Sectorial Adoption Analysis of Cloud Computing by Examining the Dissatisfier Landscape

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Abstract: Cloud computing in many ways can be viewed as both a technology offering and a business alternative. But its adoption today is driven more by economic rationale than by technology justifications. Cloud, being a new offering, is bound to run into a lot of inertia in terms of its initial market acceptance. This inertia is driven by the dissatisfiers – some real and some perceptional – that inhibit a widespread adoption. The four key adoption inhibitors identified in the context of cloud adoption are vendor related risk, security related risk, no-gain risk and efficiency related risk. These inhibitors are examined, in terms of their relative impact, across four industry sectors - SME, BFS, Education and Hospitals. This study mainly aims at equipping the cloud vendors with information regarding the relative risk perceptions of the four mentioned inhibitors on a sector by sector basis. The paper posits that this understanding will facilitate the cloud computing vendors to improve product conceptualization at the production level and fine-tune product positioning at the sales and marketing level to enhance market penetration.

Keywords: Cloud computing, sectorial adoption analysis, cloud dissatisfier mapping, segmented risk profiling, product positioning, conjoint regression

1. Introduction

Cloud computing in many ways can be viewed as both a technology offering and a business alternative. Yet, its adoption today is driven more by economic rationale than by technology justifications. Cloud – as seen from the customer side is more of compelling business economics than of complicated new-age technology. Though in delivery terms, cloud offering is a merger of state-of-the-art concepts like virtualization, server consolidation, interoperability and dynamic CPU provisioning, its risk-benefit analysis is purely driven by business imperatives. As a technology, Cloud Computing topped the Gartner's Hype Cycle only as late as 2009. The hype has since then settled down and 'computing in the ethereal cloud' is slowly emerging as a cost-effective alternative to traditional computing. Irrespective of user, cloud offers a platform that converts fixed cost to variable costs. Again, irrespective of customer segments, cloud converts today's upfront capital expenditure (CAPEX) to tomorrow's deferred operational expenditure (OPEX). This paper focuses on the customer side perceptions of cloud adoption with a purely India-centric perspective.

In definitional terms, cloud computing is an on-demand, self-service, location independent, elastic, pay-for-use only, zero CAPEX, zero ownership, utility driven business model. Since cloud is a fairly new offering, there is bound to be a lot of inertia in its acceptance. This is because cloud offerings - from the product development lifecycle (PDLC) point of view - are at a nascent stage and hence perceived risks outweigh perceived gains. This paper focusses on the cloud adoption risks across four sectors – SME, BFS, Education and Hospitals. The four key risk categories identified in the context of cloud adoption are vendor related risk, security related risk, no-gain risk and efficiency related risk. The paper does a relative mapping of these four risks for each of the four mentioned industry clusters. Since cloud technology is only in the process of getting established and main stream adoption is still a few years away, many of the cloud adoption fears are nebulous and will be removed once critical volumes start building up. Till such a maturation happens, cloud vendors will have to assiduously work out ways and means of assuaging the fears that inhibit adoption – real or perceptional. This paper is posited to be a pointer in that direction.

Cloud Computing being an evolving technology, current global literature is focused more on technology and less on business. There are enough studies conducted and published today on technology aspects like virtualization, multi-tenancy, proprietary structures, usage of open-source products, interoperability, data size management and the likes. Eventually the acid test for any technology is its market acceptance. As far as market adoption goes, cloud is on the verge of crossing the vital chasm between the early adopters and the

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early majority. Early adopters have a psychographic profile of being venturesome and they are known to have fewer inhibitions in accepting a completely new technology offering. The current offerings, be it in applications, computing or storage is being lapped up by this target market. But early adopters constitute only a small single digit minority in any addressable market. The vital volumes are brought in by a large chunk of buyers who are called the early majority buyers. The early majority comprises of the pragmatists in the market and they cover the bulk of the real market. They tend to accept new technology only after measures against failure are reasonably in place. Need for referrals is a strong driver for a buy in this segment. Technology adoption by the pragmatic early majority is a crucial milestone for any nascent technology since adoption at this level will bring in the critical mass. This paper offers a multi-sector, emerging market, customer side view of cloud adoption, a technology that the authors believe is just one step away from the 'early majority' buyers.

Any new technology comes in with a set of risks – real, latent or perceived. Literature survey supported by previous work done by some of the authors and reported elsewhere indicates that there are four clear risk vectors for cloud adoption. They are vendor related risk, data security related risk, lack of significant cost reduction risk and system efficiency risk. The authors posit vendor related risk as the first dimension of perceived risk. Fear of lock-in with an incompatible vendor, lack of guarantee of business continuity and service availability, reputation fate sharing with a vendor and unclear licensing issues come under this risk profile. The next posited risk covers data security, data privacy, data confidentiality and loss of governance & control of IT delivery. The third risk posits that the gains that cloud purports to offer in terms of reduced capital and operative costs might not be sufficient enough to move from existing systems to cloud platforms. The last risk sums up the effects of latency, downtime, data bottlenecks and any other efficiency impediments.

As is the case with any systemic multi-risk environments, risks do not operate in silos. They tend to act together. Most of the time, multiple risks have a tendency to reinforce each other in such a manner that the cumulative risk effect will be much more than the sum total of individual risk effects. In the cloud risk scenario, an incompatible vendor can heighten the perception of loss of data security. The cumulating of vendor discomfort and lack of data security can reduce the sense of cost reduction advantages. Data bottlenecks and system downtime – two indicators of efficiency – can be eventually tracked in one form or the other to the vendors. Thus there is scope for multiple risks to operate together and enhance the cumulative impact. This 'conjoining' aspect of risk has been dealt with in this paper and will be explained in detail in the methodology section. The paper compares the relative weightage of the above-mentioned four risks across four customer segments – SME sector, banking sector, education sector and hospital sector. Each segment chosen is posited to have a different risk perception towards technology adoption.

Extensive literature is available today on each of the four vectors of posited risk. In addition, some work has already been done in looking at the risk-gain profile of different industry sectors that are poised to move onto cloud platforms. Before an inter-sector risk profiling is undertaken, a ringside literature survey is provided.

2. Literature survey

Extensive literature is available today on each of the four posited cloud computing risks - vendor related risk, data security related risk, lack of significant cost reduction risk and system efficiency risk. Similarly independent cloud adoption studies have been undertaken on each of the four sectors that this paper studies - SME sector, banking sector, education sector and hospital sector.

Michael. Ambrust et al (2010) refer to Cloud Computing as a symbiosis of applications delivered as services over internet coupled with the hardware/systems software in the datacenters that provide those services. A paper which has received wide citation, this Berkeley work delineates the roles of the pure cloud provider and the intermediary SaaS model packager. Brian Gammage et al (2009) talk about the strategic possibility of the 'power of IT' shifting towards external providers and users. The paper, which is essentially a Gartner report, tries to clearly define core vs. non-core strategies in the context of IT asset ownership and utilization. Both the Ambrust paper and the Gammage paper are umbrella works on Cloud Computing and offer a good starting point for zeroing in on specific risks vis-à-vis specific sectors.

Jeanne Capachin (2012) researches and reports on the slow yet steady cloud computing adoption by the banking sector. The paper covers contract management and regulations management in the context of key financial data moving to the public cloud. It has got a predominant US banking sector perspective. Paul L Bannerman (2010) has done an exhaustive comparative survey of all cloud research papers published between

2009 and 2010 and has come out with a comparative analysis of what are the various adoption risks – real and perceptional. The paper discusses various barriers to cloud adoption by reviewing opinions of industry commentators. Sarfraz Nawaz Brohi et al (2011) compare the challenges as well as the benefits in what they call the new Paradigm – Cloud Computing.

Chinyao Low et al (2011) investigates the factors that affect cloud adoption by firms belonging to the high-tech industry. Malden A Vouk (2008) maps the journey of cloud from technology to implementation. Easwar et al (2013) looks at the drivers and inhibitors of cloud adoption with a specific SME sector perspective. The data in this work is Indian SME data. Tara S Behrend et al (2011) examines cloud computing initiatives in the education sector. The paper is in the US context and examines the factors that lead to adoption of this technology from the perspective of both colleges and student community. Vladimir Vujin (2011) looks at the education industry and cloud computing, but more from a research support point of view. The paper talks about a reliable and scalable cloud environment that can foster scientific research and educational progress.

Alec Nacamuli (2010) in what is essentially an editorial piece stresses on the importance of cloud in banking in the days to come. The paper cites that regulation, data recovery, customer trust and innovation would be some of the key thrust areas which come in the cusp of cloud computing and banking. Jeanne Capachin (2010) in another well researched article on banking focusses primarily on security issues that would be on top of mind for bankers when they think of 3rd party data storage. Chris Chatman (2010) focusses on another sector which has a clear cloud adoption focus – health care sector. The paper focuses on the dual concerns of data security as well as speed of implementation for the healthcare sector. Edward J Giniat (2011) offers more insights on cloud vs. healthcare. Finally Easwar Krishna Iyer et al (2012) studies the Net Present Value (NPV) behavior for full vs. fractional adoption of cloud. The study looks at the unknown fears of cloud adoption which stretches across dimensions like security, privacy, variability, redundancy, down time, contract breach management and the likes and develops a mathematical model to monetize these risks.

To sum up, there is a body of literature available today which individually talks about cloud adoption in the context of SME, BFS, Education and Hospitals. But there isn't enough literature available that does a comparative sectorial adoption analysis of Cloud Computing. This paper fills in that research void and proceeds to do a comparative risk profiling of cloud adoption across all these 4 sectors.

3. Problem formulation and research methodology

Cloud – as a technology – has already transformed itself from a mere hype to an implementable reality in the last few years. Enlightened technology maturation and acceptance by pragmatic 'early majority' users are the next logical steps towards an all-embracing acceptance of this 'pay-as-you-use' business model. Technology vendors are keenly working on solutions like ease of deployment, interoperability, server consolidation, economics of deployment and level of customization possible in their efforts to demystify the ethereal cloud. All these activities are actually happening today on the product front. The authors of this work feel that there should be a lot of simultaneous research thrust in positioning the cloud offering to potential enterprise level buyers. There has to be aggregate studies to analyze the resistance points to cloud adoption. The research approach undertaken in this paper is a step in that direction. The methodology adopted is quantitative and conjoint linear regression is used for data analysis. The survey was done on an online format with sufficient respondents chosen from each of the segments - SME sector, banking sector, education sector and hospital sector. The study presumes that the risk variables chosen are reasonably comprehensive in understanding adoption risks in cloud today.

As previously mentioned, there is a clear inertia at the client end in going for a full-fledged acceptance of cloud computing. This inertia is partly driven by the fact that many client industries have already invested heavily in technology and are reluctant to even partially abandon their on-premise traditional IT infrastructure. For a technology intensive company, the IT infrastructure investment would be a significant portion of their assets in the balance sheet. Any move to adopt a 'pay and use' type 3rd party platform would have ramifications on sunken assets and depreciation of these assets. In addition to capital investment, organizations currently running their IT in the traditional non-cloud mode have invested deeply in people and processes to run the well-oiled in-house IT infrastructure. Any significant cloud adoption will have to take into account a major people and process transformation. The operational cost elements and its reduction is explained in the next paragraph.

For organizations that are currently running their IT in the traditional non-cloud mode, their operating costs do not 'naturally' fall in step with higher and higher cloud adoption. The operating cost reduction is something that has to be strategically made to happen. Some of the cost elements of traditional in-house IT operating costs which will continue even after cloud adoption are maintenance costs, training costs, IT staff salary costs, utilities cost, supervisory staff salary costs, hiring costs, band width costs and a host of other associated costs. A systematic 'people, process and policy' transformation is required after cloud adoption to control these cost elements and thereby gain the full benefits of cloud computing. An industry / firm which is already into a deep financial lock-in in terms of existing sunken IT assets would have an adoption inertia towards cloud.

Another reason for the slack in adoption is that despite the buildup on cloud over the last few years, the 'real' gains from the cloud offering look hazy to the buyer. To compound the scenario, the risks of full-fledged cloud adoption are yet to be fully quantified. With main stream adoption for cloud predicted to happen in the next 2 to 5 years, this is the time for the cloud vendor industry to introspect on how their new offering will be perceived by the customer. The problem formulation of this paper is a step in the direction of sectorial risk profiling and assessment of cloud adoption. The paper posits that different sectors will have different relative risk perceptions and a correct assessment of the same will go a long way in tailoring custom-made cloud solutions for each sector. Incidentally, the previous subsection on literature survey quotes at least one paper which has done a significant cloud adoption study in each of the 4 sectors that this paper is working on.

As mentioned in the abstract, the four broad risk drivers for this study are vendor related risk, security related risk, no-gain risk and efficiency related risk. They have been arrived at by collating from literature the risk studies that have been previously done. Subsequently, discussions with industry experts are used to condense the risk mapping along the aforementioned four vectors. Once the four key vectors have been identified, they are paired in all possible combinations of twos, thus yielding $4C_2$ combinations; i.e. 6 combinations of risk. The six combinations are vendor + security, vendor + no gains, vendor + efficiency, security + no gains, security + efficiency and finally no gains + efficiency. The respondents are asked to distribute their relative risk perception weightages across the six pairs in such a way that the aggregate weightage comes to 100. In this trade-off scenario, the respondents are forced to streamline their relative perception of risks. The reason for the 'pairing' of the risk elements is given in the next paragraph.

In reality, risks do not come in ones, they occur together. Hence, seeking risk weightages at a one-on-one level would have 'disjointed' the risks in the respondent's mind. In this context, the authors had the option of conjoining the risk elements either two at a time or three at a time. The 'two at a time' pairing option has been chosen because it would have become difficult for respondents to perceive the combined effect of 3 simultaneous risks. But, the process of pairing them has enabled the respondent to think in 'conjoint' terms before going for relative risk weightage assignment.

The $4C_2$ possible combinations can be represented in binomial terms as 1100, 1010, 1001, 0110, 0101 and 0011. The 1s and 0s are basically dummy variables which indicate the simple presence / absence of the risk(s) under study. A simple conjoint regression is done between the respondent's percentage risk perceptions and the binomial combinations. The part worth of each risk is derived from the regression output. In all, 5 regressions are run - 4 individual regressions for each sectors and a common regression for all respondents to get the mean risk across all sectors. The aggregated risk profiling across all sectors is not of any specific application and is done only to enable a deviance analysis of each sector's risk from the aggregate mean risk. All the 5 regressions yield an R^2 value of greater than 0.5 with education sector giving the highest value of 0.815 and SME giving lowest value of 0.574. The aggregate 'all-responses' R^2 value is 0.639. Along with regression studies, a correlation study was also undertaken by studying the correlation of relative risks across the four sectors. The correlation throws up similar and dissimilar industry pairs.

Care has been taken to ensure that there are at least 30 respondents from each sector. The study was eventually done on 150 respondents spread over SME (55), Hospitals (35), Education (30) and BFS (30). The entire sample consists of ex-ante users and hence the picture that emerges is purely one of risk perception and no way reflects a post-buy usage driven feedback. The questionnaire itself ensures that at the point of submission, the total risk weightage is exactly 100 across the six combinations of risk. Else, submission is not permitted. This ensures data consistency.

4. Analysis and interpretation

The paper basically aims at finding out a hierarchical associativeness of the four inhibitor variables on the potential cloud adopter of the four aforementioned sectors. At a one-on-one level, each of the risks is a significant deterrent. But when the market is asked to tradeoff between the risks, then distinct patterns turn up on what are the key inhibitors for a buy decision on a sectorial perspective. The paper looks at identifying the ex-ante preferences of the potential customers on the decision variables involved in cloud adoption. The part worth or utility functions that are determined for each risk gives the relative hierarchical importance that a given sector perceives for that particular risk as a tradeoff amongst various probable risks. The part worth associativeness that the study has indicated on a sector by sector basis will be a useful starting point in positioning the nebulous and intangible cloud offering to the proposed markets under study.

The relative perception spread of the four risks, as given by the respective part worth utility functions, is plotted for all the four sectors in Figure 1. Inferences on this behavior based on the results obtained are given on a sector by sector basis.

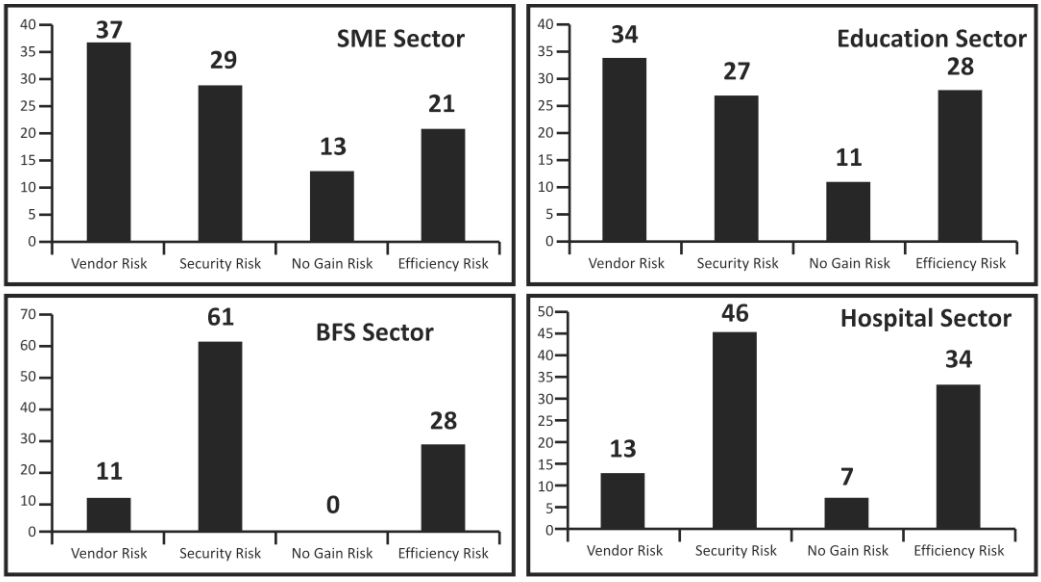

Figure 1 Relative risk assessment of cloud adoption: A 4 risk x 4 sector mapping

5. SME sector & cloud

The SME sector's risk perception spread indicates that vendor related fears dominate the mindscape of the SME market. Since Cloud – as an offering - is new and there are multiple layers of cloud vendors (ibid Michael. Ambrust et al), there is an ambiguity on who is one's actual vendor. At one layer we have the cloud utility vendor who provides computing and storage at the hardware level. At another layer, we have the cloud application vendor who packages / bundles applications like CRM and ERP along with pure play hardware. What the user gets is an amalgam of these two, vended out to him by the intermediary SaaS (Software as a Service) provider. Thus there is a perceived ambiguity of escalation point for the user when he needs trouble shooting. It is this dilemma which has given vendor related risk the highest risk ranking. If addition, cloud computing gives a plethora of offerings which can be purchased and used independently as well as conjointly. These are together clubbed as XaaS offerings and include – yet not restricted to – SaaS (Software as a Service), SaaS again (this time Storage as a Service), AaaS (Application as a Service), PaaS (Platform as a Service), NaaS (Network as a Service) and IaaS (Infrastructure as a Service). Each of them could have an independent sourcing vendor and an independent aggregating vendor. The unit by which the usage of each offering is priced is also different. All this can cumulate to heighten the vendor risk perception of the SME sector. In the absence of an expert IT think tank in most SME setups, the decisions are taken by the 'management / promoters' who might not completely understand the entire nuances of this multi-vendor platform.

The SME respondents themselves are proactive / reactive problem solvers in their domain. Hence, they instinctively understand the value of trouble shooting. The respondents currently perceive an inability to identify a feedback path by which they can solve their cloud adoption problems. This opinion, which was

obtained from random chats with SME respondents after they have filled up the questionnaire, can be posited as one of the reasons for the sector giving highest weightage for vendor risk.

The second risk is more easily explained. Data security, data privacy and its associated losses would weigh across all adoption classes and literature quotes the same as the key deterrent for wide spread cloud adoption. Since both vendor risk and security risk can be perceived even before adoption, they garner the top two perceived risk spots. The risk on 'Efficiency' will be felt only post adoption and hence it gets relegated to the 3rd spot. The inability to sense efficiency-related risk before adoption is not generic across sectors. This will be explained in the context of the next two sectors. Coming to the last perceived risk, the SME respondent market is apparently completely sold on the monetary gain aspect of Cloud Computing. Hence their risk perception of a 'No Gain' is just 13%. De-escalation of vendor ambiguity, authentication of date security and finally focus on delivery efficiency – this will be the pecking order that the SME client expects in approaching his risk mitigation in the context of Cloud.

6. BFS sector & cloud

The security risk is obviously the most overwhelming risk for the data sensitive banking sector. Of all the 16 part worth functions that have been arrived at (spread across 4 sectors x 4 risks), there is only one part worth function which has got a value in excess of 50%. This is for Security Risk in the context of BFS sector. Fears of data loss, privacy invasion, confidentiality loss, account hacking and the likes which can critically hamper banking operations add up to ensure that security risk gets a relative weightage of a whopping 61%. Banking – like any other sector in the verge of cloud adoption – definitely stands to gain from the classic cloud benefits of elasticity of usage, granularity of scaling and flexibility in pricing. Yet, this study indicates that the downside due to security fears override logical upside advantages.

The measurement and quantification of the non-cash, yet monetizable unknown risk component associated with cloud adoption has been analyzed by some of the authors of this paper in a different work (ibid Easwar et all 2012). On a sector by sector basis, one can segment and then do a weightage assignment for the possible risk factors that critically affect cloud adoption. Then, each of these weighted risks can be assigned a probability of the risk occurrence. This duality of relative weightage and probability will help in quantifying the effect of the individual risk. An aggregation of such risks elements – as applicable to a given sector – will yield a realistic value for the unknown risk component associated with cloud adoption. BFS looks like the most potential segment to start doing this risk analysis and mapping and some of the authors of this paper are working on the same in parallel. This paper only tries to look at the macro equation between BFS segment and data security. The connection is obvious according to the response data and the overwhelming 61% part worth for security risk.

Coming to the 2nd ranked risk, efficiency considerations and 'cost' of inefficiency are far more visible in banking sector than in a generic SME sector. BFS industry, which universally follows the norm of daily accounts closing and a day to day transaction reconciliation format, recognizes ex-ante the value of efficiency. In a different context, all online financial markets like stock markets, commodity markets, FOREX markets and call money markets require minimal down time and 'zero' latency as hygiene factors. Latency in cloud can be introduced by cloud elements and internet elements. In a global online financial market, where snap shot execution of trade decisions are critical, lack of efficiency will be a significant deterrent. It is for these reasons that BFS gives efficiency related risk the second highest weightage.

BFS is a very organized sector and its vendor calls are taken at national level. Given the scale of operations, there will be tight Service Level Agreements (SLAs) to ensure smooth operations. There will be in-house or hired IT expert panels to advice on the right choice of offerings and vendors. Hence the sector doesn't perceive any significant vendor related fears. The 4th fear of 'no gain' wasn't even statistically significant for this sector. This was the only sector for which a 'statistically insignificant' risk was obtained. The conjoint regression was re-run after dropping the 'no gain' risk to get the relative mapping of the remaining three risks.

7. Hospital / health sector & cloud

Health Sector and BFS sector show a remarkable similarity in their perception towards all 4 risks. Since both the sectors are part of the organized sector and remain well informed, their vendor related risk perceptions are low. Hospitals are as wary about data confidentiality as banks. Leakage of patient information can make

this sector morally and legally tenable. Today most hospitals have moved to a paperless health record format. Loss, temporary loss, swap or leakage of patient's medical data can be calumnious to the industry. Thus, like banks, data security takes the top slot for Health sector also. Data security, in this context, encompasses the privacy element as well as the confidentiality element of data – two vectors which are highly critical for the data-sensitive healthcare industry.

The important of availability of right data at right time to right medical person cannot be overstated in the context of health. The possibility of a network / system failure in between a mission critical situation such as a time sensitive surgery might be highly detrimental to the actual outcome of the surgery itself. The very credibility of the medical fraternity is hinged on availability of dynamically updated patient data. Hence, efficiency risk comes a close # 2 to data security for health sector. Here again, as in BFS, there is a clear ex-ante judgement of efficiency losses. It is worth noting that amongst the 4 sectors, the health / hospital sector records the highest risk perception of efficiency for the reasons cited above. The no gain risk is the least perceived, a rank that it consistently maintains across all 4 sectors.

8. Education sector & cloud

The education sector's high pitching of vendor risk could be driven by the fact that in this sector, students are also cloud users [unlike say in a hospital sector where the patients are not exposed to the cloud environment]. In a university, the student population would run into thousands and hence the load variability on cloud usage would be high. This creates problems with provisioning. Under provisioning of cloud services would result in service outages when the load peaks up. In education sector, there would be daily as well as seasonal peaking of load. In the Indian context, post-dinner hours would be heavy usage hours if the system is configured in such a way that academic material has to be downloaded from the cloud platform. Examination, placement and admissions time would create seasonal spikes in usage. To take care of such load variability, if the university goes for over-provisioning, it would lead to capacity under-utilization during non-peak hours. That would not be prudent from the costing perspective. Today, there are advanced technologies like 'Cloud Bursting' available where application deployment is essentially on a private cloud or private data center, but has got the capability of 'bursting' into a public cloud when the demand for computing capacity spikes up. Yet, such innovations are only emerging. Respondents of this paper are still wary of provisioning.

This scenario actually translates to a 'vendor fear' for the ex-ante market. We have respondents talking to us about vendor unpredictability in the context of what essentially is a provisioning driven system outage. This fear – like many other cloud adoption related fears – is purely perceptional. Yet, it exists in the potential customer's mind space as the study suggests.

After vendor risk, security and efficiency risks are almost even for education sector. As earlier mentioned, no sector has got a significant 'no gains' fear. This can be attributed to the fact that the cloud vendor industry has really 'sold' the CAPEX and OPEX gains of cloud computing to the aspiring adopter markets.

As mentioned earlier, 5 independent regressions were done – the first four for the 4 independent sectors and the 5th across all 150 respondents. The relative risk perception of each sector vis-à-vis the mean risk of the total sample population is plotted in Figure 2.

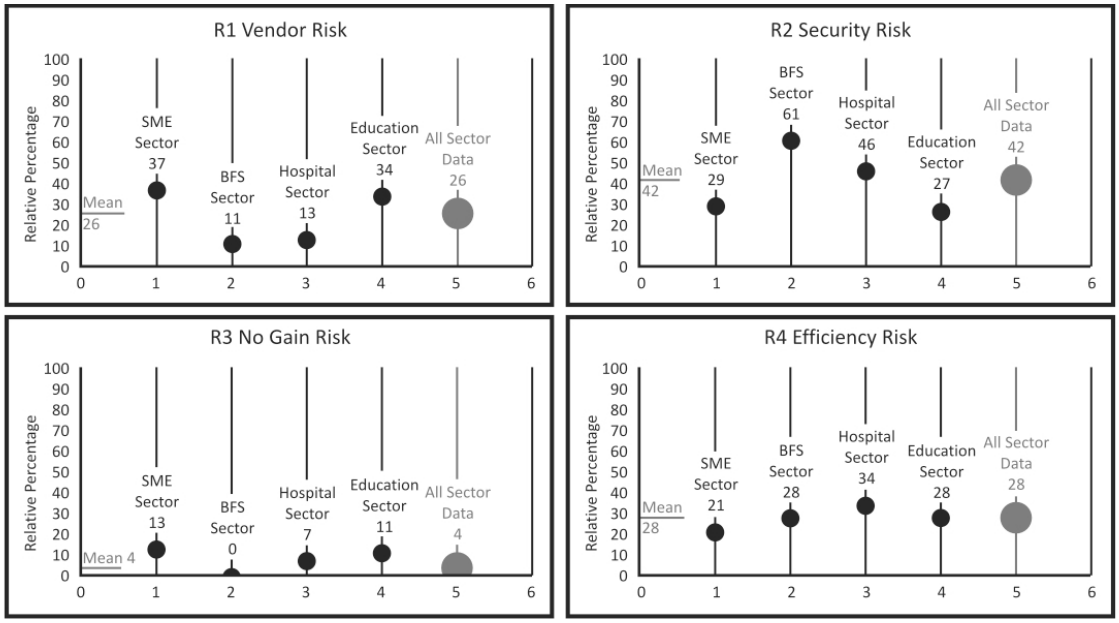

Figure 2 Relative sectorial risk vis-a-vis the all sector mean risk

It can be observed that the BFS sector and the Hospital sector tend to move together for all the risk vectors. These are two sectors that have a clear ex-ante perception of efficiency – as delivered by the IT framework – on their day to day operations. Latency effects again would have a higher bearing in a financial transaction or a medical case handling compared to the SME sector or education sector. Similarly the legal implications of a data breach would affect all industries, yet the effect would be far more pronounced in financial data as well as medical data. All this explain the correlation in risk perception between BFS and healthcare.

Similarly the SME sector and Education sector show some similarity in risk mapping behavior. In both cases, vendor risk is a higher priority compared to data security. It is worth noting that except for the pairs mentioned above, the risk perception correlations are not high for any other pair of industry sectors. This inter-pair correlation is mapped in the matrix given in Figure 3.

Correlation Matrix	SME	BFS	Hospital	Education
SME	1			
BFS	0.32	1		
Hospital	0.21	**0.97**	1	
Education	**0.89**	0.39	0.40	1

Figure 3 Correlation matrix of inter-sector risk mapping

9. Conclusion

By way of a conclusion, the authors feel that this study will crucially help cloud service vendors to segment their positioning strategy after they understand the key inhibitors of cloud adoption for different markets. Cloud marketing being predominantly B2B, brochures, mailers, ads in sector specific magazines and other promotional campaigns can be tweaked at the last delivery mile to reduce fears and increase acceptance of this nascent technology.

Though the authors have fragmented the total risk along 4 vectors only, in reality, each of these risk vectors consist of fairly uncorrelated and independent sub vectors. Fear of service continuity, fear of reputation fate sharing and risk of mismatch between vendor architecture and client business needs are all part of the broad

umbrella of vendor risk. Same is the case with privacy, confidentiality and lack of control in the context of data security. A detailed relative analysis of these sub-risks is missing in this study. That can be construed as one of the limitations of this study at this point.

Cloud as an alternative is here to stay and the business gains of cloud adoption in terms of better Net Present Value is measurable. Cloud changes the paradigm from ownership of technology to utilization of technology. The authors of this paper feel that customer-centered research will facilitate good product as well as positioning strategies in such a way that cloud adoption fears are played down and gains are ushered in.

10. Future directions of research

The papers that are quoted from literature offer perspectives of cloud adoption risk only on a sector by sector basis. This paper attempts to capture a reasonably good framework of inter-sector relative risk comparison. But as mentioned in the previous section, this work has not explored the sub-risks that reside within each risk category. A segmented and weighted study of each sub-category of risk will enable the monetization of all risk possibilities. Such a monetary association of risk will go a long way in delineating the actual Net Present Value gains of Cloud Computing (ibid Easwar Krishna Iyer et all 2012). Some of the authors of this paper are currently working on such a study.

The second thrust in research would be a country specific research approach. The risk perspectives offered in this paper are highly India centric. The relative risk perception scenario could play out differently in another country. Again, some of the authors of this work are currently working on cloud adoption risk measurement in some neighboring emerging economies.

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