Cloud Computing and SOA: Enabling the Agility Double Play

Exploring the Relationships between SOA Adoption and Cloud Computing
Executive Summary

With the hype of Cloud Computing dominating the current IT landscape, much as SOA did five years ago, we should take a breath and remember the reasons why Service-Oriented Architecture (SOA) was postured as a critical business and IT initiative then. When SOA became “hot” in July 2004, the desire for SOA was enabling business agility and flexibility, achieving reduced application maintenance costs, achieving faster time to market, driving savings and cost avoidances through service reuse, and cutting into the 20-30% integration burden most companies spend today. These are typical SOA value drivers that were stated then and still remain valid. However, based on the overhyping of SOA, the challenge to live up to those overinflated expectations has been enormous. SOA has not failed as a business, IT and architectural strategy, but it has failed to live up to the claims and expectations that were hyped. Could any technology live up to those expectations?

However, take a look at the “typical” benefits of Cloud Computing, and you begin to feel as if you’ve seen part of this move before. Many of the target benefits of cloud computing are the same ones we began our SOA initiatives to achieve: agility, flexibility, faster time to market, cost savings.

Many organizations have had success with their SOA initiatives, and thus are well postured to adopt Cloud Computing as a viable technology strategy. Cloud Computing logically builds upon SOA concepts of “services,” in particular shared SOA infrastructure services, core enterprise services, and clean layered architectures that SOA requires. Those organizations who have embraced SOA will have an easier transition into Cloud Computing. However, many organizations who struggled with SOA have rapidly abandoned their failed SOA strategies and have focused their efforts on Cloud Computing with hopes of realizing many similar benefits.

This whitepaper explores the relationships between SOA and Cloud Computing, and how one discipline builds on the other. SOA and Cloud Computing are interdependent initiatives, and if executed as related initiatives, offer an Agility Double Play. You can achieve agility and flexibility from SOA adoption, and additional enterprise agility from Cloud Computing. If an organization bypasses SOA and moves into Cloud Computing, it will eventually have to revisit SOA and services concepts, as well as the architectural and organizational disciplines required to succeed with both. Our position is that you need SOA capabilities and disciplines to succeed with Cloud Computing. The reasons you failed with SOA do not mean you will be successful with Cloud Computing. However, success with SOA, we suggest, means your organization is better positioned to succeed with Cloud Computing.
Definitions: Cloud Computing versus Service-Oriented Architecture (SOA)

Cloud Computing, like all emerging technology paradigms, is a confusing, misunderstood and overhyped concept. Like SOA, which still lacks a definitive definition that is agreed to across the industry, Cloud Computing will suffer mightily until there is widespread agreement on what Cloud Computing is, is not, and how to realize business benefits from it.

According to Gartner Group, cloud computing is “a style of computing where massively scalable IT-related capabilities are provided ‘as a service’ across the Internet to multiple external customers.” The key linkage of Cloud Computing to SOA is the term “Service.” You cannot migrate to Cloud Computing conceptually unless you understand how things—applications, components, infrastructure, data, et al—can be first provided as services, and then subsequently can be consumed as services. Thus, without service-enablement of portions of or entire layers of your IT architecture, which is what service-oriented architecture (SOA) is all about, you cannot conceptually or physically transition into Cloud Computing as a successful business model, IT strategy or architectural paradigm.

We use the following definition of SOA, which we have always preferred over others in the industry: Service-oriented architecture (SOA) is a business model, an IT strategy, and an architectural paradigm predicated on the concept of shared, reusable Services.

From this definition, three benefits of SOA can be realized. First, as a business model, SOA provides clarity on what services or capabilities should be performed internal to a business as opposed to externally to that business, much like the core and context contrast advocated by Geoffrey Moore. Core activities are essential to business success, and offer transaction cost benefits for them being performed internal to the firm. Context activities are non-differentiated, and there are transaction cost disadvantages to performing them in house. These are services that should be outsourced to others. SOA as a business model concept explicitly forces choices about what is done internally as opposed to what is acquired externally as a service provided by others. There is a direct relationship from SOA as a business model enabler to Cloud Computing. Many start-ups will leverage a Cloud Computing concept to provide IT infrastructure since they most times cannot afford to buy, staff, operate and maintain their own data centers.

SOA as an IT strategy simply states that the IT function will be structured and operated as a Service-oriented capability, where IT services will be acquired, organized, and delivered to the business to best support the business strategy. If this means outsourcing various aspects of IT capabilities to service providers, so be it. Some of these outsourced capabilities will include infrastructure services, programming services,
application and Web services, and consulting services, while also implementing SOA internally to facilitate Service-oriented operation of the IT function. As you can see, SOA as an IT strategy directly supports SOA as a business model.

SOA as an architectural paradigm is what we classically know as service-oriented architecture today, which focuses on the architectural and technical aspects of SOA. SOA as an architectural paradigm involves the activities focused on the definition of the SOA elements of your enterprise architecture, service modeling and design, SOA enablement technology and tools, service lifecycle management, and the composition of business applications from services that have been built from scratch, exposed from existing legacy applications, or have been acquired from 3rd party service providers.

As we would suggest, Cloud Computing success demands an understanding and appreciation of SOA as a business model, an IT strategy, as well as architectural and technical patterns that support service-enablement of things. Cloud Computing and SOA are interdependent concepts. Cloud Computing and SOA provide many complementary and some overlapping business benefits to your enterprise, if adopted and implemented appropriately. SOA offers benefits that Cloud is not intended to provide, and vice versa. Cloud Computing and SOA, taken together, offer multiple related value propositions to your enterprise.

**The Agility Double Play: SOA plus Cloud Computing = More Agile Enterprise**

A compelling aspect of Cloud Computing in conjunction with a SOA initiative is the ability to drive enterprise agility from two perspectives in parallel. SOA delivers enterprise agility though composition of applications and orchestration of business processes based on consuming Web services (or Services) available in your enterprise, or accessible through 3rd party service providers. SOA also supports IT flexibility by abstracting legacy systems and infrastructure from applications through a layered services architecture, which helps eliminate point-to-point interfaces and instead encourages access to service implementations via standards-based interfaces based on industry standards.

Cloud Computing offers an incremental level of enterprise agility by enabling the rapid introduction of new business or mission applications into service by hosting them in a Cloud Computing platform, which eliminates the need to specify, order, acquire, install, configure, test and manage the infrastructure (servers, storage, networks, security) to enable that business application. By leveraging a Cloud Computing paradigm, a business application can be quickly introduced without the cost, time and effort required to buy, install, and configure dedicated infrastructure. This Agility Double Play
of SOA with Cloud Computing combines many best of both world scenarios into a very real and tangible value proposition that is too significant to ignore.

What Cloud Computing Does for Your Enterprise

Cloud Computing offers many significant benefits in addition to enterprise agility. The additional benefits most organizations seek from Cloud Computing include many of the following:

**Reduced IT cost**: Cloud Computing offers a way to reduce IT infrastructure costs through a combination of capital expense avoidance, pay-as-you-go capacity, better utilization of virtualized commodity computing capacity and reduced operational costs by requiring fewer internal IT resources to focus on commodity infrastructure needs.

**Better asset utilization (infrastructure)**: Cloud Computing leverages infrastructure virtualization approaches that dramatically improve server utilization, from the 10% current average to between 25-35% server utilization, and in some cases even higher. The same asset utilization improvement applies to storage virtualization as well.

**Better asset utilization (people and skills)**: Cloud Computing allows you to essentially outsource your IT infrastructure to a 3rd party firm, which means you can focus your precious IT staff on more strategic and innovative enterprise requirements. This is a far better use of corporate people assets, skills and knowledge.

**Pay-as-you-Go Model**: A key feature of Cloud Computing is its on-demand utility nature, whereby compute or storage capacity is consumed only when needed, and you only pay for what you use when you use it. If you no longer need the Cloud, the capacity is released back to the pool for others to consume. This helps align computing and storage demand with business needs, and unused capacity will not sit idle as a capital expense, which is paid for whether it is utilized or not.

**Convert Fixed Costs into Variable Costs**: A related and powerful benefit from Cloud Computing is the ability to convert what were formerly fixed costs into variable costs, which are only paid upon usage based on internal business demand. This is a powerful concept that has significant financial and operations benefits for IT and business executives.

**Bypass Slow IT Acquisition Processes**: Cloud Computing models offer a means to quickly add operational IT infrastructure in hours/days, versus weeks/months, by enabling innovation projects to bypass often slow and arduous IT acquisition and procurement processes and quickly put into production new business capabilities. This rapid time-to-market model will be one of the major reasons Cloud Computing adoption will be rapid for areas where it makes sense. Corporate acquisition processes
are so laborious and slow that any approach that enables low cost IT infrastructure services in an accelerated time frame will be warmly embraced.

**Easy Onramp to IT Infrastructure for Start-ups or Innovative Business Ventures:** For start-up firms that do not have the capital to acquire IT infrastructure to enable their business models, the benefits are similar—less capital expense upfront, and easy onboarding into an already-operational IT infrastructure, which lets the start-up focus on its differentiated business model. For larger enterprises with innovative projects, Cloud Computing allows a very rapid time-to-market to test new business models, while avoiding the need to acquire, install, configure, operate and maintain IT infrastructure.

Regardless of the value you hope to realize from Cloud Computing, you must nevertheless focus your efforts on business opportunities where Cloud Computing makes sense for you, where risk can be mitigated and/or controlled, and where you can really deliver the value proposition you promised.

**What Cloud Computing Does Not Do, but SOA Does (or Can)**

SOA offers a range of business benefits that are unique to SOA, and that Cloud Computing cannot deliver. Thus, Cloud Computing and SOA should not be treated as mutually exclusive initiatives but as complementary initiatives. Below are a few key SOA benefits that Cloud Computing cannot offer:

**Support faster application development:** SOA offers the compelling ability to rapidly compose new business applications and orchestrate new or changed business processes based on consuming available Web services (or Services). This is a unique value proposition of SOA initiatives. Cloud Computing does not offer value in faster application development, but it does support faster time to market by eliminating the infrastructure procurement and provisioning aspects of new business application.

**Support reuse of services:** While SOA initiatives are all about developing and consuming reusable, sharable Services, Cloud Computing is more about leveraging internal or hosted infrastructure services. There is a common thread here, as many SOA initiatives focus on establishing a shared core enterprise services layer, or infrastructure services, and Cloud Computing is explicitly based on an internal or 3rd party shared infrastructure services layer. The fundamental difference between SOA and Cloud Computing is the data, business and presentation services layers of the architecture, which are not the sweet spot for Cloud Computing at this time.

**Reduce application maintenance:** SOA initiatives reduce application maintenance costs by leveraging pre-built pre-tested services, and by the fact the revising applications composed from services is much less costly than recoding software applications. While Cloud Computing does not offer much for application
maintenance, Cloud Computing does reduce the costs of infrastructure maintenance, which are also substantial costs for an enterprise.

**Reduce integration costs:** SOA dramatically reduces integration costs for an enterprise, which can range from 20-30 percent of a typical IT budget. Integration cost reductions come in the form of elimination of point to point interfaces, leveraging SOA tools such as enterprise service buses and related integration tools, and of course Web services and XML approaches to building and integrating applications.

**Support application portfolio rationalization and consolidation:** SOA initiatives facilitate sharing and reuse of common services, which provide a means to consolidate and rationalize your legacy application portfolios. Cloud Computing is focused more on simplifying and optimizing (and potentially outsourcing) the IT infrastructure layers of an enterprise architecture, while SOA tends to focus more on the application portfolios and application architecture layers of an enterprise architecture. SOA thus has more direct impact on rationalization of application portfolios, streamlining of business processes, and harmonization of data across your enterprise.

The main message here is that while Cloud Computing and SOA offer some related benefits, they are really complementary initiatives as opposed to mutually exclusive initiatives. We would argue that Cloud Computing will benefit significantly from SOA, and furthermore that the behaviors contributing to successful SOA initiatives are very transferrable to an incipient Cloud Computing initiative. If your enterprise pursues both initiatives, you can achieve the Agility Double Play.

**SOA to Cloud Transitions: Jumping Into Cloud Computing**

The transition to Cloud Computing for many organizations is occurring now, beginning with some education and awareness, evaluation of vendor platforms, and pilot implementations. There are five primary transition paths from SOA to Cloud Computing. An organization’s transition to Cloud Computing success will depend in many ways on its relative success with SOA and the necessary supporting competencies, skills and disciplines that SOA success requires. Below are the five Cloud Computing transition patterns:

**Transition to Cloud Computing from a Successful SOA Initiative:** An organization’s Cloud Computing initiative builds upon SOA successes by leveraging SOA governance disciplines, shared infrastructure services, shared data services, well defined and layered enterprise architectures, and of course applications composed of services, which should be more easily onboarded onto a Cloud Computing platform. This is a relatively easy Cloud Computing transition pattern, and offers a virtuous cycle of the cumulative benefits of SOA coupled with the incremental benefits of Cloud Computing. This is an agility double play!
Transition to Cloud Computing from an Immature SOA Initiative with Preliminary Success: An organization’s Cloud Computing initiative begins from an immature yet potentially successful SOA initiative, where Cloud Computing can leverage architectural discipline, build on already-implemented SOA shared infrastructure services, and leverage SOA governance disciplines. This Cloud transition pattern offers promise for both SOA and Cloud Computing success, but the SOA effort still requires more time to mature and pay dividends.

Transition to Cloud Computing from an Immature SOA Initiative That is Stuck in the SOA Red Zone and Still Hoping for Success: This Cloud Computing transition pattern essentially means the organization is frustrated with its SOA initiative, and believes that Cloud Computing can deliver IT value to the enterprise in a lower risk, less business-engaged fashion. This transition pattern does not mean SOA will not succeed, just that the organization is struggling with typical SOA adoption challenges, and thus Cloud Computing offers another avenue to pursue. The danger of this Cloud Computing transition pattern is diverting critical IT resources and funding to Cloud Computing when the SOA program still requires sustained focus and effort.

Transition to Cloud Computing from a Failed SOA Initiative: An organization’s Cloud Computing initiative begins from a failed SOA program, and the organization essentially abandons the concepts of SOA and services, infrastructure services, composition of applications from services, reuse and sharing of services, etc. SOA failure has many causes, but generally it indicates the organization did not have the appetite for SOA itself, SOA governance, sustained SOA investment, and the discipline required to realize the incremental and cumulative benefits of SOA over time.

Transition Directly to Cloud Computing, Skipping SOA altogether: This Cloud Computing transition pattern essentially means an organization was a late adopter of SOA, or it never really gained traction with its SOA efforts, and instead has chosen to move directly to Cloud Computing. The danger of this Cloud Computing transition pattern is that there are many good architectural, technical and organizational benefits that derive from SOA, and if an organization has not grappled with them, it may not have the organizational knowledge base to succeed with Cloud Computing.

The transition into Cloud Computing from SOA is a natural one in many respects. The Cloud Computing transition patterns above are fairly representative of the industry, and we will explore below the implications of the relationship of SOA adoption to Cloud Computing adoption.

SOA Failure does not Breed Cloud Computing Success

SOA failure does not breed Cloud Computing success. However, SOA failure does not directly portend Cloud Computing failure either. They each require differing levels of engagement with business stakeholders and business process owners for success, while there is overlap of in areas where both can be successful to a given
enterprise. SOA success, we suggest, may well facilitate the transition into a successful Cloud Computing initiative by leveraging disciplines, capabilities and knowledge acquired through your SOA initiatives.

SOA failure can be caused by a variety of reasons, some of which may impact an organization’s ability to transition to Cloud Computing, and some of which may not. Below are some typical SOA challenges that may contribute to limited SOA success or outright failure:

- **SOA Governance shortcomings**: SOA challenges or outright failures can in many instances be attributed to poor governance or complete lack of SOA governance, not so much from a technical governance perspective but from an organizational, cultural, acquisition and service ownership perspective.
- **Failure to deliver end-user value**: Many times, we see organizations spending too much time on service provider activities and SOA enablement technology implementations as opposed to working with business and end-user communities to apply SOA to their business problems. Thus, the benefits of SOA tend to get lost when the effort is focused on “doing SOA” versus “enabling the business via SOA.” There is a profound difference between the two orientations.
- **Too much focus on SOA service provider capabilities, and not enough time delivering end-user applications and capabilities**: Related to the comments above, if you cannot successfully engage with the business leaders and business end-user community, you will struggle to maintain ongoing commitment to SOA unless you rapidly deliver business value to your customers.
- **Overemphasis on “Doing SOA” versus “Applying SOA to deliver business value via SOA-enablement.”**: The SOA benefit tends to get lost when the effort is focused on “doing SOA” versus “doing business via SOA-enablement of applications, data, business processes and IT infrastructure.” Too much time has been spent “doing SOA” as opposed to engaging with the business to apply SOA to their business challenges.
- **Too much effort trying to explain what SOA is versus delivering business results through services**: As we all know, the most successful SOA initiatives are embedded in the business such that we are not talking about “SOA” at all. The sooner we get the SOA conversation out of the way and focus on the business or mission objectives, the better off we all will be, and the more successful SOA will be.

Many SOA failures and SOA Red Zone struggles can be attributed to an internal, service provider focus as opposed to understanding how to engage with business stakeholders and apply SOA to their business challenges. Cloud Computing, by virtue of its more targeted and narrower value proposition, may be able to avoid the over promise and
trough of disillusionment that SOA has suffered through. However, the Cloud Computing hype cycle is in full swing.

**SOA Patterns and Cloud Adoption Implications**

There are a few Cloud transition patterns from SOA that clearly auger well for a successful Cloud Computing initiative. We explore a few of these here, with the stipulation that this list is not exhaustive, nor is it intended to.

SOA initiatives tend to cluster into four primary SOA patterns based on AgilePath’s SOA modeling framework, the SOA Quad Model: data-centric, process-centric, legacy-centric and consumer-centric patterns. In addition, there is a core enterprise services pattern as well, which focuses on integrating a SOA platform to provide core enterprise services such as security, messaging, mediation, routing, transformation and the like.

Success with any of these SOA patterns will bode well for Cloud Computing. However, some SOA patterns lend themselves particularly well to the transition to Cloud Computing. We will explore a few here.

**SOA Infrastructure Services/Core Enterprise Services (CES) Pattern:** SOA initiatives often center on developing a robust, integrated SOA platform and infrastructure that delivers core enterprise services (CES) that are shared by business and mission applications. Cloud Computing offers similar core enterprise services through its infrastructure virtualization model. Thus, a successful SOA infrastructure services effort will pave the way for successful Cloud Computing infrastructure virtualization pattern, which is normally an industry starting point for many Cloud Computing initiatives.

**Data-Centric SOA Pattern:** Many SOA initiatives focus on semantic integration, data accuracy and data normalization around an enterprise data model. These efforts fall under the data-centric SOA pattern, which is typically implemented via a robust SOA data services layer. Successful data-centric SOA initiatives can lend themselves to Cloud Computing success through the data and storage Cloud Computing pattern. Storage as a service and enablement of rapid sourcing, analysis and dissemination of information from data are fairly common Cloud Computing patterns, although the storage Cloud pattern is more common than the data cloud pattern to date.

**Consumer-Centric SOA Pattern:** Presentation services and application composition frameworks are encompassed by the consumer-centric SOA pattern, which enables end-user capabilities at the glass delivered by a SOA initiative. The corresponding Cloud Computing pattern is the Application/Platform Cloud Computing Pattern, where applications and platforms are virtualized and provisioned via Cloud middleware to enable application scalability, reliability and remote user access via the Web, and also where application platforms are similarly provisioned to users over the Web. The
Application/Platform Cloud Computing pattern is supported in many respects by the Consumer-Centric SOA pattern, although applications and platforms in the Cloud Computing are more provider-side features of Cloud Computing than they are service consumption activities represented by the Consumer-Centric SOA pattern.

**SOA/Service-Virtualization Sub Pattern**: Enabling services virtualization is a SOA sub-pattern or best practice that helps ease the development and provisioning of services by providing SOA platform middleware functionality such that service developers do not have to focus on it. Service virtualization is based on loose coupling and abstraction concepts, but functionally allows services deployment to be simplified, and services development, testing and provisioning to be standardized for distributed developer teams. SOA/Service virtualization is a clear onramp to Cloud Computing, and is supported by the SOA/Services Cloud Pattern.

**SOA Governance (Plus Two) Pattern**: AgilePath’s Quad Model adds two additional dimensions to the four core SOA patterns: Governance and Security. These are sometimes called “Plus Two” SOA patterns. SOA success can almost always be associated with a solid SOA governance model, comprised in part of governance policies, processes, enablement technology and organizational models and boards. Cloud Computing governance is emergent, and the requirements and disciplines of Cloud Computing governance are not well defined yet. However, we would expect that an organization that has implemented successful SOA governance will be able to transition those experiences and best practices into the requirements of Cloud Computing governance to address issues of Cloud security, Cloud onboarding and offboarding, Cloud Management, Monitoring and Operations, Quality of Service (QoS) and Service Level Agreement (SLA) documentation and enforcement.

We suggest that certain SOA patterns provide a natural onramp to Cloud Computing, although there are differences in the deployment and support requirements for them. In this light, successful SOA initiatives can directly support an organization’s transition to Cloud Computing. Again, we emphasize that these initiatives bring some overlapping and unique value propositions to the enterprise that pursues them both. For organizations that have not succeeded with SOA, we urge that you do not give up. Cloud Computing and SOA are both mutually interdependent, and success with one will enable success with the other. Success with both allows the Agility Double Play we described above.

**Things to Do Tomorrow**

This whitepaper offers ways in which SOA and Cloud Computing are interdependent and mutually reinforcing business initiatives for an enterprise. We suggest that SOA success can lead to Cloud Computing success based on the SOA patterns that have been pursued in the industry to date. While SOA and Cloud offer
some overlapping benefits to your enterprise, they each bring unique value as well. Below are some suggestions for you, and some things you should begin doing tomorrow.

- **Develop a Cloud computing strategy and roadmap**, stating clearly what you hope to achieve through Cloud Computing, what business challenges cloud potentially applies to, and what business challenges are not in scope. This will help you focus on appropriate and high-potential Cloud use cases.

- **Understand various Cloud Computing patterns** and the implications of implementing Cloud Computing for target business requirements in your enterprise. Understand the relationship of SOA patterns to Cloud Computing patterns, and how they might reinforce one another.

- **Be clear on the desired business and financial benefits you are seeking**; operationalize the Cloud Computing and SOA initiatives, objectives and actions you will implement to achieve those value propositions.

- **Plan for the Agility Double Play**: Execute SOA and Cloud Computing initiatives in parallel, or in overlapping work streams, to develop synergies. SOA and Cloud Computing are not mutually exclusive efforts.

- **SOA brings enterprise value that Cloud Computing efforts do not deliver, and vice versa**. Be sure that the business value you seek is being delivered by an appropriate technology paradigm - SOA and/or Cloud Computing.

- **The Agility Double Play is achieved through a unique implementation of both SOA and Cloud Computing**. Enterprise agility can come from iterative implementations of SOA and Cloud Computing, based on the various SOA patterns and Cloud Computing patterns we have documented.

- **Be wary of the Cloud Computing Hype Cycle**. Cloud has seemingly overshadowed SOA’s hype cycle. Avoid the trough of disillusionment by being clear on the value you seek, and how you will attain it. The use of SOA and Cloud Computing patterns will help align your efforts to deliver the business results you hope to achieve.

The rapid rise of Cloud Computing is following the typical hype cycle of another technology trend. Many organizations are making the leap to Cloud Computing and bypassing their failed or stalled SOA efforts. Yet, our observation is that many enterprises who struggled with their SOA adoption efforts may also struggle with their Cloud Computing adoption. While Cloud Computing offers benefits that SOA cannot offer, SOA delivers benefits that Cloud Computing cannot deliver. They are related, interdependent, and mutually reinforcing. SOA combined with Cloud Computing enables the Agility Double Play. Successful SOA adopters are better prepared for Cloud Computing success, while failed SOA adopters may struggle. However, both business initiatives will benefit from clarity around business goals, and the strategies applied to realize those business goals.
Suggested Reading


Marks, Eric: *SOA Governance for the Services Driven Enterprise* (2008)

Marks, Eric and Michael Bell: *SOA: A Planning and Implementation Guide for Business and Technology* (2006)


AgilePath Whitepaper: Rightsizing and Refactoring SOA Governance

AgilePath Whitepaper: Excelling in the SOA Red Zone

AgilePath Whitepaper: The Value Proposition for SOA Governance

AgilePath Whitepaper: SOA Quad Model Overview