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*Research Article*

## **Achieving Process Standardization in Digital Society with 'ASCP Model'**

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### **Abstract**

Process standardization is targeted to address the digital society in general and business community in particular for satisfying the needs of inter-enterprise integration standards that provide real-world value (as mentioned in the Object Management Group Mission statement). For this purpose a unified model that allows a better understanding on the nature and significance of strategic alignment in theory and practice called 'Abstraction Standardization Customization Personalization model' (ASCP Model) is conceived based on Abstraction-Standardization-Concretization Methodology. Classification is an important tool for perception and can be found in numerous scientific disciplines. Several application areas of classification are described in the context of information modeling. The usefulness of classification both as a reference model and a methodology is required for the purpose of systematically positioning the macro level problems in various layers defined in the classification scheme and is adopted in ASCP Model. ASCP Model is a classification scheme to drive and derive Process Standardization. Consistency in operations is necessary for claiming the process as a reference to set of standard patterns. Business Process Modeling has undoubtedly emerged as a popular and relevant practice in this regard. Our findings suggest that the critical areas of concern are standardization of processes, process modeling approaches, identification of the value and its proposition in business process modeling and in model-driven process execution. It is believed that ASCP both as a model and methodology is expected to persist as a road for building standard process blocks targeting the digital governance and digital business community in the future.

**Keywords:** ASCP Model, Business Process Management, BPM and SOA Synergy, Managing Value Chain.

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## Introduction

Purpose of this section is to introduce the problem statement and elicit the potential for a solution based approach to address the problems and challenges mentioned in the problem statement.

## Problem Statement

Collaboration with other enterprises is increasingly important to stay competitive and be successful in business. Enterprises must be able to effectively and sufficiently interact with suppliers and customers so as to align inter-enterprise coordination efforts towards satisfying a single customer needs. However it is also required to have focus on various issues such as not only meeting the customer needs but also fulfilling the collaboration goals, agreeing on a shared universe of discourse, interoperability between enterprises (van Sinderen 2012). Though Object Management Group's (OMG's) Model Driven Architecture based Model Driven Engineering (MDE) approach has brought substantial benefits as compared to other software engineering approaches, MDE suffers from two major shortages: (i) it is unable to deliver domain models from which the correct functional requirements can be derived and hence true validation on whether the developed software can meet user expectations is hardly possible (ii) providing formal definitions to models to be produced during the system development process (Dietz 2012). So it is believed that a Business Process Management (BPM) and Service Oriented Architecture (SOA) synergy approach becomes useful to support the design of a Mediation Information System (Mu et. al. 2011).

## Research Objective

For example, Enterprise Resources Planning (ERP) systems are reflecting as an insufficient means and forms of e-business applications to meet the new challenges posed by the modern and extended global supply chains. Companies are finding that

their massive investments in ERP are now restricting the flexibility to adapt or morph (Lindley, Topping & Lindley 2008, pp. 79). In order not to build up inventories (bullwhip effect) or risk of not meeting customer delivery, companies must insist on an information infrastructure that makes all activities appropriately transparent to all parties involved in the supply network. Value chain management paradigm makes supply chain practice more effective. It has a potential to standardize the supply chain integration process. The standardization of supply chain integration process tends to help companies better leverage the information shared among supply chain integration partners. Without standardization, however, uncertainty reduction becomes less valuable as the processes themselves become uncontrollable (Zhou & Benton 2007, pp. 1363).

Process standardization has a positive impact on the process performance. Standardization as a part of Business Process Management (BPM) approach, strives for achieving continuous process improvement. Hence it is a relevant measure for business process reengineering and controlling. It is a means to obtain incremental improvements and enhance the company's bottom line. Managers can use the evidence of process standardization for the effective process implementation (Munstreamann, Eckardt & Weitzel 2010, pp. 44). A more recent standardization effort in the BPM context is related to the current momentum of XML and Web services technology. Web services is a promising technology to foster interoperability of mediating information system based on the Service Oriented Architecture (SOA) paradigm as well as with technology based open standards and light-weight protocol systems (van der Aalst, Hofstede & Weske 2003, pp. 10).

Further, the research study by Munstreamann, Eckardt & Weitzel (2010) mentions that the business process as the *object* is required to be standardized to streamline the business process, where

Standards are documents, established by consensus and approved by recognized body that provides, for common and repeated use, rules, guidelines or characteristics for activities or their results, aimed at the achievement of the optimum degree of order in a given context. Despite the importance of standardization, the IS field has not pursued research on it vigorously. Not much relevant literature can be found on standardization, although some ideas can be borrowed from the rich business process improvement literature (pp. 30-31). Quality, Cost, Delivery and Flexibility are the most conventional operational dimensions (Schoenherr&Swink 2012, pp. 100) of the integrated enterprise. However inter-enterprise integration needs can propose to have combinations of unique skills, knowledge and joint capabilities at different abstraction levels. So it is believed that a unified strategic alignment model as a driving methodology to cross validate the inter-enterprise process standardization is required to be conceived.

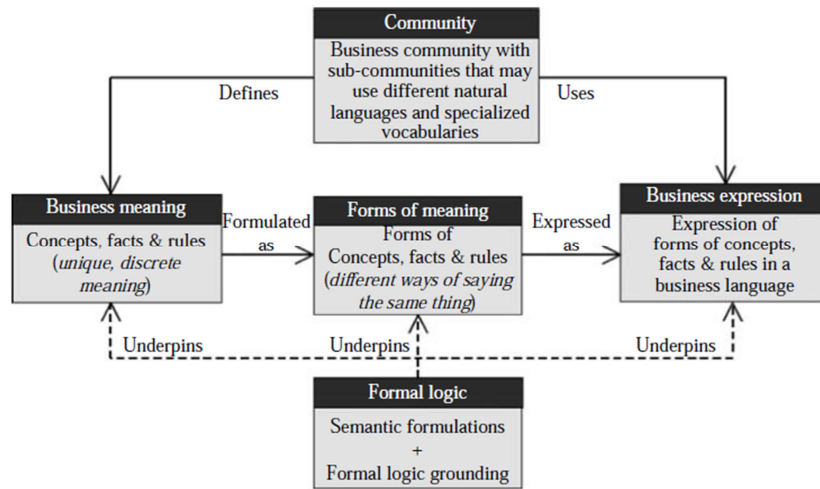
It means a new model is required to address the digital society in general and business community in particular to satisfy the needs of inter-enterprise integration standards that provide real-world value (as mentioned in the OMG Mission statement). For this purpose it is required to conceive a conceptual model that considers the use of contemporary state-of-the-art, new management technologies and trends such as BPM, SOA and Cloud computing to address

the end-users, government agencies, business community belonging to e-governance and e-business domains. In addition, the model should be able to reflect it as a driving methodology with the evidence of coherence, consistency, comprehensiveness, conciseness and essence (Dietz 2012) to the industry supporting plausible practices.

So 'ASCP Model' (Abstraction, Standardization, Customization and Personalization Model) is designed to address the above scenario. The objective of this paper is to provide the Body of Knowledge (BOK) in the form of eliciting literature evidences that can fundamentally drive the business modeling and software design taking BPM and SOA terminology into consideration.

### **Methodology**

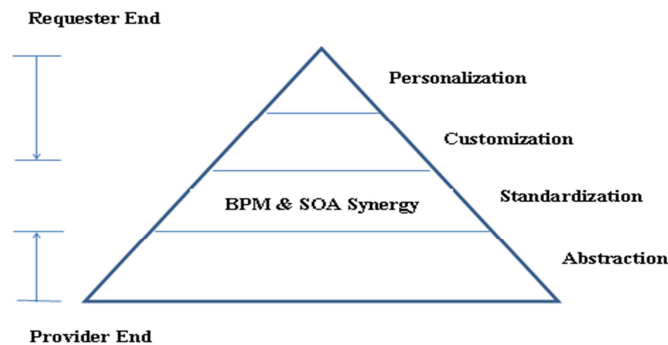
Basically our methodology is broadly divided into three levels: (i) Abstraction level (ii) Standardization Level and (iii) Concretization Level, whereas only two levels viz. (i) Abstract level and (ii) Concrete Level are mentioned in (Mu et. al., 2011). It broadly follows the pattern conceived in Gen-Spec Research Methodology (Vasista, 2011) and involves the usage of analysis and synthesis techniques (Shen et. al. 2004) while forming the standardization layer in terms of conceptualization of process modeling and design.



**Fig 1. Meta-Model for Semantic E-Business and E-Governance Initiatives (Source: Hall, 2006)**

It inherently suggests adapting and adopting a combination of different methodologies keeping in view the principles of Model Driven Engineering, Object Oriented Analysis in general and the three level representation of business model concept mentioned by Osterwalder, Pigneur&Tucci (2005) (AlSudairi&Vasista 2012) in particular. For example, adoption of overview diagram of Object Model Group’s Semantics of

Business Vocabulary and Business Rules (SVBR) (Hall 2006) represents meta-level strategic conceptual driving model (see Fig. 1) that drives to formulate the ASCP Model (see Fig. 2) as a schema level driving model for adaption (for e.g. it is the Driving model that drives the Digital Society) and finally e-governance and/or e-business models at the third level and specific level driving model.



**Fig 2. Proposed ‘ASCP Model’ for E-Governance and E-Business Community**

The third level business model is the instance level business model that gets instantiated out of the schema level driving model (for e.g. Driving models that drive e-business and e-governance). If the simplified view of SBVR model (Hall 2006) is observed, these three levels kind of patterns can be observed viz.

conceptual model, conceptual schema and a level at which it considers core level constraints. This concept becomes much clearer in the next section.

With this kind of a consistency in the observed patterns, a declaration can be

emphasized that “the very methodology approach has to be treated as the ‘nature of the system”

**ASCP Model (Abstraction Standardization Customization and Personalization Model with Abstraction-Standardization-Concretization Methodology)**

It is a process based classification schema model (see Fig. 2) to drive the complexity of digital enterprise by adopting Abstraction-Standardization-Concretization Methodology (see Fig. 3) for process based knowledge classification in terms of process modeling and software design to provide visibility

across collaborating enterprises with a unified infrastructure collaboration for unified service collaboration instantiations ‘on the fly’ (for e.g. cloud computing paradigm). These instantiations can be understood as Process Management Systems at the implementation level that are inherited from the standardized layer and are customized based on the application of theory of constraints approach (Rhee, Cho & Bae 2010) to satisfy the level of constraints of customization and constraints of personalization for the purpose of meeting their respective needs (E.g. BPMS tools from many vendors).



**Fig 3. ASCP Model Methodology**

**ASCP Model as a Process Model**

Organizations must start thinking about enabling Role-Based Productivity by Connecting Processes, Dynamic Market Conditions and Consumer Demand in Real Time. With real-time tracking and multi-enterprise views, consumer goods companies can get control over making decisions based on actual inventory levels, stock turnover rates, and patterns in consumer demand (Microsoft 2009).

Business process management is a methodology that allows companies to stay competitive and shorten the time to market periods of their products and services (Smirnov, Weidlich & Mendling 2010). Agility is one of the focused matters needed while transforming the traditionally programming based model towards model driven based service composition that enable the abstraction to separate process management aspects in layers. This layering technique

keeps the process flow model simple and more comprehensible. Layered models can be used to expose process control aspects to the most appropriate roles and levels.

BPM promotes a centralized approach to process governance and ownership, using a dashboard to act as a “process orchestrator. Using the principles of SOA, web services and object-oriented programming approach, it is possible to make the solution flexible and adaptable to future requirements and reuse of existing components. But SOA requires the set-up of a new architectural layer of abstraction – at the service level – between processes and systems. Loose coupling and reusability of services are the cornerstones of the SOA. It is a means to make business processes more agile, a condition for sustainable success in today’s business environments. Both legacy systems and newly developed applications can be formulated as a set of services as well as external systems. However it should be

remembered that SOA should never be a strategy in its own right, but should be a decision to support the organizational strategy (Van den Bergh & Viaene 2012).

The underlying methodology of BPM and SOA though focuses on processes, the business process analysis follow object oriented process approach, while architecture and high-level design are component based. Component interfaces play a central role in the architecture. The reusability and encapsulation is now required to be raised to components, creating stable and coarse-grained abstractions, similar in nature to services.

### **Abstraction Layer**

The starting level layer is the highest level business process abstraction layer (Gartner 2010). This layer consists of the information concerning the collaborative situation (Mu et al. 2011). Also called 'as-is' business process description in BPM methodology.

A variety of drivers for process modeling efforts, from low level service orchestration to high-level decision support, results in many process models describing one business process. Depending on the modeling purpose, these models differ with respect to the model granularity. Business Process Model Abstraction (BPMA) is emerged as a technique that delivers a high-level process representation containing more coarse-grained activities and overall ordering constraints between them (Smirnov, Weidlich & Mendling 2010). BPMA is an operation on a model which preserves essential properties by leaving out insignificant details in order to retain information relevant for a particular purpose. BPMA can be realized by means of two basic abstraction operations: elimination and aggregation. While elimination omits insignificant activities, aggregation groups several semantically related activities into one high-level activity (Smirnov, Weidlich & Mendling 2010).

For example, Process Management Portal can be understood as an abstraction layer, linking and aggregating contents and services reducing the complexity of their access as well as mapping context and services with the flow of business process (Martin & Nußdorfer 2006) as a part of representation leading to standardization efforts with content.

### **Personalization and Customization Layers**

Service Provisioning over the internet using web service specifications becomes more and more difficult when real business requirements start taking shape in line with the community and individual level specifications. Dynamic Service Encapsulation approach promotes to achieve flexibility by not only exposing individual resources according to flexible description of their complexly aggregated products but also would reduce the technological overhead in virtual service exposition over the Internet. In this approach, the entities at different abstraction levels allow integration partners with their different roles to access the corresponding services or products through these abstract entities in an e-Business process (Kipp, Schubert & Geuer-Pollmann 2010).

The specific objectives of business solutions include: creation of adaptable process management technologies by enabling virtual services to be combined dynamically from the available set of existing functions; organizing currently available web services according to the specific life-event requirements; creating a comprehensive work flow process that provides clear instructions for end users and allow them to personalize services as required. Therefore personalization of user preferences should be supported while capturing requirements and specifications of these services (Velicanu & Surugiu 2007).

The behavioural profile relations at personalization layer and customization layer allow different levels of freedom for

activities. A behavioral profile is said to be inconsistent, if there exists no process model that satisfies all the constraints of the behavioral profile. Whether such a process model exists or not depends on the applied notion of a process model and the intended structural and behavioral characteristics of the synthesized model. Once consistency of a behavioral profile at each layer is validated, abstract model structure is derived from the behavioral profile. These consistent behavioural profiles are leveraged to get synthesized with the high level process model. Finally the conceptual model leads to provide a standard, concise, compact and comprehensive view on the process (Smirnov, Weidlich & Mendling 2010).

For example, Process Management (PM) portals support cross-functional, cross-departmental and cross-enterprise virtual team consists of partners, employees, customers and suppliers. PM portals enable personalized contextual views on aggregated services and contents related to specific virtual teams. Each portal user gets a personalized environment that can be further individualized. The filtration process of views on services and content are defined by the personalization layer that in turn is based on the information profiles (Martin & Nußdorfer 2006).

### **Standardization Layer**

Standardization is a process of setting the optimum criteria for any industry to function and carry out operation in their respective fields of production. Industry standard envisages the regulated, lawful, logical usage in the segment of the economy dealing with industrialization. This may include services and goods. Standardization within the industry contributes to global as well as domestic competitiveness. Standardization serves as a quality check for any industry. Standardization is essential to properly carry out industrial policies and rules (Economy Watch 2010).

Standardization plays an important role in the economy of any country. Standardization

process motivates administration and the legislative bodies in governing the practical as well as the technological standards as per the constitutional and legal requisites. Standardization can provide a bench mark for the evaluation of the industry and ascertains the rank of an industry in the economic set up of a country. Optimum standards facilitate the creation of political as well as business related advantages. Standardization provides a platform for giving a shape to new creations and also provides assurance of transparency (Economy Watch 2010).

The 'ASCP model' uses process cartography as a technique to describe gaps mentioned in the overall approach (Mu et. al. 2011). Pucher (2009) mentioned top-down and bottom-up approaches as two components of the conceptual information architecture. But meet-in-the-middle approach is adopted for formulating the standards layer, where it uses top-down approach for system synthesis and bottom-up approach for system analysis (Cai & Gajski 2003) as 'ASCP model' supports platform based design targeted to address the digital society. The 'ASCP model' gives a road map for highlighting the scope for achieving the consistency towards using standardization in the inter-enterprise scenario. The ambiguity of understanding between inconsistency and process view by Sommerville, Sawyer & Viller (1999) clearly indicates the need of classification scheme regarding abstraction levels. It is called inconsistency at the standardization layer however it is called process view sociologically at customization layer and personalization layer. So the debate for public or business policy reform is to clearly understand the very formulation of policy at the meta-level. A resolution on whether to consider the layer extracted from system synthesis or the layer abstracted through system analysis. Hence it is suggested performing the reconciliation of the abstracted knowledge (by removing the bottom-up process inconsistencies) and transformed knowledge (by removing top-down data inconsistencies) in the form of

creating a map of rules while formulating the standardization layer for delivering policy goals. It is emphasized that it is where there is a scope for policy reforms. It emphasizes process modeling and software design as two important areas in this regard. It uses the synergy benefit of BPM and SOA where the share of SOA and BPM for small enterprise is mentioned [by Bajwa et al. 2009]. Barguiet. al. (2011) proposed four steps for ontology building process viz. (i) enrichment (ii) extraction (iii) comparison and (iv) upgrade that can generate the decision making knowledge as standard concepts and to construct the decision making ontology.

It is believed that a review on the research work done by Ko, Lee & Lee (2009) can give a comprehensive demonstration and illustration on the standardization layer of the abstract model conceived by the author. Ko, Lee & Lee (2009), attempted to put effort in rationalizing the terminologies associated with BPM and its standards. Correspondingly, the representation of systematically categorized standards based on the BPM life cycle consists of (a) a rationale for the categorization and (b) a current status of prominent BPM standards. BPM Lifecycle consists of four stages viz. (i) Process design, (ii) System Configuration (iii) Process enactment and (iv) Diagnosis. Rationale is well explained using a flow chart. BPM standards are categorized as: (i) Graphical Standards (ii) Interchange Standards (iii) Execution Standards and (iv) Diagnosis

Standard. Further Ko, Lee & Lee (2009) provided the rationale for the categorization of BPM standards and actual categorization of BPM standards.

When SOA is combined with BPM, the methodology focus takes a paradigm shift from Process to Service, where services are published capabilities that can be dynamically discovered and composed. In order to utilize a service, a client needs to obtain its interface and invoke one of the operations published in that interface. While services are discovered dynamically, component interfaces cannot be discovered dynamically. But both offer functionality that can be invoked through interfaces and both need to have specifications associated with those interfaces (RDF Group 2007).

BPM standards and specifications (e.g. Business Process Execution Language – BPEL) are based on established BPM theory and Petri nets and are eventually adopted into software and systems (e.g. Intalio Designer from KAISHA-Tec Active Modeler).

BPM standards and systems are also what Gartner describes as “BPM-enabling technologies (Ko, Lee & Lee 2009).

Table 1 provides a mapping between traditional BPM approach and the proposed SOA based BPM approach. The analysis stage must start considering the high-level design concept (RDF Group 2007).

**Table 1: Mapping BPM and SOA Aspects**

Sl. No.	Aspect	Traditional Business Process Management	Service Oriented Architecture
1.	Model	Business Process Model	Domain Model
2.	Model Type	Use Case	Service Type
3.	Specification	Component Specification	Interface Specification
4.	Web Modeling	Web Application Models	Web Service Model
5.	Computing Compatibility	Regular Web based Client Server Computing model	Cloud and Distributed Computing
6.	Abstraction consideration	Business Oriented and Object Oriented Analysis	Service Oriented Analysis, Design and Integration
7.	Document Focus	Business Analysis	High Level Business Services Design and Architecture
8.	Semantic Aspect	Semantic Extension capability is Not sure	Semantic extension capability is possible.



Authors' effort is to highlight the importance of adopting the best capable features of BPM and SOA. As BPM and SOA demands agility approach, it might not be difficult for an experienced business analyst who keeps state-of-the art information technology tools and specifications in mind would be in a position to translate these mappings while preparing customer requirement specifications document.

In the BPM and SOA synergy modeling, services are specified using the same technique currently used to model systems and components. Each service is modeled as an interface, with a number of provided operations, and the semantics of the operations are defined using pre-and post-conditions based on an underlying service type model. The system functionality is captured as services rather than being provided by a system abstraction(RDF Group 2009). Author completely agrees with the idea of RDF Groups proposition of providing visibility to artifacts. RDF Group (2007) mentioned that there is no existing methodology that can identify and define services in the earlier development process and especially in the analysis stage. But in the current methodology, services play a predominant role in the form of making services visible to the user and testing community (either e-business or e-governance community) rather than just focusing on the reusability aspect in different business processes or applications. Use case modeling still continues to drive the development process even in this innovative methodology. Services are identified and their purpose and scope are captured at the time of use case diagrams and its flow are described (RDF Group 2007). In the BPM notation these are represented using Swim Lanes.

Thus 'ASCP Model' based BPM is a fundamental level driving methodology that gives enterprise the opportunity to identify business processes at four abstraction layers levels for the purpose of deriving process standardization. While BPM tools help in

modeling and developing those business processes, SOA helps in integrating different applications, which are based on the modeled business processes to satisfy the inter-enterprise needs. This concept is adoptable for not only implementing the standard way of building reusable business services but also helps in bridging the gap between business and IT through a series of "business-aligned" services (Fotou 2011).

### Conclusion

While the advantage of adopting ASCP model for building this kind of ontology is that it allows analysts to overcome the lack of domain knowledge required during requirement elicitation, it suffers from the limitation generalizing the experimental finding towards building actual standard concepts and the comprehensiveness of the standard requirement specification through system synthesis efforts can be questionable at the ideal level. Moreover ontology population opens new interesting perspectives such as identification of conflicts and contradictions that may arise from enriching the ontology with new elements as mentioned by (Baurgui et. al. 2011).

Adoption of BPM-SOA plays a strategic role for organizations to integrate inter-enterprise process to be successful in competitive environment. Applying BPM-SOA is a key enabler for the seamless horizontal integration of IT systems particularly in a Mergers &Acquisition scenario as the organization transforms the processes of the merged entity. The sole purpose of working and bringing these kinds of innovative intervening modes is to reduce the capital and operational expenses and to improve effectiveness and efficiency with standardization (Wipro 2010).

SOA and BPM are complementary disciplines that, together, will yield valuable synergy and competitive advantage for those who exploit them. SOA provides an enterprise architecture discipline for organizing what is

to be done, while BPM provides a design discipline of how it can be done (Cummins 2010).

**Table 2: Understanding Value Proposition as a Difference between Input and Output Model Components [Based on Alsudairi & Vasista, 2012]**

	Input Model Components	Output Model Components	Instrument for Technical Visibility
1	Process Management	Value Management	Semantic Value Management Portals
2	Knowledge Management	Intelligence Management	Use of Business Intelligence Tools
3	People Management	Resources Management	Role and Authority based Cloud Services
4	Process Activity Management	Web Services Activity Management	Dash board based Business Activity Monitoring Tools

At the implementation level it maps to adopt BPMS tools while doing business modeling as a first step under the process based approach of industry practice called.

The purpose of designing and delivering the ASCP model is to realize how the synergy of BPM and SOA would function to manage value chain in an innovative way.

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