

# Impact Of Cloud Computing In Indian Healthcare Firms: A Study

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**Abstract:** Cloud computing (CC) is an advanced technology that firms can use to reduce costs and increase efficiency. However, most firms hesitate to adopt CC. This technology has become a dominant IT trend during the past few years for its potential to remarkably change the technology and the business landscape. Extant studies have demonstrated CC benefits as well as few challenges associated with CC services application theoretically. However, no extant study has examined the technology, organizational, environmental, human and business (TOEHB) context. The study is purposed to identify the factors which influences the cloud computing adoption (CCA) in Indian healthcare sector through technology, organizational, environmental, human and business (TOEHB) perspective. This research was conducted using methodology of quantitative technique which was established on a study of 307 healthcare firms i.e. hospitals in India. A research model was proposed which consisted of seventeen hypothesis and then tested through logistic regression analysis and confirmatory factor analysis. The findings of the study shows that relative advantage (RA), infrastructure readiness (IR), trust & security (TS), higher administration support (HAS), peer pressure (PP), service expertise (SE), internal excellence (IE), prior experience (PE) hard financial analysis (HFA) and soft financial analysis (SFA) were significant contributors in cloud computing adoption (CCA) for Indian healthcare perspective. This empirical research provides original observations for CCA for Indian healthcare perspective.

**Index Terms:** Factors, Technological, Organisational, Environmental, human, business, Cloud Computing Adoption (CCA), Healthcare, India.

## 1 INTRODUCTION

Technological innovations, such as cloud computing (CC), social media, and mobile devices assist firms with gaining intensity and strategic advantages (Lee 2019). Among these, CC has pulled in significant consideration on the grounds that their services offer various advantages: It gives firms on-request self-benefit, broad network access, and asset pooling with instant calculations and exceedingly adaptable capacity through its data centers and calculation technology (Brender & Markov, 2013; Mezgár & Rauschecker, 2014). Cloud computing (CC), certainly not another thought. Its model goes back to those days when researchers and firms rented computation time on large main frame computers. Firms like IBM developed these in the 1950s. John McCarthy who was Stanford Computer Researcher and an Artificial Intelligence pioneer, and Douglas Parkhill, at that point Canada's Assistant Deputy Minister for Research imagined in the start of 60s that calculation may some time or another be organized as an open utility like power and water (McCarthy 1961; Parkhill 1966). CC has been in the midst of the sixties and since the offer of a significant bandwidth in the nineties; it could be created to serve the majority. With the end goal to get by in this fast developing condition, worldwide rivalry places gigantic weight on firms to decrease price, increment gainfulness and upgrade productivity which has urged to receive the most forward innovations that empower them to lessen costs, support upper hand and enhance the bottom line (Misra and Mondal, 2011; Sultan, 2010; Winans and Brown, 2009; Demirkan, *et al.*, 2008; Gill, 2011; Ownwanne and Goel, 2010). Inception of CC has progressed as a critical technological advancement to diminish these getting ready expenses through enhancing accessibility, adaptability, reliability and preparing throughput (Dwivedi and Mustafee, 2010;

Choudhary and Vithayathil, 2013; Oliveira *et al.*, 2014). Lately, CC has been a critical idea in the IT domain; it is perceived as very important territory of venture in IT. It has the probability for encouraging economic development by offering existing actualized remote foundation for processing and information administration needs with lower beginning venture capital. CC advancements have turned into a genuine focus in IT field; it furnishes firms with various points of interest, for example, asset pooling, fast versatility, wide system get to... and so on (Mell and Grace, 2011). Embracing new innovations like CC will assist numerous firms with gaining an upper hand and enables them to wind up more proficient and profitable (Rohani and Hussain, 2015). CC is changing the manner in which firms purchase, offer and manage client; besides, it is additionally turning into a fundamental piece of the firm's strategies (Pyke, 2009). Classification of CC can be done into three models: IaaS (infrastructure-as-a-service), PaaS (platform- as-a-service) and SaaS (software-as-a-service). The last two are alluring to firms since they don't require investment in data innovation (IT) equipment. They just require agreeing to accept certain services dependent on individual needs. As such, the services are charged dependent on clients' needs and diminished expenses (Dutta, Peng & Choudhary, 2013; Wu, 2011). The cloud deployment and delivery models are talked about in this study. CC is a creative innovation. It has extraordinarily modified the IT business and its commercial operating logics. It empowers firms to diminish their working expenses by utilizing on-site hardware, information storage, and system in the data center, rather than buying extra hardwares. It likewise empowers firms to enhance efficiency and make new business models and values (Mezgár & Rauschecker, 2014; Navimipour *et al.*, 2015; Lee, 2019). However, firms hesitate to use CC because they are not the sole controllers; that is, the resources and information stored on the cloud server are hosted by CC providers. Therefore, numerous firms resist the acceptance of CC. (Lee, 2019; Wu, 2011). The main objective of this article is to identify the factors which influences the cloud computing adoption (CCA) in Indian healthcare sector through technology, organizational, environmental, human and business (TOEHB) perspective. Because CC is in its infant stage, investigating CCA is worthwhile. Also from the literature review, most of the earlier studies on CCA were done on

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manufacturing sector throughout the world, hence in this study we focused on Indian healthcare firms as the area of research. Healthcare firms around the globe endeavour to utilize innovative and effective solutions for give better healthcare services. One such activity is the utilization of ICT in healthcare firms to convey healthcare more efficiently and effectively. For healthcare organisations, CC offers opportunities such as: reducing the cost of IT services, providing better patient care and supporting research activities. However, healthcare firms still have some concerns about CC services such as the risk of system unavailability, data security and privacy issues (AbuKhouza, *et al.*, 2012). This makes an establishment for the utilization of innovative technologies and models that may advance healthcare IT frameworks, for example, CCA. This creates a foundation for the use of innovative technologies and models that may move healthcare IT systems forward, such as CCA. In spite of the fact that analysts recognize CC as an IT worldwide wonder, they additionally feature that the components affecting CCA assume dicerent jobs crosswise over dicerent economic conditions. One of the significant part that contributes intensely and is one of the biggest client of software advances is healthcare segment, anyway healthcare segment is still not utilizing CC to its full degree and thus not taking advantages offered by the same. There is a gigantic capability of CC in the healthcare firms particularly in India. Additionally, substantial measure of investment funds can likewise be watched while exploiting CC in healthcare division. Notwithstanding, there are various difficulties which should be settled and tended to before Indian healthcare industry can begin utilizing CC to its maximum capacity (Owunwanne, *et al.*, 2010). CCA in the healthcare segment requires vital planning to take full advantage of this rising model. Understanding the different key aspects and factors of CC is critical and could urge firms to embrace this computing model (Gazzar, *et al.*, 2016). The proposed TOEHB context in this study will be very helpful because most of the prior studies only consisted of Technological, Organizational and Environmental perspective but human and business perspective was neglected in this sector and hence the various sub-factors for human and business perspective are also included in this study for CCA in Indian healthcare firms' context. The TOE framework discusses about internet connection, compatibility, relative advantage, integration, infrastructure readiness, trust & security, higher authority support, change resistance, innovation acceptance, regulatory support, peer pressure, service expertise, innovativeness, internal excellence, prior experience, hard financial analysis, soft financial analysis (Alharbi *et al.* 2017; Haddad, *et al.*, 2014). The factors which are identified under human and business perspective are also important for CCA in healthcare firms. As a result TOEHB framework is proposed in this study for ease of understanding the advantages of CCA in healthcare firms of prospering countries like India.

Perspectives	Factor	Definitions in the study	Sources
Technological	Internet Connection	It refers to the ability of firms to get connected to net for accessing world wide web.	Alharbi, et al., (2017); Singh, et al., (2017); Alharbi, et al., (2017); Ayoobkhan, et al. (2017)
	Compatibility	It alludes to the advancement which fits the potential adopter's past works on, existing values and present needs.	Rogers, (2003); Gutierrez et al., (2015); Alharbi, et al., (2017); Singh, et al., (2017); Alharbi, et al., (2017); Ayoobkhan, et al. (2017)
	Relative Advantage	It is the dimension to which a technological perspective has a bigger number of advantages has a larger number of points of interest than hindrances.	Roger (1983), Roger (2003), Miller (2008), Tan et al., (2009), Kim et al., (2009), Jain and Bharadwaj (2010), Low et al., (2011), Alshamaila et al., (2013), Guitierrez (2015), Senyo, et al., (2016), Alharbi et al. (2017)
	Integration	It refers to join CC with present IT systems.	Alharbi, et al., (2017)
	Infrastructure Readiness	It alludes to technological infrastructure at the healthcare firms, for example, network technologies and IT frameworks.	Oliveira, et al. (2014); Senyo et al., (2016); Alharbi, et al., (2017)
	Trust & Security	It is the trust and privacy for the customers on CCA for utilizing CC.	Premkumar and Ramamurthy, (1995); Thong, (1999); Zhu et al., (2003); Zissis and Lekkas, (2012); Sultan (2014); Senyo et al., (2016); Alharbi et al. (2017)

Organisational	Higher Authority Support	Top administration has significant role in initiating, executing and adopting new advances as they have critical job in setting firm's strategy and building up directions for innovation.	Premkumar et al., (1997); Zhu et al., (2003); Pan and Jang, (2008); Alshamaila et al., (2013); Gangwar, et al., (2015); Ayoobkhan, et al., (2017)
	Change Resistance	It refers to the attitude towards change.	Alharbi, et al., (2017)
	Innovation Acceptance	It implies preparation of framework and IT human resources who are required to help cloud adoption.	Alharbi, et al., (2017)
Environmental	Regulatory Support	Governmental help which is given to empower CCA.	Nkhoma and Dang, (2013); Makena, (2013); Senyo, et al., (2016); Alharbi et al. (2017)
	Peer Pressure	Degree of pressure which a firm faces from their rival firms in same type of industry	Lafolet, (2011); Ramdani et al., (2009); Gangwar et al., (2015); Alharbi et al. (2017)
	Service Expertise	Service expertise refers to cloud service providers. Firms that need to receive services of cloud are worried about capacity of service providers to guarantee the accessibility of information when required.	Pan and Jang, (2008); Chong and Ooi, (2008); Sultan, (2011); Alshamaila et al., (2013); Chang et al., (2013); Gupta et al., (2013); Oliveira et al., (2014); Alharbi et al. (2017)
Human	Innovativeness	It enables firms to attempt the most recent advancements and to discover creative methods for actualizing IT administrations for better serviceability.	Alharbi et al. 2017
	Internal Excellence	It refers to the internal frameworks of standards and processes intended to deliver products and services that fulfil client requirements	Alharbi et al. 2017

	Prior Experience	It refers to previous experience of using IT resources	Haddad, et al., 2014
Business	Hard Financial Analysis	Financial analysis of tangible item that is to be owned by a firm	Alharbi et al. 2017
	Soft Financial Analysis	Financial analysis of intangible item that is to be owned by a firm	Alharbi et al. 2017

**Table 1.** Provides the list of factors which are found from extant literature as determinants for CCA in healthcare sector

Rest part of article is as per the following: relevant literature reviews on healthcare CCA is in Section 2 as well as presents a research model for healthcare CCA and estimation of seventeen hypotheses. Research methodology describing the way data accumulation and analysis in Section 3. The findings of the research in Section 4 and Section 5 explains the findings. At last, the article finishes with conclusion of the research done along with future research directions.

## 2 Literature Review

### 2.1 Cloud delivery and deployment models

There are three models of in CC; first is infrastructure-as-a-system (IaaS). IaaS is known as essential dimension of cloud organizations, which passes on framework administrations to customers over a system like software and hardware (Mell, and Grance, 2011). Second is Platform-as-a-service (PaaS). Access to every asset is offered online, required to fabricate an application. Utilities comprises; application structure, enhancement, testing, arrangement and encouraging devices, which offer access to programming dialects and libraries (Velte, et al., 2009). Software as a service (SaaS) is the third dimension of CC. SaaS is known for giving customers a touch of programming or software over a system or network, for instance, web, where it facilitates customers to introduce the product and use application at whatever point and wherever they approach the system or network (Gangwar, et al., 2015). It likewise gives an agile updating to applications as the provider of service encouraging the application structures performs updates that happen clearly with no reserved downtime, and it helps with the ejection of legacy systems which makes firms widen their item application into other worldwide locales (Sultan, 2011 and Yang, 2012). There are four deployment models through which services of Cloud are offered, in particular, private, public, community and hybrid. To begin with, the private cloud offers interior usage of innovations that are kept up in house. Private cloud is restrictive to a firm and now and then managed by the firm itself. Next cloud is public which gives services to the overall population which includes firms and people. Public cloud framework is usually owned, facilitated and directed by third-party utility providers. Some prominent public cloud administrations are Salesforce.com, Google AppEngine, S3 (Simple Storage Service) and Amazon EC2 (Elastic Cloud). Community cloud provides cloud service to gathering of firms with tantamount trade aim, security and contract document requirements. Participation of gathering is compared to a network where mutual interest individuals share. Cloud benefits that the community expand are to individuals. Ultimately, the hybrid cloud gives a mix of all the three i.e. community, public or private deployment empowered by a regulated innovation which guarantees portability of information and application (Mell and Grance, 2010; Yang and Tate, 2012; Wai-Ming et al., 2013; Marston et al., 2011; Senyo et al., 2016; Marinos and Briscoe, 2009; Jula et al., 2014). Apart from these main service delivery models, various varieties are as of now found in the writing. These incorporate ideas, for example, IT-as-a-service, SCM-as-a-service, data-as-a-service etc. Everything-as-a-service or X as a service coinage has thusly come to practice. In any case, it is important that there are three-principle models only for delivery of service and rest are all off-shoots from the three (Mujinga, 2012; Senyo et al., 2016).

### 2.2 CCA from Indian Healthcare Perspective

The greater part of the Indian populace (roughly 70%) still lives in rural zones in India. Furthermore, out of this 70% rustic populace, the vast majority of them can't get to the doctor's facilities, specialist doctors, critical medication and prescription source and additionally medical equipment and tools. India, as a nation in an entire, has around 25,000 essential wellbeing focuses which is just a fundamental arrangement of open

doctor's facilities and wellbeing focuses. There is shortage of Public hospitals too outside huge urban communities. Public hospitals' service standard varies from one another and lack even the basic healthcare record management systems (Pucihar, *et al.*, 2016). Indian healthcare sector is one of the biggest areas regarding income and work. Great nature of medical services and prepared medicinal assets are not available over the nation. India is deficient in keeping up the national health record through any consolidated electronic framework. On the off chance that such framework exists and actualized on cloud, it would be an extraordinary activity to keep up and deal with the patient's health record at one place that can be accessed from anyplace by the medicinal specialist to give fast and compelling healthcare resources in case of emergency. This would likewise permit the Indian health segment and different therapeutic related sellers to investigate on the future need and give better equipment or medications as has occurred in prospered nations (Habjan, *et al.*, 2017). With the appearance of cloud in Indian healthcare segment, the method for giving the medical services will be changed, for example, telemedicine. With the assistance of such headway even in absence of assets, the better healthcare services can be accessed and given via prepared restorative professionals in remote regions of the nation. Such advantages may draw in the healthcare suppliers to embrace the cloud innovation. With the selection of CC in healthcare industry, government can build up an arrangement to keep up and deal with the patient's information at one place and lessen the expense of IT framework by individual healthcare service providers. On the off chance that Indian healthcare industry starts to move onto Cloud based frameworks, all the related difficulties can be overcome and ready to make a centralized healthcare record over the nation. Later on, we can begin the telemedicine with the assistance of Cloud based healthcare applications.

### 2.3 Research framework, model and hypotheses

Surviving CC writing has utilized prominent adoption frameworks and speculations, for example, grounded theory, technology adoption model (TAM), TOE framework, theory of reasoned action (TRA), migration theory, diffusion of innovation (DOI) etc. Additionally it has been seen that two different frameworks are utilized in study of CCA, to be specific, firm adoption (meso-level adoption) and individual adoption (micro-level adoption). For example, DOI, TAM and TRA are conspicuous in innovation adoption.

#### 2.3.1 Different Frameworks

TAM is a broadly acknowledged model for understanding adoption of IT and its usage across worldwide contexts. This model tries to clarify relationship between technological innovative acceptance and adoption accordingly, behavioural intension to utilize it (Gangwar *et al.*, 2015). TOE is utilized for firm dimension adoption of different IT services. It incorporates technological, organizational and environmental factors which makes it beneficial over other adoption model in studying technological innovation acceptance, innovation use and value creation from innovation development (Gangwar *et al.*, 2015; Senyo *et al.*, 2016). Theory of DOI states individuals receive new thought, behaviour or goods as new or creative. Researchers found that individuals who adopt an innovation early have unexpected qualities in comparison to individuals who adopt a development later. In any case, the constraint to

this theory is the adopter classes did not start in public health and it was not created to explicitly apply to selection of new practices or health innovators and it likewise does not consider a person's assets or social help to adopt new innovation or behaviour. TRA explains relationships among behaviours within human action and attitudes however this theory is restricted regarding having the capacity to foresee practices that expect access to specific chances, skills, conditions or assets. Be that as it may, aforementioned models are reasonable for adoption in individual dimension and will in general regard just the dimension of technological adoption and not the environmental, organizational and ethical points of view. As this paper explores the CCA determinants among firms, the TOE framework addresses the factors of TOE and is treated as suitable theoretical framework. This framework was produced to examine firms' choice to accept and execute an inventive innovation contemplating the context of TOE (Tornatzky and Klein, 1982). Along with TOE perspective human and business perspective has also been discussed in this research with reference to prior studies (like Alharbi, *et al.*, 2017; Ayoobkhan *et al.*, 2017). But as our focus of research is Indian healthcare sector so, TOEHB is proposed in this study.

#### 2.3.2 TOEHB Framework

The TOEHB context in this study will be very helpful because most of the prior studies only consisted of Technological, Organizational and Environmental perspective but Human and Business perspective was neglected and hence the various sub-factors for Human and Business perspective are also included in this study for CCA in Indian healthcare context. As human and business perspective plays an important part for adopting any new kind of technology and it is an equally important factor along the other three factors. The TOE framework discusses about internet connection, compatibility, relative advantage, integration, infrastructure readiness, trust & security, higher authority support, change resistance, innovation acceptance, regulatory support, peer pressure, service expertise, innovativeness, internal excellence, prior experience, hard financial analysis, soft financial analysis. The factors which are identified under human and business perspective are also important for CCA in healthcare firms. As a result TOEE framework is proposed in this study for ease of understanding the advantages of CCA in healthcare firms of prospering countries like India. RA is characterized as the dimension to which a factor related to technology can provide more gain to the healthcare firms (Roger 2003). CC guarantees different benefits to firms that embrace it, for example, proficient coordination among firms, speed of business communication, better client communication, and access to market information mobilization (Low *et al.*, 2011; Alharbi, *et al.*, 2017). Different advantages of CC incorporates diminished costs, flexibility, scalability, portability, pay-per-utilize, and shared assets (Miller, 2008; Guitierrez *et al.*, 2015). The healthcare client of CC can scale up the assets and infrastructure according to necessities. Regarding flexibility, CC enables clients to access and work with reports from wherever and whenever given that they have a PC connected with internet. Additionally, the capacity to offer shared assets is another favourable position of CC that empowers representatives to get to assets put on cloud regardless of their location, in this way firms saves a great deal of time and cash (Jain and Bharadwaj, 2010). Pay-per-use feature also is an added advantage of CCA (Senyo *et al.*, 2016). Thus this

study proposes following hypothesis: H3: RA influences CCA *Integration (IG)* Integration is a concern for any firm especially for healthcare sector. Integrating various departments of a hospital or integrating various hospital in one platform for sharing the resources is very important for successfully using getting benefits after CCA (Alharbi, *et al.*, 2017). If any software is not compatible with cloud then there is a need of IT experts for solving this issue and there is a shortage these experts in healthcare sector in India. Thus the proposed hypothesis is: H4: IG influences CCA *Infrastructure Readiness (IR)* It alludes to technological framework at the healthcare firms, for example, network technologies and IT frameworks. Different researches have demonstrated that IR is a facilitator of CCA (Oliveira, *et al.* 2014; Senyo *et al.*, 2016; Alharbi, *et al.*, 2017). It implies preparation of framework and human resources of IT who are required to support cloud selection. Firms who have the IR are better primed for CCA. Thus the proposed hypothesis is: H5: IR influenced CCA *Trust and Security (TS)* This factor is a concern for healthcare firms as they feel that their data is not safe and secured in cloud as they do not have direct control on them (Zissis and Lekkas, 2012; Sultan 2014; Senyo *et al.*, 2016). However, private cloud solution implementation can ease the trust and security. There is a lack of trust and confidence to most of the organizations in the developing countries on this technology. Previous research works have not stressed on this as an important factor (Premkumar and Ramamurthy, 1995; Thong, 1999; Zhu *et al.*, 2003). But study done by Senyo, *et al.*, in 2016 have fulfilled this gap. Thus the proposed hypothesis is: H6: SC influences CCA

#### **Organizational Context (OC)**

OC can be characterized as the assets and characteristics of the firm (Amini, 2014). It identifies various diverse factors concerning the firm itself, including firm size (FS), firm scope (FSC), higher administration support (HAS) and innovation acceptance (IA). But in healthcare sector research identified three major factors higher administration support (HAS), change resistance (CR), technology readiness (TR) as variables that should be considered in CCA (Tornatzky and Klein, 1982; Low *et al.*, 2011; Oliveira and Martins, 2010; Alshamaila *et al.*, 2013; Makena, 2013; Alharbi, *et al.*, 2017; Ayoobkhan, *et al.*, 2017). *Higher Administration Support (HAS)* HAS assumes a significant role in beginning, implementing and accepting new technologies as they have significant role in setting organizational strategy and establishing directions for technology (Gangwar, *et al.*, 2015). The support dimension results in number of assets dispensed to that technology (Oliveira and Martins, 2010). There is a positive relation between HAS and adoption of an innovation (Premkumar *et al.*, 1997; Zhu *et al.*, 2003; Pan and Jang, 2008; Alshamaila *et al.*, 2013; Ayoobkhan, *et al.*, 2017) as well as negative relation also (Alharbi, *et al.*, 2017) In the event business process reengineering is required for CCA, the intensity of upper management is a significant contributor as per past research. Thus the proposed hypothesis is H7: HAS influences CCA. *Change Resistance (CR)* There is a plausibility for resistance to change especially from IT staff at the firms. One possible clarification behind the impediment is its worry of IT staff that they may lose their positions due to the CCA (Alharbi, *et al.*, 2017). Hence, CR is an important factor for CCA. Thus the proposed hypothesis is: H8: CR influences CCA. *Innovation Acceptance (IA)* Innovation Acceptance means to grasp new

innovation for achieving objectives that is determined by the overall state of mind resulting from a gestalt of mental patrons and inhibitors. It implies preparation of framework and human resources of IT who are required to support cloud selection. Firms who have the technological readiness are better primed for CCA. Hence, IA is an important factor for CCA. Thus the proposed hypothesis is: H9: IA influences CCA.

#### **Environmental Perspective (EP)**

It covers the large scale region that a firm directs its business including industry advertise components and the presence of technology service providers. It is imperative to consider issues on environment relating to innovative selection choices of firms. Prior investigations (Zhu *et al.*, 2003; Chong and Ooi, 2008; Wu and Subramaniam, 2009; Oliveira and Martins, 2010; Low *et al.*, 2011; Ayoobkhan, *et al.*, 2017, Alharbi, *et al.*, 2017) had recognized factors, for example, industrial pressure, rivalry, access to assets provided by others, and bureaucracy matters as significant factors of adoption. The environmental factors utilized in this research includes regulatory support (RS), peer pressure (PP) and service expertise (SE). These factors are viewed as essential since they have considerable impact on the accomplishment of firms. *Regulatory Support (RS)* RS come as legislation that try to protect and promote healthcare firms that embrace a development (Nkhoma and Dang, 2013; Makena, 2013). There is no regulation in India that specifically prohibits, restricts or governs CCA. CC challenges geological limits and is available in various nations. In this manner, a legitimate support is regarded critical to secure firms that receive CC as laws change from nation to nation (Senyo, *et al.*, 2016). Hence, in this study we have considered it as a factor. Thus the proposed hypothesis is: H10: RS influences CCA *Peer Pressure (PP)* It is the level of pressure which a firm faces from their rival firms in same kind of industry. PP is distinguished as instigator of acceptance (Lafollet, 2011). This peer can expect a positive employment in new innovation selection especially when the development impacts the opposition (Ramdani *et al.*, 2009). Thusly, firms those are first to CC adoption are required to infer gains in terms of survival and competitive advantage, this will influence other hospitals to CCA (Gangwar *et al.*, 2015; Alharbi *et al.*, 2017). Thus the proposed hypothesis is: H11: RP influences CCA. *Service Expertise (SE)* Earlier research have evaluated that in adoption of innovation SE is significant (Pan and Jang, 2008; Chong and Ooi, 2008). In CC, service experts relate to the cloud service providers. Firms that need to receive services of cloud are worried about capacity of service providers to guarantee the accessibility of information when required. Availability of SE is an important factor for CCA in healthcare. The advertising exercises, directed interchanges and past activities finished by these SE can significantly affect a potential customer's choice of whether to receive new IT developments or not. More particularly, managers' will investigate trading partners viewpoints, for example, governmental help (Alshamaila *et al.*, 2013; Oliveira *et al.*, 2014), Service linkage (Chang *et al.*, 2013), IT items co-creation and customisation (Gupta *et al.*, 2013) and seller locking (Sultan, 2011). Thus the proposed hypothesis is H12: SE influences CCA.

### Human Perspective (HP)

It alludes to the inward capacities of the firm's workforce and the essential technical competence and skills (Oliveira, *et al.*, 2014). Innovativeness allows hospitals to find innovative ways for CCA. Availability of internal expert also needs to be considered before CCA. The factors identified are: innovativeness (INN), internal expertise (IE) and prior experience (PE). *Innovativeness (INN)* The innovativeness of the leaders greatly affected the readiness to CCA in healthcare firms. It enables hospitals to attempt the most recent advancements and to discover inventive methods for actualizing IT services at the clinic for better serviceability (Alharbi *et al.* 2017). Thus the proposed hypothesis is: H13: INN influences CCA. *Internal Excellence (IE)* The accessibility of inside specialists is another imperative factor that ought to be viewed as while making the choice of CCA at healthcare firms. Its jobs staff will be changed because of the usage of CC to concentrate more on managerial exercises rather than operational exercises. Hospitals may need to enlist IT staff that can oversee CC agreements viably but it could be expensive to recruit them (Alharbi *et al.* 2017). Thus the proposed hypothesis is: H14: IE influences CCA. *Prior Excellence (PE)* As CC is a rising innovation, earlier innovation encounter is critical for healthcare firms. Notwithstanding, since the utilization of CC is as yet creating in the field of healthcare, the investigation identified that more preparation will be required for IT staff. Health centres are slow in adopting new information technologies and doctors prefer to utilize developed technologies for patient's wellbeing reasons (Haddad, *et al.*, 2014). Thus the proposed hypothesis is: H15: PE influences CCA.

### Business Perspective (BP)

From this research it was found that the healthcare firms must consider financial aspects before CCA. Important factors to be considered for CCA are financial aspects and strategic benefits after its adoption. The factors are: hard financial analysis (HFA) and soft financial analysis (SFA). *Hard Financial Analysis (HFA)* Financial analysis of tangible item that is to be owned by a firm (Alharbi *et al.* 2017). Thus, it is an important factor for CCA in healthcare firm. Thus the proposed hypothesis is: H16: HFA influences CCA. *Soft Financial Analysis (SFA)* Financial analysis of intangible item that is to be owned by a firm. An essential factor to be viewed as while adopting CC. CC will build joint effort between the hospital and different firms (Alharbi *et al.* 2017). H17: SFA influences CCA.

## 3 Research Methodology

This research means to decide the factors affecting healthcare firm's choices to CCA from various hospitals in India, through the use of TOEHB framework, with the end goal to enable firms to more readily think about their future CCA. Data was collected through structured questionnaire and reliability was also tested. The target populations were healthcare firms operating in India and stratified random sampling technique was adopted as it allows population harmony from the sub population (Hair, *et al.*, 2010). Government and private hospitals of rural and urban areas were set as target population. The respondents from the selected hospitals or health centres were doctors, procurement department staffs, hospital store staffs who have IT knowledge of current and future operations of their respective firms. The sample was selected from each strata through the technique of Stratified

Random Sampling method. 307 responses were valid for analysis after data entry and examination. The valid sample represented 88.01% of the targeted sample. Structural equation modelling (SEM) and logistic regression is adopted as data analysis technique. The analysis of data was done in five stages, to be specific data examination, analysis of demographics, validity and reliability test, logistic regression analysis and confirmatory factor analysis (CFA). CFA was implemented for testing and approving the applied model underlying. AMOS version 22 was utilized for CFA on collected information for measuring model outcomes as CFA decides whether a validity test on an estimated model be replicated (Hair *et al.*, 2010; Byrne, 2010; Senyo, *et al.*, 2016). At last, implementation of logistic regression analysis, for hypothesis testing. The reason for choosing logistic regression technique among other factual techniques on the grounds that CCA which was dependent variable was dichotomously estimated.

## 4 Findings

4.1 Demographics characteristics of respondents Table 2 shows the distribution of respondents based on gender and years of online experience. The majority of the respondents have been participated in the survey are male of 74.59% and 25.4% of the respondents are female. Years of experience in using online services is concerned, 29.96% of the respondents are having less than 3 years of experience in using online services, while 48.85% of the respondents are having experience between 3-5 years. Around 21.17% of the respondents are having more than 5 years of experience in using online service in their organizations. Therefore, this implies that most of the respondents are having experience in surfing net in order to support the area of the research.

Item	Frequency	Percentage
<b>Gender</b>		
Male	229	74.59
Female	78	25.4
<b>Years of experience using online services</b>		
< 3 years	92	29.96
3-5 years	150	48.85
> 5 years	65	21.17

**Table 2.** Demographics characteristics of respondents

4.2 Validity and Reliability There are two critical estimates, validity and reliability that decide the trait and helpfulness of the information gathered. Validity is about correctness and whether the instrument estimates what it is proposed to measure. Reliability is about precision; it is utilized to check the consistency and soundness of the questionnaire. The researchers of the current study relied upon scales and items that were recently created and utilized by different analysts with comparable interests. Also, a draft of the questionnaire was checked on by two scholarly professors– who have adequate information and involvement in this extension to ensure that each item is measuring what is expected to measure, and to avoid any complexity from any vagueness or unpredictability in the expressing of the questions. Cronbach's alpha coefficient was used as an instrument to measure the

reliability (Hair Jr., J.F., Anderson, R.E., Tatham, R.L. and Black, W.C. (1998) *Multivariate Data Analysis*. 5th Edition, Prentice Hall, Upper Saddle River), the values of all indicators or dimensional scales should be above the recommended value of 0.70. Table 3 represents the results of Cronbach's alpha for the independent and dependent variables. Cronbach's alpha coefficients of all the tested variables are above 0.70 which indicates that the composite measure is reliable.

Variable	No. of items	Cronbach's Alpha
Technological Perspective	6	0.711
Organizational Perspective	3	0.755
Environmental Perspective	3	0.773
Human Perspective	3	0.791
Business Perspective	2	0.731

**Table 3.** Cronbach's Alpha

**4.3 Assessment of overall measurement model** The first factor TP was measured by combining the six variables namely, IC, C, RA, IG, IR and TS by the CFA analysis. The standardized factor loading (FL) of five variables was above 0.7 which demonstrated strong convergent validity for measuring TP. The second factor OP was estimated by combining three variables namely, HAS, CR and IA by CFA analysis. The standardized FL of three variables was above 0.7 which demonstrated strong convergent validity for measuring OC. Third factor EP was measured by combining three variables namely, RS, TPP and RP. The standardized factor loading (FL) of three variables was above 0.7 which demonstrated strong convergent validity for measuring OP. The significant standardized FL were respectively, 0.90, 0.95, and 0.93 that are above threshold recommended (0.7). The fourth factor HP, which is measured by combining the three variables namely: INN, IE and PE. The standardized factor loading (FL) of three variables was above 0.7 which demonstrated strong convergent validity for measuring HP. The three variables recorded FL of 0.89, 0.91, and 0.97 which are above the recommended threshold. The last factor BP, which is measured by combining 2 variables namely, HFA and SFA. The standardised factor loading (FL) of two variables was above 0.7 which demonstrated strong convergent validity for measuring BP. Both the variables recorded FL of 0.93 and 0.87 which are above the recommended threshold. Thus, for further analysis and retention the six constructs are valid in the altered measurement model. Despite of alternation in final measurement model the p-value was still significant. Due to large sample size the p-value was still significant as argued by Hair *et al.*, (2010).  $\chi^2/df$  can be a better criteria for analysis. Value of  $\chi^2/df$  is 1.71 which is less than commended threshold of 2 in Table 4 (Carmines and Mclver, 1981). The RMSE (root mean square error of approximation) of the final model had a value of 0.05 which is in concurrence with required criterion. In this way, the model fits the set of data. Table 3 shows the final measurement model, the incremental fit indices obtained ranges from 0.97 to 0.95 which is more than recommended threshold ( $\geq 0.90$ ). The PFI (parsimonious fit indices) additionally recorded estimations, 0.81 and 0.76, which are above recommended estimation of 0.5. Table 5 shows discriminant validity test, the AVE (average variance estimate) recorded by the variables which ranges from 0.831 to 0.915.

The values recorded are above 0.50 which is the validity threshold, it is an indication of acceptable convergent validity of the measuring scales (Hair *et al.* 2010). Additionally, AVE for each variable is higher than square of the correlation betwixt that construct and any other constructs, an indication of adequate discriminant validity between the constructs (Cable and DeRue, 2002).

Goodness-of-fit Indices	Bench Mark	Initial model
<i>Absolute goodness-of-fit measure</i>		
$\chi^2$ (CMIN)	0.05	0.00
$\chi^2/\text{degree of freedom}$	2	1.71
<i>Absolute badness of fit measure</i>		
Root mean square error of approximation (RMSEA)	0.08	0.06
<i>Incremental fit measure</i>		
Comparative fit index (CFI)	0.90	0.95
Incremental fit index (IFI)	0.90	0.95
Turker-Lewis index (TLI)	0.90	0.97
<i>Parsimony fit measure</i>		
Parsimony comparative of fit index (PCFI)	0.50	0.81
Parsimony normed of fit index (PNFI)	0.50	0.76

**Table 4.** Goodness-of-fit indices for final measurement model

				Shared Variance			
Constr ucts	CR	AVE	EP	TP	OP	HP	BP
EP	0.961	0.898	0.948				
TP	0.939	0.831	0.552	0.917			
OP	0.941	0.915	0.539	0.331	0.957		
HP	0.932	0.871	0.516	0.697	0.713	0.927	
BP	0.923	0.853	0.527	0.586	0.637	0.813	0.957

**Table 5.** Construct, AVE and shared variance

So, the data set is supported by final measurement model with sixteen variables out of seventeen proposed variables in the research model. The supported variables of all five factors among Indian healthcare firms are C, RA, IG, IR, TS, HAS, CR, IA, RS, PP, SE, INN, IE, PE, HFA and SFA. **4.4 Confirmation of Hypothesis** The testing of hypothesis using logistic regression adopted the following steps: Change in value of  $-2 \log$  likelihood ( $-2LL$ ) from the base model  $\chi^2$  test was performed, Hosmer and Leme, and estimation of Wald statistic is shown for the model fit. In order to estimate the significance of independent variables in improvement of model fit  $\chi^2$  test was used. In order to predict the model, value of  $-2L$  times the log was used by logistic regression (Hair *et al.* 2010). Table 6 shows the model summary where  $-2LL$  and  $R^2$  values are displayed. 13.2 percent value of Nagelkerke  $R^2$  points the data variation is explained by logistic regression in

table 5. Another method for contrasting the proposed research model with base model is Hosmer and Lemeshow test (Lemeshow and Hosmer, 1982) which is shown in table 7. The test indicated the research model and base model is not much distinct from each other and subsequently, possesses decent illustrative capacity. Hence at last, Wald test was performed for testing of hypothesis and level of significance for all significant individual independent variables (Hair *et al.*, 2010). As per significance ten out of seventeen proposed variables proved to be significant contributors for CCA. As per logistic regression output in table 8, ten out of seventeen proposed variables were significant contributors. RA, IR, TS, HAS, PP, SE, IE, PE, HFA and SFA are the ten significant contributors with p-value less than 0.05 which is the recommended threshold. IC, C, IG, CR, IA, RS and INN have greater p-values and hence they are rejected by the model. The final research model is shown in figure 2 along with p-values and coefficient values of the significant determinants of CCA. Out of ten significant factors or determinants, highest Wald value is recorded by TS, followed by IR, PE, HAS, SE, SFA, PP, RA, IE, HFA. The most important determinant for CCA is TS in the context of healthcare firms in developing or prospering nation.

Step	-2 Log likelihood	Cox and Snell R <sup>2</sup>	Nagelkerke R <sup>2</sup>
1	362.034	0.097	0.131

**Table 6. Model Summary**

Step	χ <sup>2</sup>	df	Sig.
1	10.558	13	0.227

**Table 7. Hosmer and Lemeshow test**

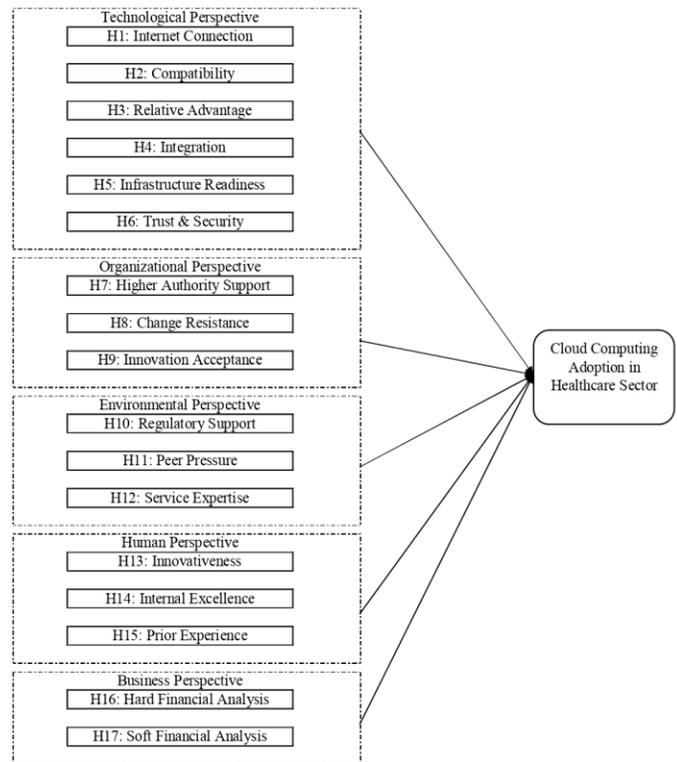
Factors	Coefficient (β)	SE	Wald	p-value	Support for model
Internet Connection (IC)	0.055	0.195	0.080	0.777	H1: rejected
Compatibility (C)	0.024	0.141	0.054	0.619	H2: rejected
Relative Advantage (RA)	-0.534	0.261	4.176	0.041	H3: supported
Integration (IG)	0.244	0.175	1.943	0.163	H4: rejected
Trust & Security (TS)	0.459	0.197	6.773	0.019	H5: supported
Infrastructure Readiness (IR)	-0.780	0.301	6.697	0.010	H6: supported
Higher Administration Support (HAS)	-0.417	0.163	6.543	0.011	H7: supported
Change Resistance (CR)	0.175	0.157	0.533	0.429	H8: rejected
Innovation Acceptance (IA)	-0.044	0.181	0.069	0.697	H9: rejected
Regulatory support (RS)	0.150	0.203	0.549	0.459	H10: rejected
Peer Pressure (PP)	0.613	0.261	4.766	0.047	H11: supported
Service Expertise (SE)	0.415	0.161	6.413	0.013	H12: supported
Innovativeness (INN)	0.139	0.127	1.913	0.161	H13: rejected
Internal Excellence (IE)	-0.531	0.257	4.163	0.037	H14: supported
Prior Experience (PE)	0.456	0.193	6.667	0.007	H15: supported

Hard Financial Analysis (HFA)	0.423	0.208	4.139	0.042	H16: supported
Soft Financial Analysis (SFA)	0.601	0.254	5.456	0.017	H17: supported
Constant	-1.021	0.847	1.459	0.229	
Notes: *p<0.05; **p<0.01					

**Table 8. Hypothesis confirmation in logistic regression**

### 5 Discussion

Figure 2 shows the final model consisting of factors and variables with significant coefficient values of determinants of CCA in healthcare sector.



**Figure 1. Research Model for CCA in Healthcare**

**Figure 2. Final CCA model for Healthcare sector**

#### 5.1 Technological Perspective (TP)

The TP at first comprised of IC, C, RA, IG, IR and TS. In any case, after the analysis of data, only three variables, RA, IR and TS were accepted. RA's significance in CCA is rational with prior research done (like To and Ngai, 2006; Wang *et al.*, 2010; Alharbi *et al.*, 2017). In any case, its  $-\beta$  value with CCA is conflicting with the researches above aside from the discoveries of Low *et al.*, (2011). The negative value may be due to specialized information required to comprehend CC, a generally new innovation, and its complex billing systems. Nonetheless, a few investigations have discovered RA to be negatively affecting CCA in the high-tech industry (Low *et al.*, 2011) or unimportant as in Taiwan hospitals (Lian *et al.*, 2014). The finding in the current study is consistent with other studies that found perceived benefits have positive impact on CCA decision. IR has critical effect on CCA. Present IT foundation need to adapt to a portion of the specialized attributes of CC. This finding is like the discoveries by HIMSS Analytics Cloud

Survey which demonstrated that so as to utilize CC services, healthcare firms need to update their system framework (HIMSS, 2014). Present research suggests that healthcare firms in India should upgrade a portion of their IT framework so as to execute cloud solutions. IR is a facilitator of CCA. TS additionally had critical effect on CCA and this is likewise in concurrence with surviving research (like Chebrolu, 2011; Zissis and Lekkas, 2012; Sultan, 2014). These earlier investigations stressed the significance of SC in the acceptance of a new development. The idea of CC manages a basic take a look at security of information, frameworks and providers of service on the grounds that, a rupture could result in significant issues for adopters. Along these lines, its noteworthiness as a determinant is the correct way (Lian *et al.*, 2014).

### 5.2 Organisational Perspective (OP)

HAS, CR and IA were variables that comprised OC factor for CCA. After analysis of data it was found that only HAS had significant impact on the CCA. The importance of HAS is reliable with different researches (like Dholakia and Kshetri, 2004; Pan and Jang, 2008; Low *et al.*, 2011; Alshamaila *et al.*, 2013) as it has been identified as a crucial determinant in technology acceptance. BPE and designation of assets might be required because of an innovation acceptance, in this way, top management's backing is required. But there is a confusion as it has perceived some negative impact too. This perplexity may allude to the way that choices about CC will require endorsement from different level of management (i.e. hospital directors and Ministry of Health directors). One conceivable purpose behind an apparent negative effect of best administration might be absence of learning about CC. Another conceivable reason is that a few managers may even now have a few worries about the execution of CC in healthcare firms (Tashkandi, *et al.*, 2015; Alharbi *et al.*, 2017). Along these lines, HAS is fundamental in the CCA as per the current research. Another vital factor in the firm's point of view is CR. This factor is vital on the grounds that the CCA will influence the entire firm not just explicit units or divisions (Low *et al.*, 2011). This factor was found to adversely influence CCA (HIMSS, 2014) which is relentless with the finding of this current investigation. A conceivable clarification for this can be, because of CCA its IT staff may end-up losing their positions. Workshops must be organised to explain the CC concept to all the stakeholders in the healthcare firm.

### 5.3 Environmental Perspective (EP)

RS, PP and SE are the variables that comprised the factor EP for CCA. After data analysis it was found that PP and SE has significant impact on CCA while RS did not have significant impact. Regarding RS, there is as of now no national direction for CC in India. In any case, the respondents cleared up that the execution of CC must conform to all IT directions in India. Different researchers (Alshamaila, *et al.*, 2013; Tashkandi, *et al.*, 2015; Alharbi *et al.*, 2017) found that RS isn't a determinant of CCA. That could be on the grounds that help is required for healthcare firms so they don't have to think about it when making on the choice about CC (Borgman, *et al.*, 2013). Another factor is PP in the environment of healthcare. This factor was found to positively affect the CCA since the investigation demonstrated that the execution of CC at different doctor's facilities will influence their choice decidedly. This finding is like the discoveries of different investigations

that observed outer strain to be decidedly related with CCA (Alshamaila *et al.*, 2013; Tan *et al.*, 2012; Tashkandi & Al-Jabri, 2015; Alharbi *et al.*, 2017). Another factor SE can provide fruitful usage of CC for healthcare firms. It was found to influence CCA in Indian firms emphatically. This finding is reliable with different investigations that found the accessibility of IT providers with great abilities of help and fame to be imperative (Güner and Sneiders, 2014; Alshamaila *et al.*, 2013; Alharbi *et al.*, 2017).

### 1.3 Human Perspective (HP)

INN, IE and PE are the variables that comprised the factor HP for CCA. After data analysis it was found that IE and PE has significant impact on CCA while INN did not have significant impact. The availability of IE was found to affect the decision on CCA in Taiwanese hospitals (Lian *et al.*, 2014). The present investigation likewise shown that the jobs of hospital IT staff may require a few changes. As CC is a developing innovation, PE is vital for Indian healthcare firms. Be that as it may, since the utilization of CC is as yet creating in the healthcare field, there is need of all the more training for IT staff in Indian healthcare firms. IE and PE are found to have positive effect on the choice of CCA in healthcare in India. Hospitals more often than not are moderate in receiving new data advancements and leaders at hospitals like to utilize develop advances for patients' wellbeing reasons (Hadad, *et al.*, 2014; Alharbi *et al.*, 2017).

### 1.4 Business Perspective (BP)

HFA and SFA are the variables that comprised the factor BP for CCA. After data analysis it was found that both has significant impact on CCA. Current research establishes cost sparing is one of the fundamental drivers of CCA. This finding is bolstered by different examinations that observed cost sparing to be an imperative factor when choosing to CCA (Lian *et al.*, 2014; Oliveira, *et al.*, 2014). Notwithstanding, there are still a few worries about the concealed expense of actualizing this innovation. Healthcare firms to give careful consideration to characterizing their prerequisites to keep away from useless expenses. Another positive factor affecting the CCA in Indian healthcare firms is SFA which thinks about the business openings and advantages that CC accommodates the firms. Consequently, firms should likewise consider the immaterial parts of CCA solutions. This finding is reliable with earlier investigations (like Alharbi *et al.*, 2017).

## 6 Conclusion

The research determined the factor of CCA in healthcare firm in a developing nation like India. This examination considered technical, environmental, organisational, human and business perspective. The five factors used in research were analysed and approved utilizing CFA and hypothesis testing was performed utilizing logistic regression. Due to dichotomous type of CCA i.e. related variable, the logistic regression was picked amidst other methods to test and approve proposed assumptions or hypothesis in connection to fifteen independent variables. Research model initially comprised of seventeen variables. Outputs from logistic regression and CFA and added acceptance to only ten out of the proposed seventeen variables. The approved variables are namely: RA, IR, TS, HAS, PP, SE, IE, PE, HFA and SFA. The unapproved seven variables are namely IC, C, IG, CR, IA, RS and INN were not significant to the model and hence eliminated as

CCA determinants from perspective of health care firm in developing country. Therefore it is suggested that healthcare firms should give careful consideration to the significant contributors particularly in context of developing nation. 6.1 Contribution to research and practice This study has made significant contribution to research and practice. In terms of research it has contributed to body of knowledge on CC by testing and validating the TOEHB framework in Indian healthcare perspective which is a developing country. Empirical support provides that this study cannot be studied only from just technological or organizational or only environmental contexts since the findings demonstrates the importance of human and business factors also in CCA in healthcare perspective. Ultimately this investigation bridges the ostensible writing gap on CC among prospering and prospered nations. Additionally, this investigation adds to rehearse by attracting consideration of practitioners to important factors in CCA. Thus, the healthcare firms venturing into CC have a fundamental understanding of the determinants, a knowledge which was not available to Indian healthcare firms which is a developing country. Thus, firms planning to adopt CC need to take critical look at RA, IR, TS, HAS, PP, SE, IE, PE, HFA and SFA. This study likewise exhibits that making a great ICT condition will have positive effect on CCA in Indian healthcare sector. The empowering condition as enactment, ICT policies and infrastructures will engender the CC agenda. This investigation repeats the significance of sufficient RS as strategies in help of CC as present laws are viewed as playing catch-up with innovative advancements particularly in creating nations like India. 6.1 Limitations and further research This study focussed mainly on healthcare firms in developing country i.e. India. Hence, similar studies can be done for other developing countries. Further investigation can be done on other specific sectors.

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