

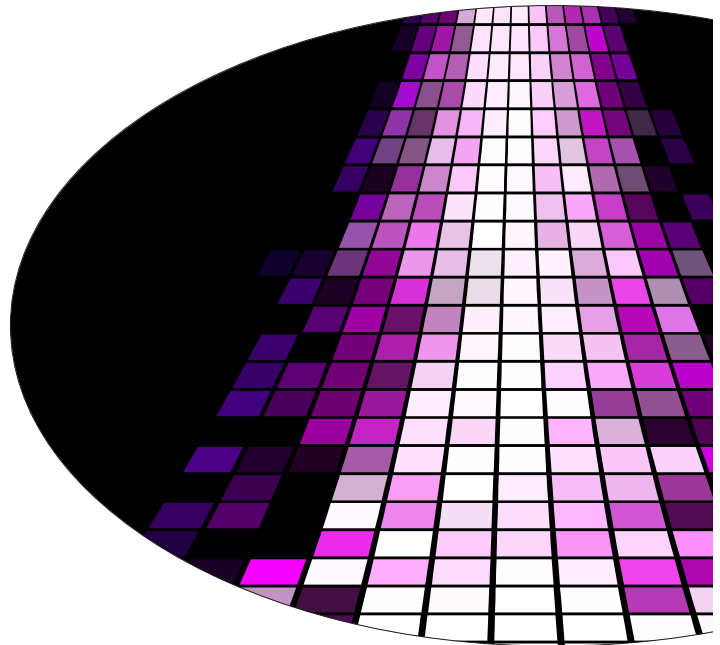
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**Adoption of Cloud Computing in India**

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# Adoption of Cloud Computing in India

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## Abstract

*The researcher looks at adoption and applicability of cloud computing to e-governance in India. Data has been gathered via structured questionnaire from stakeholders of various businesses - public & private sector of India, including Indian IT companies that offer cloud computing solutions to clients. The study takes a balanced and unbiased view of cloud computing with focus on India, to figure out the key factors that lead to its adoption using factor analysis and whether these factors could be the drivers for its adoption in e-governance. Cloud computing has picked up in developed markets and is starting to pick up in India. For enterprises, SMB, Government, NGO & individuals - it reduces initial investments, results in cost savings, gives flexibility, scalability, service on demand, device independency and anytime accessibility and reduces key data loss in the event of hardware crash, loss or theft. However, it has issues like confidentiality, information security, legal & regulatory challenges and malicious attacks as data gets stored in a distributive internet cloud, generally beyond any nation's geography. The intended target audience for this research are Union & State Governments, Large Municipal Corporations, National Federation of Urban cooperative and credit bank societies Ltd. (NAFCUB).*

**Keywords:** *Cloud Computing, India, e-governance*

## CLOUD COMPUTING IN INDIA

Almost all of us are direct or indirect consumers of cloud computing in day to day lives, although we might not be fully aware of this. Majority of the free email services, well known social networking forums, and photo and audio-video sharing services used by us rely on cloud computing directly or indirectly. For some of us, cloud computing has also started to evolve by offering the benefits like online sharing and storing, collaboration as well as content management tool.

Cloud computing is like using electricity on need and "paying per use" basis, as we do at our homes or offices. Consumer is interested in seamless and uninterrupted power supply and is not aware or concerned if the electricity produced was from thermal, hydro, solar, wind or nuclear source. When different states and cities cannot produce electricity as per peak seasonal demand, they take it on lease from the "power grids". On the similar lines users can rent different virtual machines, software and applications from cloud's global computing grid which is 365 days a year, 7 days a week & 24 hours a day. It is also less costly and very user friendly

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along with easiness to use. Users can have their new, upgrades or downgrade requirement serviced as per their requirements. Users can return these back when they don't need it. Cloud computing is like 'free' economy where the entry and exit barriers are negligible. It is a method for facilitating suitable permission to use collective group of organized computing assets like networks, servers, storage, applications, and services which can be quickly reserved and freed up as and when required by user and without spending too much time or working hard for it.

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According to Mell and Grance (2009), users can concentrate on their core competency or focus on their line of business and do not need to spend time, effort and energy on IT and computational needs. Users do not have to worry about multiple and heterogeneous vendors, software & applications upgrades, updates, licenses, versions, maintenance support, servers, storage, space, data center, disaster recovery, business continuity, power, connectivity, integrations, technical manpower, different databases and operating systems.

According to Goulding (2010), cloud can be of three types: S-a-a-S, P-a-a-S and I-a-a-S. Software-as-a-Service (SaaS) is a way of allowing user to self care their software and applications through easy navigational self service channels like web browsers and IVR (Interactive Voice Response). For example, Microsoft Business Productivity Suite, Force.com, and Zoho etc. In I-a-a-S (Infrastructure as a Service), the solution provider handles the infrastructure like virtual machines but gives flexibility to the user to deploy their own operating systems, storage, and applications. The examples could be Amazon and Go-Grid. In P-a-a-S (Platform as a Service), IT developers, programmers and coders can devise, build up or install applications on the cloud. For example, Microsoft Windows Azure platform and Google App Engine.

Hurwitz et. al (2009) explained that Cloud Computing comes in three different types, which are known as Private / Public / Hybrid Clouds. The required cloud format to be used by an enterprise is dependant on the type of data, type of security and type of management required. A public cloud is used when data or resources are placed on Internet and is needed to be shared by different people. A private cloud is used when data or resources are to be maintained privately and not to be shared by any other enterprise or people. Private cloud requires high level of security. A hybrid cloud includes the features of both private and public clouds where in a part of data can be shared and a part of data can be securely accessed using VPN (Virtual Private Network).

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## **BENEFITS OF CLOUD COMPUTING**

Aarksore Enterprises, remark that companies would see cloud computing as a method to increase IT efficiency since it decreases the requirement to put up capability more than surplus of the highest predictable demand. Taking benefit of "expandable" group of computing assets, clouds increase the nimbleness of organisation's information technology. It has the possibility to reduce IT expenses by doing away with the initial costs of machines and software. It is the cloud provider which puts in the required multiple and heterogeneous vendors software and applications upgrades, updates, licenses, versions, maintenance support, servers, storage, space, data center, disaster recovery, business continuity, power, connectivity, integrations, technical manpower, different databases, operating systems and day to day operations

Bernard (2010) specified that cloud also suits Micro and Small & Medium Enterprises (MSME) or Small & Medium Business (SMB) in operational requirements, and investment capabilities as these organizations do not generally have IT manpower. They are able to save huge money while they focus on core competency of their business to graduate from MSME to evolved SMB stage.

Janakiramm (2010) shared that cloud very well suits budding entrepreneurs as they can benefit from 'elastic' nature of Cloud by paying for what they really use. The challenge is to optimize the budget between human resources and IT infrastructure. Being elastic by nature, cloud adds tremendous value. One can start with one server and potentially scale to hundreds of servers on demand. It reduces initial investments and potential cost savings, give flexibility, scalability, on demand service, device agnostic (desktop, laptop, Mac, Smartphone, PDA or mobile phone) and anytime, anywhere access making it independent of any specific machine. Hence, it helps business users to not worry about key data loss in the event of hardware crash, loss or theft.

## **DEPLOYMENT OF CLOUD COMPUTING IN INDIA**

Salesforce.com, Google App Engine, Novatium, IBM, Oracle, VeriSign, Microsoft, US Department of Energy, GE and British Telecom are just a few examples of organisations that utilize Cloud Computing. In India, Micro and Small & Medium Enterprises (MSME) or Small & Medium Business (SMB) like Su-Kam, Janalakshmi Financial Services, Tulip Telecom, Netmagic, Nustreet, Affordable Business Solutions, India Info line, Redbus, Wildcraft and Karnal Agro Forging are early adopters of cloud computing.

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The large enterprises like Infosys, Tata Motors, Mahindra Renault, Schiller Corp, Welspun, HDFC Bank, Sify and ESPN-Star also using cloud computing for supporting multi location and heterogeneous user needs.

Having specified the benefits of cloud computing in various professions/ streams, this paper mainly focuses on the benefits of cloud computing with special reference to E-Governance

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Novehedi et al. (2010), stated that cloud is a method for governments to directly reach out the common man or citizens using self service tools like internet, IVR, phone etc. The citizens can directly access the required information and services without going to state capital or district head quarters, thus saving them time, effort, money and increasing their productivity. The citizens can seek any information about any ministry, department, statutory body, autonomous agency, and any semi or quasi Government unit. It includes information of the Union or Central Government, State Governments, District, Taluka or Tehsil or block, Municipal Corporation or Committee etc. All these initiatives lead to a satisfactory and good relation between citizens and the respective Government and the citizens can actively participate.

Srinivas (2008), explained that the services generally accessed by citizens are Railways, Income Tax, Passport, Immigration and Visa, Company Affairs, Central Excise, National ID / UID, e-Office, India Portal, Common Service Centers, e-Courts, EDI, e-Biz, e-Procurement, Pensions, Land Records, Road Transport , Property Registration , Agriculture, Municipalities, Gram Panchayats (Rural), Police , Employment Exchange ,E-Courts, Land Records, Transport, Land Records, Treasuries, Municipalities, Police, e-District, Commercial Taxes, Agriculture, Gram Panchayats, Employment Exchange, Banking and Insurance.

### **CONCERNS FOR E-GOVERNANCE PROJECTS**

There are certain issues in the above said E-Governance projects. The websites like [www.indianrailways.gov.in](http://www.indianrailways.gov.in) and other websites of some government departments are very slow in the peak hours or particular seasons. This leads to high dissatisfaction amongst the citizens as they are dependant on this medium to do the urgent tasks, but due to lack of even moderate speed - the tasks remain incomplete. Moreover, the opportunity is lost and citizen has to bear the burden without his or her fault. At other times, few websites are down or inaccessible. Also many a times, one Government website shows some information while the other is yet to get updated - leading to partial fulfillment of service. According to Verma (2010), these issues could be resolved if cloud computing is adopted. To

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uphold the service quality levels during peak hours or at increased loads, cloud facilitates augmentation of the resources on the fly - thus giving a reliable e-Governance experience to citizens. For example, if Indian Railways could adopt this model - the problems around booking tickets under the normal reservation or even the emergency reservation, in the mornings, can be avoided. Similarly, Income Tax filing could be easier electronically during the peak days. It supports Government's green initiatives by consolidating and standardizing all resources, leading to optimization.

Julka (2010) described that Jammu & Kashmir has fruitfully conducted a cloud based proof of concept, courtesy Madhya Pradesh (M.P, a State in India). By doing this, it has started offering E-Governance services like ration card and recruitment to common man of the state in just two months time, at no cost to state initially. This may save for the state, up to INR 689 crore allocated for data centre, in a pay per use model. Jammu and Kashmir's (a State in India) back end data processing hub would be in MP and latter would get income from former on number of transactions. "Cloud services are going to become mainstream, we are encouraging other states to share applications and data centers, as successfully demonstrated by these two states", said a top e-governance official at the Ministry of IT & Communications. "This pilot can change the paradigm of citizen service delivery. It shows that citizen services can be rolled out within weeks," said Neel Ratan, Executive Director at PricewaterhouseCoopers, who consulted the State Governments in the rollout. The State Data Centre project is part of INR 27,000 crore "National e-Governance Plan" started in 2005, wherein every state or Union Territory was asked to build their own state data center (SDC). 13 states have started their data centers. Rest 23 states are in the process of starting them. These SDCs would host common man's data like home, agricultural and commercial property; various transportations; ration card, voter card, driving license, excise and applications for police and state administration's websites. Like Jammu and Kashmir, some of these 23 states or Union Territories can, not only quickly start E-Governance services for their citizens by using already established SDCs of other states on per-transaction agreement but can also save costs if cloud computing is adopted.

Many domestic and international vendors like Microsoft, Google, Infosys, Tata, Wipro, HCL, Zinnov, Prithvi, Tulip, Mahindra Satyam, Patni, Cap Gemini, Accenture and Price Water House Coopers are already bidding for E-Governance projects across India.

**FACTORS IN FAVOR FOR ADOPTION OF CLOUD COMPUTING**

Sharma (2009) enumerated the figures on the Indian SaaS market from Springboard Research (January 2009) report 'Software as a Service in India: An Overview'. The report depicted that Indian SaaS market would show growth of CAGR 76 percent between 2007-2011 and reach \$260 million in revenues by end of 2011. The Indian SaaS market is all set for 76 percent increase. As per survey subjects, who have not adopted SaaS, implementation of SaaS, is being considered at their end and they plan to adopt it by 2012. ERP and CRM services look more promising as they would get biggest demand from the nation. It is vital to the 30 million plus small and medium businesses in India who are looking for user friendly, trustworthy and expandable software to help in getting decent revenue increases. This technology would keep on evolving as more users seek a change in existing old technologies with state of the art, futuristic, projected and expandable yet dependable technologies like cloud computing. Aman Dokania, VP and GM-Infrastructure Software and Blades Sales, HP Asia Pacific and Japan, shared, "Currently, adoption is limited by uncertainties surrounding risks and rewards. Customers want assurance and a safe path to cloud adoption that will address potential risks of security, performance and availability, while providing clear RoI. However, we see that this will change as customers become more knowledgeable about the technology and more standards are created. Most customers are considering private cloud as part of their IT architecture and strategy."

Moumita(2010) predicted that cloud computing in Indian market would increase ten folds from \$110 million to \$1084 million by 2015. Big companies in BFSI, production, services, communication and SME would see it as an expense reduction tool. As per the report by management company, Zinnov, "the current domestic market for software-as-a-service (SaaS) is estimated to be \$66 million, dominated by applications in the areas of collaboration, customer relationship management, and enterprise resource planning and e-mail workloads. The balance \$44 million is platform-as-a-service (platform as subscription for writing applications) and infrastructure-as-a-service (infrastructure on pay-per-use model)". "Indian SMBs lack budgets, want business improvement, lack management bandwidth required to manage internal IT and are looking for rapid growth in next few years. For all these, cloud computing is the answer," said Mr Praveen Bhadada, Engagement Manager, Zinnov Management Consulting. Highlighting further details, Zinnov said that, " SaaS in India is likely to reach \$650 million, while PaaS and IaaS markets will cumulatively touch

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\$434 million." Zinnov said, "sectors such as BFSI, education, healthcare and retail will increasingly rely on cloud computing for a better reach. For instance, with healthcare expenditure increasing in the country, telemedicine, patient record management and hospital productivity will be the opportunity areas for cloud adoption. Similarly, the retail market where an overwhelming majority of the players are the small 'mom and pop stores', the adoption of cloud-based applications (such as mobile-based CRM solutions) is likely to gather momentum. Also, Zinnov believes that e-governance projects will drive significant adoption of cloud computing, across India".

However according to Shukla (2010), ability to design, architect, develop and implement larger cloud based frameworks that can add value to life is certainly a dream come true for any technology services provider. Best of the minds need to be in one place to pull all the strings to get it going. As per IDC publication, "Most public sector agencies need to urgently coordinate and integrate the various e-government functions".

"Cloud computing adoption amongst outsourcing users is set to double between 2010 and 2012", according to research from the National Outsourcing Association (NOA), (2010).The research found that current desktop cloud computing penetration in UK is just 3 per cent, but projected that adoption would reach 10.8 per cent in the desktop environment by 2012. Adoption of cloud computing in the application development and production environments is expected to grow by 35 and 57 per cent respectively over the same period. 82 per cent of respondents specified that cost reduction was one of the most significant factors that contributed to this increase. 68 per cent of respondents highlighted that it is extremely important to refresh or upgrade existing systems. The need to increase scalability of server resources was cited by 52 per cent of respondents, with 50 per cent expressing that redeployment of budgets was an important factor.

### **FACTORS INHIBITING THE ADOPTION OF CLOUD COMPUTING**

Factors inhibiting the adoption of cloud computing as per National Outsourcing Association (NOA, 2010) included the fear of vendor lock-in, lack of data visibility, fears over data security and back-up issues. The survey, which included government bodies, financial, telecom, media, manufacturing and retail businesses also found that 74 per cent perceived cloud computing to be highly relevant within their specific sectors. More than half indicated that cloud computing is more relevant within production than in development environments. 100 per cent respondents felt that hybrid



cloud environment (using a mix of both in-house and external processes) was the most appropriate form for all aspects of IT operations. 98 per cent found cloud computing to have its greatest applicability in the desktop/end-user environment.

Singh (2010) in his article mentioned the statement of secretary, DIT, R Chandrashekhar "...as people start using IT as a service such as software, data centers and all other means, which are all bundled together, cloud computing is also proving to be a fairly attractive model in India. First, many people may want to use 'pay as you go' model and that generally appeals to the Indian economy." He added, "on the context of e-governance, there are other aspects of possibility through cloud computing. The pace of implementation can be accelerated by sharing resources like different kinds of software platform that are available for making e-services available in one state or one part of the country or a department. Once they are put onto a cloud (may be a government cloud), it could help in the usage of the same artifacts by other departments and organizations to speed up the rolling out of different projects". "As we move towards better-connected and more centralized environment for delivery of services, the complexity is contained within the cloud, so the roll out of projects of various offices becomes simpler," he said.

One method which might get acceptance from the state governments is giving services to local bodies via their own clouds. Public utility services, massive data intensive programs and large scale delivery capabilities are some of the most challenging aspects that any government faces when it wants to cater to millions of people. Technology consumption, right framework creation and adoption have always been an issue either at strategy level or execution level. However modern day governments can take a CIO centric approach these days to cater to public demands using technologies such as Cloud computing.

The capability of efficient conversation and work in partnership has been thought as one of the highest benefit of cloud's adoption in Government departments. It also has the capability to decrease corruption and roll out e-services in few weeks rather than years.

Zinnov Management Consulting (2010) firm is of the opinion that e-governance programs would drive good adoption of cloud computing in India.

## **RESEARCH METHODOLOGY**

A survey was conducted to measure awareness and attitudes towards cloud computing services for e-governance. 34 respondents participated in the study out of a sample of 56. This included organisations like Society for Promotion of e-governance (SPEG), eGovWorld.org, NASSCOM, FICCI, ASSOCHAM and PHDCCI.

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## DATA ANALYSIS

Cloud computing has slowly starting gaining ground in e-governance and the survey data shows that adoption is likely to go up soon. The data collected was analysed using across statistical software SPSS.

## AWARENESS ABOUT CLOUD COMPUTING

Around sixty four percent of the target respondents were aware of the cloud computing technologies. Forty four percent of respondents were from public sector whereas fifty six percent from private sector. Ninety one percent of the public sector respondents were aware of Indian government's e-governance initiative. This figure was relatively higher (ninety four percent) for private sector respondents. However, majority of public sector respondents were not aware of cloud computing as a tool that can be used in e-governance. There is pervasive need of awareness and confusion about cloud computing. The number of subjects that are not aware of cloud computing (65 percent) are almost double than the percentage of respondents who are familiar with it (35 percent). Twenty percent of public sector respondents were part of the cloud computing initiative of their organization. The corresponding figure for private sector was thirty two percent. Twenty seven percent of public sector respondents said that the e-governance initiatives using Cloud Computing as taken by Jammu & Kashmir and Madhya Pradesh government are successful. This figure was relatively higher (thirty two percent) for private sector respondents. Almost all the respondents had shown interest in implementing multiple applications using cloud computing services viz. Human Resource Management, Customer Relationship Management, Enterprise Resource Planning, Virtualized server environment, Database applications and Web applications. Few of the respondents seemed to be interested in Procurement, Finance and using cloud computing services.

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## FACTORS RESPONSIBLE FOR ADOPTION OF CLOUD COMPUTING

The main factors which would be responsible for the adoption of cloud computing in India have been extracted using Factor analysis. The respondents' ratings were subjected to Principal Component Analysis to reduce multicollinearity among items, with the Varimax Rotation method. Thirty one items were reduced to four components where Factor 1 had Initial Eigen value of 25.1 with 80.9% of variance, Factor 2 had Initial Eigen value of 2.6 with 8.4% of variance, Factor 3 had Initial Eigen value

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of 1.2 with 4.0% of variance, and Factor 4 had Initial Eigen value of 0.7 with 2.4% of variance.

Table 1 : Rotated Component Matrix (a) for extracting the main factors responsible for Adoption of Cloud Computing in India

|                                   | Component |      |      |      |
|-----------------------------------|-----------|------|------|------|
|                                   | 1         | 2    | 3    | 4    |
| Awareness                         | .501      |      | .777 |      |
| Trustworthy                       | .550      | .527 | .558 |      |
| Secured touse                     | .586      | .549 | .561 |      |
| Private services                  | .458      |      | .728 |      |
| Public services                   | .569      | .584 | .437 |      |
| Hybrid services                   | .485      | .598 | .426 |      |
| Used for multiple applications    | .458      |      | .728 |      |
| Cost reduction                    | .861      |      |      |      |
| Flexibility                       | .563      |      | .728 |      |
| Accessibility                     | .861      |      |      |      |
| Elastic scalability               | .834      |      | .453 |      |
| Easy to implement                 | .834      |      | .453 |      |
| Service quality                   | .834      |      | .453 |      |
| Non critical applications         | .709      |      | .509 |      |
| Latest softwares                  | .540      |      | .710 |      |
| Sharing of resources              | .861      |      |      |      |
| Availability of info to citizens  | .861      |      |      |      |
| No need to travel for information | .861      |      |      |      |
| Reducing corruption               | .492      |      | .627 | .444 |
| Faster rollout of services        | .843      |      |      |      |
| Increase in satisfaction          | .843      |      |      |      |
| Security concerns                 | .531      | .459 |      | .594 |
| Performance concerns              |           | .914 |      |      |
| Availability concerns             |           | .914 |      |      |
| Integrity concerns                |           | .914 |      |      |
| Ability to customize              |           | .914 |      |      |
| High investment                   |           |      | .589 | .643 |
| Regulatory requirements           |           | .556 |      | .618 |
| Not enough suppliers              |           | .556 |      | .618 |
| Company should invest             |           | .556 |      | .618 |
| Concerns to be overcome           | .564      | .637 |      |      |

Extraction Method: Principal Component Analysis.  
Rotation Method: Varimax with Kaiser Normalization.

a Rotation converged in 7 iterations.

From the above table, the main factors (having component value greater

than 0.4) which would lead to adoption of Cloud Computing in India for implementing E-governance projects have been extracted. From Factor 1, various items which explains the Benefits of Cloud Computing for e-governance projects are cost reduction, accessibility, sharing information, travel, rollout of services, satisfaction. From Factor 2, various items that were retrieved which explain the Concerns of Cloud Computing for e-governance projects are performance, availability, integrity and customization. Items from Factor 3 could not be taken as the values got converged in the values of Factor 1 and Factor 2.

A measure of construct reliability Cronbach's alpha was calculated for the two sets of extractexd factors. These coefficients ranged from 0.9 to 1.0 as a rule of 0.7 or more represent satisfactory reliability of the items measured. Thus the items measuring the dimensions appear to be sufficiently reliable.

#### APPLICATIONS OF CLOUD COMPUTING

Table 2 : Frequencies for Applications of Cloud Computing in India

|                 |                       | Responses |         | Percent of Cases |
|-----------------|-----------------------|-----------|---------|------------------|
|                 |                       | N         | Percent |                  |
| Applications of | HRM                   | 24        | 11.2%   | 70.6%            |
| Cloud           | Procurement           | 31        | 14.4%   | 91.2%            |
| Computing(a)    | ERP                   | 34        | 15.8%   | 100.0%           |
|                 | CRM                   | 34        | 15.8%   | 100.0%           |
|                 | Finance               | 24        | 11.2%   | 70.6%            |
|                 | Database_applications | 34        | 15.8%   | 100.0%           |
|                 | Web_applications      | 34        | 15.8%   | 100.0%           |
| Total           |                       | 215       | 100.0%  | 632.4%           |

a Dichotomy group tabulated at value 1.

The preferences of respondents to use Cloud Computing in wide range of applications are more or less same or similar in nature. Most of the respondents agree to use the cloud computing services for ERP (Enterprises Resource Planning), CRM (Customer Relationship Mangement), Database applications & Web applications and the areas directly or indirectly related to these applications. The above data also signifies that respondents are

not very willing to use cloud computing in HRM (Human Resource Management) and Finance stream.

### **CONCLUSION**

Cloud computing has low levels of end to end awareness, trust and adoption among government officials in India (despite all the attention cloud computing receives as one of the leading IT trends). They were not fully familiar with cloud computing, and do not trust it fully. Awareness and trust are lacking even among professionals who are familiar with it and may be responsible for securing enterprise systems and information. While cloud adoption is expected to grow, respondents' inexperience with cloud computing, security concerns (and in some cases, lack of concern) and uncertainty about governance could make it difficult for Government organizations to effectively implement cloud computing or realize full value from it.

Apart from awareness of cloud computing, the end to end infrastructure (ecosphere) built by service providers is very limited in India. The security of data is very important and Government definitely would like to ensure that the privacy and accessibility of confidential data is properly handled. Also, many a times - there is dire need that data must not leave shores of the nation as data and privacy laws are varied in different countries. So in the scenario of data theft abroad, it would be really difficult for the Government to bring the guilty to the book. The outlook for cloud computing adoption in government depends on how well cloud service providers tackle these issues. Also, they need to raise the levels of awareness and trust in the model. The data reflects barriers to adoption, but adoption rates and user experiences show the barriers can be reduced. Respondents who know cloud computing well, trust it most. For example, those who are familiar with cloud computing tend to implement it, those who implement expand their use by accessing multiple applications through the cloud, and professionals who are most involved in cyber security have more trust in cloud computing. Against this backdrop, the author recommends organizations to take the following actions as specified in the recommendations below to assess the suitability of cloud computing for Government agencies and to prepare them for implementation.

### **RECOMMENDATIONS**

Specifically designed seminar and customized workshops for various Central / State / Semi / Quasi Government agencies, Municipal corporations and committees, Government departments and autonomous bodies must be done so that they become aware about the, benefits, usage and applications of cloud computing for citizen services.

Cloud service providers must ensure data privacy and integrity and they need to have very tight processes for handling confidential data. This data must not pass beyond Indian shores via any medium or channel.

Quick e-delivery of citizen services must be done for Government sector which can be mutually evolved and Proof of Concept (PoC) or dry run can be done to give confidence & win trust of key stakeholders.

A common Government Cloud, which would essentially be co-owned by Government and consortium of cloud service providers to bring standardizations and shared responsibility of all stakeholders, could be initiated so that adoption increases quickly, in the wider benefit of common citizen of India.

### LIMITATIONS OF THE STUDY

This study has certain limitations that are required to be taken into account while considering its contributions. The main limitation of the study was a relatively small sample size. In this study, the wide-ranging conclusions have been made from a narrow empirical perspective. Moreover, the study focused on primary data collection from government officials who are working or planning to work on the implementation of cloud computing projects in India. This was a challenging task for the researcher as the respondents were not willing to share the detailed information. For these reasons, these findings cannot be generalized to a broader community.

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