It's written in the Cloud:
The hype and promise of Cloud Computing

Amir M. Sharif
Brunel Business School
Brunel Univeristy, UK

Amir.Sharif@Brunel.ac.uk

Purpose of paper:
This viewpoint discusses the emerging IT platform of Cloud Computing and discusses where and how this has developed in terms of the collision between internet and enterprise computing paradigms – and hence why cloud computing will be driven not by computing architectures but more fundamental ICT consumption behaviours.

Design/methodology/approach: The approach has been based upon the discussion and recent developments of Software as a Service (SaaS) and associated ICT computing metaphors and is largely based upon the contemporary discussion at the moment of the impact of social, open source and configurable technology services.

Findings: It is suggested that whilst cloud computing and SaaS are indeed innovations within ICT, the real innovation will come when such platforms allow new industries, sectors, ways of doing business, connecting with and engaging with people to emerge. Thus looking beyond the technology itself.

Research limitations/applications: Author viewpoint only, not research based.

Practical applications: Brings together some of the recent discussions within the popular as well as business and computing press on social networking, open source and utility computing.

Social implications: Suggests that cloud computing can potentially transform and change the way in which IS and IT are accessed, consumed, configured and used in daily life.

Originality / value of paper: Author viewpoint on a contemporary subject.

Keywords: Cloud Computing, Software as a Service, Configurability, Socio-Technical impact

Type of Paper: Viewpoint

Cloud Computing is the latest technology that is being feted by the IT industry as the next (potential) revolution to change how the internet and information systems operate and are used by the world at large. The concept owes much to the evolution of infrastructures based upon client-server, Application Service Provider (ASP), Service Oriented Architecture (SOA), Grid Computing and even more historically, "time-slicing" of mainframe computers. The resulting technology ultimately resembles a mélange of these techniques – and no less a galaxy of three or more letter acronyms to boot.

But what is the cloud anyway and why should anyone care? In a nutshell, the idea is that this is an accessible resource of hardware and software which an organization or individual can harness, anywhere in the world via the internet. This is not a new idea, by any means, and it certainly has its roots in distributed grid-based computing. The best example of this idea is the comparatively successful SETI project, which allows individuals to download and run analyses of radio telescope data in the search for extraterrestrial life (UCAL, 2009). The difference between that distributed (and global citizen-driven) approach to distributed computing and what the cloud offers, is that the access model shifts from a push of software and resources, to a pull of software and resources: as needed, non-time bound, and paid for as required by the consumer. Thus the hope for this type of utilitarian-based information system is that it will provide configurable IT building upon the above notions of distributed third party software and service providers (much like the ASP model). These providers will give access to resources – thus SaaS, Software as a Service – using the now well respected approach of the internet as the transportation layer (O'Reilly, 2004).. These resources, which may also include the underlying hardware assets as well, can thus be combined and recombined by anyone who wishes to access cloud services. And this is the significant difference from previous technology platforms that have tried to commoditize computing. Potentially new configurations and suites of software/hardware can then be brought together and tailored for specific business and consumer needs and contexts – maybe only existing for a brief period of time and then being released back into the "vapour" of the cloud. This highlights another innovation of this platform: the requirement not to be tied into direct capital investments in technology (be they server farms, data centres, software licences and the legions of support and other technical staff to maintain them). This challenge to IT is significant and has immediate impact if brought to full realization of course, including the potential to redesign and change the IT skills landscape.

How would cloud computing work though and just what could the implications for technology vendors be? Well, a manufacturing company say, may require software components which allow them to carry out accounts payable, accounts receivable, inventory management, supplier logistics, sales order processing, e-Commerce and customer relationship management activities. By using and accessing services through the cloud, the components relevant to their business could be bought on a pay-and-go basis, without the need to purchase whole ERP, finance or CRM suites. Instead the process becomes decoupled from software and hardware vendors, and a relationship is then formed directly with the middle-man: the cloud computing provider. At the moment, both Amazon and Microsoft are in the running to be such intermediaries to anyone who wishes to tap into seemingly unlimited resources (BBC, 2008). Clearly this means that monolithic ERP and CRM solutions will then tend towards becoming a thing of the past, with many vendors (such as SAP notably) beginning to struggle to address and achieve the aims of integrated, yet decoupled, non-monolithic enterprise systems (so-called ERPII).

The advent of the second generation of the internet, so-called Web 2.0, and its cousin Open Source, are therefore the perfect backdrop to cloud computing (in metaphorical terms they are the "sky"). Web 2.0 is clearly based upon the notion of rapid, highly configurable and customizable ICT platforms and artefacts that extend and transform communication and collaboration amongst humans, as opposed to between computers (Casarez *et al.*, 2008). Witness the exponential growth of sites such as MySpace, Facebook, del.ico.us, digg, flickr, YouTube, Twitter, Bebo and others in the space of little over 3 years. We are now living in an era where the sharing of, contribution, publication and distribution of an individual's own content is king. This truly is a major revolution of course, second only to the invention of the printing press in the same terms. Cloud computing then, posits an (almost) infinite yet discernable context to enable configurable and customizable computing to become available. This aggregation and packaging of self-selected software and hardware in an entirely requirements-driven manner, cleaves in two the traditional marriage of users and proprietary platforms. Hence in the example given previously, it would not be unfeasible to purchase specific business software components from Oracle, SAP, Microsoft and even Apple and link them together, via the cloud (thus also satisfying the inter-operability goals of Enterprise Application Integration, EAI).

But is Cloud Computing the new nirvana – and is it Web 3.0 even? The concept is still dependent upon the decoupling of enterprise systems into interface-ready modules which require an existing software architecture such as web services to be in place first. Secondly, software and hardware vendors will now have to eventually think about giving in to this open-source-inspired view of ICT consumption (and will not roll over and give in without a fight either). But this presents a huge risk in competitive advantage terms – and the loss of earning power through the loss of the lucrative licensing business model that the industry has learned to love. Thirdly then, those IS platforms concerned (ERP, CRM, supply chain and e-Commerce) need to be re-engineered and many vendors will face a long journey to release their code into the wild. Some are still recovering from the shift to leaner methods of information management – i.e. the markup revolution through XML and other "rapid" data sharing languages (North, 2008). Fourthly, at the same time, there is a major risk inherent in the handing over of company and individual data to third party cloud computing providers and the key issue of data security. And fifthly, the associated cost escalator of the usage and maintenance of (initially "thin") cloud services that will be implied. Would you be willing to hand over all your customer information to Amazon, so they can rent you ICT resources (servers, data farms, applications) on a per minute basis? It's a tough choice, although liberated by the massive savings that could be made. Compare for example, the cost of simulating drug interactions in a computerized virtual lab which would require a grid of dedicated machines and associated high-end simulation software as reported in recent Microsoft adverts (Wired, 2009). The cost comparison when adopting cloud resources would be in the ratio of tens of millions of dollars as compared to hundreds of thousands of dollars. Given these financial differentials, and the gearing back down to the consumers of such services, who will ultimately regulate and ensure that such services would be fairly run and administered? We are talking about computing as a pure utility now of course – and we all know and love our utility operators and all they stand for don't we.

Perhaps this view is quite cynical. But I think the main challenge to cloud computing and the hype that must be overcome in due course is the computing equivalent of "it's the economy stupid!". That is, replacing the word economy with the word, consumers. For that's exactly what this will be about – the consumption and hence economical supply

and demand of software as a service. This next phase of computing truly requires a deeper understanding, more than ever before of consumers and not computer-based behavior. And yes, even the esoteric aspects of structure and agency (how we change and use technology and vice versa). Another inherent challenge that actually is an opportunity is the chance to tap into the SME enterprise application market.

For a long time, one of many holy grails within the software industry has been how to make more of the potentially lucrative SME enterprise application market, which has until recently always been a poor relation to its larger sibling, the corporate market. The largescale vendors such as Microsoft, IBM, Sun, Oracle and the like have always believed that by adapting their existing products which are traditionally consumed by corporates (proverbial "mountains"), to the smaller market ("molehills" in comparison), they can expand and deepen their dominance. Clearly Google has usurped them through the availability of online tools such as their Google Docs suite of applications for free (Stross, 2008). The SME market is more fickle by nature, as such organisations are not as tied-in to their investment as larger corporates may be, due to the size of the expenditures involved. They are also less sensitive to sudden changes in technological fashion, due to the fact they traditionally are late adopters of emerging technologies.

Hence the real and fundamental success of cloud computing is actually "up in the cloud" above these mountains and molehills. This relates to vendors, service providers and consumers of such services understanding their specific computing needs and expectations – and realizing that IS consumers are now both users as well as configurators of the available cloud resources. Practitioners and academics alike should support this technology more as it develops, not just as a minor incremental stage in the evolution of internet computing; but as a perceptible shift in our relationship with a virtualized economy. There are clearly aspects of this technology which will require input to understand consumption patterns of software as well as matching these to how business processes occur. Thus aspects of participatory design of such services are key. But most of all and as signified by the recent interest in human-centric patterns of thinking (such as the growth of behavioural finance and economics to explain human decision-making) also requires input from non-technical specialists and experts too (Thaler and Sunstein, 2009).

However, just like a cloud the hope must be that these ideals do not evaporate into empty promises yet again. Or worse still, shower us with yet more technology which we may well do without. As ever we must decide by ourselves if such tools are really supporting and not hindering progress in terms of how we interact, exchange and bring information, content and knowledge together in a trust-based medium.

I ultimately do believe that cloud computing, if used and adopted properly can unite, identify and create wholly new business sectors and industries just as the original internet revolution did. Certainly for large scale and complex human-driven endeavours which require a multitude of systems and stakeholders to come together, such as where the introduction of electronic platforms are taking shape in local and central governments worldwide, cloud computing has the most promise – but where it also brings with it the most expectations.

Amir M. Sharif

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