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### Cloud Computing: Shifting the Enterprise Architecture Paradigm

I have been somewhat fascinated by the prospects of Cloud Computing. What is really interesting is the cheap and easy way you can provision your technology stack. It definitely lowers the barriers to entry (and exit) for small startup companies, and in some cases can make these companies completely virtual in their operational existence.

While cloud computing is no silver bullet, if strategically leveraged, this new computing model could significantly disrupt the Enterprise Architecture (EA) ecosystem. In addition, if companies begin to orient their businesses around a cloud computing paradigm, this may lead to major shift in the various aspects of traditional IT solution delivery and operational activities.

In wake of the recent upheavals in the global economy, businesses of all sizes are scrambling to redefine their business and operational activities around cost optimization strategies. Many companies are on life support and are therefore very willing to do whatever it takes to rapidly adapt or streamline their operations for short-term sustainability. According to some industry analysts, small is the new big, consequently enterprises are now seriously recognizing the true value of being lean, agile and nimble.

But how can large businesses make the transformational shift to operate in the cloud, especially after spending many years executing tried-and-true practices of the past? What segments of EA will be most affected as a result of running the enterprise in the cloud? Will this force the enterprise architect to realign the EA around a more business-oriented paradigm?

Running your core IT systems on a cloud computing model will certainly disrupt the most challenging aspects of the EA landscape. For example, there might be very little or no emphasis on the infrastructure segment of the enterprise architecture. In other words, previously important components of the EA technology viewpoint, comprising infrastructure and application software, could potentially be eliminated from the equation altogether. This essentially could change the traditional EA models as we know them today.

In essence, cloud computing will obviously cause a paradigm shift for the enterprise architect. Why? The cloud model is purely service based with simple plug-and-play type setup, which may not require heavy IT involvement in some cases. Enterprise architects therefore may now have to be more business focus and creative in their job function since many of the EA challenges – e.g. infrastructure and application management – are now offloaded to the cloud computing vendor at significantly lower cost to the business.

In addition, the enterprise architect will have to re-strategize his/her approach to how the EA is managed in the new scheme of things. A shift in focus to more strategic, value-add aspects of the business will be paramount. This may include service management, demand management, supplier relationship management, performance management, etc.

A lot more emphasis will be placed on performance management in particular. Operational scorecards to track and manage service-level agreements (SLAs) with cloud service suppliers will play an increase role in the new enterprise dynamics. New business functions might have to be forged to handle the different kind of services offered in the cloud – these include Platform as a Service (PaaS), Software as a Service (SaaS), Infrastructure as a Service (IaaS), Database as a Service (DaaS), Communication as a Service (CaaS), Security as a Service, etc.

So, there is a cloud that hovering over the IT landscape and it just might start pouring rain on the enterprise architecture. Should the enterprise architect be prepared for such an event?

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## Comments (11)



**Tom Nolle**  
 President of CIMI Corp and  
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I think that the impact of cloud computing on EA will depend on how effective the EA approach was in the first place. Execution of an EA strategy should be largely technology-neutral and if one was put into place in the right way, it would facilitate the transition to cloud computing.

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I also believe that most enterprises will have to adopt private cloud architectures to get full benefit of the public cloud resources. IMHO no major company is likely to outsource its IT to the cloud any time in the next five or ten years. What they will do is to outsource "specialized" and "overflow" activities, which will be facilitated by having all of their internal IT architected for cloud computing already.

If the transition between what I call the Technologies layer of an EA and what I call the Operations layer is done correctly, it will not only support a cloud transition, it will actively facilitate it.

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Tom, I agree that the impact of cloud computing on the EA will depend on the overall implementation of a company's EA strategy. And yes, an EA implementation should be technology-neutral, but most are not since technology has become a pivotal player in many facets of business operations. Consequently, you'll hear talks along the lines of private clouds, public clouds, virtualization, etc. in the context of cloud computing.

I tend to take a business-oriented approach to EA. Here's my rationale: if there is no business there is no need for technology; however, a business can exist and function without computer technology... yes, this is possible even today.

IMHO the principal problem that cloud computing solves is technology provisioning via an on-demand model over the Internet (intranet in the case of private clouds). This is a very attractive value proposition for the business since it helps simplify the technology landscape and facilitates flexibility in the enterprise.

So the overall impact to EA would be felt more at the Operations and Technology layers, plus there is no issue regarding transitioning between these layers. In fact, in the case of public clouds, there would be a reduction in both layers; and in the case of private clouds, there could be an increase in both layers. In any case, there is value-add at the Business layer due to flexibility benefits that cloud computing brings to the business -- e.g. on-demand capacity, ease of application or platform provisioning/deprovisioning, etc.

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**Tom Graves**  
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@Carval - "a business can exist and function without computer technology" - in some business-continuity / disaster-recovery contexts a business will cease to exist unless it can function without computer technology.

The biggest problem with cloud is not the technology but the business-risk. The technology will sort itself out over the next few years; however, much if not most of the business-risk will remain - yet most of the cloud-evangelists still seem to be 'solving' those problems by loudly pretending they don't exist, which is not helpful...

Business-risk barely appears in many people's 'EA' because that haven't yet moved out beyond the technology. Cloud is just another technology, in an endless stream of 'new' technologies: we should be doing trade-off analysis with it in exactly the same way as we do with any other technology. If - as I think Tom N is suggesting - you start your EA from themes such as the business-need / business-opportunity / business-risk factors, and use a service-oriented approach at that level as 'business services', then cloud et al become just another available option at what should be an almost implementation-agnostic implementation layer.

Right now that implementation-agnostic approach requires a seriously sophisticated EA, with the full backing of the enterprise behind it; but quite a few large orgs are getting close to that level by now. The existing cloud apps and infrastructure fit well with the SME / startup mindset because the enterprise is small: the complexity is much lower, and there's usually a much more cavalier attitude to risk - why is why they're startups, of course. It also works well with 'startup'-like experiments in a large org, for exactly the same reasons. But don't even think of trying that with business-critical processes and data in a large global org: the complexities and risk-issues are bad enough as it is without throwing near-religious obsessions about cloud into the mix.

Cloud is just a technology - nothing more than that. It's just another trade-off in the age-old balancing-act between centralisation and decentralisation, but beyond that there's very little that's new beyond some seriously-nasty risk-issues that few people seem to be willing to address. Don't get hung up on the technology: concentrate your EA on the business-issues and risk-issues first, and only then look for technologies and processes that can support them.

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**Tom Nolle**

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I sort of agree, but I also think that EA can't and shouldn't escape some technology focus. Workers are human resources; computers and networks and other technology tools are non-human resources. When I worked surveying enterprises on EA, one thing I found was that most didn't like a totally abstract approach. The model I use (which I call MTOT for Mission, Tasks, Operations, Technology) was designed to be worked as two interrelated components; the Missions/Tasks part is totally business, the Technology is (obviously!) technology-based, and the Operations processes are what exploit the bottom to fulfill the top.

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**Gregg Haugland**

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Cloud Computing is just another technology paradigm shift, and while both interesting and important, I don't believe that it should, or will have much of an impact on an EA strategy. From a pure business (user) standpoint, the technology that happens behind what's on the screen in front of you is pretty irrelevant - as long as the tool (application?) adequately performs the job functionality required and delivers business value. In a major corporation, my guess is that a large percentage of the compute-resource consumers don't know if they are using a desktop, a network-distributed, or a SaaS application - and don't care.

As Carval pointed out, there may be a significant impact on IT specific strategies, but that happens all the time. The transition from mainframes to distributed processing had a huge impact on IT operations. On the other hand, so did the advent of OO based applications on development groups; and internet/web based implementation on security and telecom. Cloud computing is just another resource to be included in the big picture, and should be evaluated with the same risk/return as any other available technology.

Stepping away from the IT mindset for a moment, the world-wide adoption of cellular-based technology did (as Carval posited in the original post) "significantly disrupt the Enterprise Architecture (EA) ecosystem", although I would substitute the word 'impact' for 'disrupt'. The fact that everyone in the company had a cell phone in his/her pocket changed almost every business process, from the CEO to the mail guy, and across all functional business units. This, however, did not change the difficulty in generating, or the value in using an EA, it simply changed the base assumptions and culture.

With a nod @ Tom G, the enterprise is a very big and dynamic ecosystem, and Cloud Computing is a pretty small component when viewed in that respect. The practices, processes and business values used to create an EA remain the same.

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I might differ a bit with Tom G's "Cloud is just a technology - nothing more than that". IMHO the cloud computing model is more of an orchestration of capabilities offered by several existing technologies -- like virtualization, grid computing, utility computing -- with the goal of delivering business and IT capabilities via the ubiquitous Internet. I tend to like the wikipedia explanation ([http://en.wikipedia.org/wiki/Cloud\\_computing](http://en.wikipedia.org/wiki/Cloud_computing)).

I must agree that the main issue with cloud adoption by large corporations is business risks -- and yes, cloud proponents don't seem to be talking much about this aspect in their lectures. While I'm not a wholehearted cloud computing advocate, I do see tremendous cost and business flexibility benefits as I had mentioned previously. On the downside however, there is much yet to be done especially regarding security risks and system/resource availability risks.

I tend to stay away from viewing the cloud model as purely a technology issue, although under the covers it is. But this is the responsibility of the cloud service provider to contend with -- i.e. mitigating the risk concerns highlighted by the business (i.e. the customer). This essentially minimizes the impact to the customer's EA from an infrastructure and operations standpoint. However, the impact to the customer's EA would be felt more on the business side whereby additional security and availability risks are introduced.

The question therefore is whether this shift in the EA dynamics will effect a renewed approach to the EA strategy implementation.

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Carval - agreed that cloud is an orchestration rather than a single technology, but that too is still just a technology - a 'technology of technologies', in the same sense that Defence talk about 'systems of systems'. It's the 'enabling thing', not the 'thing' itself - the 'thing' being the purpose of the business.

The most subtle risk, and perhaps greatest risk, in cloud is that the end-to-end

link is not in anyone's control. From the provider's perspective, they may well be able to give very solid SLAs about uptime and scalability and audit and the rest; the end-user's IT department can give solid guarantees about maintenance of the 'last mile' connections; but the whole point of the net is that no-one controls it - and therefore, in effect, no-one is responsible for it. We know exactly what happens at each end; but we have no idea what happens in the middle. Latency-times can vary from milliseconds to minutes or more - which means it's all but unusable for most business-transactions, let alone real-time systems. No-one knows what route any packet will take; it could be intercepted anywhere, lost anywhere, substituted anywhere. And that's before we start talking about any of the commercial risks...

If the EA has been done properly, starting from a whole-of-enterprise perspective, with solid mapping of 'pervasives' such as risk and quality and security and the like, cloud will barely make a dent: it's just another technology with strategic-level impacts that need to be evaluated and assessed in the normal way. (Yes, cloud would require detailed review, and would/should impact in the technology / applications / process space, but it should not require any fundamental change to the EA as a whole.)

If the EA has been done in the usual technology-centric TOGAF/FEAF way, yes, you're probably going to have to rip it up and start again. But that's only because the EA was done the wrong way round in the first place. If you had done it right, there would have been minimal difference: that's why I keep hammering on about the dangers of 'enterprise IT-architecture' masquerading as 'enterprise architecture'.

One useful thing about cloud is that it might at last force IT-fanatics to think about risk. Exactly as with security and service-orientation, you cannot make a usable EA for cloud that is based on technology alone: to make it work, you must start from the enterprise - not the IT - and build outward from there.

Would be good if the cloud-evangelists finally got that point, and started seriously thinking about more than just the IT. I won't hold my breath waiting for that to happen, though. <wrygrin>

Posted April 12, 2009 |



#### Tom Graves

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@TomNolle - "I also think that EA can't and shouldn't escape some technology focus". I agree entirely: any EA has to be of practical use, which "a totally abstract approach" isn't - it's literally ungrounded. An EA has to cover everything, at the appropriate level of detail - though most good EA aims to provide the overview that allows the domain-architects to dive down into the implementation-detail but still link everything together in an integrated way.

(My concerns about the term 'human resources' and its huge dangers for EA are off-topic for here: we'll come back to them some other day! :-))

My objection to the current over-hyping of cloud, from an EA perspective, is that it starts from the technology, and then goes looking for uses for that technology, in order to justify the technology. Otherwise known as 'cart before the horse'... But if we start from an IT-centric approach to EA, we won't even be able to see that it's cart-before-the-horse, because the EA is centred on the IT rather than on the business of the enterprise.

Cloud is in no way unique in this: we've seen it before with BPR, and we're also seeing it right now with the struggles to make service-orientation work. The only way to make the EA work is to start from the business - actually one layer above, at the level of the 'shared enterprise' in which the business operates - and expand outward from there in a holographic, everywhere-and-nowhere-as-centre approach. If we settle on any one place as 'the centre' - including, for that matter, business as 'the centre of everything' - our EA is toast: it has to cover everything, all of the time, at the appropriate level of detail for the task in hand.

In that sense, cloud is just one more detail amongst many, many, many others. Yes, it's interesting and relevant - but so should be everything else, surely? Yes, it has EA impacts - but doesn't everything else? And yes, it's 'hype-du-jour', but so what? - something else will be along in a year or two's time. In a real EA, we're in for the long haul, not the hype-cycle: if you keep a sense of perspective, a sense of realism, you will have some chance of getting it right. Otherwise? - well, that's what the hype-cycle is for, isn't it? <wrygrin>

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#### Shepard Towindo

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EA is a discipline concerned about enterprise efficiency and agility thru capturing and analyzing critical (business, application, data, and infrastructure) architectures, strategies, and processes. Cloud computing is about providing computing resources via the internet. Enterprise Architects can make lease vs

buy decisions for computing services that are provided via the cloud, its another tool in the EA toolbox.

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I think some of our dialog here is a sort of classical supply- or demand-side vision debate. I don't have a personal position on this topic; my view is created from surveying enterprises. In the survey group, a significant majority (better than 3:1) believe that the optimum EA approach for their business would have to have a strong bottom-up analysis to capture their current technologies and commitments or it would risk being too abstract to apply.

I know that there are some (perhaps many) who disagree with this on philosophical grounds, and I don't dispute the point conflicts with classical EA methodology. However, it aligns with business reality, and I will always believe that the best approach is one that can get approval!

We use the MTOT system to allow harmonization with the enterprise views. If the user doesn't want anything from the bottom up, fine; you can work it top-down only. So far nobody has asked for that, though.

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I agree that the cloud computing paradigm is potentially of greater benefit to startups and small business owners than it is to the larger enterprises. As a recent entrepreneur myself, I found that the cost of entry into a number of services was actually affordable because of the pay per use model.

I did build infrastructure for core services (I am actually a form of "cloud" provider providing an online backup solution), however the rest of my services are virtual. The services include VoIP, 800-number redirection, web hosting, email, and support desk. These days you can build a strictly virtual business with little to no infrastructure and startup cost. That is a huge boon for the small business.

To Carval's point, larger companies could probably take a look at this business model and move to the cloud where it makes sense. As many of the comments stated, it absolutely does not make sense for core applications where performance is key and the risk is high.

Regarding risk, you need to treat your cloud service providers as you would any other outsourcer. You have to do your due diligence to ensure that they are treating your services with the same security, redundancy, and maintenance requirements that you would do yourself.

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