manage metadata as information asset; knowledge-centric, interoperable solutions
Technology	Technology-driven, proprietary solutions	Declarative processing, open vendor solutions (i.e., open source code)
People	Crisis-driven, single focus mentality	Collaboration – Communities of Interests

Figure 2 Required Transformations

required by the organizations that developed them and often cannot be dismissed. Therefore, what is needed is a complimentary interoperability methodology that provides an information architecture for *choice*. How choice is supported by conceptual agreement, lexical alignment, traceability, and the capture of textual, declarative rationale is covered in the next section.

Enterprise Evolution

The *BCM* evolved after years of addressing the symptoms of the interoperability problem and not the root causes directly. The *BCM* extended the registry-based, business transaction model developed first at the XML/edi Group and later at OASIS and UN/CEFACT with ebXML (Electronic Business XML) specifications. As the *BCM* was developed it became clear that it had wide application to the rapidly changing mission of corporate and government Enterprises. These organizations are actively

Transformation Means Thinking and Acting Differently

Interoperability needs to be addressed on multiple layers and at times requires us to view the problem differently. Architects design by adding constraints to the 'blueprint' as requirements are gathered. These limits, applied correctly, define a process or application that meets the customer's needs. 'Modularity' has proven to be a key factor in providing reuse and encapsulating complexity. In particular the Open System Interconnection (OSI) model has proven to be extremely successful in depicting the layering of communications between computers from different vendors. The OSI-developed International Organization for Standardization (ISO), [http://www.iso.org] addresses the very difficult problems of integrating different data formats and data exchange protocols. Granted, the OSI model has improved interoperability, particularly for the transmission stream over the

physical link, data transfer, switching technologies used to connect systems, transparent data transfer between end points, and sessions; however, it leaves open the lexical alignment required for semantic exchange in the application layer. Today, the OSI encapsulation strategy has evolved and incorporated into advanced architectures such as Object Management Group's (OMG) Model Driven Architecture (MDA) [http://www.omg.org]. In fact it is rare to find an architecture that significantly deviates from the 1994 OSI general model.

In 2003 we are now well positioned to address the challenge of semantic exchange. But to do this we need to adopt a different view; a complementary view. The new view needs to address agility in the Enterprise by understanding which components are stable and which are volatile. From a strong base, our Enterprise can be agile to provide business with "choices". Interoperability is all about choice and meshing or aligning choices at various layers.

So what does this new model look like? At first glance, (**Figure 3**), it appears that the world has been turned upside down. Closer inspection reveals more than a connectivity diagram. This complementary model provides for a semantic base in the form of an information

architecture, but declares vocabularies to be precarious, even more fluid than interfaces themselves! This 'Agility' model and the idea of 'choice' are the underpinning of the *BCM*. To achieve the results defined in the *BCM* doctrine, semantic services are built on an information architecture designed to address eBusiness requirements –
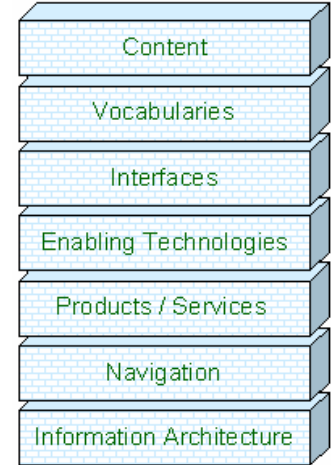
Figure 3 Agility Model

designed for agility and interoperability. The *BCM* prescribes a protocol to follow for aligning disparate systems and Enterprises.

The information architecture identifies the type of artifacts that an organization should register and manage for agility and interoperability. The Lubash Pyramid (**Figure 4**) highlights those critical items required for business integration either within a CoI or Enterprise. Any information valued as a business asset should be controlled, made visible, and shared with partners for integration.
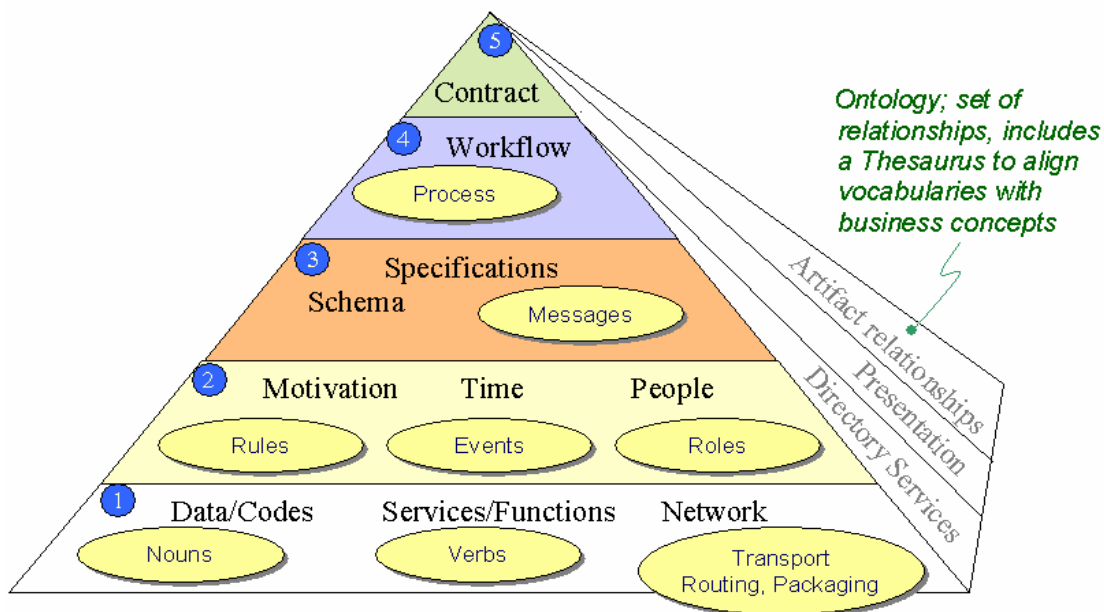
Figure 4 The Lubash Pyramid; Information Architecture

The pyramid provides for exact communications between stakeholders by detailing common artifacts which become the building blocks for assembling reusable components resulting in increased productivity that enables the Enterprise to become more agile. Only by facilitating the capture of business targets, best practice patterns, and decision rationale with common mechanisms can an Enterprise evolve and be competitive.

As a result, the pyramid is a completely new way for building information infrastructures that link business needs to technology solutions. It is also highly adaptable and compliments existing frameworks and artifacts. In partnership with more established methods, the *Business-Centric Methodology* supports legacy systems; web-based, service oriented, net-centric, and legacy architectures; and communications spanning the value-chain, be it internal or external to the Enterprise.

The Business-Centric Methodology

The *Business-Centric Methodology* is a complementary approach to current architectures and methods for constructing a business-oriented infrastructure that transforms the interoperability problem into opportunities. Additionally, the *BCM* focuses on increasing best value within an eBusiness environment in order to reduce development time, integration resource requirements, and maintenance costs through reuse and coordination of efforts. By making the business objectives, agreements, semantics, and rules of an organization preeminent in system and partnership development; by simplifying the transformation of corporate data into context-specific information collected in *templates*; and by separating the technical solution from the business infrastructure, the *BCM* establishes an approach that addresses interoperability specifically to break the stovepipes and bridge the differences between systems, applications, partnerships, and departments.
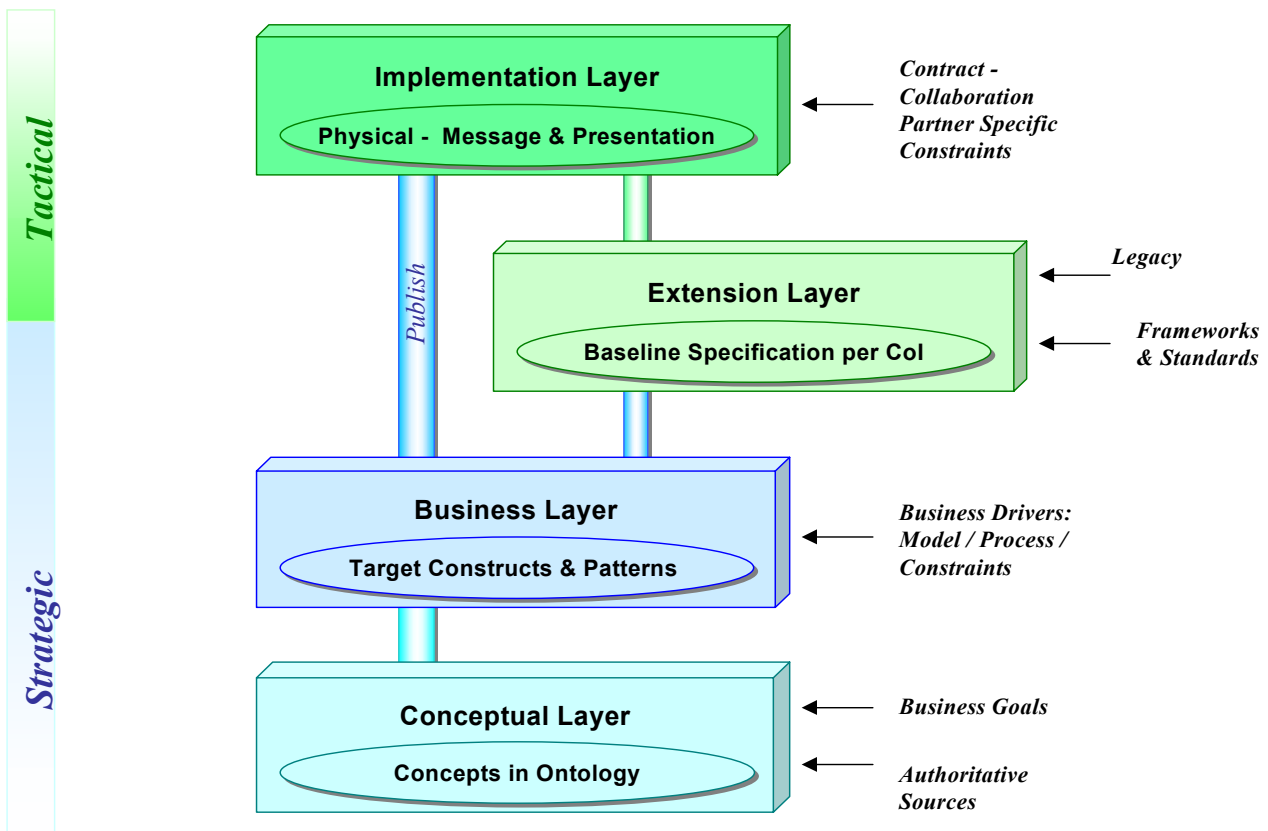

Figure 5 Taking a Strategic Approach in Applying Constraints for Maximum Reuse

The following are three other key aspects of the methodology:

1) The *BCM* is applicable to both the establishment of robust business partnerships as well as the development of open, highly adaptable technical solutions that are driven by the needs of business rather than the capabilities of current technology. Additionally, Universal Identifiers (UIDs) enable the application of the *BCM* at any point in the system life cycle from initial development to the integration of legacy systems.

2) By decoupling the technical solution from the overarching business objectives and requirements the *BCM* produces a business-oriented, information model that remains robust, consistent, and independent of rapidly changing technology.

3) The *BCM* involves a layered approach for strategically managing artifacts and constraints while achieving *semantic interoperability*.

Addressing Constraints in Layers, Providing a Strategic Complement to Tactical Implementation

The use of a layered approach allows one to apply a 'divide and conquer' approach to the process rather than deal with all constraints at implementation. With layers building upon one another, the interoperability problem can be more easily addressed and the necessary rationale collection can be simplified and in proper form for reuse. Semantic alignment occurs at the Conceptual Layer rather than the Implementation Layer which results in relationships based on best business practices rather than on constantly changing technology. The layered approach allows for the identification of definitive authoritative sources and for alignment between transaction partners concerning who owns the form, function, content, and definition of a specific term, attribute, or concept. Information exchange and proper interoperability are possible if, and only if, alignment occurs between the (1) Conceptual, (2) Business, (3) Extension and (4) Implementation Layers as shown in **Figure 5.**

Doctrine for Interoperability

Business First
- Shifting power to the users; customer and business experts, e.g. self-service
- Provide traceability from business vision to implementation (and status)
- Managing information assets to ensure: visibility, accessibility, interoperability, and understandability through metadata
- Semantic-driven; technology neutral context supported by classifications, ontology and patterns for semantic alignment
- Moving the semantics from applications to the infrastructure layer
- Objective: not standard language - but instead standard reusable mechanisms to better negotiate differences
- Capture rationale for pragmatic interoperability; Templates and models to define 'what' not 'how';
- Its not just technology; people are key asset

Multi-Faceted Architecture
- Function-centric; not system or entity
- Choice: Web (human), data, process, services
- Modular and layered to address complexity; leverage open initiatives such as XML
- Service-oriented; loosely coupled interfaces
- Wrap legacy systems with services
- Provide structure for business patterns
- Defer physicalization as long as possible

- **Conceptual Layer** –Improves the understanding of the semantics by aligning the terminology of the business and uncovers the real meaning of the business vocabulary. As a result, use can be extracted and interpolated to higher-level business aggregates. One of the principal byproducts of this layer is a completed *Concept Definition Template*.

- - **Business Layer** – Develops an understanding of the core business goals that the "preferred" business objects must accomplish and constrains them according to defined business processes and patterns. Business rules allow for the capture of Enterprise logic by analyzing the impact of changes, identifying areas of reuse, and defining functional requirements from an Enterprise perspective – business context is captured in the layer as *Target Constructs*.

- **Extension Layer** – Provides outreach for mapping the Enterprise *Target Constructs* to the desired industry consortiums, standard bodies, and internal legacy system formats. The product of this mapping includes a *Baseline Specification* for each desired community perspective.

- **Implementation Layer** – Performs an in-depth technical requirements analysis of the message and the selected framework driven by the Collaboration Partner Agreement (CPA). It is here where business objects become physical with agreed upon tagnames, lengths, header information, and the like. In addition to the output of the message, maps are published for possible reuse and aligned concept aliases are registered for later reference.

The *BCM* can be implemented (1) in a top-down approach during new development efforts, (2) in a bottom-up approach when dealing with legacy systems, (3) or from the middle-out when adopting an architecture. One objective of the business-centric model is to graphically represent the variety of shared artifacts for reuse, each exercising different constraints. By applying the right constraints at the right level and not physicalizing them too soon the process enables business, not technology, to drive the exchange. The result is a far more agile Enterprise.

Opportunities

Enterprises who adopt the *Business-Centric Methodology* are afforded the following advantages:

a. Gaining both Pragmatic and Semantic Interoperability
b. Leverage a Service-Oriented Architecture with mitigation mechanisms
c. Ability to align more than just at the contract – provide the critical information to adjudicate differences
d. Provide an additional potential lower-cost alternative to mapping
e. Supporting Communities of Interest – providing the base for expedient CoIs

Service Oriented Architecture exploits loose-coupling to lower the technological requirements necessary to implement business transactions. The strength of the *template* approach is further enhanced by the registry-centric nature of SOAs

resulting in a simplified process for mapping different applications and business agreements that reduces the number of steps involved and maximizes reuse of previously developed interfaces and artifacts. Finally, as more and more business partners or enterprise applications exploit these benefits of the *BCM* to establish strong conceptual alignment and interoperability they coalesce into highly effective Communities of Interest with common, verified, and reusable resources, interfaces, and partnership agreements.
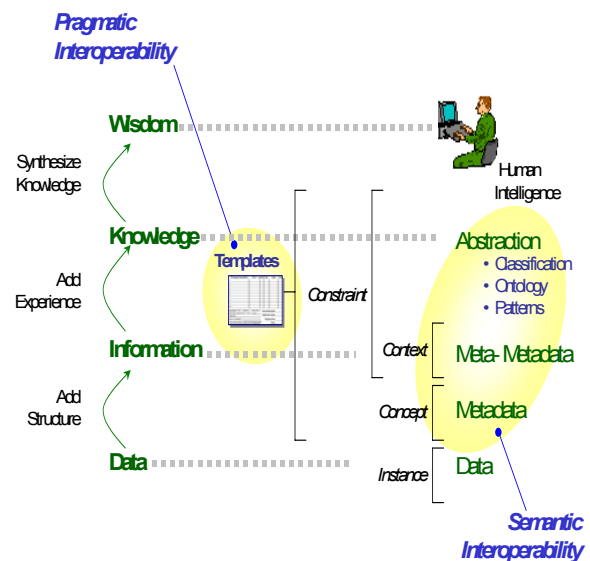

Figure 6 Moving from Information to Knowledge

Gaining both Pragmatic and Semantic Interoperability

Organizations have been attempting to achieve 'knowledge management' with only limited success. Those who have been successful have built a solid base for *semantic interoperability* with strong support for metadata that captures concept and context, in addition to classifications, ontology, and patterns. As shown in **Figure 6,** the *BCM* attempts to incorporate today's information disciplines for *semantic interoperability* and templates for *pragmatic interoperability*.

Templates are a system of linked forms used to create meaning by prompting users for rationale in addition to metadata and to provide input for automated mechanisms. The captured rationale and documented constraints are necessary to make transformations from data to information
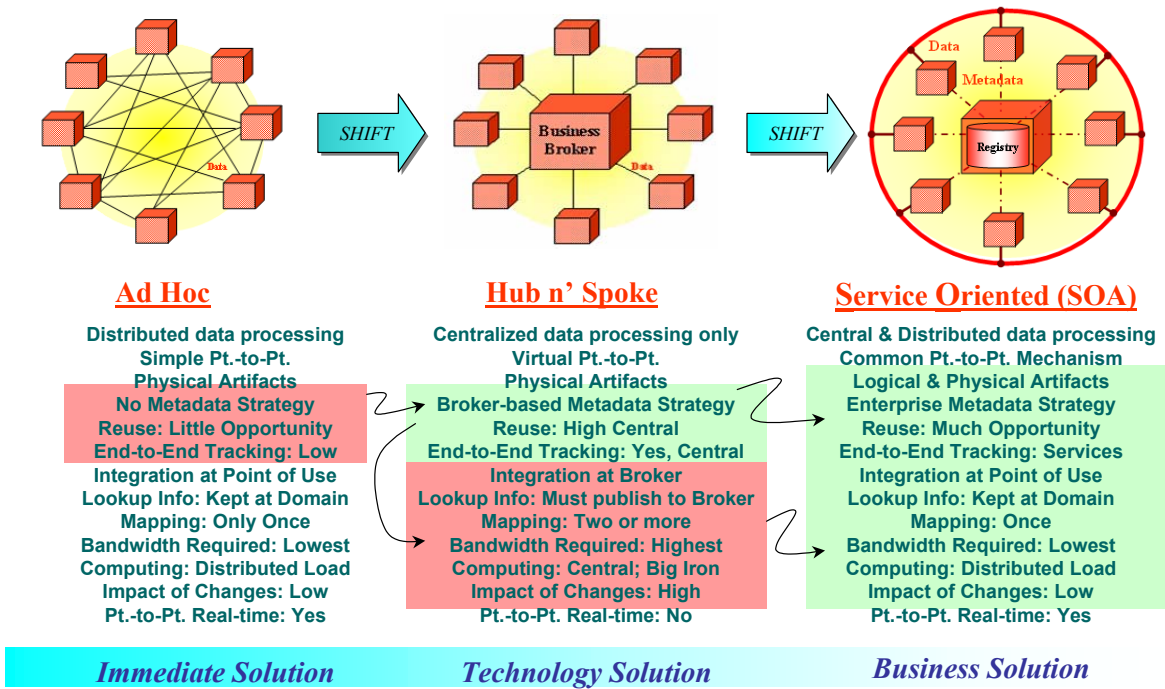
Figure 7 Advantages to Moving to Service-Oriented Architecture

to knowledge. *Templates* build upon semantic interoperability and constrain information with in a business usage context. *Pragmatic interoperability* results when *templates* are used at the various layers of the methodology to collect metadata and business rationale; apply form to this information to establish context; and further constrain it using human capital and experience to produce useful knowledge. *Templates* simplify data collection, properly classify the resulting information, and reveal underlying patterns within the information. *Templates* are highly effective at improving precise communication and understanding between business domain experts and technologists. Additionally, *templates* are dynamic and will be modified as the Enterprise is fine-tuned based on lessons learned resulting from the various processes.

Leverage a Service-Oriented Architecture with mitigation mechanisms

Figure 7 depicts the trend toward loosely coupled, metadata-centered Service-Oriented Architecture (SOA). An SOA offers an alternative hybrid solution that produces an optimum result and eliminates many of the

problems associated with the point-to-point and hub 'n spoke approaches (right view). While the hybrid solution follows a distributed model, it allows the enterprise to coexist with centralized infrastructure components as well. Additionally, adoption and development of an XML-based SOA will allow the organization to deliver services and content internally and externally to a wide variety of audiences and physical environments. The *BCM* provides the business solution with key artifacts and products accessible to services for exchange interpretation, mapping and choreography.

Ability to align more than just at the contract – provide the critical information to adjudicate differences

Another of the key benefits of the *BCM* is the potential for conceptual alignment between business partners and integrated applications at all levels of their information architectures is logically shown in **Figure 8**. The emphasis on metadata exchange allows higher degrees of integration beyond the "contract only" level that is common in 99+% of the exchanges seen today. This interrelationship is depicted below where the Lubash Pyramid represents the information architecture.   When collaboration
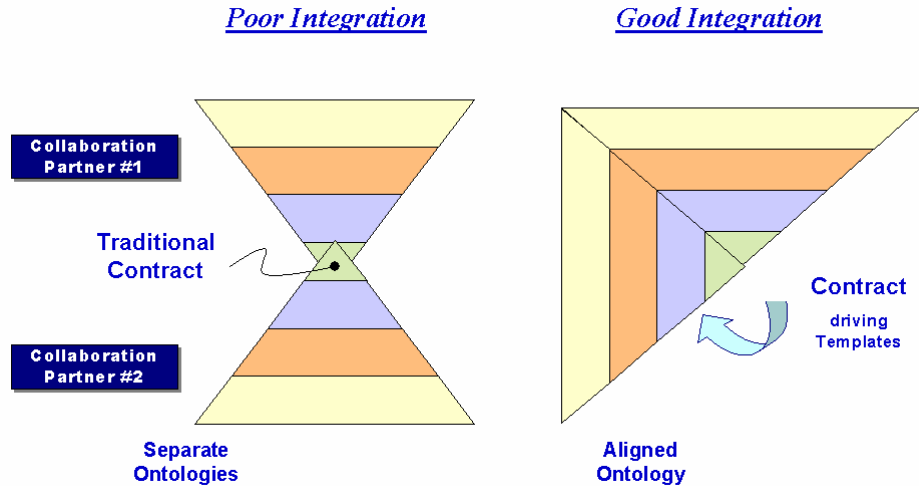
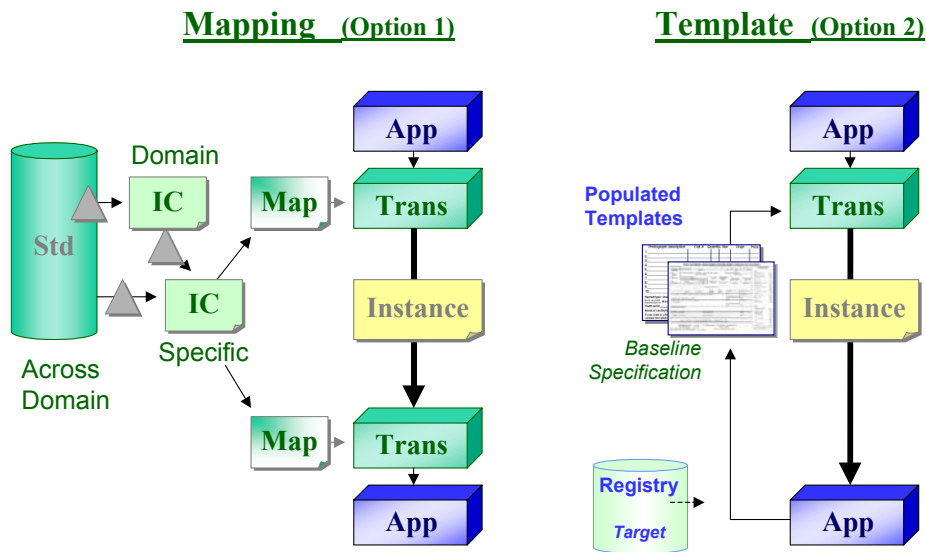**Figure 8 Sharing Information for Better Collaboration**

Figure 9 BCM provides for Simpler Alternative for Information Exchange

partners do not take the time to establish ontological alignment there is poor integration limited to only the contractual layer. However, when partners align their ontologies, lexicons, and metadata they achieve strong integration at each layer of the architecture. The creation of comprehensive information architecture during the *BCM* process is instrumental in achieving this semantic and ontological alignment. Additionally, this move toward metadata exchange will ease interoperability costs within enterprises and the community.

Provide an additional potential lower-cost alternative to mapping

The *BCM* offers developers a new and simpler option for integration that eliminates mapping each interface as shown in **Figure 9**. In contrast, Option 1 depicts the process used today that results in a third-party (standard information) exchange model and nomenclature that is not native to either trading partner. By sharing populated *BCM templates*, trading partners or applications can exchange information in a more direct manner. Even more importantly, Option 2
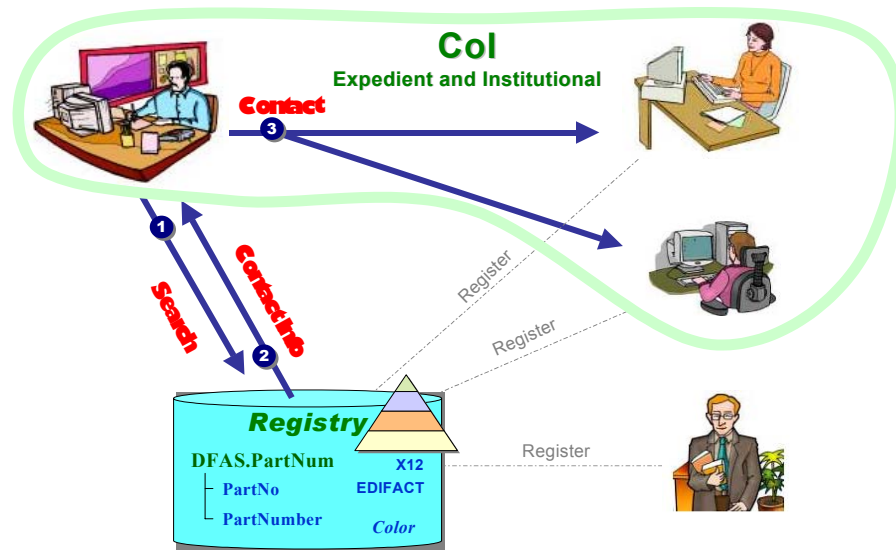
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Figure 10 Leveraging the Registry to Build Communities of Interests

presents an opportunity to eliminate a mapping if the sending system puts their message information into the format of the receiving partner's template.

Clearly we have seen the *Template* approach (Option 2) work when the receiver is the "three hundred pound guerilla", such as when automated tax forms are sent to the IRS, a large institution. While this works just fine, what about the reverse: when the sender is the large enterprise, or worse yet, when each trading partner is a large enterprise?   Then the enterprise(s) need to look at and closely review the complete value-stream. Questions that need to be asked include: a) Is making things easier for the large enterprise better for the whole? b) In the long run, is this the least costly approach? or, c) If the receiving systems are primarily off-the-shelf applications, can a hand-full of *templates* work for 90% of the community? If so, can these *templates* be examples for those other 10% in the community remembering that *templates* are easier to develop and use than traditional mappings such as those used with Electronic Data Interchange (EDI).

Supporting Communities of Interest – providing the base for expedient CoIs

The advent of registry-based, SOAs and the *Business-Centric Methodology* creates yet another opportunity related to the establishment, maintenance, and supporting *Communities of*

Interest (CoI). As more and more Enterprise artifacts are generate by the *BCM* process are documented and stored in the *Registry*, the amount of information that can be shared between business partners will increase as well. **Figure 10** shows how this organizational memory and the registry mechanism for its effective retrieval improve the ability of users to identify and contact other users, businesses, and communities of like mind and interests. Those who access the Registry can track the history of use of different artifacts and can filter out those that relate to their objectives and function, as well as extract from the noise pertinent information. Since the contact information of those accessing and using the artifacts is collected as well it is possible for researchers to identify pathways to those individuals, organizations, and businesses that have similar interests and concerns. Consequently, this ability simplifies the identification of community members and facilitates the establishment and implementation of expedient and institutional communities of interests.

Moving the Organization
Business transformation is evolutionary and needs to build upon the existing infrastructure. Ideally, organizations will establish 1, 2, 5, and 10-year plans in order to monitor and guide this evolution. Parts of the organization will move faster than others, but the master plan for the organization needs to be off the same page. The

evolution will not take place overnight, as the problem was not created overnight. But the potential return on investment is high and worth the effort. Managers need to show leadership by putting the proper policy in place, molding a collaborative culture, and funding the information architectural base of the organization. The development of communities of interests needs to be supported along with education and other facilitation outreach efforts. Proper and trusted workplans, metadata plans, knowledge management plans and transition plans need to be agreed to and worked. The best place to start is by documenting procedures and taking first cuts at the organization's taxonomies. Organizations will learn a lot during the early phases of applying the methodology. They can leverage 'hot button' initiatives, such as the organization's portal effort, to derive the organization's taxonomy and other ontological artifacts; harvest or federate current Enterprise information; and develop and complete initial best practice *templates* for identified high payback areas. Additionally, they can collaborate with ongoing Enterprise Architecture initiatives by applying the methodology to proof-of-principles and other new developments. In short, just do it.

To best leverage *BCM,* the organization needs to provide users the facilitation infrastructure for artifact discovery and navigation (NetCentricity), such as the classification and ontology for the clustering of like terms, and the differentiation of business terms usage through decomposition. The principal components resulting from this shift are (1) Ontology, (2) Registry, (3) Workflow, and (4) Content Management System. With the *Business-Centric Methodology*, the Enterprise cannot only take advantage of technology innovations that complement and enhance the information architecture, but also provide the environment to foster vendor development of technology that exploits deployed systems rather than making them obsolete.

Conclusion

In conclusion, the *BCM* presents a methodology for business agility and interoperability that:

- Addresses the root cause rather than just the symptoms of our integration problems by providing semantic and pragmatic interoperability,

- Is business-centric, shifts power to the business experts, and manages Enterprise artifacts and governance through CoIs,

- Provides visibility, accessibility, and understandability using open declarative mechanisms that allow for mass customization of diverse vocabularies, schemas, and models within heterogeneous trading environments,

- Insulates business from the high rate of change of technology by dividing the problem into multiple levels and applying constraints properly to reduce complexity and promote reuse, and

- Provides for Enterprise-wide agility and prepares the Enterprise for new business opportunities.

Tactical-only development efforts consider only part of the problem and result in incomplete solutions that waste time and corporate resources. Adoption of an Enterprise solution that addresses business context and people is imperative. The *Business-Centric Methodology* results in Enterprise solutions that are strategically aligned and produce customer best value results

For more information on the *Business-Centric Methodology* please contact Mr. Mike Lubash, DFAS CIO, Team Leader, Emerging Technologies and the DoD XML Finance and Accounting Community of Interest Manager, at mike.lubash@dfas.mil.   http://www.DFAS.info