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THE FUTURE OF ENTERPRISE COMPUTING IN 2015

A number of significant changes are occurring in the IT industry that are mutually reinforcing. These changes are pushing the industry to a tipping point. Beyond this a paradigm shift will occur that will fundamentally affect the nature of the relationship between IT, consumers and businesses. By 2015 this shift will have transformed enterprise computing and the role of the CTO and CIO with it. There are three key areas of focus right now for enterprise IT – Cloud Computing, Service Oriented Architecture and Modelling. Planning and executing a strategy in each of these areas will give the enterprise the best chance of minimising the risk and maximising the competitive advantage that the paradigm shift will bring. The authors provide some suggestions based on their experience of what these strategies should cover.

1 BACKGROUND

This whitepaper is based around a presentation that the authors gave at the Microsoft Architect Insight conference in April 2008.

The white paper closely follows the presentation in structure, and uses much of the text, expanding where the authors felt more detail was needed.

2 INTRODUCTION

The objective of this paper is to offer a glimpse into where SOA and Enterprise Computing may be in the near future of 2015, in the context of the momentous changes (some of which are discussed in section 0) occurring in the IT industry. As a tool for exploring the extremes of possibility in this future world, two scenarios will be examined, the first is a potentially bright or optimistic 'best-case' future and the second is an equally potentially dark pessimistic or 'worst-case' one.

This paper will look at the challenges this presented to Architects and Strategists and look at some key actions that can be taken to guide enterprise IT through the storm of disruption. It will also examine how one moves from the potential storm to a future where IT as a service regains the credibility of the Business by transforming itself from a cost centre into a driver of business agility.

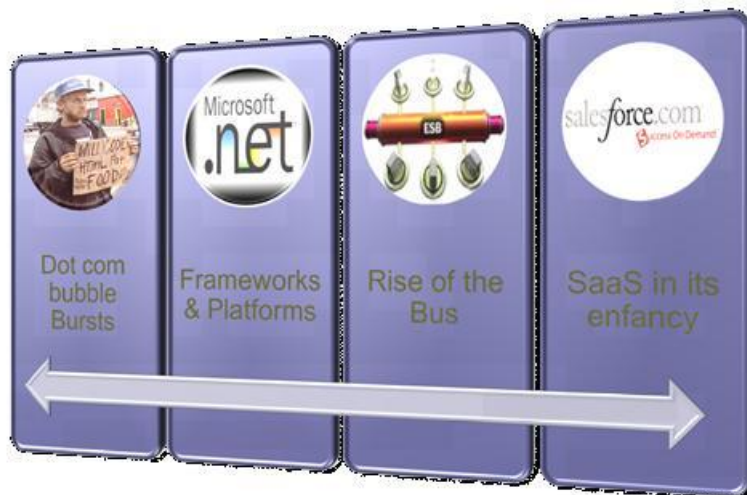
2.1 WHY 2015

2015 was chosen by the authors to reflect a likely period in which significant change is likely to be seen in the enterprise computing landscape. This is also a period short enough to avoid being simply an exercise in crystal ball gazing.

The authors spend a lot of time talking to customers and trying to understand the key challenges they face. Often their concerns are very similar - their view of the future is unclear, they know large changes are happening and they want to understand how to take the right road to a profitable future where IT and the business are working better together.

Writing in early 2008, 2015 is seven years away. If you are an architect or a senior manager in IT, it is quite likely that you were involved in IT seven years ago, and that you may still be involved in the industry in another seven (apologies to any young entrepreneurs or those approaching retirement for which one of these statements isn't true). Ask yourself how much your role has changed in the last seven years, and then look forward another seven – what will your role be like then? In order to better understand the significance of this period of time, consider the events of the last seven years.

2.2 LOOKING BACK 7 YEARS



In 2001, seven years had already elapsed since Gartner coined the term Service Oriented Architecture (SOA), but in reality there were few patterns and even fewer tools to help early adopter organisations reap the benefits, SOA adoption was still in its infancy. The lead up to year 2000 and the extensive IT system rework was over, The Dot com bubble had just burst, and the market downturn started by that event was

accelerated by another – 9/11, with the net result that hundreds of thousands of IT jobs were lost worldwide.

IT investment which had been increasing year on year, now sharply decreased. In 1970 IT spend accounted for 3% of investment; by 1990 this had risen to 9%, and the curve kept on rising so that by the year 2000 IT investment as a percentage of total corporate investment had risen to a massive 22%. Much of this investment was targeted at the desktop and associated infrastructure.

On a product front, Microsoft released the first version of .NET and later in 2004 their 2nd version of Biztalk™, providing a first stab at a SOA Integration Platform rather than just a point to point integration tool. This investment continues with the recently announced Oslo programme. Around this time the successes some large enterprises were having with some new distributed integration patterns began to consolidate into the idea of an Enterprise Service Bus (ESB), and the ensuing fierce discussion about whether this was a product or simply a pattern is still ongoing. In the World Wide Web, a new delivery model was born – Software as a Service, enabled by new revenue streams supported by advertising and subscription.

2.3 THE PRESENT DAY



Moving back to the present, the current situation in the banking sector has the potential to precipitate a global recession (some countries may already be in recession), IT spend is declining year on year, and IT departments are constantly asked to do more with less.

Although prevalent, and discussed everywhere, the implementation of consistent SOA platforms is still not mainstream. Software as a Service (SaaS) has moved into early maturity and Cloud computing is just starting to take off, leading to the notion of Everything as a Service (XaaS). From a Business perspective, Business Process Modelling is just starting to become a key driver for IT projects, and the nirvana of Model Driven (everything) is a vision of many vendors' roadmaps.

2.4 THE INSIDERS VIEW

Over the last few months the authors have had conversations with many CTO's, CIO's and Chief Architects to gather their views of the future in 2015 around SOA and enterprise computing. There is an interesting mix.

"What is certain is that SOA will become a commodity" - Director of a major SOA stack vendor

"By 2015 the emphasis should be on consuming services not producing them. Applications will be composed by orchestrating these services." - CEO of a large SOA consultancy

"It is inevitable that modelling will replace a good bit of coding in the foreseeable future, but coding will never go away. Modelling objects will replace many of the mundane pieces of code that are written but more sophisticated functionality will need to be coded" - CTO of an Enterprise Architecture consultancy

3 STORM IS COMING?



Rapid IT change is certainly nothing new, it could be said perhaps it is the only constant. What is perhaps unique today is that all of these changes are happening together, and their interplay is driving the industry towards a tipping point that is likely to lead to a paradigm shift. These shifts will occur in the way IT relates to businesses and consumers.

Any change potentially disrupts business, but the quantity and the degree of change being driven by the trends emerging today have led some analysts to describe the approach of a 'perfect storm' of disruption (McKendrick, 2007). But it is not the case that this should be seen as an entirely negative event. The past

has shown that those that not only weather disruptive changes, but plan a strategic route through to the other side will be in the best position to capitalise on the opportunities these changes are bringing to maximise competitive advantage and become the Google or Amazon of the new era.

In this section, some of the most disruptive of these changes are examined.

3.1 THE EVOLUTION OF SOA

The simple SOA of the last few years is evolving into more advanced architectural forms. Event driven architecture (EDA) adds fully asynchronous, one-way communications patterns to simple SOA request/response. Monitoring of these event streams has allowed business activity monitoring (BAM) to provide real-time information to businesses where this was not possible before.

A new architectural pattern Context Driven Architecture is emerging that utilises the principles of complex event processing (CEP). CEP goes beyond simple BAM, utilising techniques such as detection of complex patterns events, event correlation and abstraction, and relationships between events. Context Driven Architecture goes further by seeking to detect complex patterns and extract meaning in event streams with the goal of providing situational awareness, advanced business intelligence and automated sense and response behaviour in near real time.

Some analysts are predicting that smart or 'intelligent' software is the next revolution in applications and context-awareness provides the semantic underpinning that creates this intelligence, but identify that it is the modularity and access provided by SOA and the record of the changes provided by EDA that have defined the essential foundation on which CDA will emerge over time (Yefim V. Natis, 2007).

This evolution of SOA into CDA will enable a new generation of smart applications in finance, defence, risk, compliance, Telco's and logistics.

3.2 MODEL DRIVEN EVERYTHING

Models have been around in IT for a long time. In the sense all programming languages are models, albeit procedural rather than declarative ones, and at the other extreme, so are the white board diagrams, but the nirvana of having models themselves execute as code and be seamlessly integrated from analysis through to operation has failed to materialise. The first real attempt with the early case tools of the 1990 failed to deliver on the promise of model driven development. However recently, after a lull in the first half of this decade, modelling has broadened its reach.

Business Process Modelling (BPM) as an approach to managing business process change is gaining ground, and the tooling to support this modelling is maturing rapidly. Domain Specific Models (DSM) are still in their infancy, but offer the possibility of higher level abstractions than general purpose modelling tools do, reducing the effort and cost necessary to specify a system.

These improvements will allow models to be the primary artefacts throughout the software development lifecycle, and this in turn will make a model driven approach to development much easier to take.

Business Process Management Suites (BPMS) and model driven Integrated Development Environments (IDE'S) are merging with tools that take a composition-first approach to development. This results in a new class of tool sometimes called an Integrated Composition Environments (ICE) (Daryl C. Plummer, 2007). An ICE brings together business and technical models, together with tools for service creation and consumption.

By 2015 such ICE tools will be on their 2nd or 3rd evolution – could this mean a realistic prospect of modelling replacing code for a high percentage of everyday development activities?

3.3 VIRTUALISATION/TERA-ARCHITECTURES

The age of the global-class infrastructure has arrived. Huge data centres have, or are being constructed by mega-vendors such as Microsoft, Google, IBM and SunGard, these can offer cloud computing power at a fraction of the cost of a corporate data centre.

This is driving the transformation of IT to a utility service in the same way that power changed at the end of the last century. In the early 1900's most large manufacturing facilities had an attached power generation facilities. Such facilities require high up-front capital investment, a specialised team of engineers to maintain, and complex often bespoke equipment to effectively deliver the power to the areas of the factory.

The cost of such corporate power generation facilities was increasing rapidly as a percentage of total spend. This was a significant drag on companies' profitability, but a complete necessity because electricity as a power source gave a significant competitive edge.

This dependence on bespoke, locally produced power had occurred because the technological advances necessary to allow electricity to be distributed as a utility had not yet been invented. In the next decade a number of technical innovations occurred virtually simultaneously that allowed electricity to be distributed via a grid over large distances, and enabled suppliers to bill for usage on a unit basis. This created a revolution, the shockwave from which is still being felt today. Electricity as a utility enabled power consumption in the home and workplace and every electrical device we have today exists because of that paradigm shift.

The parallel with the changes in IT in the first decade of the 21st century are striking. A number of key breakthroughs, such a virtualisation, and tera-architecture enabling the management of servers as commodity items have led to the ability to generate compute platform services at almost infinite scale.

So in today's world, the internet is the power grid, and the central generator stations, the power-plants are the tera-architecture data centres (Carr, 2008).

The reduction in per-unit cost that the new global-class data centres can achieve and the removal of the need for capital investment in IT infrastructure will lead over time to the end of the corporate data centre in its current form.

3.4 CLOUD COMPUTING

Software as a service (SaaS) has been around for a while now and has entered the mainstream, but most early offerings were only a service in the sense that an entire business function could be operated in the cloud. SaaS has now evolved to offer a finer granularity of services that can allow businesses to compose end-to-end business processes that utilise a combination of services provided in the cloud with those provided within the enterprise. This increase in flexibility is allowing businesses to consider involving SaaS providers in business processes that are more bespoke or customised to a specific business rather than the highly generalised and commoditised offerings of the first generation of SaaS.

The tera-architecture data centres described previously have been the catalyst for the emergence of a true web-based IT platform. This infrastructure as a service model provides compute, storage (e.g. Amazon Elastic Compute Cloud (EC2) and Simple Storage Service (S3)), security (e.g. Perimeter eSecurity), application management (e.g. Windows Live Mesh), and business continuity services (e.g. EMC Fortress) hosted in the cloud.

This model has led to an explosion of in-the-cloud service offering, and pioneers are beginning to offer everything as a service (or XaaS). Almost every aspect of providing IT platforms can now be found available as a service offering in the cloud. Enterprise class data services including RDBMS (e.g. Microsoft SQL Server Data Services), ETL, Data mining and data warehousing (e.g. Vertica Analytics); integration services including SOA fabrics and ESB's (e.g. MuleSource MuleOnDemand) as well as B2B and supply chain integration; software development including IDE's, build test and deployment (e.g. Bungee Labs BungeeConnect); even desktop as a service (e.g. Deskstone Virtual-D) where a complete client business desktop including email, intranet and office applications can now be bought as a service.

Revenue models for vendors offering these services are very different from before: subscription, per-use fees and advertising have taken over from one-off purchase plus annual maintenance. The payoff for the users of these services is lower entry and operating costs than have been possible before. XaaS is allowing IT departments to reduce the capital investment and operating costs, allowing them to concentrate on delivering business value.

3.5 WEB2.0 AND WEB ORIENTED ARCHITECTURE (WOA)

Web 2 technologies such as Microsoft Silverlight, Ajax and Adobe AIR have created a web that is much more interactive and rich both in appearance and content. Pioneers like Amazon and Google feed content tailored to the individual users, based on context derived from the analysis of data, or by allowing users to pick and choose.

Web based enterprise portals such as SharePoint provide a way of quickly constructing composite applications from service oriented building blocks. Many web application providers provide tool kits for producing on-the-fly 'mash-ups' of user interface components such as maps with data sources to allow users to create new applications almost on the fly (e.g. Google Mashup Editor, Microsoft Popfly). This style of architecture (known as Web Oriented Architecture or WOA) gives technically aware consumers, and more recently business people the tools to create new applications from existing services already available on the web¹.

The experience of browser based applications will soon match that of desktop applications, reducing the user experience gap between web-delivered and 'thick client' desktop user interfaces. If the power of today's desktop applications is available via a browser, then in most cases the need for an installed application disappears.

¹ There is a lively ongoing discussion on the relationship between WOA and SOA, and what this means for businesses.

3.6 THE GROWTH OF HYPER-CONNECTIVITY

Wired broadband access has now reached saturation point in the developed world. The speed of broadband connections has steadily increased to the point where it is now possible to deliver even high-definition video content over the web.

New standards such as 802.11n mean that wireless is catching up fast in both speed and adoption, and are making networks of consumer devices cheap and easy to construct. Mobile internet access is already at usable speeds and will soon achieve the speed of early broadband connections through new 3.5G technologies such as HSDPA and WiMAX, with the promise of even faster connection in the future.

Several products now provide the capability to seamlessly switch devices across wired, wireless and mobile bearers without the user experiencing any loss of connectivity or indeed even knowing that this has occurred (e.g. Brand Apollo).

Taken together these advances are providing an 'always connected' experience for most users of the internet. This has wide implications not just for consumer IT but also for the enterprise workforce and its productivity outside the office.

If you are always connected to the internet, why have a pc, with all that wasted local processing capability – all you need is an internet appliance – effectively a smart browser.

3.7 WHAT DOES IT ALL MEAN?

These are just a few of the trends affecting IT. There are many others that are equally influential including: the rise of the 'digital native', the next generation entering the workplace that regard IT as a commodity and expect the same degree of access to it at work as at home; Amazing new developments in user interface technology which may spell the end of mouse and keyboard for interacting with computers, and new interface senses such as touch and motion; the rise of virtual worlds and social networking communities which are creating new ways for groups to collaborate, share, and socialise both at home and work (Tapscott & Williams, 2006).

Think about the potential effects of all these changes –

- The age of smart software
- IT as a cheap utility
- The end of the corporate data centre
- The end of code
- The end of desktop software
- The replacement of the pc with simple internet appliances

Each of these individually is a large change – in combination the effects are reinforced. These disruptors are changing the way people manage and interact with IT - so what does the future hold for IT in the enterprise? Will innovators use this opportunity to gain enough competitive edge to become the next Google or Amazon? Will the pain of these disruptions force those that are ill prepared out of business?

4 TWO POSSIBLE FUTURES AMONG MANY

Predicting how any aspect of human endeavour will look in seven years is both challenging and liberating. On the one hand, the non-linearity of cause and effect can mean even small changes in the early part of the time frame can have a large impact by the end, with the result that predictions can be wildly out. Of course that also provides an opportunity to be more extreme in describing possibilities than for a prediction only a few years hence.

To bound the many possible futures of 2015 the authors decided to examine two possible extremes, one taking a very optimistic or 'bright' view, and the other a pessimistic or 'dark' view. To ground this from an enterprise perspective, these two alternate futures will be looked at from the point of view of

the CTO of a medium sized company, reflecting on his/her position in 2015. Where possible we have included citations to original work that led us to believe a particular outcome was likely.

4.1 THE PESSIMISTIC VIEW



“Looking back to 2008, the future looked promising, but I have to say I feel that my position now is no better and in some ways worse than then. Some of this is down to the failings of the IT industry as a whole, but with hindsight perhaps there were decisions I could have taken that would have improved my current position.

Today SOA exists, but its effectiveness has been limited, and my CEO for certain does not think it has increased business agility. The reductions in funding caused by the

2nd Great Depression of 2008/09 canned our enterprise-wide SOA strategy – it was just too hard and too expensive, so to at least get some SOA implemented, I allowed tactical implementations at a department level as and when requested.

Although this gave some short terms returns, it has resulted in several uncoordinated SOA implementations, with ESB's from different vendors. These do not communicate well together, so when the business has looked for service re-use we have had to implement our own ad-hoc gateways between ESB's. This has created difficulties in testing, deploying, securing and maintaining the connections that cross these SOA domain boundaries.

What hasn't helped is that SOA standards are not comprehensive enough to specify all the aspects needed for SOA communication, and those that exist are not enforced or applied consistently by the stack vendors (Michelson, 2007).

So we still have software silo's at a department level, only this time they are based on services rather than applications. Services are developed and used within a particular SOA domain, mostly at department level, and a few high-value services are shared across domains at high cost (McKendrick, Keeping SOA, the silo killer, from creating new silos, 2008).

There were a number of high profile failures of service and security in early cloud infrastructures and this led to a distrust of the public cloud by our board and many other enterprises (Malik, 2008). Sure we use Software as a service in the cloud for well-defined commodity business processes such as CRM and many startups and small companies using SaaS as a low cost of entry option, but the only enterprise using cloud infrastructure and services strategically are those that can afford to own and operate their own private global-class infrastructures – it's worth it for them because they can effectively centralise the functions of corporate data centre's in their many geographically distributed locations.

Although virtualisation initially reduced my IT costs, the continuing cost of developing, testing and upgrading large siloed applications means that I still have high total cost of ownership. In addition the fragmented, siloed SOA domains mean that it's difficult to deliver agility to end-to-end business processes consequently the board has stopped investing in SOA as a means to business agility.

I still have to concentrate much of my time on managing the overall IT burden; In fact the board is meeting this week to discuss whether there is a continuing role for a separate IT department. I think it's only a matter of time before they break apart the departments, assigning responsibility directly to the business units' directors.”

In this fairly extreme example the CTO is facing a number of challenges, some of which are because of the overall direction taken by SOA and 'Cloud' vendors, and others, it could be argued, are due to lack of positive action or strategic direction from the CTO. Worryingly, in some recent customer engagements the authors, have begun to see some of the precursors for this scenario occurring. If this continues the key challenge of provision of an IT capability that enables rapid change in the business will not be met.

What would an opposite extreme look like again from the viewpoint of a typical CTO?

4.2 THE OPTIMISTIC VIEW



"I like my job; we've come a long way since the dark days of 2008. My role as CTO has really become how to maximise the value of technology to the business.

In today's world of 2015 SOA is ubiquitous and pervasive both in the enterprise and in the cloud to the extent that only a few specialist applications requiring local or disconnected processing are not either service enabled or consume services, and as such SOA is a commodity item taken for granted and seldom explicitly talked about. SOA standards

covering all areas necessary for SOA communication including security, identity and governance have solidified and been widely adopted by stack vendors. Let me take you through the schematic of the enterprise (figure 1 below)

Web Platform

Infrastructure as a service within the cloud has become a true utility, with provision concentrated with a handful of worldwide mega-providers. I outsource many of our business processes, and conduct others within a cloud based service. For example in my department elements of our database processing, integration and even software development and deployment is provided as a service in the cloud (Barnett, 2008).

Service Design Studio

Any service that is not core IPR of the business I source through our service design studio partner. They specialise in building customised end-to-end business processes from a large pool of highly competitive and therefore innovative small service workshops (Ted Friedman, 2006).

COE

The SOA Centre of excellence (Malinverno, Lheureux, Thompson, & Schulte, 2008), reporting to me, has a high level of tech-savvy business analysts skilled in business process modelling for the enterprises domains who use a model-driven BPM suite to define the end-to-end business processes, a task which is essentially about the choreography of services between the service domains; together with a small number of business savvy software and infrastructure engineers who undertake acceptance testing and configuration of services and ensure that security, governance, and service levels are maintained.

SOA Domains

Internally to the enterprise there are a small number of business service domains, each using its own service bus fabric and publishing services that reflect the specialisation of that business domain (Schulte, 2007). The service buses are federated together, under a strategic SOA coordination and governance plan defined and implemented through a SOA centre of excellence (COE). Externally there we have an additional outsourced business service domain, run by a service design studio and utilising an in-the-cloud ESB service offering to integrate best-of-breed commodity services to meet the business needs for end-to-end processes. This external domain is also coordinated by the SOA centre of excellence. The provision of entirely new services is rare, most of SOA is now about consumption of services.

Composite Applications

When a business unit requires a new or changed business process, providing the business process modelling has been done, we can quickly produce a SOA based composite applications which is composed of a small number of services from across the enterprise (where these are the core business expertise) together with a large number of services in the cloud (for commodity type services provided by Business Process Outsourcers).

The composite apps that we create to provide the user experience to front-end the business processes are themselves developed and deployed in the cloud using Software Development and

Deployment as a service (SDDS), sometimes this is done by an in-house team, or it can be done by the service design studio, depending on the amount of customisation and new IPR.

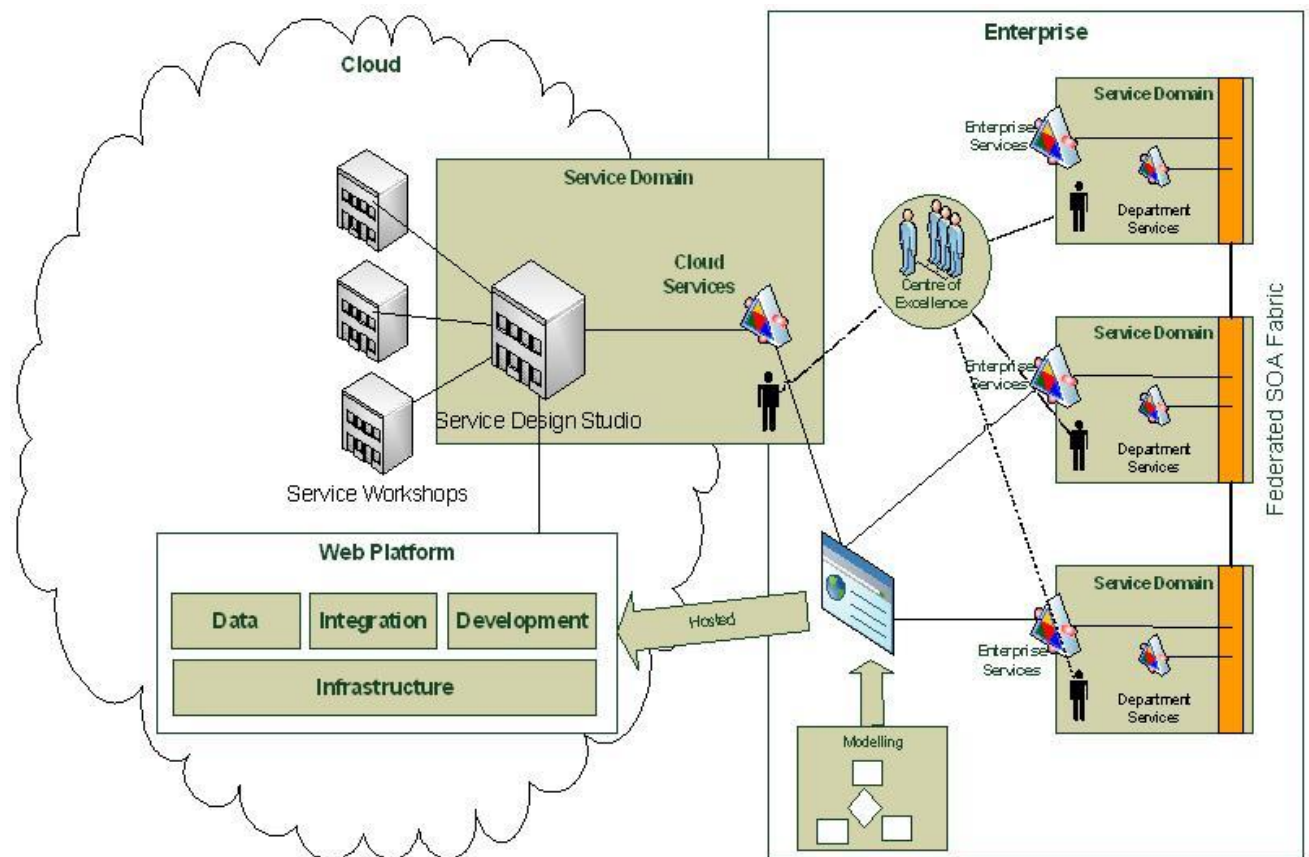


Figure 1: Enterprise & Cloud in a Bright 2015

All this means that enterprise business process changes can be defined, tested and rolled out in a matter of a few days, once the process itself has been defined. A tactical composite application (you might call it an enterprise mashup) can be assembled by business users, guided by the COE in a few days. Even our strategic applications tend to be fluid, with services being swapped out with minimal impact, as the highly competitive service workshops compete through innovation to be chosen by the service design studio to provide new and updated services at lower cost.

My position now is far better than in 2008. The Agile business is a reality. SOA and the cloud have been instrumental in allowing me to transform IT from a cost centre to a strategic business asset. The road has not been easy – it has required strategic planning and management with many difficult decisions, but it's been worth it.

This has allowed me to spend more time on maximising business benefits by making the best use of this technology and thereby raising my boardroom profile.”

The assumptions of this extremely optimistic scenario do rely on some key industry events occurring – notably the creation and adoption by vendors of standards to enable easy federation of SOA fabrics, and ‘cloud’ providers providing enterprise class service levels (though as either a consumer or someone ‘in the trade’ the reader has the power to influence vendors in the right direction). But the most important determinant of this outcome has been the strategic actions of the CTO in managing the organic growth of SOA both within the enterprise and within the cloud.

5 TAKE ACTION NOW



Although at extremes, each of these futures or elements of it, could become a reality by 2015. Recent experience with customers has shown the authors that there are those that have already started down the road to the 'dark' scenario, but also those that have started down a route more likely to take them closer to the 'bright' scenario. What are the differences between these two groups of customers? The authors believe the differences lie with some key actions that are being taken now that can potentially make a large difference to the outcome in 2015.

Based on analyst research, current trends and feedback from customers' success, actions should be taken around three key themes:



Taking action now in these three areas together will potentially provide organisations with the competitive edge to deliver future business needs, and increase agility

5.1 KNOW WHERE TO USE THE CLOUD

Although it has the potential to change the rules of the game in IT as much as the 'bright' future scenario suggests, the time period over which this will happen is still uncertain.

In a recent online survey (ZDNet) two-thirds of respondents felt that Cloud computing was too risky for general enterprise use, which means that even at this early stage in the cloud computing paradigm up to one-third of business are considering using some aspect of cloud computing in the enterprise now. If they are successful, this early adoption strategy could lead to substantial competitive advantage.

Whilst the authors think that Cloud computing is not mature enough right now to put the most sensitive and business critical processes there, certainly until security and resilience are better addressed, the right thing to do is not to dismiss all cloud offerings out of hand, but to pick and choose the low risk, high return on investment options *and do them now*.

The best way to start is to adopt a clear Strategy for using the cloud, particularly the more mature aspects of Software as a Service (SaaS), but also looking at the other 'Everything as a Service' (XaaS) offerings such as platform as a service.

The strategy needs to cover a number of areas:

- Identify business drivers
- Produce a roadmap for adoption
- Choose the correct tenancy models
- Agree a governance plan
- Specify minimum security requirements
- Avoid Lock-in

5.1.1 Identify Business Drivers

Do the analysis to ensure that you understand what business needs are driving your move to SaaS. Many early adopters chose SaaS because their IT was resource constrained, this continues to be one of the major drivers to use the cloud - if you don't have the capability currently and can't afford the capital expenditure to develop it on premise, the cloud is a good option.

Is agility a key driver – do you need to deploy new business processes and applications very quickly, or do existing processes change rapidly? This is another scenario where the cloud offers good options right now.

How complex and customised is your business process? Right now cloud providers tend to be better at standardised, commodity type processes, so if you have a complex, highly customised business process or have heavy investment in legacy mainframe businesses, then the cloud is not mature enough yet. However you should consider how business process modelling might allow you to simplify those business processes to the extent that the cloud is an option.

How important is your data security – regulatory requirements may mean that current cloud offerings do not afford the degree of separation and security you need to fulfil your statutory requirements (see tenancy below).

5.1.2 Produce a Roadmap for Adoption

Consider putting non-differentiated department level, commoditised processes (for example sales, hr and some aspects of finance) into the cloud right now – these are not core to your business and are 'commodity' type functions that tend to be relatively standardised.

Seriously consider trying out cloud providers now or in the near future for processes at the department level that have some degree of Intellectual Property Rights (IPR), require configuration or customisation, or integration with 3rd party applications and data (many of the major cloud providers have now embedded Integration as a Service offerings of one kind or another, and these will mature quickly).

The cloud is probably still not mature enough for the next step. Advances are needed in terms of SOA support – the availability of cloud services for consumption by on-premise enterprise systems, standard for the integration, enterprise class service level agreement, and billing of such services are still evolving and maturing. Analysts believe this will happen over the next 2-3 years, and eventually SaaS will be mature enough for enterprise-wide integration with systems in the corporate data centre, supply chain and customer. Given this timeframe, it is important to start planning for this move now, particularly if your enterprise is looking for a major technology refresh around this time.

Look at the 'everything as a service' models that cloud providers are beginning to deploy – start some small proof-of concepts to look at 'platform as a service' offerings – could using integration, development, data and deployment as a service allow departments to build Web-oriented tactical applications that deliver business agility now?

5.1.3 Tenancy Model

Decide which tenancy model² best suits your SaaS strategy now and in the future. Do you need to keep your data physically separate, to what degree do you need to control performance and

² Tenancy as in: is your data on disks shared with other customers, or your application running on processors shared with other customers applications?

scalability, are your processes highly customised? The answers to these questions will determine whether you need to select an Isolated tenancy (such as IBM's Blue Cloud), shared execution, or the more common multi-tenant models of Amazon or Google.

5.1.4 Create a Governance Plan

Choose a cloud provider based on the same criteria you would apply to your own on premise enterprise systems. A cloud provider should monitor its systems and network 24/7, and have 24/7 support. It should be able to produce SLA-related monitoring data in near real time directly to your IT department.

The provider should have a disciplined change management process in place. It must give your customer adequate notice of the changes it makes and promptly respond to customer requests for changes. Changes should be adequately tested, and the cloud provider must be prepared to roll back changes that fail in production. SLAs are often suspended during scheduled downtime so ensure that the provider doesn't plan too much scheduled downtime

5.1.5 Specify Minimum Security Requirements

Establish a minimum level of security that you expect from a cloud provider, and then look what additional security you would like and see how much each provider that meets the minimum would charge for this. As with monitoring and support, start with the same criteria you would use for on-premise system security. E.g. network, platform, application and operations.

5.1.6 Avoiding Lock-in

One potentially large risk is cloud lock-in – it could be extremely difficult to move cloud applications to another vendor. To guard against this make sure that the services you consume in the cloud are ones that can be swapped out with minimum disruption to your business. Ensure that if you are utilising platform as a service to develop in the cloud that proprietary languages or standards are not being used that would prevent you from switching to another provider easily.

If you have a strategy that encompasses these points, you will have minimised the risk and maximised the potential benefits and there should be no reason why you can't start using many cloud services right now, and take advantage of the potential competitive edge that the evolving everything as a service world will provide.

The move of cloud providers to capture a slice of the enterprise market is happening rapidly, with most of the major players including Microsoft, Sun, IBM and Google all competing to offer enterprise-class cloud services as quickly as possible. This can only be good for businesses willing to be early adopters or fast followers.

5.2 REAL WORLD SOA

One of the authors' greatest fears is that SOA will be branded a failure. The success of SOA is incredibly important to ensuring that IT delivers for the business. There have been a large number of successful SOA projects, but also some high-profile failures, and as with many aspects of life, unfortunately it is the failures that are grabbing the headlines, and this in combination with recent downturns in the global economy could see precious funds switched away from SOA initiatives. So how do you ensure your SOA initiatives succeed?

There are plenty of SOA projects underway right now that are not going to deliver on the promise of better business agility. Go back and look at how your organisation is doing SOA and be prepared to be ruthless in stopping initiatives that are likely to fail now. There are four key things you can look for that should trigger alarm bells.

- Technology driven
- Trying to boil the ocean
- Lack of Control

5.2.1 Technology Driven

If your SOA project is not driven from the business then stop it. Has your IT department announced it needs a SOA. Why? SOA is a means not an end. To do SOA you need to have viable relevant business services, so it is vitally important that any SOA initiative is driven by a real business need.

Involve business analysts and management from the outset. You need a deep understanding of processes in order to be able to understand which parts of the enterprises application portfolio can be re-engineered as services, and also which parts to prioritise.

The best way to do this is to do business process modelling, and have a good business process modelling suite that allows service design to be carried out seamlessly from a model of the business process.

Related to this is a failure to identify immediate business benefits. Wherever possible services should be defined as a vertical slice so the business gets benefits from a service as soon as it created, rather than horizontally. This is about getting the granularity of a business service right – high enough that it delivers business benefit, but low enough that it can be flexibly reused as part of wider enterprise level processes, and does not become just another monolithic silo. The aim is to ensure the business sees immediate gains so that the board continues to fund it, whilst providing long term agility.

5.2.2 Trying to boil the Ocean

Is your enterprise architect calling for a single enterprise-wide SOA backbone? Stop! This is unlikely to be practicable or achievable in a timeframe that will provide ROI. There are already more failures than successes in organisations trying to do this grand-designs style enterprise wide SOA. Failure to deliver on this grand plan will kill board support for SOA dead, and so it should – this is not going to work.

That is not to say that SOA should not be a part of an enterprise architecture plan, far from it SOA initiatives need to fit into a strategic framework (see below), but the implementation of that vision needs to be broken up into manageable chunks that will deliver quickly. A better approach is to allow grass-roots SOA to occur at a more local level in the enterprise where smaller more focussed projects can deliver ROI quickly.

5.2.3 Lack of Governance and Control

But, and it's a big but, this organic SOA has to be developed against an overarching strategy. If there are SOA initiatives already underway in departments, but you have no overarching strategy or governance plan, or worse you do but you're letting SOA happen outside of that plan then stop now! If you don't, you could end up with fragmented SOA silo's that are no better at delivering business agility than the component based applications of the recent past. Smaller scale department level SOA is the way forward, but it is hugely important that you actively manage this.

The authors have experience of where customers have done SOA well and where they have done it badly, and what things have been done that has helped them succeed. The key answer is having some central control over how SOA evolves. One approach that can work well is to create a Centre of Excellence or COE (a term coined by Gartner, but a concept that has been around much longer than the term).

The COE will define a small number of service domains within the enterprise, aligned along major business process boundaries. Commonly this may be along business units, geographical areas or subsidiaries. Each domain will may have one dominant application server (such as SAP in finance) or several, but should have a single SOA fabric. The COE defines the shortlist of vendors that can be chosen from by a domain to provide the SOA fabric, and ensures these vendors interoperate well and can utilise the same governance tools.

In this way rather than fighting against the fragmentation of SOA, you actively manage it through a centre of excellence. Each domain forms a state in a federated SOA, with the COE enforcing the federal law. The COE implements your SOA strategy by providing common guidance on processes and ensuring governance and standards.

The COE structure is itself federated with representatives permanently embedded in each service domain - they work with the business to identify services, and categorise those that will be enterprise class, as well as advise on governance framework and ensure service level agreements are in place for the services that will be shared.

The COE staff are full-time, permanent parts of the IT organisation, operating as a public utility to support the goal of aligning IT and business. The COE may:

- Set standards for the SOA infrastructure.
- Evangelise at both a business and technical level on SOA and integration architecture.
- Provide guidance and best practice to development departments in methodologies, patterns and development tools.
- Control enterprise service repositories to manage SOA interfaces and metadata
- Ensure uniformity of SOA governance standards in each service domain

In smaller organisations the ongoing cost of running a COE may be seen as prohibitive, however the majority of the COE team can be virtual, drawn from existing business and technical staff that have an active involvement in SOA and Business Process Management. Over time the ROI from a COE can be measured in the overall success of SOA initiatives.

5.3 FOCUS ON MODELLING.

Although today, we have not seen the delivery of Model Driven development, there is optimism and potential in the market and a significant push from vendors to move to this vision. This trend can be seen across the industry and even, most recently, from Microsoft with their OSLO (Microsoft, 2007) initiative.

Model driven approaches have been in our industry for a long time, with limited success. The Case tools of the 80's and 90's promised a lot, and delivered in many instances little against the wider vision.

However in recent years there has been a renewed drive around

- Patterns
- UML
- Model Driven Architecture (MDA)
- Software Factories
- Domain specific Languages
- Frameworks

Together these are pushing the vision of everything as a model (XaaM) forward.

Does this mean that in the future development will not be necessary? In the current way of extensive coding the answer is probably a qualified yes. But even by 2015, it is not likely that a modelling capability where developers are not needed at all will have emerged, and in fact the authors do not believe that a total model driven approach, except for certain standardised applications would ever occur.

However development will be done very differently and the ratio of modelling to coding/configuration will flip from around 80% code to 20% models to 80% models and 20% code. Developers will be operating at a far higher level of abstraction, interacting heavily with the business staff, in the business language in a collaborative manner with declarative programming of models.

For this to occur there will have to be a paradigm shift so that Models and their configuration will become the run-able artefact. Investments in modelling from Major vendors such as Microsoft and IBM make this shift very likely. Once you get to this, the alignment of the business-IT, making an agile enterprise is far further along. By 2015 Modelling Suites and Integrated Composition Environments will be in at least their 3rd iteration, so if they follow previous platforms will have the degree of maturity needed for widespread enterprise adoption.

So, today focus on:

- Adopt business process modelling as a discipline. Look for tech-savvy business process analysts internally to staff your BPM team, and make it part of the SOA centre of excellence.
- Look for a toolset that will integrate seamlessly with your service development, human workflow and integration tool-sets.
- Ensure your development stack uses the latest tools for model driven development, leveraging declarative models, frameworks and patterns.
- Focus on understanding your business domain, its language and build or look for Domain specific modelling approaches to truly model the business. This means that plain UML is not really the answer on its own because it is too generic (though it is possible to go some way towards a DSL with heavy use of features such as stereotypes), but UML and DSL together are complementary and most organisations will need both to deliver on the promise of model driven development – many services will be cross domain and some domains will be too poorly defined for DSL.
- There are lots of competing modelling approaches and standards and present and in reality no single modelling tool/ approach will deliver it all, so focus on an XML based approach that would allow the transition between different tools. Follow closely analyst (e.g. Gartner, Forrester, Butler) tracking of the development of Modelling Suites as they converge from separate business process, development and database design modelling tools into single integrated composition environments.

Modelling is perhaps the hardest of the 3 actions to follow up on, but it is just as important as using the cloud and successful SOA.

6 CONCLUSION

We are at a crossroads where a storm of disruption is changing the face of IT beyond recognition, and although it is too early to be certain of what the calm after the storm will look like, it is likely that we are in the midst of a once-in-a-generation paradigm shift.

This provides a great opportunity for us to influence the future to ensure IT delivers better value to the business.

Today we have presented two extreme futures and in reality, the future will be a mix of these. You have the power to influence but you must take action now if you want have the power to choose between the bright and dark scenarios.

Real world experience has led the authors to believe that taking strategic action in three key areas will provide your organisation with the best chance of ending up in 2015 with IT that enables business agility and provides strategic value to the business.

Take advantage of the opportunities that cloud computing presents; Ensure SOA becomes successful by taking a real world approach, but with strategic control, and focus on modeling to increase the productivity of your developers.

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APPENDIX A GLOSSARY OF ABBREVIATIONS

Term	Definition
BAM	Business Activity Monitoring
BPM	Business Process Modelling
BPMS	Business Process Management Suite
CDA	Context Driven Architecture
CEO	Chief Executive Officer
CEP	Complex Event Processing
COE	Centre of Excellence
CRM	Customer Relationship Management
CTO	Chief Technical Officer
EDA	Event Driven Architecture
ESB	Enterprise Service Bus
HSDPA	High-speed downlink packet access
ICE	Integrated Composition Environment
IDE	Integrated Development Environment
IPR	Intellectual Property Rights
MDA	Model Driven Architecture
ROI	Return on Investment
SaaS	Software as a Service
SaaS	Software Development and Deployment as a Service
SLA	Service Level Agreement
SOA	Service Oriented Architecture
UML	Unified Modelling Language
WiMAX	Worldwide Interoperability for Microwave Access
WOA	Web Oriented Architecture
XaaS	Everything as a Service
XaaS	Everything as a Model
XML	Extensible Markup Language