Bilingual Enterprise and Solution Architecture

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Introduction

There is a well recognized communications gap in the area of providing information technology (IT) systems in support of business activities. This gap is simply the result of specialization. When people focus on a particular domain of knowledge and interest they inevitably develop language and local jargon to communicate among themselves. We now know that IT has completely permeated every form of business and other enterprise, so that any inability for IT and the business to communicate causes serious problems for effectiveness and efficiency in doing business. We feel that this is a root cause behind the historically bad track record of IT implementations, which the Standish Group (1994, 2004) and KPMG (2002) estimates place in the 70% failure rate or higher[i]. This situation points to the need for a kind of bilingualism, where the languages of business and IT are easily understood and integrated wherever necessary. In turn, we feel that a good approach to this need for bilingualism is to take an architectural perspective across both the business and the IT domains. The IT world has been successful in overcoming the incomprehensible "Victorian novel" style requirements document through various forms of modeling and methods-based notations and representations. At the heart of our approach to bilingualism is a bilingual enterprise and solution architecture that complements and integrates with IT architectures.

The need to address this disconnect of communication has never been more urgent. The world of business today is increasingly competitive and uncertain. A period of innovation and market growth has been followed by one of rigorous competition, unrelenting financial pressures, and unpredictable threats. Managers today are faced with decisions about outsourcing and cost cutting, business process integration and productivity, partnerships and investments for growth. These are issues at every level from departments to business units, from enterprises to industries, and from regional to global economic planners. The level of business complexity has risen. In a few short years the ability of small local enterprises to reach out to achieve global presence has exploded, clearly enabled by technology.

Bilingualism

Our use of the term "bilingualism" in this paper signifies the ability to bridge the communications gap between business and technology prevalent in today's organizations. It is important to make the distinction as to what is meant by the business and technology

communities. *Business* refers to the users of technology i.e. business, government, educational institute, charitable foundation etc. and *technology* as the providers of technology-based solutions.

When we say "technology" here, we specifically mean information technology. There are obviously many other forms of technology including electronic, mechanical, chemical, and biological as well as any other emerging technologies. Descriptions and discussions of such technologies are actually part of the business terminology in enterprises where those technologies are created and/or used. This means that IT practitioners need to be aware of, and incorporate this wider domain of technological terminology into their vocabulary, in order to be fully bilingual. Coupled with the fact that most business people use jargons unique to professions (law, accounting, engineering, etc.) or work specialties (order processing, supply chain management, etc.), this means that on the business side we are really talking about multilingual abilities, but for our purposes we use bilingual to indicate the necessity to speak clearly about IT as well as the full set of business dimensions that IT is applied to.

The communications gap between business people and IT practitioners is most visible when the two groups must collaborate together to solve issues or when preparing for advances or growth in the organization. It is at these times that the two groups must convey ***key project information*** in a way which can be checked for accuracy, measured for economic feasibility and ultimately gauged against original and modified expectations. To be most effective the information should be archived and tracked from project inception to resolution in a manner that allows for reuse and growth through experience and in a way that can used by the organization as a whole; not just from either a business or technology perspective. Herein is the biggest challenge since historically business/technology initiatives have been conducted as two separate initiatives: 1) a business initiative where a need or issue is determined and 2) a technology initiative where business needs are equated to possible technology solutions and then implemented. This approach creates a focused and narrow solution set based upon the individual group's understanding of the situation at hand. There may be archived historical data about the situation but even that is usually not traceable from identification of the need to implementation of the technological solution.

We recognize that the need for bilingualism will not be accomplished solely through training a large army of practitioners who are fully fluent in both domains. Each of these domains is complicated, multi-dimensional, and constantly changing. We do think some people are, or will become, fluent in multiple domains. We also recognize that building teams that bring in the right people who can represent the various domains is a possible way of achieving a form of bilingualism. In either case, there is a need for architectural representations that capture and integrate the content of knowledge from all aspects of IT-based business solutions. Such a set of representations constitutes a kind of bilingual architecture.

Expressed through the use of diagrams, models, documents and tools, bilingual architecture seeks to articulate the fundamental terms important to business and

technology in terms understood by both, and supported by the methods deployed in the individual groups. The most important aspect to be deployed in this form of bilingualism is that it takes place end to end starting with the activities within business that ultimately results in technological solutions. Bilingualism at its core is a method of talking and understanding the key components of any initiative in two languages; *business-ese* and *technology-talk*.

Business and Technology Language(s)

Business and technology professionals speak in their own ***languages*** developed over time to serve each community well, but when taken together present a challenge to mutual understanding and the accurate conveyance of information.

Business-ese

Business communicates in a language, "business-ese" which speaks in terms of the mission of the work which the organization is employed in, and the challenges it faces. The language is mostly expressed textually, numerically or graphically through charts or illustrations. The viewpoint and scope of the language is ***predictive, analytical, operational and historic*** in nature. The predictive nature of the language manifests itself in the form of devices such as projections and plans. The analytical nature of business-ese is evident in instruments such as root cause analytics, studies, assessments and business cases etc. Business-ese expresses its historical nature through the preservation and reporting of past events in devices such as statements, reports etc. Finally the operational aspects of business-ese are usually expressed as processes and procedures which are the results and by-products of the predictive, analytical and historical features of the language.

The social network structures; such as governance bodies, organizational structures cultural practices, task forces, action committees, management structures, project teams etc. are either directly or indirectly the most important means in which business is conducted. In today's highly technical society the social structures of any organization are its primary set of resources and assets. The participation or non-participation of these social structures in any endeavor can and will spell success or failure for any organization and are the constant emphasis of the organization's leadership. Equally importantly, any IT investment or initiative will have an impact, positive or negative, on these various sets of interlocking social systems Therefore to insure the success of any technology driven initiative requires a close examination of the social structures in which will be utilizing the technology solution and an understanding of any interactions between social structures and the technological solution.

Critical and integral to business-ese is its symbiotic relationship to formal and informal social structures within the organizations that are tasked with carrying out the day to day activities of the organization. Within these social networks exists dialects of business-ese which are specifically related to the tasks that the social networking structures perform. Some examples of the dialects of business are accounting, finance and production. These tasks may be industry specific, professional, or subject matter. While these dialects sound

very different because they relate to different domains of concern, together they all constitute the language of business. What makes the relationship between the social networks and business-ese symbiotic is that as the mission of the business changes so does the social networking structures which then change the dialects of business-ese spoken within any given business.

Technology Talk

The language of IT professionals is a technology and product based language which seeks to produce structured technical solutions for current or perceived future needs or issues. Technology talk is basically ***symbolic*** in nature which seeks to ***model*** a given business environment through technological components. These components are then aggregated into subsystems and systems within architectures designed to interact and function as part of an evolving ecosystem whose sole purpose is as an enabling infrastructure for business use.

The ideas and concepts within technology talk are fairly steeped in specialized dialects which are drawn together and expressed through the use of: highly evolved ***acronyms***, ***architecture-like*** or ***systemic diagrams or drawings*** which are rarely understood by business professionals. Technology operates in fairly evolved social structures, like business; but those social structures are usually the methods by which solutions are designed and deployed; not the means by which the business of technology is conducted. For this reason technology is not as concerned with the social structural aspects of any technology initiative only the technological solution structure which will be provided to the business. This particular fact is important to understanding the gap in communications between business and technology. Technology expects structured well defined issues or requirements in which to create modeled solutions without a true understanding of the social structures that will be utilizing the technological solution and the impact that it will have on those social structures. An exception to basic technology talk is component business modeling (CBM)™ which strives to model and provide a simplified view of complex organizations by creating a modular structure of high-level business components that encapsulate the interrelationships and dependencies of its processes. This approach does go far in depicting the operational environment of the organization but does not illustrate the social structures which act upon them.

Communications between Business and Technology

In as much as business and technology speak different languages the ability to communicate between the two bilingually requires business terminology that is normally expressed textually, numerically and graphically to also be represented symbolically through diagrams and drawings. This is the architectural approach that rigorously depicts business issues so that IT professionals are able to build technological solutions from the identified needs and requirements. This approach creates a Rosetta stone collection of documentation which allows clearer communications between business people and technologists.

This approach supports the development of an incrementally built architectural representation of the business. In other words the complete architectural depiction of the business does not need to be created before IT work can start, but rather a bilingual enterprise and solution architecture can start with a single project. Critical to this approach is the ability to track the progress and construction of the fundamental pieces of information required by both business and technology for the project they are engaged on. This ***key project information*** is the minimum set of information required to establish a true and clear understanding of the goal of the initiative, the environment in which the resulting technology will be deployed, as well as a clear understanding of the potential technology assets available as a solution.

Key Project Information

The current high failure rate of technology driven projects stems often from the inability of business and IT to effectively communicate the content of information about the objective they have been brought together to work. This content is expressed in four important elements: 1) the expression of the ***business intent*** of the organization whether short or long term which corresponds a to current or future needs or requirements 2) the social environment; ***organizational, governance and cultural***, that is to say, the human systems in which the technology solution will reside, 3) the ***technology architecture*** itself, which depicts IT capabilities and their realization in various products and custom-built software and 4) the ***technological bridge*** to technology solutions which helps map, define and describe the potential technological solutions that are available for a given situation.

Business Intent

Business Intent is one of the least understood aspects of most technology driven projects. The issue here is ***clarity*** or the lack thereof. Typically technological solutions are proposed before a business need has been identified or only after process driven requirements have been articulated without a direct connection or correlation to need or business intent. Rarely is a thorough understanding of the sources of need and the thought processes of potential solutions documented, archived or maintained for analysis. This leads to fuzzy connections between what is needed and why and what can be delivered and how. Additionally the lack of documentation typically means that the same or similar issues or objectives can be worked multiple times without the advantage of reuse or lessons learned from initiative to initiative. This drives up the costs of technology driven projects and creates a considerable amount of rework and unnecessary maintenance issues.

Business intent is derived by understanding the elemental characteristics of the forces which act upon the business. At a highest level these forces can be broken into three main categories: 1) issues or problems that arise from the day to day operations of the business, 2) environmental forces which impact the business; be they market, regulatory or natural and 3) the internal planning process developed to respond to the other forces and as a result of management's view of the direction of the business. These forces are the drivers

by which information percolates and evolves through the business and are the primary areas of interest that needs to be monitored to arrive at a current understanding of the business's intent. These forces are best articulated and documented through the predictive and analytical activities of the business and the documents they produce.

Many non-architectural documents can be used to convey business intent. These include business cases, as well as operational, tactical and strategic plans or directives. These documents lay out needed actions that the business needs to take which often leads to process and/or technology solutions. Where these types of documents may not be truly architectural in nature they do lead to the development of documents which are; that is they provide the necessary information that then can be the source of architectural documentation of the business. Business intent documents do not evolve in a vacuum; they are created through the efforts of subject matter experts that participate in social networking structures which are both formal and informal in nature.

More architectural examples of business intent documents are root cause and fishbone diagrams which portray the first stage of intent by depicting issues or goals through an architectural-like diagram that conveys textual sometimes statistical information. Other example of architectural models that express business intent can include such things as business flow charts and swim lane documents which model business interaction documents. For all these documents, it is important to understand that they have a synergistic relationship to one another and that the exclusion of one document type tends to exclude information which would provide a comprehensive and clear picture of the historical evolution of issues and goals to process and technology driven resolutions.

Organizational/Governance or Cultural Structures (Social Networks)

Usually ignored or only examined in a cursory manner the social aspects of the deployment of technological solutions poses probably the biggest risk to the success of highly complex technology solutions since an unused or underutilized technology solution is an unsuccessful one. It is even quite possible that an ill-conceived IT deployment can do harm to important social network structures in the business.

Social networks are the environment in which technological solutions are deployed. They compose the population of users of the technology organized through hierarchical and non-hierarchical structures. The word here is ***context*** for technology is provided for these groups to do the work of the business and not the other way around. Social networks are groups that are delineated and organized around the natural structures of the business; first by management, product, mission or task orientation (***organizational***) such as Macro Architectural Frameworks diagrams like the Stafford Beer's Viable Systems Model, then by cross functional mission centric governing groups (***Governance***) and lastly by discipline or role (***Cultural***) as Social Entity Relationship Diagrams. What makes the examination and documentation of these structures so vital to any initiative is that these groups constitute the mechanism by which needs surface and by which a resolution is deemed to occur. Taken individually these organizational structures only portray a partial picture of the environment and the business intent in which the technology will reside.

Taken together the interactions of these groups with business intent create a clear, complete and contextual vision of the demands of the environment in which the technological solution will live in. Examples of bilingually communicated documentation that articulates the Social Network structures include management organizational, task force organizational and business unit organizational charts. A complete picture would show the interaction of the groups from an architectural perspective. Other supporting social networking documentation would include Task force findings and recommendations, regulatory requirements (closely aligned with governance groups) and Analytical Hierarchy Process diagrams which depict the relative weighting and grading of potential solutions or decisions by a cross section of the entirety of all social networks involved. The goal is to show the alignment and mapping of business intent (issue/goal through process) to Social Networks who will be using the technology. This mapping clarifies ambiguity regarding the need for a solutions and provides context for analysis of possible solutions

Technology Architecture

The part of this structure that is best understood is the whole set of IT architectures that technology practitioners use to model the solution domain. Examples of technology architecture representations include such things as use case models. object class diagrams, object interaction diagrams, component models, architectural overview diagrams, and many more. We will not belabor this subject here, because it is so well-understood in the IT worlds, and has been standardized through things like The Open Group Architectural Framework (TOGAF) and the Rational Unified Process (RUP). It is important to mention it for completeness, since this constitutes on of the two large language domains where we hope to achieve bilingualism.

Technological Bridge

After understanding the business intent and social networking (organizational, governance and cultural structures) environment that the technology solution must reside in; an understanding must be conveyed as to the possible solutions of technology available for a deployable resolution and how that relates to the initiative at hand. This understanding consists of a mapping of the processes/procedures that will require technology and the needed technology (readily available or required). Manifested as a set of architectural diagrams or documents this view known as a Technology Bridge illustrates a correlation between business intent as described through needs and requirements and the technology which will enable them.

Technology bridges are a relatively new concept to both business and technology; some include: 1) Component Business Models (CBM) which seeks to create an analysis of business components that "cuts across" siloed business units. Business components represent all of the unique activities that an organization pursues to create value. 2) Service oriented modeling and architecture (SOMA) which refers to the more general domain of service modeling necessary to design and create a service oriented architecture. SOMA covers a broader scope and implements service oriented analysis and design

through the identification, specification and realization of services, components and flows. 3) Business analytics which refers to a broad set of mathematical models and algorithms, and data sensors, filters, and aggregators. This class of mathematics and data technologies is central for optimizing operations and real-time operations decision making in many industries. They are used to sense and respond to critical events (e.g., the failure of a database or sudden drop in pressure along a gas pipeline) and to continuously changing business conditions (e.g., continuously adjusting electricity prices responding to changing gas spot market prices or adjusting supply to actual retail sales.) Other examples include portfolio management tools and documents as well as configuration management documents and tools.

Most if all of the above examples have some bilingual characteristics yet fail to be fully bilingual separately necessitating that a combination of several be used to give a complete picture as is the case with CBM and SOMA outputs and Portfolio and Configuration management tools.

Bilingual Enterprise and Solution Architecture

There are many components of information important to the building of an effective bilingual enterprise and solution architecture. A major aspect of a bilingual architecture is the business architecture. Where no widely accepted standard currently exists for the building of business architecture, a proposed standard can be found at http://www.research.ibm.com/journal/sj/381/mcdavid.html. Within this document figure 3 suggests a standard way of looking at many of the key aspects of business architectural concepts and Figure 9 proposes some ideas about how they relate to IT system architectural concepts. For the purpose of this document we will be looking at three elements of information found in a bilingual enterprise and solution architecture which are least understood and the reason why many projects fail, namely: business intent, organizational/governance or cultural structure and technological bridges.

The success rate at communicating these elements of ***business intent***, ***organizational/governance or cultural structures*** and potential ***technological bridges*** bilingually is fairly poor due to the inherent language differences between business and technology but there are some work in progress to try to help bridge the gap. One such effort seeks to express the content elements as architecture is a bilingual enterprise and solution architecture. A well developed bilingual enterprise and solution architecture has elements of both languages interspersed and contained in a set of documents, diagrams, and models. It is important to note that there is no universally agreed upon formats or construction methods for building or describing this architecture and that all work today is conceptual and constantly evolving. Given that business-ese is literal and driven by words, numbers and pictures and that technology talk utilizes diagrams and models then any successful bilingual representation must be able to represent information in a diagram/model approach that contains the representations in a textual, numeric and graphical fashion.

An architected approach to business provides the ability to focus on selected business characteristics, by isolating and understanding various functional modules and the output and interaction at their interfaces. The term business architecture is used in the sense of “the fundamental organization of a system, embodied in its components, their relationships to each other and the environment, and the principles governing its design and evolution”. It is in this spirit that we think about architectures of the human social systems known as enterprises, which are systems that have both abstract and concrete structure, and can be understood as sets of identifiable components that are related to each other and to their environment.

At the heart of this issue is the business organization as a human social system. These systems present unique challenges to those who would hope to provide technology-based interventions that achieve demonstrable value in a measurable way. The key challenge is that social systems are intrinsically invisible. No one can point their finger at a social system, or reach out and touch one. A social system consists entirely of relationships among humans, and as such is invisible, intangible, colorless, tasteless and odorless. It's more like software than hardware, and even less deterministic and controllable. This makes them difficult to measure, to manage, and to design in a predictable and effective manner. To a significant extent, technology is used as a means to make the business system visible to those that would interact with it. Information technology exists as a kind of intellectual and conceptual prosthesis that extends the knowing and thinking power of individual people across larger and more complex networks of social systems.

The micro-architecture of business is something like the molecular structure of the fundamental 'stuff" from which businesses are made. At a micro-architecture level, there is a large degree of apparent commonality and simplicity. The micro-architecture of all business organizations is composed of a structure of conversations, commitments, contracts, and transactions. Most of the data managed by IT systems is simply a means of capturing exactly these conversations, commitments, contracts, and transactions within various configurations of trading partners and internal organizations. This apparent simplicity is somewhat misleading; since the properties of the system may be vastly different than the properties of the elemental building blocks (e.g., the simple set of four nucleotides adenine, guanine, cytosine and thymine gives rise to all the complexity of life).

The macro level of business architecture addresses the equivalent of an anatomic level of structure and functionality of the individual enterprise. There are many ways to look at a more macro architecture of business structure and functionality. A traditional organization chart is a point in time snapshot of how an enterprise has assigned responsibility for various functions. Reorganizations are common, so a successful business macro-architecture should consider roles and accountabilities beyond the point in time power and managerial alignments. In a relatively unchanging way all enterprises need sensing mechanisms, information transmitters and expressers, memory maintainers, a locating function, producers of the intrinsic products and services of the business, resource maintainers, business relationship maintainers, arbiters of behavioral norms, strategic direction setters, and bottom line oriented managers.

The eco-architecture of business addresses multiple enterprises as they interact with each other in a marketplace environment. Increasingly partnerships of supply chains are competing against other partnerships of supply chains to gain market share. Ecosystems of business are structured in two basic dimensions. The product dimension is how enterprises specialize and cooperate in supply webs of extractors, component creators, and final assemblers of goods and services. The process dimension fosters specialization of enterprises that provide functionality to other businesses that determine it is in their interest to outsource this capability. One of the key issues in business today is the interplay of coordination costs and business effectiveness between the individual business macro-architecture of retained functionality and trans-enterprise eco-architectures.

A key to bridging the gap between business and technology is a semantic architecture that addresses both the content and structure of the terminology used in business. A semantic architecture identifies domain specific business terms from documents and conversations and classifies and links them into meaningful patterns based on predefined generic business concepts, extended by industry and discipline-specific concepts. This network of terms and concepts provides the basis for object modeling, user interface design, persistent data management design, and test cases.

(Need to add discussion on IT architecture)

Bilingual Architecture

The main point of this paper has been to explore the possibility of conveying both business and IT information in a bilingual architecture that combines the elements of both business and technology architectures in such a way as to be easily identifiable and understood by skilled practioners conversant in both business and technology. Bilingualism at its heart is the ability to understand and articulate both business-ese and technology-talk. A bilingual architecture expresses both business and technology concepts architecturally and allows for some cross-over of devices and mechanisms (i.e. diagrams, documents etc.) that could be read and understood by both languages not just a select group of people who are truly bilingual. This means that the supporting documents and diagrams of the bilingual enterprise and solution architecture would range from being singularly business or technology in nature to having elements of both within a structure that can be understood by both business and technology professionals.

Although standards for bilingual enterprise and solution architecture are still emerging, a truly bilingual approach would mean that all the elements of business intent, social network structure and technology bridges should be included. This implementation of a bilingual enterprise and solution architecture should be built incrementally meaning that one initiative should be the starting ground by which each subsequent initiative should be built upon. Care should be taken to depict business intent not purpose; this allows for a flexible, expandable architecture which can evolve, expand and mature. The idea is to start from the bottom up building from initiative to process area to business unit and eventually the entire business.

A bilingual architecture should have the following characteristics: 1) read as a view of the understanding of the business and technological situation for a moment in time 2) reflect how business intent was derived 3) show how business intent drove to the development of needs and requirements 4) illustrate which processes or procedures were created, fundamentally changed or modified 5) show the linkage of possible solutions to the assessment process undertaken by the stakeholders i.e. social networking structures to arrive at a go forward recommendation and decision 6) show the mapping of decision from the technological bridge to the technology solution that was actually implemented.

(Need to add discussion on IT architecture)

The following is a work in progress example of one possible set of documents/diagrams that would represent the business side of a bilingual and enterprise solution architecture.[ii]

Simple example of the contents of a Bilingual and enterprise solution architecture

Document Name	*Key Project Information*	*Business-ese /Technology-Talk*	*Purpose*
Fishbone	Business Intent	Both (primary Business-ese)	Define root cause of issue or change
Tree root cause	Business Intent	Business-ese	Define root cause of issue or change
Analytical Hierarchy Process Diagram	Business Intent / Organizational/ governance or cultural structures	Both	Represents key components of complex decisions; then weights and grades those components based on input of stakeholders
Business Case	Business Intent	Business-ese	Describes reason for a business action and expected outcome
Swim Lane	Business Intent / Organizational/ governance or cultural structures	Both (primary Technology-Talk)	Represent how Activities within a Process are organized by Roles, systems, and Business Units
Process Diagram	Business Intent	Both (primary Technology-Talk)	A diagram(s) which shows the triggering event(s), sequential flow of process steps, decision points, and deliverable or outcome of a process(es)
Organizational Chart (Multiple: may be either Managerial, Governance or Cultural)	Organizational/ governance or cultural structures	Business-ese	graphic presentation of the relationships and interrelationships within an organization that identifies the lines of authority and responsibility formal or informal
Component Business Model (CBM)™	Partial Business Intent and Organizational/ governance structures as well as Technology bridge	Both (primary buisness-ese)	Identifies the basic building blocks of the business. Each building block includes the people, processes and technology viewed as a service center that delivers value to the business
Service Oriented Modeling Architecture diagram (SOMA)	Technology Bridge	Technology Talk	Identifies, specifies and aids in realizing services which enable the components of a CBM. SOMA specifically is used when developing a Service Oriented Architecture
Classified Business Terms	All business aspects	Business-ese	The original source of organizing the language found in various business domains of interest
Business Services Model	Organization, etc.	Business-ese	Portrays the details of motivations and mode of interaction among business entities
Enterprise Value Net	Primarily	Business-ese	Graphic depiction of

	organization, but also business intent		relationships among players in a business ecosystem
Social Network Diagram	Organizations and culture	Business-ese	
Boundaries and Boundary Objects	Org and culture	Business-ese	Shows formal and informal social structures and the informational objects that delineate them and bind them together
Role and Accountability Model	Organization	Business-ese	Roles in the business and how they are accountable to each other and to external stakeholders
Capability Calculus Model	Intent and org	Business-ese	A detailed investment and value model for capabilities required by the enterprise
Branding and Messaging Architecture	Business Intent	Business-ese	The image and messages portrayed by the enterprise to the outside world
Various IT architecture work products (including Architecture Overview Diagram, Enterprise Information Architecture,	Technology	Technology Talk	This is a source of this kind of information: http://method.endicott.ibm.com/MethodWeb/browse/showDomains.htm?CatID=103736&Type=wpd&ShowLevel=2

[i] [1] http://www.standishgroup.com/sample_research/chaos_1994_1.php
[2] http://www.computerworld.com/managementtopics/management/project/story/0,10801,97283,00.html
[3] http://www.theregister.co.uk/2002/11/26/it_project_failure_is_rampant/
[4] Http://www.it-cortex.com/Stat_Failure_Rate.htm
[5] http://news.com.com/2100-1012_3-5181480.html