The Difference Between Process Architecture and Process Modeling/Design (and why you should care)

Graham McLeod
PROMIS Solutions AG & Inspired
www.pro-mis.com www.inspired.org
graham.mcleod@pro-mis.com

***Abstract**. A process perspective can assist organizations to deliver attractive products and services to clients and stakeholders, add value to the context in which they operate and facilitate their survival and prosperity in the face of competition.*

Unfortunately, many process initiatives bog down in excessive detail and lengthy project durations leading to frustration and non-delivery. Quality sometimes suffers due to fatigue of the business participants or the volatility of the business which may change faster than the process modeling effort can track.

Over decades of practice in process and enterprise architecture (EA) work as well as analysis of techniques and EA frameworks, we have evolved an approach which separates process architecture from process modeling (detailed analysis and design) while keeping the two perspectives fully integrated and congruent. This paper argues for separation, illustrates how it can be done from a methods and representation perspective, and highlights benefits achieveable.

***Keywords.** Enterprise Architecture; Process Architecture; Process Modeling*

Introduction

There is currently wide recognition in business that organizations benefit from taking a process perspective [1]. This has the following advantages:

- External delivery focus rather than internal organization
- Allows end to end optimisation, rather than local optimisation within a department or function, which does not itself ensure success overall
- Creates better opportunities for monitoring, benchmarking and service improvement
- Identifies opportunities for reduced overheads, better communication, reduced resources - thereby reducing costs

Service Orientation and Service Oriented Architectures (SOA) have also been touted widely in recent literature [2] as having major advantages, including:

- Increased flexibility
- Increased agility in meeting new requirements rapidly
- Reduced maintenance due to ability to reconfigure elements to meet changing requirements and to replace service implementations with little impact to overall processes

Porter [3] has long advocated the concept of Value Chains, whereby an enterprise will add value to inputs received by having an efficient sequence of core activities which enhance (add value to) the inputs, creating outputs of higher value or which are more desirable to customers and other stakeholders. Later work has extended this to the concept of Value Networks within industries, where the value chain may extend beyond the boundaries of single organizations.

Conventional Wisdom indicates that if processes are good, process modeling should also be good as it allows us to:

- Understand the existing processes
- Analyse problems and identify opportunities
- Improve the processes, leading to improved delivery, quality and reduced costs
- Design new processes from intentions, unconstrained by past practice

Unfortunately, these benefits are often not realised in practice. We have observed a recurrent set of Process Modeling Problems:

- Process modeling efforts frequently consume a lot of effort and take a long time before results are evident
- There is often a lot of detailed process modeling while the “big picture” is not understood – leading to situations where we have very efficient process designs, but for the wrong problem or only a fragment of the real (larger) problem
- Process modeling is often not connected to strategy, business goals, understanding the domain terminology of the enterprise and downstream implementation efforts

Background to Our Work

Starting in the early 1990's our organization worked to realise the benefits of Object Oriented Systems Analysis and Design in delivery of commercial information systems. We used prior experience of information engineering ala James Martin [4], the Tetrarch 2 analysis and design methodology from Comcon [6], work from Ulrich Frank and his group at the Geselschaft fur Matematik und Datenverarbeitung [7] in Germany and class and event modeling work from James Odell [5] as well as our own research and experience to compile a method known as Advanced Systems Delivery [8] which provides an integrated approach to analysing, specifying, architecting and designing object oriented, distributed, commercial information systems. Part of this method was an advanced dynamic modeling approach which integrated stakeholder analysis, value chain analysis, business process modeling/improvement and system event modeling, thereby providing a progressive and increasingly rigorous way of specifying the dynamics of a system, first at the level of the interaction of an enterprise with its stakeholders, then at the value chain level, then at the business system level, and finally at the system internal level.

During the middle 1990's, the Unified Modeling Language emerged, first at Rational Corporation, then as a submission to the Object Management Group (OMG omg.org) and finally, with additional inputs added through the review process (mainly from the contributions of Harrel and Odell) as an industry standard for the modeling of object oriented systems. In the light of the industry enthusiasm for this and the resultant tooling support for the modeling notations, we undertook a review of our methodology to see if we should abandon it, enhance it or revise it. We found that UML was very competent in the area of static modeling (class and object diagrams), but very confused in the area of dynamic modeling, where there were five different techniques which were all but unified. Worse: even if a diligent practitioner applied all five techniques, there would still be essential aspects of the requirements, analysis and design that were left ambiguous or unresolved. UML also only specified a notation, without a supporting method or meta model. We thus continued to use our method, meta model and process modeling techniques. We adjusted our notation to be as

compatible with UML as possible [9]. This was achieved to a high degree in the static models, while with dynamic models, we used elements from UML use cases, as well as from activity diagrams. These were supplemented by our own notation for concepts and refinements not present in UML. Where possible, these were implemented using the UML <<stereotype>> mechanism.

In the early 2000's, an initiative from the Business Process Management Initiative (bpmi.org) saw the creation of a proposed standard for business process modeling, the Business Process Modeling Notation (BPMN). This work was subsequently taken over by the OMG and an industry standard BPMN 1.0 emerged in 2006. This was a much closer conceptual fit to our process modeling approach and we have adopted some of the conventions and notational elements from this. In practice, some of our clients now use BPMN with our method, primarily to take advantage of tooling support. Others use our notation with our tooling (EVA Netmodeler) which provides custom support. BPMN has merit and related standards such as BPEL (Business Process Execution Language) promise improved integration with downstream workflow implementations. Our approach is still richer in dealing with additional concepts and (we believe) more concise and easier to learn and apply.

In parallel to work in the process space, we have been heavily engaged in Enterprise Architecture (EA) since the late 1980's. We introduced integrated EA frameworks and meta models around 1994 and have evolved these ever since [10]. These cover business, process, application system, information and technical architectures. From 2000 we have been creating and marketing commercial tools in support of EA and enterprise modeling, first under the brand Archi [11] and now Enterprise Value Architect (EVA) Netmodeler [12]. As part of this effort, we evolved a strong Process Architecture definition at three levels: conceptual/rich picture; meta model expressed as a class diagram; fully attributed and realised meta model captured in the tool. We subsequently worked with a specialist process consultancy group, The Project Office, to enhance the process modeling capability with quality and effectiveness metrics, such as Six Sigma. The process capability has been used to express models for the COBIT governance framework, as well as for many client organizations. Implementing the graphical modeling support for the process architecture, our process modeling notation and BPMN in the tooling required us to rationalize and unify underlying concepts in the meta model. This has led to an integrated approach which allows focusing on different concerns at the architecture level while maintaining integration with detailed modeling.

Goals

When we engage with clients, they look for quick, quality results that enable them to enhance their business operations. We see many failed business process efforts, including:

- Situations where a great deal of detailed process modeling has been performed using techniques such as event process chains (EPC) over many months without an understanding emerging of the critical issues, business goals and high level interdependencies, let alone the solutions to the issues. This is less a failure of the EPC technique than a shortcoming in method and practitioner skills. It is like trying to apprehend the electrical circuit of a building by drawing a detailed circuit diagram for each appliance found in the building.
- Detailed technical modeling done by I.T. Staff which is inimitable to the business sponsors, owners and experts
- Lack of agreement on terminology. Process modeling is done without a supporting glossary (at a minimum) or Domain Model (better) which defines the terminology and concepts being used in an unambiguous way. Where terminology is not defined, process models will mean different things in the minds of various beholders
- Lack of linkage to strategy, business goals, other aspects of enterprise architecture such as supporting applications, information used, technology employed etc.

- Modeling which continues for many months and is not revisited, while the business itself has undergone significant change

In defining our own approach, we set some goals, including:

- The technique and the resulting models should be intelligible to business participants
- We need integration to Enterprise Architecture and processes must be strategically aligned
- We need a way to ensure that the effort is externally focused and that it is reasonably comprehensive in identifying all required processes of interest
- To enable agility and rapid reconfiguration with high reuse of standard components, we sought a process approach that would facilitate and complement SOA
- There is easy integration/progression to detailed analysis and engineering with traceability and minimum rework

The Approach

We typically begin with a very high level view which models stakeholder interaction with the enterprise. Specifically we want to:

- Identify all stakeholders of relevance to the analysis effort
- Per stakeholder, determine what business events they engage in
- Per event, identify what stakeholders expect and what they provide. This will include physical things (e.g. Cash, Raw Material, Product) as well as information (business communications) in various forms (paper document, email, telephone call etc.). Here we are not concerned with the medium, but the logical communication achieved (e.g. Request Quote; Advise Payment)

The information can be captured diagrammatically (if relatively simple) or in tabular form.

The next step is the identification of business processes of interest. The objective is to pay more attention to those processes which:

- Are within the scope of the analysis effort and its goals
- Are critical to delivery of client/external stakeholder facing products and services
- Consume significant resources or are experiencing significant problems
- Are undergoing significant change as a result of business imperatives or Need to be designed from scratch to meet new goals
- Usually are either high volume (their efficiency is important) or important for some other reason (e.g. Safety, legal requirement, risk)

These criteria save us work in potentially analysing many processes which are routine, add little value or are performed very rarely.

For each process selected for analysis, we move on to preparing a process architecture. The concept of this is illustrated in a rich picture (fig. 1).

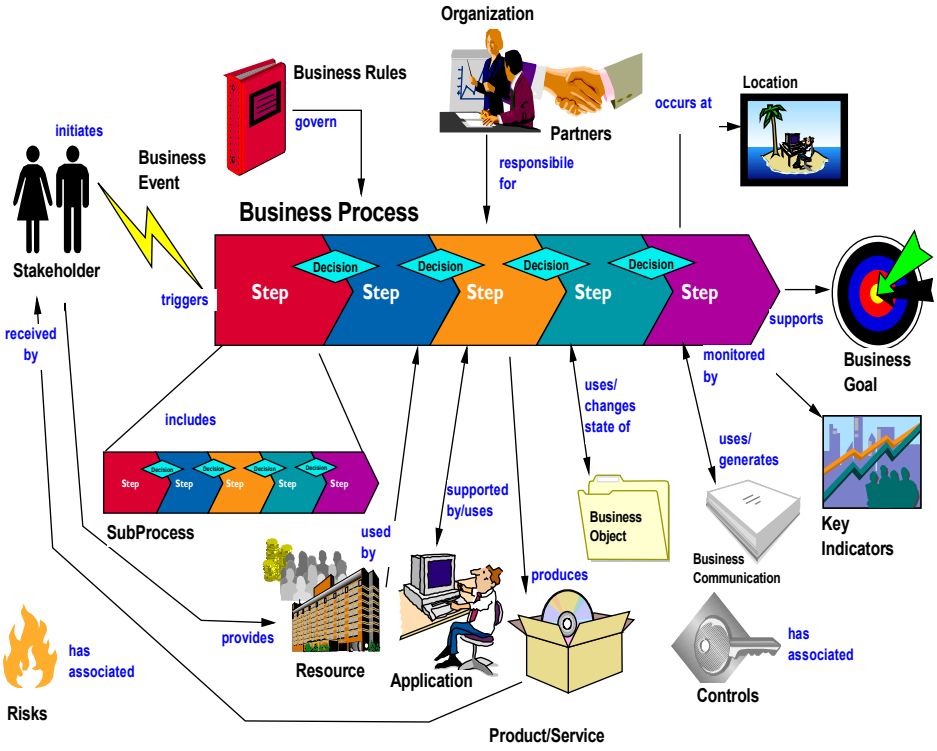

Figure 1: Process Architecture Concept

The definition for each of the object types shown in Fig. 1 is listed in Appendix 1.

The information about a given process can usually be captured in a facilitated workshop session with involved business persons in one to two hours. A focused team can produce 4-6 process architectures per day. This is in stark contrast to the times we see for detailed process models, which typically take between one week and one month per process.

The completed Process Architecture can be represented simply on a single sheet/slide as shown in the example (fig. 2).

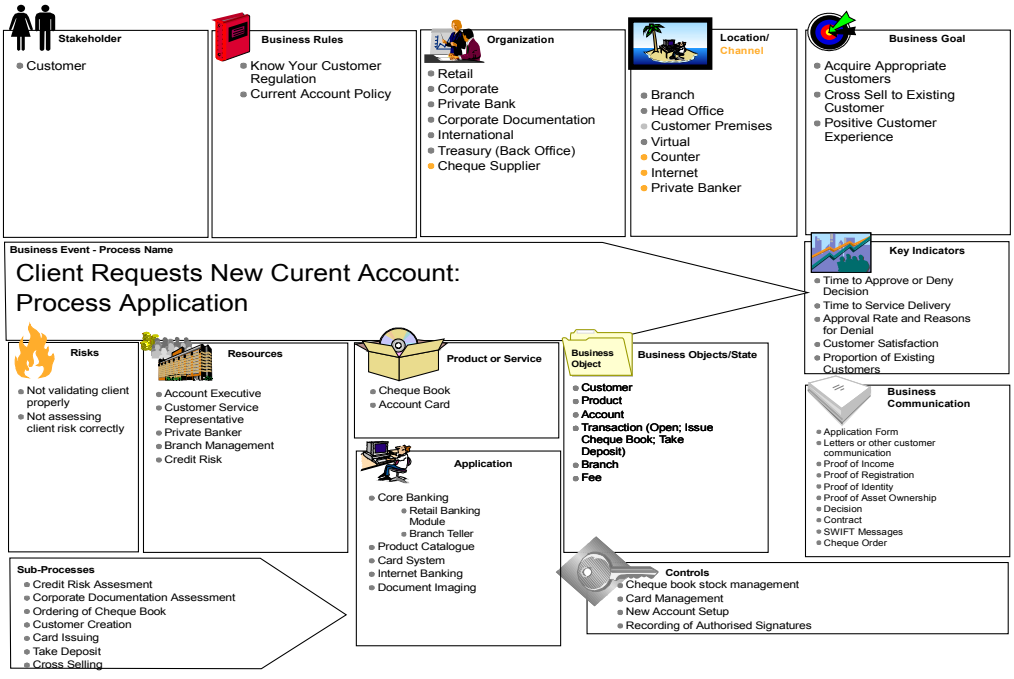

Figure 2: Process Architecture Example

The information can also be captured in a graphical model similar to the concept model shown in Fig. 1 and stored in a repository. We encourage the latter as it allows simply linking objects already identified in earlier models to subsequent ones, thereby increasing fidelity of the models and reuse. Thus when we define the next process architecture, we may already have some of the supporting application systems, business goals and business communications captured and can just link to them. This further accelerates the process. In the full meta model, each of the object types (including the process) has rich properties and relationships which will be populated in later analysis and as we discover and verify further information.

In defining the process architectures, we identify related processes, including:

- Triggering processes
- Subsequent processes
- Parent processes
- Embedded processes (sub processes)

By using this information it is possible to rapidly build high level process architecture maps, such as the one shown in (fig. 3). These provide a quick navigation mechanism and way to review overall process linkage, identify redundancies and find potential reuse opportunities. If desired, they can be enhanced with stakeholder interaction and the flow of information. Sometimes we do not model this explicitly, but allow it to emerge as a by product of capture and relating of process architectures within suitable tooling, backed by a repository. Finally, status information recorded per process can tell us whether we feel it is relevant to a given project or phase, whether it has been modeled, whether we have a model but it is out of date, which team is busy with detailed analysis, etc.

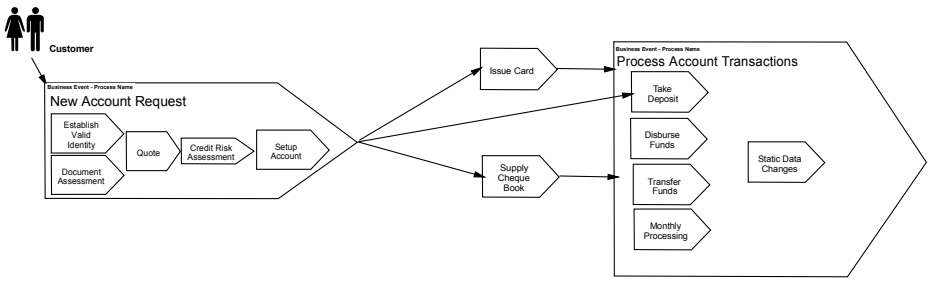

Figure 3: Process Architecture Map

Conventional detailed analysis and optimisation of processes will take place for those processes which require it. This is normally the province of project teams driving change efforts and/or system implementation. The process architectures described to this point are normally prepared by Enterprise Architects or Process Architects working across the organization. This group can provide the process architectures to the implementation teams as part of their project scoping. We also use a technique dubbed “delta models” to define the scope for a project. Delta models show the net change between a current architecture and a desired future architecture. In this case a current and a future process architecture (or architecture map) are prepared and the differences between these specified as input to project planning.

Where detailed process analysis is performed, it can be seen as a decomposition of the central process from the process architecture. Indeed, in tools, we will often see this as a “drill down” from the process architecture. The detailed process analysis can use our own techniques [8] or BPMN. An example of a process model using our techniques is shown as (fig. 4).

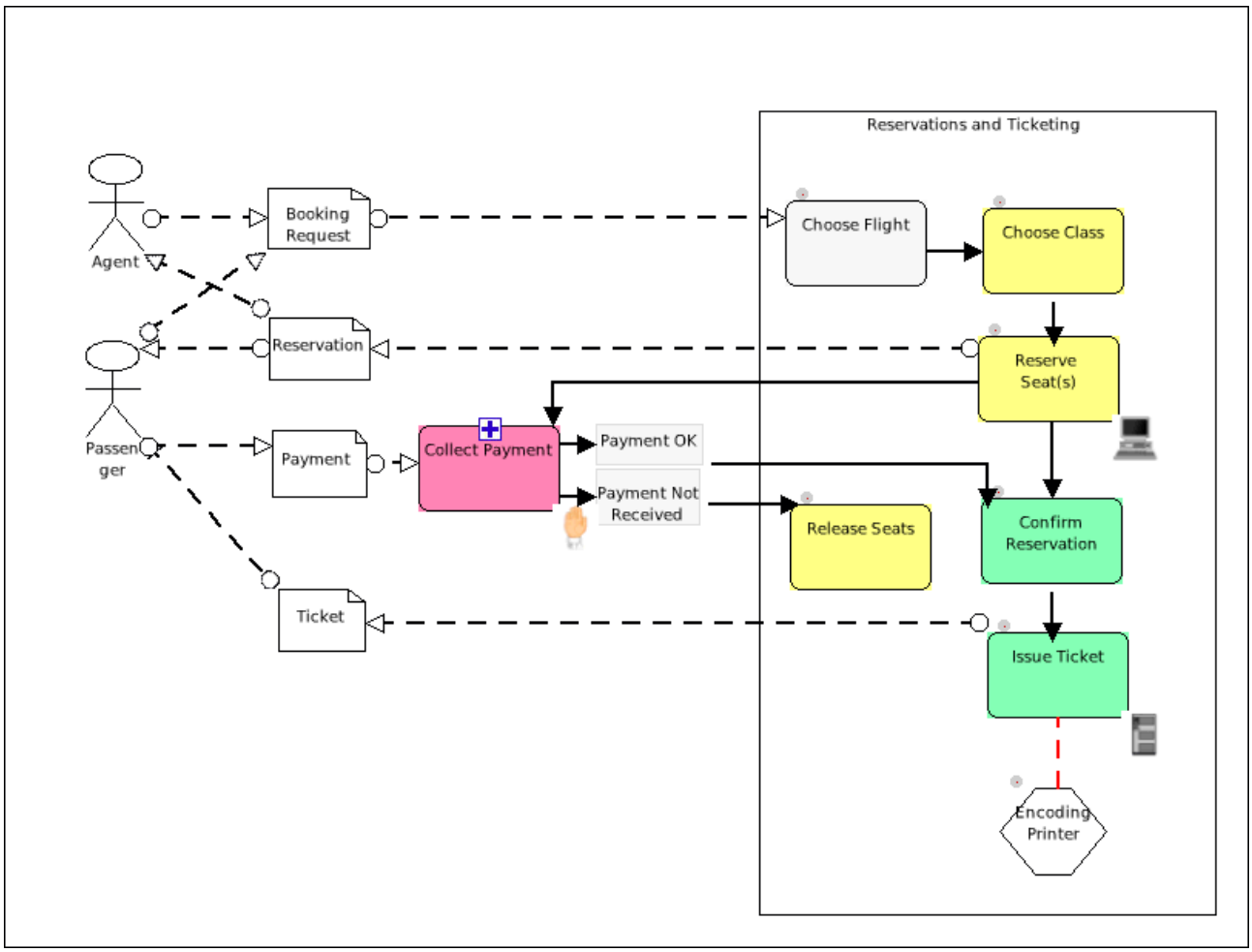

Figure 4: Detailed Business Process Model

In our approach, these models proceed through two more levels of refinement:

- They will be taken from a logical business view to a computer system view. This adds more rigour by detailing outcomes from all activities, identifying formats for all inputs and outputs, allocating responsibilities to all activities and considering non-functional requirements such as volumes, timing, reliability and more
- Finally, they will be enhanced with an implementation architecture view, which considers such issues as separation of concern, physical distribution, communication mechanisms between components, integration with existing infrastructure and other technical issues

These additional kinds of models are beyond the scope of this paper. For further information, please consult Advanced Systems Delivery: Beyond UML [8] or [9]. If BPMN is chosen as the next layer, this can be driven down to BPEL for the implementation view.

Case Studies

We have applied the approach in a wide variety of environments, especially in financial services organizations, including banks and assurance companies. Some brief case examples will serve to illustrate:

- At a large South African life assurance company, we assisted with the definitionof processes and process reengineering for the applications, quotation and policy issuing processes, including those performed by field agents. The results showed that significant benefits were

achieved by first having a high level perspective and then drilling down into detailed process analysis where required. The estimated savings in project time were of the order of 60%

- At an international private bank which operates in South Africa, UK, Switzerland and Mauritius, we assisted with a rationalisation of the business structures including: organization structure and roles; processes; applications support; information usage by processes; mapping to technology infrastructure. The approach significantly accelerated the project and we were able, with the assistance of specialised banking domain consultants, to model some 150 process architectures and related information in the space of 10 weeks. Significant savings were achieved in the project and in the subsequent adjustments in organization, processes, responsibility and technical support.
- At an international merchant bank expanding operations from Japan across Europe and into other regions, we applied the approach as part of an architecture baseline and rationalisation effort. In a period of three months, we were able to gain a thorough perspective of all core banking service processes and how these were used in the group. Significant recommendations resulted in a new architecture for servicing requests from international by the parent while allowing flexibility of interfacing and process composition in the client facing organizations.
- There is ongoing work at a full service commercial bank where the process group is leading major transformation linked to the modernisation of the bank, international expansion and the implementation of a new core banking integrated software solution. The approach has allowed a rapid understanding of the big picture, while providing structured guidance to parallel implementation team efforts.

In contrast to other process transformation efforts we have observed, the approach definitely shortens the calendar time and reduces resources. It seems also to engage business personnel much more fully, as they can immediately relate to the models and can see rapid progress.

Conclusions

We believe that the separation of the process architecture view from the detailed process modeling in techniques and the lifecycle is advantageous. It allows process architecture to be performed rapidly and at an enterprise wide level. Detailed modeling can be performed within project teams implementing change or systems initiatives. This can be coordinated and tracked by using the process architecture maps and process architectures as a high level index and status record. It is necessary to work from a single meta model with the two perspectives fully aligned conceptually. In this way, changes discovered or generated at the detail level are easily fed back to update the enterprise view. In our approach, project teams feed back any new objects identified to the architecture level as well as advising any changes to existing models that affect the high level view.

Major benefits that accrue include:

- The models are intelligible and accessible to business personnel and executives, thereby encouraging their involvement
- Reduced time and effort allows business personnel to be fully engaged in the process
- Benefits are realised earlier, encouraging organizations to do more process architecture work
- Quality of models is enhanced by
    - Higher involvement of business domain experts
    - Working within a good business and stakeholder centric context
    - Rich and integrated meta models which link business goals, stakeholders, business events, processes, information and information technology support as well as aspects

such as rules, contractual arrangements etc.

- Reuse of objects across models

- Integration to other dimensions of EA is greatly enhanced. In fact, we find that doing process architectures following a short domain modeling effort is the best way to kick start a full architecture effort. The domain modeling provides the clarity on concepts and vocabulary and the process architectures provide the key elements across stakeholders, events, communication, applications, rules, locations, business units etc.
- Downstream integration to projects and engineering level models is facilitated by providing a rich context and the precise scoping of delta models. Using modeling techniques and notations based upon the same conceptual base allows successive refinement and increasing rigour without much rework in contrast to approaches which have multiple dynamic modeling techniques and discontinuities between them
- Greater integration to business goals, value chain, service delivery to stakeholders

That said, a few caveats are in order. We caution:

- Process Architectures are not a substitute for detailed process modeling where major changes will affect responsibilities, job roles, skill requirements and information systems support. In these areas they serve as a map of the forest telling us which trees need detailed attention. They also provide a rapid starting point for such analysis when performed by different practitioners
- The approach should be backed by a sound, integrated meta model to ensure that the two perspectives (architecture vs modeling/engineering) do not diverge
- Good tooling incorporating a repository is required to fully exploit the approach and gain the benefits of easy referencing and reuse rather than recording fuzzy names and having reconcilliation problems across models

The author welcomes questions and feedback as well as collaboration with others innovating in the process and EA space.

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Appendix 1

Definition of Process Architecture Concepts

(an excerpt of the Inspired Enterrprise Architecture Frameworks™)


Application System

A system which provides specific business functionality. Examples would include: Accounting systems Stock control systems Personnel management systems Management reporting systems Document management systems In short, any system whose purpose is to support the work and functioning of the business. It will typically not include: Utility software which supports the running and management of computer systems (e.g. Operating systems, DBMS, Network software etc.) Development and modeling tools used in the creation of systems

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Business Communication

A Business Communication is any means by which data, facts, information or intelligence is communicated between parties in a Business Event or Transaction. Examples include: Documents Printed Reports e-Mails Telephone calls

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Business Event

A Business Event is anything which happens in the environment which requires the organisation to respond or take note, or something which occurs internally in the organization or is initiated by the organization and which will affect the state of business objects or relationships with stakeholders. Examples include: Customer places an order Delivery of a product Receipt of a payment Retrenchment of a staff member Concluding a contract with a supplier Launching a product Booking in a patient Business Events are typically serviced or completed by Business Processes.


Business Function

A Business Function is a function required for the business to operate effectively. These may be expressed in generic terms (provided by the architecture frameworks) or may be tailored for the organization. Typical functions would include: Marketing Product Development Sales Order Fullfillment Cutomer Support Accounts Receivable Manufacturing Personnel Management

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Business Goal

A Business Goal is a broadly stated objective, as yet unquantified. It may relate to a number of more specific Business Objectives. Examples include: Leverage IP in consulting business by packaging into products Shift focus of company from services to products Reduce exposure in emerging markets

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Business Object

An object of interest to the business. Any thing or concept about which the business wishes to keep information. Examples include:

- Customer
- Product
- Staff member
- Order

- Payment
- Product Category
- Competitor
- Contract
- Claim

Business Process

A process within the business. Can be high level (typical) or more detailed. Can be logical or physical. Can be current or future/revised.

Business Rule

A Business Rule is an unambiguous statement of a business policy, an algorithm by which a desired result is achieved, or a formula by which a result is calculated.

Examples include:

- POLICY: When there is insufficient stock, supply Category 1 customers fully before allocating stock to any other categories, then place back orders with suppliers to satisfy the balance of orders.
- ALGORITHM: Use Last In, First Out principle when any staff retrenchments are required. Modify this where necessary to retain affirmative action candidates to meet statutory quotas.
- CALCULATION: Available Stock = Sum of (Stock on hand per Warehouse) - Committed Stock

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Business Unit

A Business Unit is a business, division, department or other business entity that functions autonomously. Typically, it will have its own management, budget, objectives and responsibilities. It may or may not have separate legal status.

Control

A control is a means whereby a policy is enforced. Some controls will be required by law, others by industry bodies, some by convention. Management of the enterprise may also establish policies which require controls to be in place to ensure that policies are adhered to.

Key Indicator

A Key Indicator is a measure of performance. It can be linked to a Business Unit, A Business Process or Business Function. Its purpose is to provide guidance in measuring achievement of desirable goals. Examples would include: For an Order Process: Time from Order Acceptance to fullfillment to the customer's satisfaction For Manufacturing: Percent of products delivered that work first time, out of the box, with no intervention required For a Start-up Company: Cash Flow vs Cost of Investment

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Location

Locations specify physical or logical places. We may be interested to know where certain products are sold, or where certain systems or databases reside.

Partner

These can be suppliers, customers, other group companies, or other enterprises with whom we chose to have a relationship. Partners are very important in satisfying customer needs while allowing us to "stick to our knitting" or conentrate on our own core competencies. We cannot hope to be all things to all men, or to be experts in every field or discipline. Accordingly, we should identify and build relationships with other organizations which have competencies in areas where we do not have, or chose not to have, expertise.

Product-Service Category

Often we do not want to model individual products in detail, but rather categories of products. If we are a soap manufacturer, for example, we may want to work at the level of: Laundry Detergents Industrial Cleaners Toilet Soaps and Personal Hygiene Products The same can be true for services. If we are an assurer and finance provider, we may look at our services in categories including: Investment Services Risk Cover Services Provision of Employee Benefits Loans A category can be linked to a variety of products or brands.

Resource Type

A kind of resource, normally designated as required by a task, method or process. E.g. Vehicle, Software Developer, Workstation

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Risk Type

A classification of risk. Examples: Physical Risk (Unauthorised Access; Flood; Fire; Earthquake etc.); Fraud; Incompetence; Technology etc.

Stakeholder Type

Stakeholders include anyone (or any enterprise) with an interest in our organization's continued existence and success. Generally they derive some value from their interaction with us. They typically include: Customers/Clients Suppliers Employees Shareholders Business Partners The State (in the guise of the Receiver of Revenue at least) Stakeholders usually provide some form of input to the enterprise and expect some kind of output, which for them has added value over the input.