

Technological Disruptions Of Cloud Computing And Their Transformational Impact On Technology Based Innovative Business Model (Startups)

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Abstract

The main purpose of this research paper is to highlight the importance of new cutting edge technologies and their transformational impact in new business model which is mainly backed by Innovations. This paper will explore all the aspects of advancement of technology specifically the development in the area of cloud computing and their implications on new business model which is complemented by Innovation i.e “Startups”. Innovative businesses are the bedrock of the Tech based Indian startup ecosystem that embraces new ideas and new enterprises, which is essential for the development of Indian economy. We studied various articles and research papers and realize that the government at all level is instrumental in extending stupendous impetus to boost up startup ecosystem environment by using cutting edge technology like cloud computing, AI and IoT's etc. Through an intensive study we endeavor to understand that how startup founders are able to establish a successful entrepreneurial ecosystem by bringing technology and Innovation together. This study also illuminates our belief and underlines the differences between doing digital and being digital and digital transformation which may depends on latest infrastructure, better hardware availability and its success fundamentally rests on Innovation and Innovative ideas emerged from young talented peoples.

Keywords: Innovation, Business Model, Startup, Technological Advancement, Technological Disruption.

1. Introduction

Cloud computing technology was a long term expecting project for IT world, the long-held dream technology has a potential to empower the India's vision to become a Digital First country in a very short span of time. Cloud computing refers to the provision of Software, Storage and mega

computational power to customers from the remote data centers through the Internet and web services. The new business founders and entrepreneurs need not be worried about initial infrastructure cost in constructing a huge data center and buying the high cost enterprise software , instead they can hire

the services on rent on cloud and pay the amount as per actual usage, cloud computing provides the ability to pay-per-usage to the entrepreneurs, this features dramatically helps in businesses to sale up fast and they can get results as fast as their

projects can scale, since utilizing 1,000 servers for one hour costs close to utilizing one server for 1,000 hours. This versatility of assets, without paying a premium for huge scale, is phenomenal ever of.

Table 1. Worldwide Public Cloud Service Revenue Forecast (Billions of U.S. Dollars)

	2017	2018	2019	2020	2021
Cloud Business Process Services (BPaaS)	42.2	46.6	50.3	54.1	58.1
Cloud Application Infrastructure Services (PaaS)	11.9	15.2	18.8	23.0	27.7
Cloud Application Services (SaaS)	58.8	72.2	85.1	98.9	113.1
Cloud Management and Security Services	8.7	10.7	12.5	14.4	16.3
Cloud System Infrastructure Services (IaaS)	23.6	31.0	39.5	49.9	63.0
Total Market	145.3	175.8	206.2	240.3	278.3

BPaaS = business process as a service; IaaS = infrastructure as a service; PaaS = platform as a service; SaaS = software as a service

Note: Totals may not add up due to rounding.

Source: Gartner (September 2018)

1.1 Cloud Computing Service Type

Cloud computing is the conveyance through which we can access different equipment, programming services and infrastructure over the web, through a system of remote servers. These remote servers are occupied with putting away, overseeing, and preparing information that empowers clients to grow or overhaul their current framework. The capabilities and breadth of the cloud are enormous. The IT industry broke it into three categories to help well.

- **Software-as-a-service (SaaS):** In these types of Services, customer can use the high end software and application available on web and pay as per usage without purchasing anything. Software is owned, delivered and managed remotely by one or more providers. Instead of installing software on your own servers, SaaS companies enable

you to rent software that's hosted, this is typically the case for a monthly or yearly subscription fee

- **Platform-as-a-Service(PaaS):** Platform-as-a-Service (PaaS) is a cloud computing model in which an outsider supplier conveys equipment and programming apparatuses - for the most part those required for application advancement - to clients over the web. A PaaS supplier has the equipment and programming without anyone else foundation. Thus, PaaS liberates clients from introducing in-house equipment and programming to create or run another application. PaaS does not regularly supplant a business' whole IT framework. Rather, a business depends on PaaS suppliers for key administrations. A PaaS supplier manufactures and supplies a flexible and upgraded condition on which clients can

introduce applications and informational indexes. Clients can concentrate on making and running applications as opposed to building and keeping up the hidden framework and administrations

- **Infrastructure-as-a-Service (IaaS):** Infrastructure as a service (IaaS) is a type of cloud computing that gives virtualized processing assets over the web. Horizontally and vertically versatile figure, stockpiling and systems administration conveyed to an application on-request. Register assets, supplemented by capacity and systems

administration abilities are possessed and facilitated by suppliers and accessible to clients' on-request. In an IaaS model, a cloud supplier has the foundation segments customarily present in an on-premises server farm, including servers, stockpiling and systems administration equipment, just as the virtualization or hypervisor layer.

1.2 Cloud Evaluation

Cloud computing finds its evolution in the last 18 years, with future technology evolution driving potential adoption.

Year 2000 to 2005	Data center growth was highest in the wake of the Dot-com boom
Year 2006	Amazon enters the Cloud market with the launch of Amazon Web Services (AWS)
Year 2007 to 2008	Major player Google launches Cloud services. Part of the Technology market disagrees with the concept of public Cloud
Year 2008 to 2009	With data security concerns, players like Microsoft and Rackspace veer towards private Cloud establishment
Year 2009 to 2010	Open Source Cloud Movement takes hold as UC-Santa Barbara (AWS) and Rackspace (w/ Nasa) launch Open Source Cloud
Year 2010 to 2012	Cloud computing gains acceptance in enterprises. Major players like Netflix, NASA join Cloud , Hybrid Cloud is born
Year 2012 to 2018	Cloud acceptance grows further , Applications grow beyond SaaS with IaaS and PaaS taking firm grip
Year 2018 Onward	90% of Fortune 500 companies are using Cloud • Focus on Next-gen Cloud (XaaS) • Growth of Cloud led by Future Tech. (AI, ML etc.) • Edge Computing taking firm shape

1.3 Key Characteristics of Cloud Computing Environment

Cloud computing is a model for empowering universal, advantageous, on-request system access to a mutual pool of configurable figuring assets. The following are the key attributes of cloud computing condition because of which tech based

Startups will undoubtedly receive this innovation.

- **Self Service:** Making situations, improving abilities, including limit with insignificant exertion and lower lead times.

- **Dynamic:** On-Demand Provisioning. The capacity to include ability and limit as quickly as business requires.
- **Multi-Business:** Cloud computing addresses distributed capacity across business channels, reducing duplicate environments.
- **Scalable:** Respond rapidly to expanded business request, acquisitions, or new plans of action without enormous Capex consumptions and expanded long run-off periods.
- **Flexible Pricing :** encourages better deceivability and cost control enabling undertakings to spend on different zones as business requests vacillates
- **Digital Based Architecture:** Cloud architectures are based on virtualized environments defined by their use not by hardware.

Cloud ecosystem provides businesses the required agility to conceptualize, test & launch products. Saves on maintenance time & cost hence more innovative products. Allows businesses to acquire all the required IT resources on demand like Database-as-a-Service, Computing-as-a-Service and Security-as-a-Service

1.4 Cloud Computing Deployment Models

Ventures seeking private Clouds for their center resources while as yet moving to open/half and half Cloud conditions. Distributed computing is one of the least demanding and best approaches to set aside cash for a startup. When utilizing the cloud for all your figuring needs, there is no requirement for costly on location servers, hardware, and extra office and extra room. Additionally, you never need to stress over

paying for redesigns or support charges, as they are secured as a feature of your month to month membership bundle.

Private Cloud: Private cloud alludes to a model of cloud computing where IT services are available over private IT foundation for the committed utilization of a solitary association. A private cloud is typically managed through internal customer assets. The terms private cloud and virtual private cloud (VPC) are regularly utilized conversely. In fact talking, a VPC is a private cloud utilizing an outsider cloud supplier's framework, while a private cloud is executed over interior foundation.

Hybrid Cloud :It is a formation of at any rate two Clouds (private on reason/off reason, or open) that stay stand-out components yet are bound by standardized or prohibitive development that engages data and application portability. Half breed cloud is a distributed computing condition that uses a blend of on-premises, private cloud and outsider, open cloud administrations with arrangement between the two stages. By enabling remaining tasks at hand to move among private and open mists as registering needs and costs change, half and half cloud gives organizations more prominent adaptability and more information sending alternatives.

Public Cloud: The public cloud is characterized as processing services offered by outsider suppliers over the open Internet, making them accessible to any individual who needs to utilize or buy them. They might be free or sold on-request, enabling clients to pay just per use for the CPU cycles, stockpiling or data transfer capacity they expend.

In contrast to private cloud, public cloud can spare organizations from the costly expenses of obtaining, oversee and keep up on-premises equipment and application framework - the cloud specialist co-op is considered in charge of all administration and support of the framework. Public cloud can likewise be conveyed quicker than on-premises foundations and with an interminably versatile stage. Each representative of an organization can utilize a similar application from any office or branch utilizing their gadget of decision as

long as they can get to the Internet. While security concerns have been raised over open cloud conditions, when executed accurately, the public cloud can be as secure as the most viably overseen private cloud usage if the supplier utilizes legitimate security techniques, for example, interruption discovery and counteractive action frameworks (IDPS).

Cloud Community: It's a cloud computing infrastructure to provide cloud services to a limited clients only, the management is centrally handled by group of consumers.

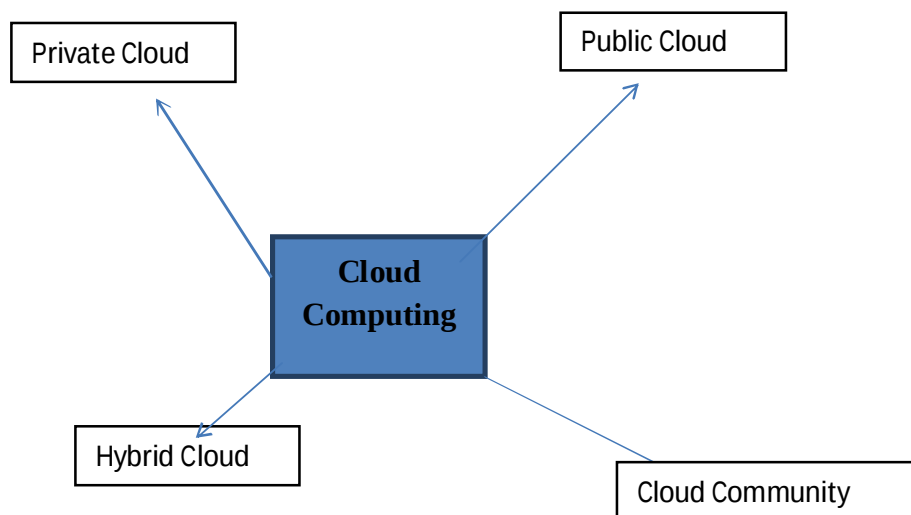


Figure1.Cloud Computing Deployment Model

There are such a large number of astounding cloud-based arrangements that new companies are utilizing to deal with for all intents and purposes each part of business, including enrolling, employing, finance, advertising, deals, bookkeeping, and that's only the tip of the iceberg. These cloud applications resemble the swiss-armed force blades for the tech world, as they can comprehensively deal with an organization's whole business procedure and increment efficiency by complex. They likewise spare a considerable measure of cash with regards to work costs and extra representatives.

Applications, for example, Salesforce, Microsoft Dynamics, and Google's G-Suite are savvy ways for new companies to set aside cash while building and developing their business. Joining incredible computerization apparatuses customized to the requirements of explicit divisions (i.e., deals cloud, showcasing cloud, client administration cloud) with the accommodation of moment and secure online access and client support, cloud-based arrangements give reasonable month to month membership benefits that are an ideal counterpart for new organizations.

These are only a couple of the numerous methods for headways in innovation which lessens costs for new companies. As all the more front line arrangements keep on being made every single day -and are being made by new businesses ready to build up these new advancements on account of the cost-cutting applications referenced in this article – this success win cooperative energy will develop and prosper and more new companies will probably make due as well as flourish.

Cloud computing alludes to the arrangement of software, stockpiling , storage and computational capacity to clients from remote server far away through the web. The idea of Cloud has been around for two decades, yet has now progressed toward becoming standard with the developing nearness of "hyper scale" Cloud suppliers in huge information, examination, man-made consciousness and IoT. The Indian Cloud market has an enormous open door for development, as the Cloud turns out to be increasingly worthwhile for the Indian SMEs, Enterprises and as the worldwide interest for Cloud develops giving India the chance to rise as a noteworthy customer and provider, utilizing its expense and different favorable circumstances.

2. Literature Review

Bhat, M. A., Shah, R. M., Ahmad, B., & Bhat, I. R. (2010). This paper presents a succinct evaluation on how Cloud Computing perspective can be used to fulfill the growing needs of the Information Support Systems and how Cloud Computing perspective can show to be future response for such structures. Over specific decades beforehand, affiliations have put tries to be at the cutting edge of the improvement and

utilization of PC based Information Support Systems to accumulate, separate and procedure the data and make information to support decisions. Diverse enrolling perfect models have been used for the reason and needs have produced for massive establishment, limitless system accessibility, cost sufficiency, extended limit, extended computerization, flexibility, structure convey ability and move of IT focus.

JoSEP, A. D., KAtz, R., KonWinSKi, A., Gunho, L. E. E., PAtTERSon, D., & RABKin, A. (2010). The author communicated the view about the long held business dream for cloud computing condition. Cloud computing, the long-held dream of figuring as an utility, can change a huge bit of the IT business, making programming significantly progressively engaging as an organization and trim the way wherein IT hardware is organized and acquired. Specialists with imaginative considerations for new Internet benefits never again require the huge capital expenses in gear to pass on their organization or the human expense to work it. They need not be stressed over over provisioning for an organization whose omnipresence does not live up to their desires, as such wasting extravagant resources, or underprovisioning for one that ends up being wildly outstanding, thusly missing potential customers and pay. Also, associations with tremendous bunch arranged assignments can get results as quick as their ventures can scale, since using 1,000 servers for one hour costs near using one server for 1,000

Kondo, D., Javadi, B., Malecot, P., Cappello, F., & Anderson, D. P. (2009, May). In this research article , the author

concluded that cloud computing has overwhelmed business registering. In any case, appropriation of distributed computing stages and administrations by mainstream researchers is in its earliest stages as the presentation and money related money saving advantages for logical applications are not splendidly clear. This is particularly valid for work area networks (otherwise known as volunteer figuring) applications. We investigate the exhibition and fiscal money saving advantages of mists for work area lattice applications, extending in computational size and capacity. We address the accompanying inquiries: (I) What are the exhibition tradeoffs in utilizing one stage over the other? (ii) What are the particular asset prerequisites and money related expenses of making and conveying applications on every stage? (iii) In light of those money related and execution money saving advantages, how do these stages look at? (iv) Can distributed computing stages be utilized in mix with work area lattices to improve cost-adequacy considerably further? We inspect those inquiries utilizing execution estimations and money related costs of genuine work area networks and the Amazon flexible figure cloud.

Sultan, N. (2010). It is contended in this article cloud computing is probably going to be one of those open doors looked for by the destitute instructive foundations in these troublesome occasions and could demonstrate to be of huge advantage (and engaging in certain circumstances) to them because of its adaptability and pay-as-you-go cost structure. Cloud computing is a developing new figuring worldview for conveying processing administrations. This processing approach depends on various existing advancements, e.g., the Internet,

virtualization, matrix figuring, Web administrations, and so forth. The arrangement of this administration in a compensation as-you-go route through (to a great extent) the well known mechanism of the Internet gives this administration another peculiarity. In this article, a few parts of this peculiarity will be featured and some light will be shed on the present worries that may keep a few associations from receiving it. This handling approach relies upon different existing headways, e.g., the Internet, virtualization, framework figuring, Web organizations, etc. The course of action of this organization in a pay as-you-go course through, (all things considered, the outstanding system of the Internet gives this organization another idiosyncrasy. In this article, a couple of parts of this characteristic will be highlighted and some light will be shed on the present stresses that may shield a couple of relationship from getting it. The objective of the study is

- To understand the new ways of business model in the age of digital transformation.
- To understand the Cloud Computing environment and their adoption level with new innovative business model at different verticals.
- To evaluate the market size of Cloud computing both at Global and Domestic level.
- To understand the IaaS, SaaS and PaaS terminology and their adoption in tech based startups.
- To review the current regulatory scenario and Cloud policy framework in India.

3. Research Methodology

Our study is based on secondary data. The secondary data required for the studies were collected from various international journals, Published online books, Published Reports, Various Analyst Reports, Technical Journals, trade magazines, Databases such as Forrester, OVUM, Gartner, government and regulatory published material and their website, websites of various media companies like Inc42.com, IndianWeb2.com, NASSCOM, yourstory.com and various publications related to the topic under study.

3.1 Limitation of the Study

The main shortcoming or limitation of my study is that it's based on secondary data. The scope of my study is very limited, we covered only the concept of digital disruption and transformational impact on small entrepreneurs specifically on Technology based startups. We further suggest researcher to explore more about the topics as the technology and innovation is like an ocean and we have to find the Pearl from within.

4. Research Findings/ Analysis

4.1 Certain Facts about Cloud Computing Environment:

- The concept of Cloud Computing has been around since late 1990s and has now evolved significantly to an estimated size of USD ~187 Bn+ globally (2018).
- Global Cloud Computing is 8% of the global relevant IT spend in 2018 and estimated to grow at a CAGR of 16.5% p.a. to reach USD 345 Bn by 2022.
- Indian Cloud Computing market is USD 2.5 Bn (2018), dominated by SaaS (39%) and IaaS (39%), and has significant scope for growth (estimated to grow at 30% CAGR to become USD 7.1 - 7.2 Bn by 2022).
- Emerging technology, commercial & consumer trends like Edge computing, Machine learning, on-demand models, Immersive experiences and XaaS will further drive adoption and innovative use cases.
- New age companies, those incorporated in the last decade (Born in the Cloud era) are driving Cloud adoption by adopting Cloud first strategy and setting example for others to follow.
- In India, Cloud adoption levels are high for few industry verticals e.g. IT/ITeS, Communications, Media & Internet enabled companies. However, Banking, Healthcare & Retail are still in the early stages of adoption.
- Cloud computing demand drivers in India : Growing opportunities from world IT outsourcing market, increased awareness of Cloud computing benefits, consumerization of IT, requirement of agile IT spending, proliferation of start-up ecosystem, and emerging technologies in India.
- Cloud computing supply drivers in India : Presence of diverse service providers, availability of skilled talent with deep domain knowledge, cost advantages in platform / product build out, mature customer service and Government initiatives that are driving Cloud Growth in India.
- Challenges for Cloud Ecosystem Growth in India include data security & privacy, interoperability, loss of control, vendor ecosystem lock-in, Quality of

Service, cost savings uncertainty and regulatory uncertainty.

- In order to set a strategic direction for the Cloud, we recommend that GoI setup tangible targets for Cloud e.g. % of Govt. IT spends on Cloud, % of India's share of Global outsourcing market. In order to boost the overall implementation, rollout and adoption of Cloud, basic infrastructure such as reliable and high quality power for Data Centers, Affordable data plans for consumers on high speed & reliable internet are a must-have

Source : Gartner Cloud Forecast 2018Q1, Industry reports, Deloitte Analysis

4.2 Global & Domestic Market Size of Cloud Computing Business

- SaaS is the largest service type with a market share of 39% reaching to USD 129 Bn by 2022.
- SaaS is expected to grow at 16% (CAGR) and reach USD 129 Bn. By 2022
- SaaS share in Cloud spending is driven by a multitude of Cloud-based software offerings as well as IT spending shifts towards lower-cost solutions by Startups, Large and Medium-Small enterprises.
- IaaS is expected to have largest growth (25.4% CAGR), with Top-3 players in Cloud introducing to offer Hybrid Cloud offerings to consumer. IaaS growth is

expected to be driven by data security & safety measures provided by CSP.

- PaaS is expected to grow at a CAGR of 20.7% to reach ~USD 32 Bn in 2022.
- Other services e.g. Cloud management etc. will grow at a moderate CAGR of 8.7% to reach ~ USD 80 Bn in 2022.
- India's IT spending as a % of its GDP for 2018 is only 1.6%, which is almost half the global average of 3.0%.
- India's Cloud adoption is currently placed at 6.0%, which is lagging behind global average of 7.9% and is almost half the US, UK adoption levels of 11.4%.
- The current global trend suggest that the IT spend and Cloud adoption in India is at a nascent stage and there is a significant scope for growth, both in terms of IT spending and adoption of Cloud in India in the near future.
- Cloud computing in India is currently estimated to be USD 2.5 Bn, dominated by IaaS & SaaS.
- Share of SaaS as a % of Total Cloud spend is expected to increase from 39% in 2018 to 47% by 2022.
- IaaS growth is expected to remain, but share is expected to shrink to 33% in 2022 from 39% in 2018.
- Over 13% of India's workloads are expected to be moved to Cloud driving up the adoption of Cloud

Source : Gartner Cloud Forecast 2018Q1, Deloitte Analysis, world bank data, Gartner Market Databook 1Q18

4.3 Cloud Service Provider-Technology Based Startups

Table 2.Cloud Service based Startups details

CLOUD SERVICE PROVIDERS	SERVICE OFFERING	GEOGRAPHICAL FOCUS	KEY OFFERINGS
<i>Practo</i> is the leading healthcare platform that	SaaS / IaaS / PaaS	World wide	-Analytics -Databases

connects millions of patients with healthcare providers across the world. Founded in 2008 , HQ in Bangalore			-Networking -Appointment Booking -Online doctor consultation -Ordering medicines.
Knowlarity Communications is a pioneer in mechanized voice advances with an economical facilitated custom voice arrangement that associations use to make customized calls to a great many their clients in multi day Founded & HQ: 2009, Singapore	SaaS / IaaS / PaaS	Geographically expanded in Southeast Asia, South Asia, and the Middle East	-Virtual Receptionist -Superfax -SmartIVR -Hosted PBX -IVR, Toll Free Numbers -Virtual Numbers Conferencing -API -Cloud
Freshdesk is an honor winning cloud-facilitated help desk solution provider company, it's arrangement outfitted with top tier highlights for conveying quality client support. Once set up, Freshdesk transforms your help messages into tickets that you can follow for fast and precise reaction Founded & HQ: 2010; Chennai, India	SaaS / IaaS / PaaS	World Wide	-Customer support service -Multi-channel support -Analytics -Customer queries
Druva is currently one of the leading companies in Cloud data protection and management operating across 6 countries It's customers include over 4,000 global organizations, and protects over 40 PB of	SaaS / IaaS / PaaS	World Wide	-Data management-as-a-service solution -Cloud applications -Data protection Security -Analytics -Server

data. Founded & HQ: April 2008; California, USA			
Pentation Analytics is an insurtech company which helps enable insurers and intermediaries to better engage with policy holders Founded & HQ: 2015; Hartford, Connecticut	SaaS / IaaS / PaaS	India , China and USA	-Predictive intelligence -Process automation tools -AI -Analytics -Enterprise applications
ESDS is one of India's driving Managed Data Center Service and Auto-Scalable Cloud Solution supplier. ESDS has officially moved forcefully toward turning into India's No.1 Cloud Hosting Company, building up a colossal customer base. Founded & HQ: April 2007; California, USA	Brokers/ System Integrators W	World Wide	-Managed Data Center -Managed Cloud Solutions -Virtualization -Disaster Recovery -Server Hosting
Pi Datacenters is Asia's largest uptime certified tier IV, state-of-the-art, greenfield data center organization, based in Amravati, Andhra Pradesh Founded & HQ: 2014; Amravati, India	Brokers/ System Integrators	Asia	-Disaster as a recovery -Enterprise applications on the Cloud -Cloud Hosting -Platform as a Service
Cloudmantra is a start-up providing AWS and SMAC services to start-ups, corporates, enterprises and consumers Founded & HQ: 2012;	Brokers/ System Integrators	World Wide	-Cloud Advisory -Cloud migration services & deployment -Managed Services -Big Data & Analytics -Cloud Native app -

Pune, India			&product development -DevOps
Tata communications offer a full breadth of solutions and global reach to support clients Cloud needs Founded & HQ: 1986; Pune, India	Brokers/ System Integrators	World Wide	-IZO platform -Application aware networking -Managed security
CtrlS is amongst the prime data centers in India, extending colocation, cloud hosting and network solutions Founded & HQ: 2007; Hyderabad, India	Brokers/ System Integrators	World Wide	-Co-location services -Managed Services -Banking community Cloud -ERP community Cloud -Remote Infrastructure Management (RIM) -Work Area Recovery (WAR) -SAP Colocation Services -SAP HANA Hosting
Netmagic is a premium Managed Hosting and cloud service provider in India Founded & HQ: 1999; Mumbai, India	Brokers/ System Integrators	World Wide	-SimpliNet Load Balancer -SimpliNet Virtual firewall -SimpliStor -Cloud computing -Managed Security -Disaster Recovery-as-a-Service(DRaaS) -Software-Defined Storage
DigitalOcean, Inc. is a USA based cloud infrastructure which provides developers Cloud services that support to deploy and scale applications that run concurrently on various computers Founded & HQ: 2011; New York,	Brokers/ System Integrators	Asia	-Cloud Computing -Cloud Servers -Virtual Hosting -Cloud Hosting -Cloud Infrastructure -Simple Hosting -Virtual Servers

USA			
Mindtree carries an all holistic approach to deal with Cloud environment and infrastructure which helps an organization's to transform its business to digital Founded & HQ: 1999; Bangalore, India	Cloud Computing	World Wide	-Cloud strategy services -Cloud migration services -Cloud infrastructure and implementation services -Cloud security and governance services -Cloud management services.
Cognizant Cloud360 hyper platform is considered as a director of enterprise Cloud services that delivers as on-demand service experience for better Cloud-enabled environments Founded & HQ: 1994;New Jersey, USA	Cloud Computing	World Wide	-Cloud Strategy and Consulting -Cloud Application Services -Cloud Management Services -Cloud Infrastructure Services -Cloud Software Services
HCL, a leading global technology services company, offers solutions and services to help enterprises achieve their Cloud goals Founded & HQ: 1976; Noida, India	Cloud Computing	World Wide	-On-premise Cloud assessment -Cloud design consultancy -Private Cloud build -Cloud transformation -Operations and Optimization
Mobisy Technologies Pvt. Ltd. intends to put the potential of technology and data in the hands of common field sales and supply chain operators and support them sell smartly and efficiently. Founded & HQ: 2007;	SaaS	World Wide	-Sales force automation -Enterprise mobility -Supply chain automation -Mobile application development -Retail e-commerce application -CPG sales automation -Distribution channel

Bangalore, India			automation -Retail execution
GeniSIGHTS is established with a focus on researching and devising the Sophisticated analytical techniques to solve the pressing needs of the businesses. Founded & HQ: 2016; Chennai, India			-E-retail: market basket analysis, market modeling, AB testing, Uplift modeling and data analysis -Travel: pricing analysis, customer segmentation -Finance: Credit scoring, portfolio optimization -Telecom: churn analysis, market basket analysis, pricing and performance analytics
Chargebee controls all crucial workflows from lead to the ledger with power-packed integrations that include Salesforce, Xero, Quickbooks, Avalara, Slack,etc Founded & HQ: 2011; Walnut, California,USA	SaaS	World Wide	-Integrate payment gateways -SaaS Metrics -Email notifications -Accounting -Customer Management
CloudCherry is Customer Experience Management software that helps global enterprises improve customer experience, track customer journeys and boost profitability. Founded & HQ: 2013; Salt Lake City, USA	SaaS	World Wide	- Customer experience management -Key performance metrics -Churn management -Omni-channel experiences -Brand experience
Exotel is a Cloud telephony platform that	SaaS	World Wide	Smart business phone system-IVR, call

powers communication for businesses, startups and small and medium enterprises in India. It provides APIs that support companies devise their communication flow Founded & HQ: 2011; Bangalore, India			recordings and analytics, missed call alerts, custom call flowbuilder Allows user to make calls directly from user's browser without copying numbers
Loginext is enterprise logistics management software where solutions are designed to serve all client needs using smart technology and big data analytics enabling comprehensive field service management. Founded & HQ: 2014; California, USA	SaaS	World Wide	-Real time tracking -Field sales-force automation -Dynamic route planning -Location intelligence -Delivery automation software -Supply chain optimization -On-demand delivery software
Zoho is an electronic online office suite containing word handling, spreadsheets, introductions, databases, note-taking, wikis, web conferencing, client relationship the board, venture the xecutives, and so on. Founded & HQ: 1996; California, USA	SaaS	World Wide	-Web based business tools -IT solutions -Business productivity suite -Network management -Enterprise IT management -Social media management -Invoicing -Email marketing
ADAS technologies help provide its clients end-to-end business solutions by creating software's that are creative,	SaaS	World Wide	-ERP solutions -Software development -Website application -Search engine optimization

innovative and technically sound in order to meet the requirements and objectives Founded & HQ: 2006; New Delhi, India			
Manthan delivers business intelligence (BI), analytics, and artificial intelligence solutions to global businesses. The company develops and markets a suite of software solutions to consumer businesses, enabling them to make profitable data-driven business decisions. Founded & HQ: 2003; Bangalore, India	SaaS	World Wide	-Customer Marketing Platform -Analytics Platform -Merchandise Analytics -Store performance solutions -Supplier collaboration platform

Source: Compiled by Authors, data collected from various resources and website, NASSCOM reports.

4.4 Cloud Startup ecosystem- Challenges

Recognizing all the potential and expansion of cloud computing has encountered in recent ages, there are also many challenges businesses are suffering. While the outlook is largely positive, there are a few hurdles to overcome for increasing Cloud adoption by new emerging enterprises. These challenges are:

- Data Security
- Interoperability
- Regulatory Compliances
- Loss of Control
- Re-architecture of process and system
- Vendor ecosystem lock-in
- Cost saving uncertainty

Data Security: Data security is a major concern for companies managing sensitive customer and business information. India ranks 4th when it comes to online security breaches.

Interoperability: Necessity for Large Enterprises to have capability to integrate smoothly with existing deployments, in addition to cost benefits.

Regular Compliances: National and international laws on data sovereignty and data privacy, industry specific regulatory compliances and jurisdictions are the top considerations for enterprises.

Loss of Control: Perceived concerns around potential loss of governance at an infrastructure level, where enterprises lose

direct oversight of data, servers and security protocols

Re-architecture of process and system: Migration to Cloud infrastructure and offerings tends to have a cascade down impact on the existing processes and systems, which need to be re-engineered

Vendor Ecosystem Lock-in: Potential loss of flexibility of migrating in and out of the Cloud vendor ecosystem, they also lose out on access to better products and pricing available with other Cloud vendors.

Cost Saving Uncertainty: Visibility of cost savings tend to shrink in the longer run, and is a challenge to businesses as most Cloud service providers have complex pricing models which may also include hidden charges in their offerings.

4.5 Government Initiatives and Policies to support Cloud Computing Ecosystem in India

Indian government has also taken multiple steps to make India a Cloud conducive market and launched multiple policies to boost tech based startups, some of these are as following:

Cloud First Policy under 'Meghraj'

So as to use and tackle the advantages of Cloud Computing, Government of India set out upon a goal-oriented activity – "GI Cloud" which has been began as 'Meghraj'. The focal point of this activity is to quicken conveyance of e-benefits in the nation while enhancing ICT spending of the Government.

NIC Cloud Services

So as to encourage client offices in profiting Cloud administrations, NIC has selected Cloud Coordinators who are knowledgeable with Cloud Technology and NIC Cloud administrations.

These Cloud Coordinators would control and bolster the clients in setting up and overseeing Cloud accounts, making and overseeing servers on Cloud just as facilitate with Cyber Security and Network groups of NIC, as and when required.

National Informatics Center (NIC) started providing Cloud services to consumers (services are open to Government & PSU only as of now). The first National Cloud was setup by NIC in 2014.

NDCP 2018: Cloud Vision for India 2022: TRAI in National Digital Communications Policy, defines Cloud vision for India 2022 as "Establishing India as a global hub for Cloud computing, content hosting and delivery, and data communication systems and services "

4.6 Global Cloud Computing Market Size:

- Driven by the positive impact of trends, Cloud spend is catching up fast on traditional IT across the globe.
 - Cloud spending was at \$152 billion in 2017, and estimated to be at \$187 billion by the end of 2018
 - Growing at 16.5% (CAGR), Cloud spending is expected to touch \$345 billion by 2022
- Globally, Cloud is expected to contribute increasing proportion of total IT spending by Enterprises.

- Trends show large number of enterprises showing Cloud-first tendencies as a way of maintaining competitive advantage and relevance in the business environment.
- Large Enterprises are likely to move workloads away from traditional and virtualized environments toward the Cloud at a relatively faster rate than prior Cloud adoption waves.
- SaaS is the largest service type with a market share of 39% reaching to \$129 billion by 2022.

(Source: Gartner Market Databook 1Q18, Gartner Cloud Forecast 2018Q1, Deloitte Analysis)

Indian Market Size for Cloud Computing

- Current state of Cloud penetration across countries indicate significant opportunity for growth in India.
- Cloud computing in India is currently estimated to be \$2.5 billion, dominated by IaaS and SaaS
- India's IT spending as a percentage of its GDP for 2018 is only 1.6%, which is almost half the global average of 3.0%.
- India's Cloud adoption is currently placed at 6.0%, which is lagging behind global average of 7.9% and is almost half the US, UK adoption levels of 11.4%

- SaaS is expected to show strong growth driven by cost-effective and larger number of SaaS offerings for large, medium and small enterprises
The current global trend suggests that the IT spend and Cloud adoption in India is at a nascent stage and there is a significant scope for growth, both in terms of IT spending and adoption of Cloud in India in the near future.
- Over 13% of India's workloads are expected to be moved to Cloud driving up the adoption of Cloud.
- Driven by high adoption levels India IaaS market is estimated to grow ~2.5X approaching \$2.3-2.4 billion by 2022

(Source: World Bank, Gartner Market Databook 1Q18, Gartner Cloud Forecast 2018Q1, Deloitte Analysis)

4.7 Cloud Computing Investment in India in Software as a Service (SaaS) Startups:

Investments in Indian SaaS companies have garnered over \$1.6 billion in the last 7-8 years. Increased investments in the SaaS industry in India are acting as a catalyst for India to become a SaaS hub. Investors are continuously pumping in more money in new innovative startups and helping them grow globally.

Year of Investment	No. of SaaS Companies	Investment in USD
2010	42	23
2011	50	55
2012	72	118
2013	65	107
2014	71	232
2015	73	562
2016	24	329
2017	7	258

(Source: NASSCOM Reports)

These increasing investments are leading to a surge in SaaS startups in India. The successes of early startups like Zoho and Freshdesk, who have made a mark globally, have added to this surge. Indian startups' world-class solutions combined with easy access to global customer base online, will help India become a strong player in the global SaaS industry.

Conclusion

Cloud startups in India have gained major share in the global tech startups ecosystem e.g. Zoho, freshworks etc. Globally, increasing number of countries are embarking on initiatives for development of Cloud ecosystem, the prominent ones being, 'Cloud first' policy, providing financial incentives for setting up data centers, providing Government instituted Clouds to promote innovation, etc. The Government of India in NDCP 2018 has stated the vision for Cloud as 'Establish India as a global hub for Cloud computing' and has taken multiple steps for its growth: 'Cloud first' guideline (MeghRaj) along with NIC provides Cloud services. It's a verifiable truth, cloud computing is changing the IT business in general. It is moreover shaking up the business information (BI) and expanding the business skyline. Through my study we foresee cloud computing will develop in the coming days, so business founders should consider and adopt the changes accordingly. In this paper we concluded that cloud computing gives many propelled highlights, despite everything, it has a few deficiencies, for example, the moderately high working expense for both public and private Clouds. In my study we also recommended that the GoI is required to thoroughly evaluate the consequences of data localization including industry impact,

economic impact, impact on data privacy and security before implementing data localization.

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