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Factors Affecting the Successful Implementation of Cloud and IoT - A Study on IT and Business Leaders

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ABSTRACT

The Internet of Things (IoT) is turning into the following Internet-related transformation. It enables billions of gadgets to be associated and speak with one another to share data that enhances the nature of our day-by-day lives. Then again, Cloud Computing gives on-request, helpful and versatile system get to which makes it conceivable to share computing assets, without a doubt, this, thus, empowers dynamic information integration from different information sources. There are numerous issues hindering the fruitful implementation of both Cloud and IoT. The integration of Cloud Computing with the IoT is the best path on which to defeat these issues. The huge number of assets accessible on the Cloud can be greatly helpful for the IoT, while the Cloud can acquire attention to enhance its impediments with true protests in a more powerful and dispersed way. This paper gives to the various factors that affect the integration of the Cloud into the IoT by featuring the integration advantages and implementation challenges. This paper mainly focus on a study which was conducted on various IT and business leaders.

Keywords : Cloud, IoT, CIO, SLA, QoS

I. INTRODUCTION

Cloud empowers its dynamic accessibility applications and framework, paying little respect to locale. Moreover, fast hierarchical advancement works out as intended in perspective of the mechanical and psychological capacity to deal with the capacity to make or arrange a game plan and fuse enrolling power in its assistance and business benefits more quickly than would be conceivable with the present rising organizations. Cloud computing in like way advances IT streamlining with the target those IT assets is planned for most essential money saving favoured outlook. This is conceivable in light of the way that cloud computing underpins gigantic adaptability to manage times of intrigue while keeping up an imperative partition from extended conditions of under-used IT framework. With its particularly autonomic character, cloud-computing takes out a colossal bit of the time largely required to demand and plan IT assets. Cloud computing likewise yields basic cost adventure sponsors in the land required for server utilization and besides power and cooling costs. As a result of virtualization and the cloud's ability to tap assets (either through a private cloud or tapping direct open cloud assets), server estates can manage the chose weight to expand their physical impression.

II. LITERATURE REVIEW

a) Reliability

Enduring quality is one of the key elements to be considered in coursed computing condition. Decided quality is depicted as the likelihood that a given thing

will play out its typical farthest point concerning a given time distribution under a given strategy of conditions. A cloud will be more dependable on the off chance that it is more denounce tolerant and more adaptable to propelling conditions. It is difficult to have a cloud that is totally free from sorrows or dissatisfaction safe [Garrison, 2012]. Different kinds of dissatisfactions are interleaved in the passed on computing condition, for example, flood bafflement, timeout dissatisfaction, asset missing dissatisfaction, coordinate dissatisfaction, equipment dissatisfaction, programming frustration, and database disillusionment.

The boundless idea of cloud computing is uncommonly fundamental yet hard to isolate on the grounds that cloud computing is comprised of the blend of different factors, for example, wide-zone frameworks, heterogeneous programming/adapt parts, and so on. There are different confused trades among the various parts of cloud computing. Thusly, the standard quality models that are depicted for unadulterated programming/outfit or regular frameworks cannot be connected with the surveying of cloud unwavering quality [Pocatine, 2010]. The downtime of the cloud server develop negatively affects the cloud advantage enduring quality. Surveying and re-designing undeterred quality in coursed computing is not so much direct errand. Notwithstanding these, two or three contraptions are utilized to overview and overhaul the cloud advantage consistency.

b) Availability

High transparency is, at last, the colossal vessel of the cloud. It encapsulates the probability of wherever and at whatever direct access toward organizations, mechanical congregations, and information and is the connecting with the effect of dreams of a future with organizations with no physical workplaces, generally speaking organizations with totally arranged and joined IT frameworks. Transparency or openness is in like way identified with fearless quality: an organization that is on 24x7 yet goes continually isolated is futile. As cloud organizations and applications wind up being even more amazing and more dependent on the covered cloud mastermind, it twists up continuously hard rapidly perceiving and managing issues. Weights can ascend out of an individual organization, and furthermore from the collaboration of various parts and mechanized structures over spread frameworks and server farms, acknowledging issues that set aside a long opportunity to be settled.

c. Scalability:

Lee and Kim showed programming centred procedures for ensuring the high versatility of administrations in Cloud Computing. [Lee and Kim, 2006] High flexibility under high administration loads seeks nothing out of pocket; it very well may be ensured by grasping some versatility confirmation designs. The most broadly perceived conventional arrangement is to simply incorporate the required resources. Nevertheless, as they propose in the paper, diverse plans can ensure high adaptability or adaptability.

There is always some cost drew in with running versatility ensuring plans, for instance, the expense of additional CPU and memory. The adaptability expanded through such plans should be with respect to the expense of applying the plans. That is, cost-reasonability should be considered in ensuring flexibility. Administrations should give the level of the esteem decided in their SLAs. Administrations with palatable flexibility should not to encounter the evil impacts of significant degradation of QoS. Adaptability affirmation designs should ensure that administrations satisfy the confinements of meeting the immaterial edge of their QoS properties [Collinchau, 2013]. From this, two convincing programming centreed plans can be resolved: advantage replication and administration

development. Administration replication is a methodology for cloning administrations that are successfully running on interchange centres to propel the administration stack over the centres without impacting errands ahead of time. Rehashed administrations secure additional advantages gave by the new centre points for dealing with greater administration stack. Figuratively speaking, advantage replication enhances advantage flexibility and diminishes the threat of QoS corruption by dealing with greater advantage loads. To exhibit a sufficiency of administration replication, they imitate the advantage replication plot for the seventeen extraordinary volumes of administration stack [Collinchau, 2013]. On each advantage stack, they take a gander at general administration system with advantage replication plot the extent that typical response time.

Administration migration is an arrangement for setting an administration on a choice centre when a particular centre can't give high QoS in view of a physical issue or programming issue. After administration migration, the moved administration has out a vague influence from it did on the insecure centre, and the volatile centre point is ousted from the once-over of administration centre points. Components, advantage stack and machine of adaptability ensuring plan, are same with advantage replication re-enactment. In this re-enactment, they have a circumstance that an administration is drawn to a closer centre from clients. To enable this, they acknowledge that the response time is in respect to the partition. Appropriately, an administration is moved to the speediest centre point to the extent that the response time. They developed a web application for controlling the provisioning and de-provisioning of web-server VM events, a dynamic scaling estimation in perspective of the huge point of confinement or scaling marker of the web application [Chen and Kunz, 2016]. The scaling marker that is picked here is the number of dynamic sessions or logon sessions in each web application.

In perspective of the moving typical of the scaling pointer, a dynamic scaling computation is used to trigger a scaling event to the provisioning subsystem. Dependent upon the revived bits of knowledge, movement to scale up or down may be begun. Scaling up or down suggests that an event will be set off that instructs the provisioning subsystem to start or close down web-server virtual machine events in the cloud. Right when the web application is scaled up, the as of late started virtual machine event will run the web application. After the web application events are readied, the front-end stack balancer configuration record is then invigorated and resuscitated to place them into dynamic administrations. As determined heretofore, the scaling estimation is executed in the Service Monitor sub-system and is used to control and trigger the scale-up or down in the Provisioning sub-structure on the quantity of virtual machine cases in light of the estimations of the scaling marker [Frey, Reich, et al. 2013].

d) Security

Like PC security programs, cloud security consolidates a relative general concern: keeping up the validity of data, guaranteeing access is limited to underwrite clients, and keeping up the availability of data and organizations (EDUCAUSE, 2010).With cloud computing, the data and organizations are outer to the grounds and in like way controlling moreover, securing these points of interest changes into an impressively more unpredictable and testing proposition. Data encryption, e-exposure, rehash and dependability of data fortresses and recuperation of data, the entire arrangement sensibility of the cloud seller and laws concerning farthest point and access to data all breeze up fundamental issues. It is central that individual and controlled data are sincerely ensured and that they are appropriately overviewed. Fratto (2009) called attention to that the security of

data remains the commitment of the data proprietor/outsourcer and scattered computing professional organizations are not plainly subject for data misfortune or fines or other lawful. Like PC security programs, cloud security consolidates a practically identical general concern. Data orchestrated in an open cloud and applications running in an open cloud may encounter specific security exposures than would be the situation in an on region energized condition.

Right when an association purchases into a cloud, each one of the data created and arranged will physically abide in premises had and worked by a provider. In this extraordinary situation, the fundamental issue is whether a supporter can obtain an attestation that a provider is executing the equivalent or proportionate controls as for what the endorser would have completed. The going with issues develop when an endorser is endeavoring to ensure scope for these controls: Compliance necessities, regarding data that an endorser is a significance to move to a cloud, may call for specific levels and granularities of audit logging, the time of cautions, activity declaring, and data support. For encryption of data still, the quality of the encryption figuring suite, the key administration plots a provider reinforces, and the number of keys for each datum proprietor (individual or shared keys) should be known by the data proprietors. Data arranged in an open cloud and applications running in an open cloud may experience particular security exposures than would be the circumstance in an on-area encouraged condition.

Data Privacy: Security watches out for the protection of data for specific components, for instance, endorsers or others whose data is taken care of in a structure. Assurance passes on authentic and chance concerns and should be viewed as a particular test and also a legal and good concern. Guaranteeing insurance in any handling system is a specific test; in a cloud setting, this test is befuddled by the circled thought of fogs and the possible nonattendance of supporter care over where data is secured and who has or can approach.

Framework Integrity: the cloud requires security against deliberate subversion or mischief of the value of a cloud. Inside a cloud, there are accomplices: endorsers, providers, and a combination of chiefs. The capacity to fragment get to rights to each one of these social occasions, while monitoring harmful attacks, is a key normal for keeping up cloud reliability. In a cloud setting, any nonappearance of porousness into a cloud's frameworks makes it more troublesome for endorsers of checking the uprightness of cloud-encouraged applications. Cloud computing administrations use the Internet as a transmission medium and change data development resources into administrations for end-customers, including programming administrations, figuring stage administrations, change organize administrations, and crucial structure leasing.

Vaquero and Lindner prescribed that cloud computing could be described as the joining of virtual resources according to customer necessities, adaptably solidifying resources including hardware, change stages, and diverse applications to make administrations [Faisal, 2011]. The novel features of cloud computing join the capacity of customer data in the cloud and the nonattendance of any prerequisite for programming foundation on the client side. For whatever timeframe that the customer can interface with the Internet, most of the gear resources in the cloud can be used as a client-side structure. When in doubt, cloud-computing applications ask for driven, giving distinctive administrations as demonstrated by customer requirements, and expert communities charge by metered time, instances of usage, or portrayed period.

The use of passwords as an affirmation strategy is even more outstanding to general customers, yet messages sent by the customer are weak against the covert record by software engineers who might then have the capacity to use the data in the message to sign into the administration as the customer.

Additionally, the One-Time Password (OTP) approval system fluctuates from a great many people gatherings' beginning of a secret word. By far, most grasp a mystery word to be a watchword picked by the customer to be critical and can be used repeatedly. The complement of OTP, in any case, is the single-use nature of the mystery key. In the wake of getting affirmation from the customer, the structure side must make an ensured transmission channel to exchange data with the customer. The Secure Attachments Layer (SSL) is a run of the mill strategy for building secure channels, primarily using RSA encryption to transmit the secret keys required for the opposite sides to encode and unravel data transmitted between them [Zheng, 2009]. Consistent methodologies for guaranteeing customer data join encryption going before a capacity, customer approval strategies before capacity or recuperation, and building secure channels for data transmission. These security systems commonly require cryptography figurings and propelled stamp techniques, as illuminated underneath. Ordinary data encryption systems fuse symmetric and Hilter kilter cryptography computations.

e) Capacity

As huge IoT sensors, IoT actuators, and IoT gadgets are associated with the Internet, IoT data volume from these things are required to increment dangerously. Also, it is normal that a significant number of these high volumes of IoT data are created and additionally devoured inside edge systems, not to navigate through cloud systems. As of recently, primarily IoT data produced IoT things are moved and gathered in a remote server and to store IoT data in a remote server requires a costly expense of transmission and capacity. To alleviate the expense of transmission and capacity, it is required to partition IoT data into two sorts of data; one is put away in edge systems and the other is put away in cloud systems. The impact of Edge computing is uncovered with the treatment of IoT data in edge systems.

As of not long ago, most system hardware, for example, switches, passages, and switches simply forward data conveyed from other system gadgets, not to peruse the substance or change them. In light of end-to-end communication, data is recognized and continue at a last relating hub. This is a common use of cloud computing a customer service communication. Be that as it may, in the IoT environment, some IoT data will be exchanged to a cloud system and some IoT data will be conveyed to an edge hub/haze hub. The primary purpose behind this partition is to give constant preparing and security upgrade. Despite the fact that there are numerous new advancements to diminish the postpone time and transmission time, it is difficult to ensure ongoing handling. The commonplace utilize instance of this necessity is the Industrial Internet and savvy processing plant. What's more, despite the fact that, there are control capacities to give security, the more fundamental decision is that not to uncover the private data to open systems. On the off chance that we separate IoT data into private data and non-private data and keep private data inside an edge organize, not to uncover them in an open system, it will diminish numerous feeble purposes of security.

In the event that we consider new difficulties of IoT administrations, the enormous volume of IoT data, as well as the gigantic number of IoT things, can be a basic issue. Despite the fact that we recognize this future issue, Internet design initially has the capacity of scalability and it will alleviate the scalability issue in the IoT environment. In any case, we can't assess the quantity of IoT things later on and we can't

ensure the Internet engineering still manage the scalability issue in the IoT environment. Edge computing will isolate the scalability area into edge systems and outside system (e.g., cloud systems) and this partition of scalability space can give a more effective approach to handle the enormous number of IoT things. Since Edge computing can deal with IoT data in an edge zone and store the IoT data in an edge/haze hub, and continue IoT data on the off chance that it is required, it can likewise isolate the administration area into two sections. Edge Computing can focus on the administration of IoT things in an edge zone and collaborate with the administration of other outside systems.

f) Throughput

Throughput implies the execution of errands by a figuring administration or contraption over a specific period. It checks the proportion of completed clash with time exhausted and may be used to evaluate the execution of a processor, memory and also framework trades. Throughput was considered to evaluate the benefit of PC processors. This was, generally, registered with respect to bunch occupations or assignments consistently and countless consistently. A couple of backups measure a structure's general throughput by evaluating the total and unusualness of work, the number of synchronous customers and application/system responsiveness. Additionally, for arranging trades, throughput is evaluated by discovering the proportion of data traded between zones in the midst of a foreordained period, overall occurring as bits consistently (bps), which has created to bytes consistently (Bps), kilobytes consistently (Kbps), megabytes consistently (Mbps) and gigabytes consistently (Gbps).

The physical zone of the data can influence the execution of the system if it is arranged in another bit of the world. In this way, Cloud plans may comprehend the postponement in the administration (Kim et al., 2009). Concurring the result consider the interviewees avowed that execution issues are caused generally by the low web association the adopters have in there. In like way, little organizations should ensure to have a snappy Web association which would reduce inaction (Marston et al., 2011). As demonstrated by Thurman (2008), execution is one of the troubles of cloud advancement execution contiguous data security, data affirmation, and availability. There are challenges in grasping conveyed computing advancement. Key execution obstacles are application quality (i.e. application execution likewise, versatility), application faithful quality (i.e. persevering administrations) and data security and insurance concern (i.e. illegitimate access of organization data, security bursts) (Benlien et al., 2009). In this manner, execution is a factor for organizations who wish to get Cloud courses of action and use them capably.

g) Lower costs

In cloud computing, setting up an organization as a utility, and giving figuring as an organization to clients is a piece of the real work. One of the beguiling and fundamental cost issues in cloud computing is the capacity to pay for the favorable position, in the viewpoint of necessities, keeping away from the significant costs for PC frameworks purchases (Armbrust, 2009). Consequently, cost sufficiency is another basic factor bearing organizations should note while tolerating spread computing. The organizations of today dependably filter for approaches to manage cut expense or additional cash. Organizations need to spend a critical piece of their wage on the IT foundation, while under 10% of their servers can be incredibly used, accomplishing an essential maltreatment of cash. Also, these servers should be supplanted respectably at standard intervals and ought to be kept up and administrated; expanding its aggregate cost practices significantly (Marston et al., 2011). Cost perfect conditions are the most grounded driver influencing

IT chiefs' impression of SaaS openings (Benlian et. al, 2011).

Above all, cloud computing enables organizations to decrease their gear costs (Miller, 2009). While using cloud administrations, organizations never again require intense and high-evaluated PCs to run applications inside the cloud. This starts with the lessened requirements for a dealing with power and storage space (Miller, 2009). Not in any way like standard programming, for running cloud has applications had PCs required less memory. They moreover can be with minimal hard plates in light of the way that there isn't foundation programming. Therefore, organizations can diminish costs by procuring lower-esteemed PCs. Since using cloud computing, organizations don't have to do high interests in the IT system. This especially concerns the greater organizations (Miller, 2009). Instead of putting a colossal proportion of trade out an extensive number of extreme servers, the IT divisions of those organizations can use the cloud` figuring vitality to supplant or improve the internal preparing resources. Plant administrator (2009) states, as Armbrust at al. (2009), that organizations don't have to manage the zeniths and the nonpeak times in figuring power asks for any more drawn out by getting new equipment, the apex figuring demands are dealt with by cloud servers. Cloud computing furthermore prompts cut down programming costs.

Organizations never again need to buy disconnect programming packs for each PC (Miller, 2009). Or maybe, a particular application is gotten to simply by the laborers using that application. Moreover, this in like manner infers saved the expense of presenting and keeping up that item on each PC. Another item related cash sparing preferred standpoint is that organizations don't have to pay for an item refresh in order to have the latest variations of the applications (Miller, 2009). As all applications are in the cloud, they are redesigned thusly by the provider. Organizations can in like manner immensely diminish their help costs (Miller, 2009). This implies both gear and programming upkeep.

According to Miller (2009 p. 26), organizations are "never again compelled to what a singular work region PC can do" and now can "perform supercomputing – like assignments utilizing the vitality of countless and servers." Thus they can perform more conspicuous errands and augmentation by and large their benefit and capability. On the other hand, from a provider`s perspective, the basic cash sparing favorable circumstances for the vendors are the foreseen employments and the more broad customer base (Goncalves and Ballon, 2011). Disseminated computing cuts down legitimate expenses and empowers an association to offload three sorts of organization (Rosenthal et al., 2009).

III. SURVEY AND TOOLS USED FOR THE SURVEY

The survey was conducted using online methods. The survey attempted to explore the major challenges faced by CIOs in cloud computing and IoT based organizations from various industries. This study was conducted on IT and business leaders/professionals from various countries across the globe. A sample size of 405 was used for this survey. Since the target population is unknown the baseline was of 385 has to be maintained. The sample size of 405 was used in order to have an effective result after excluding the errors. A website named e-mailmeform.com was used to create an online survey. It is a paid services based portal which provides survey setup services. This has security features like one response from one computer and one response from one IP address. These sort of security features would help to avoid duplicate submissions resulting in improved quality responses. A total of 40 questions were asked to the respondents and the results were captured and correlated using the IBM SPSS statistical tool.

IV. SURVEY RESULTS & DISCUSSIONS

Altogether, about 346 male and 59 female respondents were surveyed to explore the major challenges faced by CIOs in cloud computing and IoT based organizations from various industries purely from the healthcare, manufacturing and service line. Thus the totality of the participants equals about 405 in number. The feminine gender has the less valid percent of participation as compared to the male counterparts.

We can therefore infer that there is likelihood of more males functioning as IT business leaders than their female counterparts. This singular fact was considered in the distribution of the survey questionnaires. Out of the 405 respondents to the online questionnaire, only 55 people (both males and females) falls within the age range 21 to 25 years of age; eighty-six participants similarly fell within the age bracket of 26 to 30; whereas fifty-two respondents that participated in the online survey falls between age 31 to 35. The number of participants between the age ranges of 36 to 40 is forty-eight while the rest participant, about one-hundred and sixty-four, are all over 40 years of age.

	Frequency	Percent	Valid Percent	Cumulative Percent
Male	346	85.4	85.4	85.4
Female	59	14.6	14.6	100.0
Total	405	100.0	100.0	

Fig 1 : Gender

	Frequency	Percent	Valid Percent	Cumulative Percent
21-25	55	13.6	13.6	13.6
26-30	86	21.2	21.2	34.8
31-35	52	12.8	12.8	47.7
36-40	48	11.9	11.9	59.5
>40	164	40.5	40.5	100.0
Total	405	100.0	100.0	

Fig 2 : Age

In all, the majority of the respondents are well above forty years of age while the least frequency of the respondents falls between ages 36 and 40. From the pool of respondents, it's a single participant that has his highest form of education as at then being PUC/XII, representing a minute 0.2% of the total respondents. The number of graduate-respondent elevated as high as 127 people in total representing 31.4% of the total respondents. A whooping 192 participants claimed to be holders of a post-graduate degree or qualification (47.4 % of the population) while, about thirty-five of them already has a PhD degree in relevant disciplines. Only forty-seven of the respondents studied a professional course accruing to about 11.6 percent of the total population. The remaining 0.7% of the total respondents, that is only three people, had a different educational background from the listed.

	Frequency	Percent	Valid Percent	Cumulative Percent
PUC/ XII	1	.2	.2	.2
Graduation	127	31.4	31.4	31.6
Post-Graduation	192	47.4	47.4	79.0
Doctorate	35	8.6	8.6	87.7
Professional course	47	11.6	11.6	99.3
other	3	.7	.7	100.0
Total	405	100.0	100.0	

Fig 3 : Education

According to the population studies, about forty-one team leaders responded to the online survey representing a significant percentage of 10.1 percent. Only eighteen of the participants that responded were junior managers in rank while thirty-one participants were senior officers or managers within their respective organizational domain. The number of respondents that were vice-presidents or general-managers amounted to thirty-five in all whereas a whooping one hundred and eighty-two of the participant were actually chief information officers, chief executive officers and/or chief functional

officers-which accounts for almost half percent of the population. The remnant of the 405 respondents occupied other organizational positions not reflected in the listed designations.

	Frequency	Percent	Valid Percent	Cumulative Percent
Team leader	41	10.1	10.1	10.1
Jr. Manager	18	4.4	4.4	14.6
Sr. Manager	31	7.7	7.7	22.2
VP/GM	35	8.6	8.6	30.9
CIO/CEO/CFO	182	44.9	44.9	75.8
Other	98	24.2	24.2	100.0
Total	405	100.0	100.0	

Fig 4 : Designation

With respect to their overall experience, most of the respondents had less than ten years of experience and exposure concerning the job description of a chief information officer; that is, about 169 respondents had lesser that ten years' experience of the subject matter accounting for 41.7 percent of the total population.

In the same vein, ninety-six of the participant had an overall experience and exposure of greater than or equal to ten years, but lesser than 20 years at the same time. Also, ninety-nine of the participants had already an overall experience worth more than twenty years but below thirty years of age. The remainder forty-one respondents already had experiences of the subject matter over accumulated years, typically above thirty years. Thus, the overall percent of respondents with the highest frequency suggests those of years below ten while those with years above thirty had the lowest overall percentage.

	Frequency	Percent	Valid Percent	Cumulative Percent
<10 years	169	41.7	41.7	41.7
10-20 years	96	23.7	23.7	65.4
20-30 years	99	24.4	24.4	89.9
>30 years	41	10.1	10.1	100.0
Total	405	100.0	100.0	

Fig 5 : Overall Experience

Most of the volunteers who responded, about a whooping population numbering about 197 people, only have had between one to five years of experience as a chief information officer (CIO) in their present position which may range from junior manager to senior managers, etc. Only a handful of sixty-three persons who participated in the online survey have only had less than a year of experience as related to the job competencies of a chief information officer in any position they may be holding. Then it was calculated that about seventy-four of the total 405 respondents had only served between five to ten years in the capacity of a chief information officer in any capacity or position. The rest seventy-one respondents have had over ten years of experience in their present position with respect to the subject matter.

	Frequency	Percent	Valid Percent	Cumulative Percent
<1 year	63	15.6	15.6	15.6
1-5 years	197	48.6	48.6	64.2
5-10 years	74	18.3	18.3	82.5
>10 years	71	17.5	17.5	100.0
Total	405	100.0	100.0	

Fig 6 : Experience in Present Position

The number of respondents within the telecommunication, service and information technology (IT) industries that participated in the online survey was 226 in number representing a whopping 55.8 percent of the total population.

About twenty-five participants interviewed are currently working in certain manufacturing industries accounting for 25% of the totality of respondents. Forty-seven of the respondents are working in the healthcare sector of the economy whereas thirty-three of the respondents are domiciled in the finance, banking or the insurance companies, with the rest seventy-four of them practicing in other spheres of discipline accruing a whole 18.3 of the percentage of the whole population.

	Frequency	Percent	Valid Percent	Cumulative Percent
IT/Telecommunication/Service	226	55.8	55.8	55.8
Manufacturing	25	6.2	6.2	62.0
Healthcare	47	11.6	11.6	73.6
Finance/Insurance	33	8.1	8.1	81.7
Other	74	18.3	18.3	100.0
Total	405	100.0	100.0	

Fig 7 : Industry sector of your present organization

From the table provided above, majority of the CIO respondents interviewed are currently working in either an IT/telecommunication and service firms accounting for about 226 respondents in all. In addition, 25 of the remainder are from the manufacturing industries; 47 from healthcare settings while another 33 of the remaining respondents are currently on a job with a finance/insurance companies. The others could not fit into any of the afore-mentioned categories, thus representing 18.3 percent of the total number of respondents.

	Frequency	Percent	Valid Percent	Cumulative Percent
Definitely	142	35.1	35.1	35.1
Very Probably	115	28.4	28.4	63.5
Probably	112	27.7	27.7	91.1
Probably not	32	7.9	7.9	99.0
Definitely not	4	1.0	1.0	100.0
Total	405	100.0	100.0	

Fig 8 : Do you think that the changed role of CIOs has resulted in successful implementation of Cloud computing and IoT based technologies.

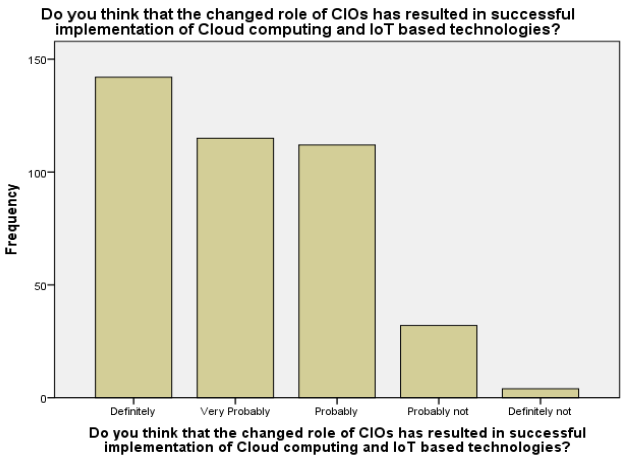

Fig 9.

As showed in the data computed above, exactly 142 respondents out of the total number of people who responded, which is 405 in number, strongly agreed with the fact stating CIO should be able to answer how an IT solution is beneficial to the company. Following this wise, a whopping number of 115 respondents, representing 28.4 percent of the total respondents also did agree though not strongly with the fact stated above. Meanwhile, very few respondents, about 32 in number and accounting for 7.9 percent of the total respondents, disagreed with that: Do you think that the changed role of CIOs has resulted in successful implementation of Cloud computing and IoT based technologies? Only four of these respondents who disagreed, strongly expressed their own disagreement while about 112 of the remainder participants went neutral and indeterminate on the matter.

a. Reliability and Availability

	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly Agree	57	14.1	14.1	14.1
Agree	181	44.7	44.7	58.8
Neutral	128	31.6	31.6	90.4
Disagree	32	7.9	7.9	98.3
Strongly Disagree	7	1.7	1.7	100.0
Total	405	100.0	100.0	

FIG 10: Our cloud and IoT platforms have minimum likelihood, collapse, or failure

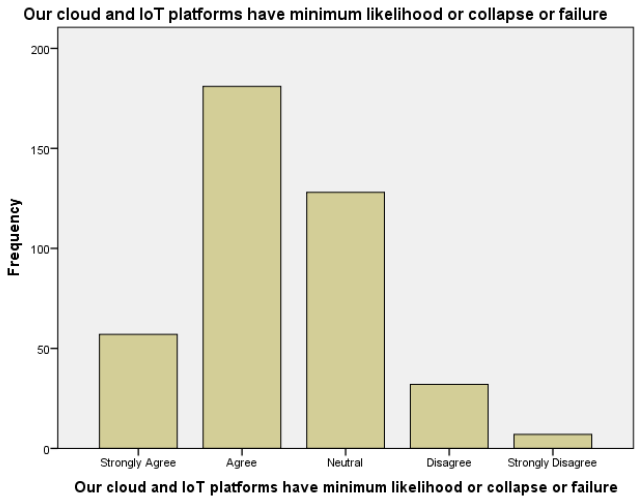

Fig 11

As showed in the data computed above, exactly 57 respondents out of the total number of people who responded, which is 405 in number, strongly agreed with the fact stating CIO should be able to answer how an IT solution is beneficial to the company. Following this wise, a whopping number of 181 respondents, representing 44.7 percent of the total respondents also did agree though not strongly with the fact stated above. Meanwhile, very few respondents, about 32 in number and accounting for 7.9 percent of the total respondents, disagreed that as a CIO, our cloud and IoT platforms have minimum likelihood, collapse, or failure. Only seven of these respondents who disagreed, strongly expressed their own disagreement while about 128 of the remainder participants went neutral and indeterminate on the matter.

	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly Agree	66	16.3	16.3	16.3
Agree	215	53.1	53.1	69.4
Neutral	99	24.4	24.4	93.8
Disagree	21	5.2	5.2	99.0
Strongly Disagree	4	1.0	1.0	100.0
Total	405	100.0	100.0	

Fig 12: In case of cloud/ IoT breakdown, we have adequate arrangements to recover

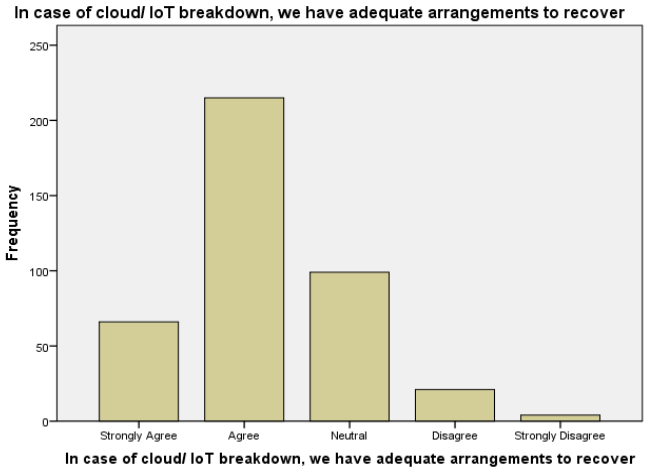

Fig 13

As showed in the data computed above, exactly 66 respondents out of the total number of people who responded, which is 405 in number, strongly agreed with the fact stating CIO should be able to answer how an IT solution is beneficial to the company. Following this wise, a whopping number of 215 respondents, representing 53.1 percent of the total respondents also did agree though not strongly with the fact stated above. Meanwhile, very few respondents, about 21 in number and accounting for 5.2 percent of the total respondents, disagreed that as a CIO, in case of cloud/ IoT breakdown, we have adequate arrangements to recover. Only four of these respondents who disagreed, strongly expressed their own disagreement while about 99 of the remainder participants went neutral and indeterminate on the matter.

	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly Agree	69	17.0	17.0	17.0
Agree	225	55.6	55.6	72.6
Neutral	92	22.7	22.7	95.3
Disagree	15	3.7	3.7	99.0
Strongly Disagree	4	1.0	1.0	100.0
Total	405	100.0	100.0	

Fig 14: We us quick and effective tools for addressing issues in our cloud and IoT platforms

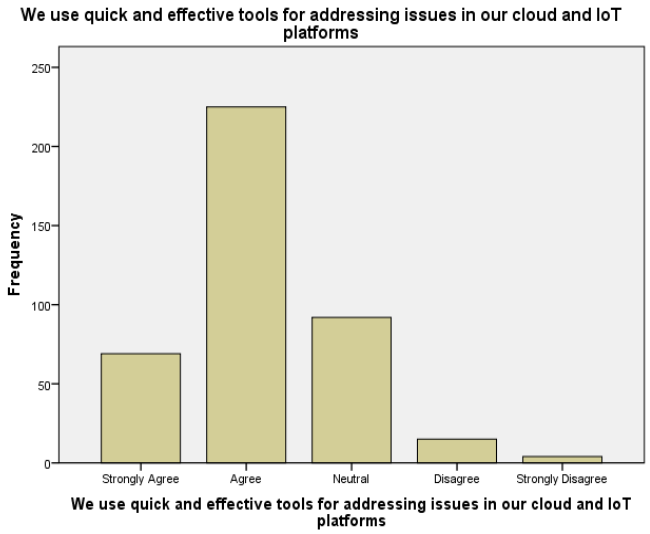

Fig 15

As showed in the data computed above, exactly 69 respondents out of the total number of people who responded, which is 405 in number, strongly agreed with the fact stating CIO should be able to answer how an IT solution is beneficial to the company. Following this wise, a whopping number of 225 respondents, representing 55.6 percent of the total respondents also did agree though not strongly with the fact stated above. Meanwhile, very few respondents, about 15 in number and accounting for 3.7 percent of the total respondents, disagreed that as a CIO, we possess quick and effective tools for addressing issues in our cloud and IoT platforms. Only four of these respondents who disagreed, strongly expressed their own disagreement while about 93 of the remainder participants went neutral and indeterminate on the matter.

	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly Agree	74	18.3	18.3	18.3
Agree	226	55.8	55.8	74.1
Neutral	93	23.0	23.0	97.0
Disagree	9	2.2	2.2	99.3
Strongly Disagree	3	.7	.7	100.0
Total	405	100.0	100.0	

Fig 16: Users can confidently use our cloud and IoT platforms continuously

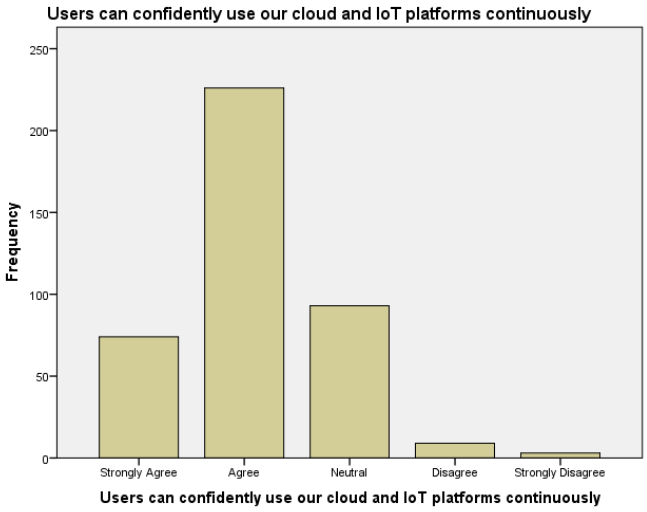

Fig 17

As showed in the data computed above, exactly 74 respondents out of the total number of people who responded, which is 405 in number, strongly agreed with the fact stating CIO should be able to answer how an IT solution is beneficial to the company. Following this wise, a whopping number of 226 respondents, representing 55.8 percent of the total respondents also did agree though not strongly with the fact stated above. Meanwhile, very few respondents, about 9 in number and accounting for 2.2 percent of the total respondents, disagreed that as a CIO, users can confidently use our cloud and IoT platforms continuously. Only three of these respondents who disagreed, strongly expressed their own disagreement while about 93 of the remainder participants went neutral and indeterminate on the matter.

	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly Agree	96	23.7	23.7	23.7
Agree	210	51.9	51.9	75.6
Neutral	76	18.8	18.8	94.3
Disagree	18	4.4	4.4	98.8
Strongly Disagree	5	1.2	1.2	100.0
Total	405	100.0	100.0	

Fig 18: We have taken enough measures to backup and store data to be easily retrieved during emergencies

Fig 19

As showed in the data computed above, exactly 96 respondents out of the total number of people who responded, which is 405 in number, strongly agreed with the fact stating CIO should be able to answer how an IT solution is beneficial to the company. Following this wise, a whopping number of 201 respondents, representing 51.9 percent of the total respondents also did agree though not strongly with the fact stated above. Meanwhile, very few respondents, about 18 in number and accounting for 4.4 percent of the total respondents, disagreed that as a CIO, we have taken enough measures to backup and store data to be easily retrieved during emergencies. Only five of these respondents who disagreed, strongly expressed their own disagreement while about 76 of the remainder participants went neutral and indeterminate on the matter.

	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly Agree	79	19.5	19.5	19.5
Agree	209	51.6	51.6	71.1
Neutral	81	20.0	20.0	91.1
Disagree	31	7.7	7.7	98.8
Strongly Disagree	5	1.2	1.2	100.0
Total	405	100.0	100.0	

Fig 20: The cloud/ IoT platform is up and working at all the times

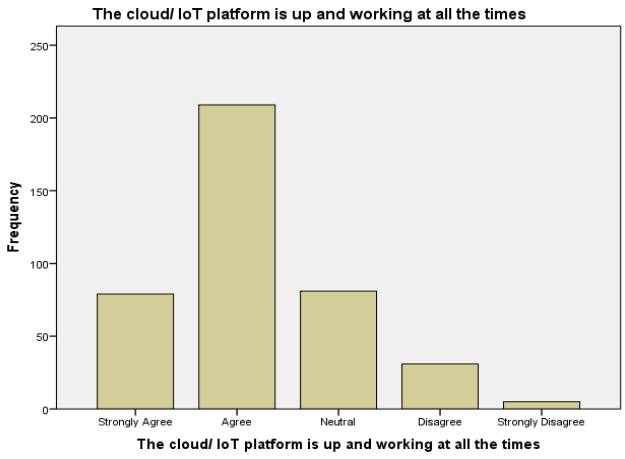

Fig 21

As showed in the data computed above, exactly 79 respondents out of the total number of people who responded, which is 405 in number, strongly agreed with the fact stating CIO should be able to answer how an IT solution is beneficial to the company. Following this wise, a whopping number of 209 respondents, representing 51.6 percent of the total respondents also did agree though not strongly with the fact stated above. Meanwhile, very few respondents, about 31 in number and accounting for 7.7 percent of the total respondents, disagreed that as a CIO, the cloud/ IoT platform is up and working at all the times. Only five of these respondents who disagreed, strongly expressed their own disagreement while about 81 of the remainder participants went neutral and indeterminate on the matter.

	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly Agree	98	24.2	24.2	24.2
Agree	192	47.4	47.4	71.6
Neutral	92	22.7	22.7	94.3
Disagree	19	4.7	4.7	99.0
Strongly Disagree	4	1.0	1.0	100.0
Total	405	100.0	100.0	

Fig 22: Our cloud platform experiences minimum downtime

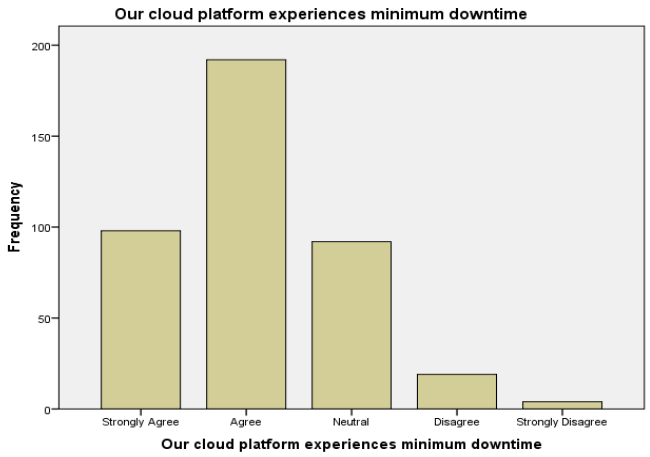

Fig 23

As showed in the data computed above, exactly 98 respondents out of the total number of people who responded, which is 405 in number, strongly agreed with the fact stating CIO should be able to answer how an IT solution is beneficial to the company. Following this wise, a whopping number of 192 respondents, representing 47.4 percent of the total respondents also did agree though not strongly with the fact stated above. Meanwhile, very few respondents, about19 in number and accounting for 4.7 percent of the total respondents, disagreed that as a CIO, Our cloud platform experiences minimum downtime. Only four of these respondents who disagreed, strongly expressed their own disagreement while about 92 of the remainder participants went neutral and indeterminate on the matter.

	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly Agree	84	20.7	20.7	20.7
Agree	213	52.6	52.6	73.3
Neutral	95	23.5	23.5	96.8
Disagree	11	2.7	2.7	99.5
Strongly Disagree	2	.5	.5	100.0
Total	405	100.0	100.0	

Fig 24 : Our cloud and IoT platforms are prepared to withstand server failures

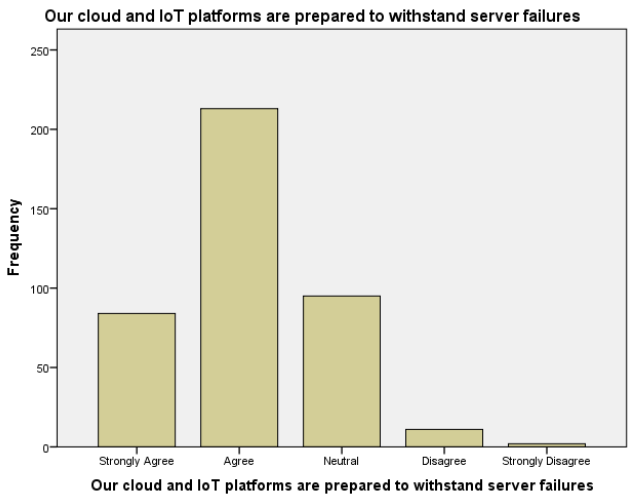

Fig 25

As showed in the data computed above, exactly 84 respondents out of the total number of people who responded, which is 405 in number, strongly agreed with the fact stating CIO should be able to answer how an IT solution is beneficial to the company. Following this wise, a whopping number of 213 respondents, representing 51.6 percent of the total respondents also did agree though not strongly with the fact stated above. Meanwhile, very few respondents, about 11 in number and accounting for 2.7 percent of the total respondents, disagreed that as a CIO, our cloud and IoT platforms are prepared to withstand server failures. Only two of these respondents who disagreed, strongly expressed their own disagreement while about 95 of the remainder participants went neutral and indeterminate on the matter.

	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly Agree	93	23.0	23.0	23.0
Agree	210	51.9	51.9	74.8
Neutral	88	21.7	21.7	96.5
Disagree	13	3.2	3.2	99.8
Strongly Disagree	1	.2	.2	100.0
Total	405	100.0	100.0	

Fig 26 : Our cloud and IoT platforms are resilient enough to endure power outages, network failure and environmental damage.

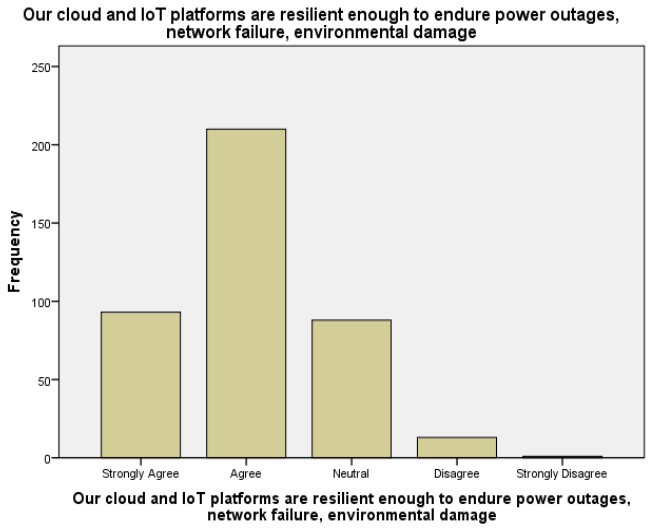

Fig 27:

As showed in the data computed above, exactly 93 respondents out of the total number of people who responded, which is 405 in number, strongly agreed with the fact stating CIO should be able to answer how an IT solution is beneficial to the company. Following this wise, a whopping number of 210 respondents, representing 51.9 percent of the total respondents also did agree though not strongly with the fact stated above. Meanwhile, very few respondents, about 13 in number and accounting for 3.2 percent of the total respondents, disagreed that as a cio, OUR CLOUD AND IOT PLATFORMS ARE RESILIENT ENOUGH TO ENDURE POWER OUTAGES, NETWORK FAILURE, ENVIRONMENTAL DAMAGE. only one of these respondents who disagreed, strongly expressed their own disagreement while about 88 of the remainder participants went neutral and indeterminate on the matter.

	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly Agree	98	24.2	24.2	24.2
Agree	211	52.1	52.1	76.3
Neutral	84	20.7	20.7	97.0
Disagree	9	2.2	2.2	99.3
Strongly Disagree	3	.7	.7	100.0
Total	405	100.0	100.0	

Fig 28 : We have taken measures for automated backups in case the cloud fails

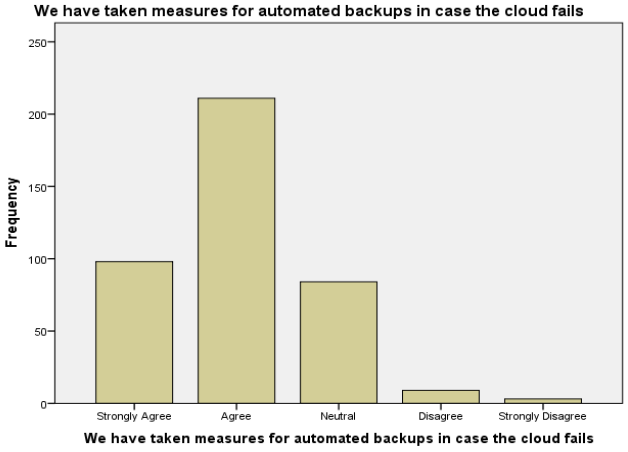

Fig 29:

As showed in the data computed above, exactly 98 respondents out of the total number of people who responded, which is 405 in number, strongly agreed with the fact stating CIO should be able to answer how an IT solution is beneficial to the company. Following this wise, a whopping number of 211 respondents, representing 52.1 percent of the total respondents also did agree though not strongly with the fact stated above. Meanwhile, very few respondents, about 9 in number and accounting for 2.2 percent of the total respondents, disagreed that as a CIO, we have taken measures for automated backups in case the cloud fails. Three of these respondents who disagreed, strongly expressed their own disagreement while about 93 of the remainder participants went neutral and indeterminate on the matter.

b. Scalability and Security

	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly Agree	115	28.4	28.4	28.4
Agree	211	52.1	52.1	80.5
Neutral	67	16.5	16.5	97.0
Disagree	11	2.7	2.7	99.8
Strongly Disagree	1	.2	.2	100.0
Total	405	100.0	100.0	

Fig 30 a : Our cloud and IoT platform can accommodate a large number of users in its full capacity

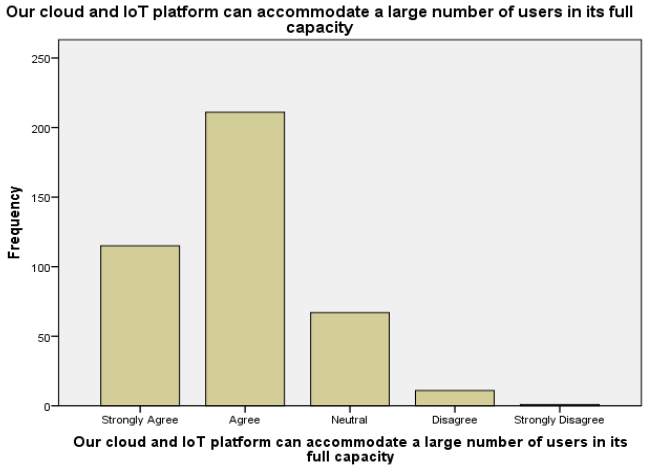

Fig 30b

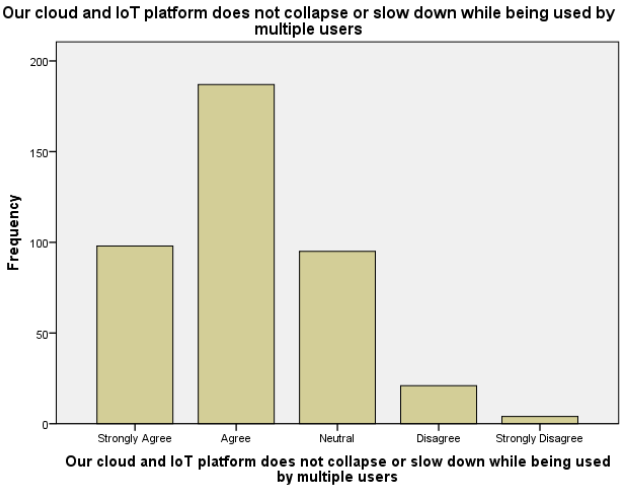

Fig 32

In accordance with the computed data computed in Fig.30a and 30b, the number of people who responded to the notion stating that as CIOs our cloud and IoT platform can accommodate a large number of users in its full capacity, was 405. About 115 of these respondents representing 28.4 percent of the total respondents strongly agreed with this notion, while 211 respondents accounting for a whopping 52.1 percent of the total respondents did agree but not strongly with this notion. However a few number of respondents, not more than eleven in number did disagree with the notion with one more respondents strongly disagreeing, with about 67 respondents representing 16.5 percent of the total respondents were neutral as concerns this notion

In accordance with the computed data computed in Fig.31 and 32, the number of people who responded to the notion stating that as CIOs our cloud and IoT platform does not collapse or slow down while being used by multiple users, was 405. About 98 of these respondents representing 24.2 percent of the total respondents strongly agreed with this notion, while 187 respondents accounting for a whopping 46.2 percent of the total respondents did agree but not strongly with this notion. However a few number of respondents, not more than twenty-one in number did disagree with the notion with four more respondents strongly disagreeing, with about 95 respondents representing 23.5 percent of the total respondents were neutral as concerns this notion

	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly Agree	98	24.2	24.2	24.2
Agree	187	46.2	46.2	70.4
Neutral	95	23.5	23.5	93.8
Disagree	21	5.2	5.2	99.0
Strongly Disagree	4	1.0	1.0	100.0
Total	405	100.0	100.0	

Fig 31: Our cloud and IoT platform does not collapse or slow down while being used by multiple users

	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly Agree	112	27.7	27.7	27.7
Agree	203	50.1	50.1	77.8
Neutral	79	19.5	19.5	97.3
Disagree	11	2.7	2.7	100.0
Total	405	100.0	100.0	

Fig 33: We keep making improvements to the IoT and cloud platform to ensure higher scalability

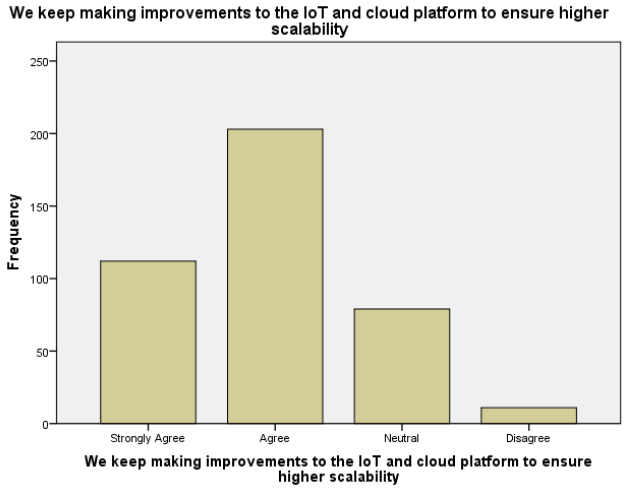

Fig 34

In accordance with the computed data computed in Fig.33 and 34, the number of people who responded to the notion stating that as CIOs We keep making improvements to the IoT and cloud platform to ensure higher scalability, was 405. About 112 of these respondents representing 27.7 percent of the total respondents strongly agreed with this notion, while 203 respondents accounting for a whopping 50.1 percent of the total respondents did agree but not strongly with this notion. However, a few number of respondents, not more than eleven in number did disagree with the notion, with about 79 respondents representing 19.5 percent of the total respondents were neutral as concerns this notion

	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly Agree	104	25.7	25.7	25.7
Agree	213	52.6	52.6	78.3
Neutral	75	18.5	18.5	96.8
Disagree	11	2.7	2.7	99.5
Strongly Disagree	2	.5	.5	100.0
Total	405	100.0	100.0	

Fig 35: Our systems can handle multiple application requests arising at the same time

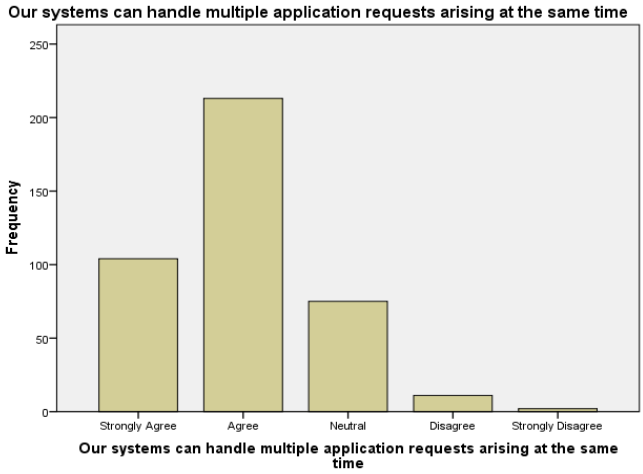

Fig 36

In accordance with the computed data computed in Fig.35 and 36, the number of people who responded to the notion stating that as CIOs our systems can handle multiple application requests arising at the same time, was 405. About 104 of these respondents representing 25.7 percent of the total respondents strongly agreed with this notion, while 213 respondents accounting for a whopping 52.6 percent of the total respondents did agree but not strongly with this notion. However, a few number of respondents, not more than eleven in number did disagree with the notion, with only two more respondent strongly disagreeing. About 75 respondents representing 17.5 percent of the total respondents were neutral as concerns this notion

	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly Agree	102	25.2	25.2	25.2
Agree	202	49.9	49.9	75.1
Neutral	84	20.7	20.7	95.8
Disagree	13	3.2	3.2	99.0
Strongly Disagree	4	1.0	1.0	100.0
Total	405	100.0	100.0	

Fig 37: Our cloud and IoT platforms have been designed to match up with the changing business objectives

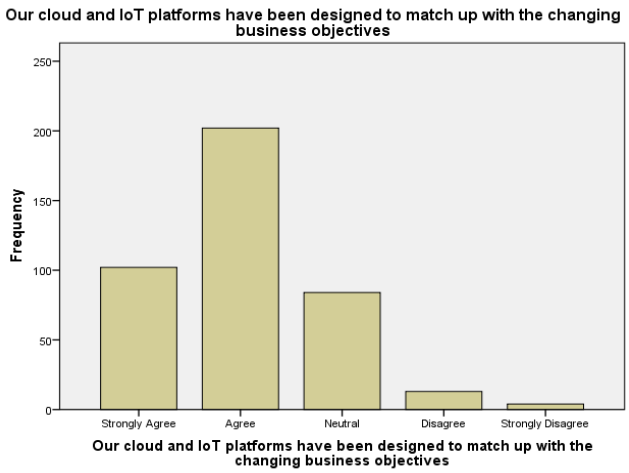

Fig 38

In accordance with the computed data computed in Fig.37 and 38, the number of people who responded to the notion stating that as CIOs Our cloud and IoT platforms have been designed to match up with the changing business objectives, was 405. About 102 of these respondents representing 25.2 percent of the total respondents strongly agreed with this notion, while 202 respondents accounting for a whopping 49.9 percent of the total respondents did agree but not strongly with this notion. However, a few number of respondents, not more than thirteen in number did disagree with the notion, with only four more respondent strongly disagreeing. About 84 respondents representing 20.7 percent of the total respondents were neutral as concerns this notion

	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly Agree	139	34.3	34.3	34.3
Agree	182	44.9	44.9	79.3
Neutral	72	17.8	17.8	97.0
Disagree	9	2.2	2.2	99.3
Strongly Disagree	3	.7	.7	100.0
Total	405	100.0	100.0	

Fig 39: We give utmost importance to network security and data security in our cloud and IoT platforms

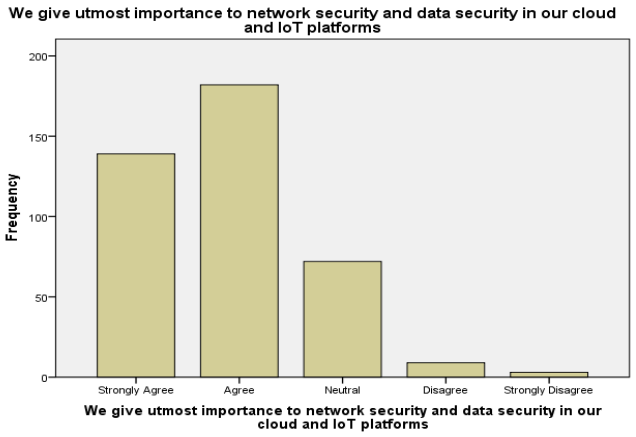

Fig 40

In accordance with the computed data computed in Fig.39 and 40, the number of people who responded to the notion stating that as CIOs We have adequate safeguards for different interconnected devices to avoid data theft or breach of privacy, was 405. About 139 of these respondents representing 34.3 percent of the total respondents strongly agreed with this notion, while 182 respondents accounting for a whopping 44.9 percent of the total respondents did agree but not strongly with this notion. However a few number of respondents, not more than 9 in number did disagree with the notion, with only three more respondent strongly disagreeing. About 72 respondents representing 17.8 percent of the total respondents were neutral as concerns this notion

	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly Agree	116	28.6	28.6	28.6
Agree	176	43.5	43.5	72.1
Neutral	100	24.7	24.7	96.8
Disagree	10	2.5	2.5	99.3
Strongly Disagree	3	.7	.7	100.0
Total	405	100.0	100.0	

Fig 41: We have adequate safeguards for different interconnected devices to avoid data theft or breach of privacy

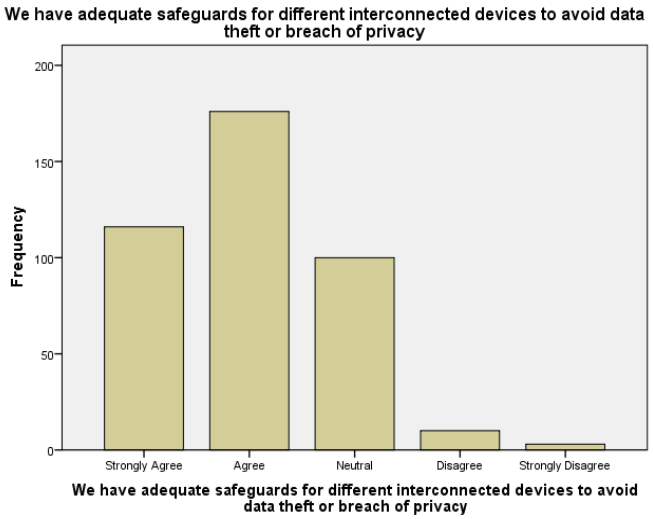

Fig 42a

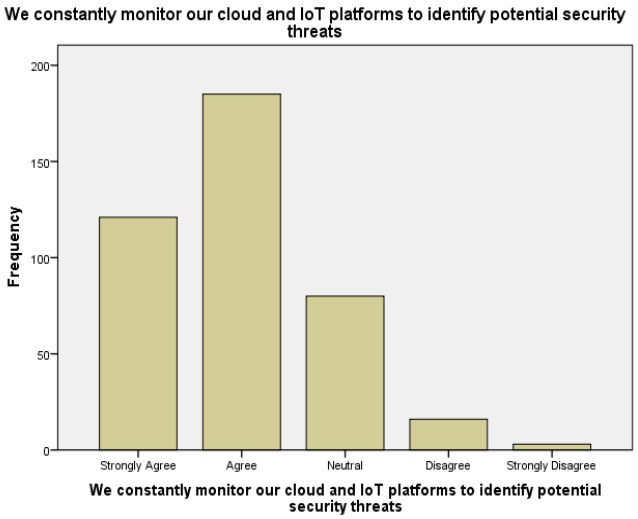

Fig 43

In accord to the data computed in Fig.41 and 42a, the number of people who responded to the notion stating that as CIOs We have adequate safeguards for different interconnected devices to avoid data theft or breach of privacy, was 405. About 116 of these respondents representing 28.6 percent of the total respondents strongly agreed with this notion, while 176 respondents accounting for a whopping 43.5 percent of the total respondents did agree but not strongly with this notion. However, a few number of respondents, not more than 10 in number did disagree with the notion, with only three more respondent strongly disagreeing. About 100 respondents representing 24.7 percent of the total respondents were neutral as concerns this notion

In accord to the data computed in Fig.42b and 43, the number of people who responded to the notion stating that as CIOs We constantly monitor our cloud and IoT platforms to identify potential security threats, was 405. About 121 of these respondents representing 29.9 percent of the total respondents strongly agreed with this notion, while 185 respondents accounting for a whopping 45.7 percent of the total respondents did agree but not strongly with this notion. However, a few number of respondents, not more than 16 in number did disagree with the notion, with only three more respondent strongly disagreeing. About 80 respondents representing 22.0 percent of the total respondents were neutral as concerns this notion.

	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly Agree	121	29.9	29.9	29.9
Agree	185	45.7	45.7	75.6
Neutral	80	19.8	19.8	95.3
Disagree	16	4.0	4.0	99.3
Strongly Disagree	3	.7	.7	100.0
Total	405	100.0	100.0	

Fig 42b : We constantly monitor our cloud and IoT platforms to identify potential security threats

	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly Agree	114	28.1	28.1	28.1
Agree	190	46.9	46.9	75.1
Neutral	89	22.0	22.0	97.0
Disagree	10	2.5	2.5	99.5
Strongly Disagree	2	.5	.5	100.0
Total	405	100.0	100.0	

Fig 44 : We regularly update and improve our data safety mechanisms to counter novel means of breach to network security.

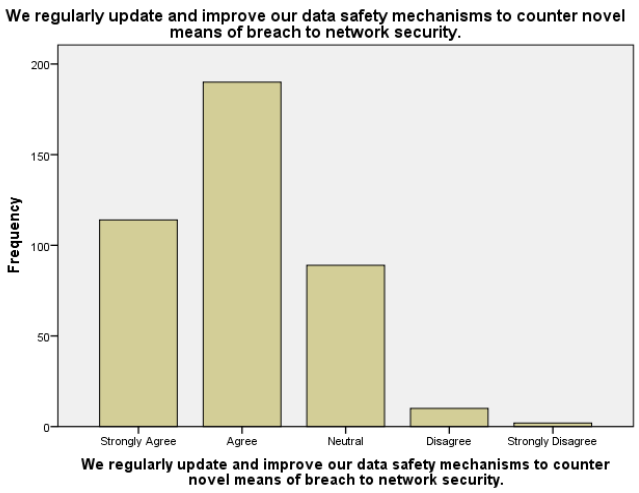

Fig 45

In accord to the data computed in Fig.44 and 45, the number of people who responded to the notion stating that as CIOs We regularly update and improve our data safety mechanisms to counter novel means of breach to network security, was 405. About 114 of these respondents representing 28.1 percent of the total respondents strongly agreed with this notion, while 190 respondents accounting for a whopping 46.9 percent of the total respondents did agree but not strongly with this notion. However, a few number of respondents, not more than ten in number did disagree with the notion, with only two more respondent strongly disagreeing. About 89 respondents representing 22.0 percent of the total respondents were neutral as concerns this notion.

c. Capacity and Throughput

	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly Agree	116	28.6	28.6	28.6
Agree	202	49.9	49.9	78.5
Neutral	79	19.5	19.5	98.0
Disagree	7	1.7	1.7	99.8
Strongly Disagree	1	.2	.2	100.0
Total	405	100.0	100.0	

Fig 46: Our cloud and IoT platforms are designed to make optimal use of existing resources

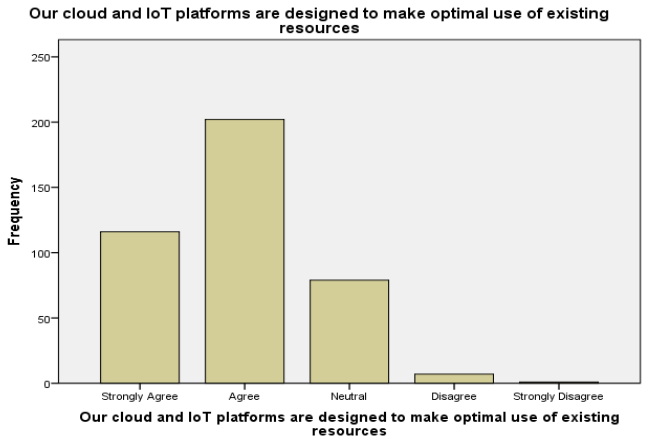

Fig 47

In accord to the data computed in Fig.46 and 47, the number of people who responded to the notion stating that as CIOs Our cloud and IoT platforms are designed to make optimal use of existing resources, was 405. About 116 of these respondents representing 28.6 percent of the total respondents strongly agreed with this notion, while 202 respondents accounting for a whopping 49.9 percent of the total respondents did agree but not strongly with this notion. However, a few number of respondents, not more than 7 in number did disagree with the notion, with only one more respondent strongly disagreeing. About 79 respondents representing 19.5 percent of the total respondents were neutral as concerns this notion.

	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly Agree	104	25.7	25.7	25.7
Agree	203	50.1	50.1	75.8
Neutral	82	20.2	20.2	96.0
Disagree	12	3.0	3.0	99.0
Strongly Disagree	4	1.0	1.0	100.0
Total	405	100.0	100.0	

Fig 48: We constantly track the resources used up by our cloud and IoT products and take steps to minimize resource loss

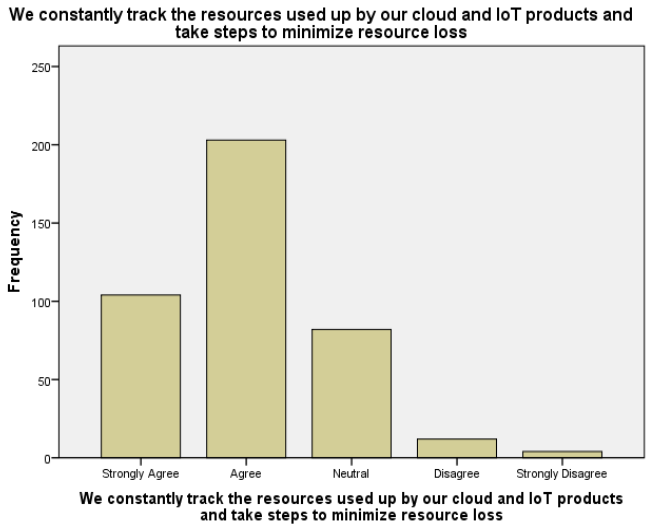

Fig 4

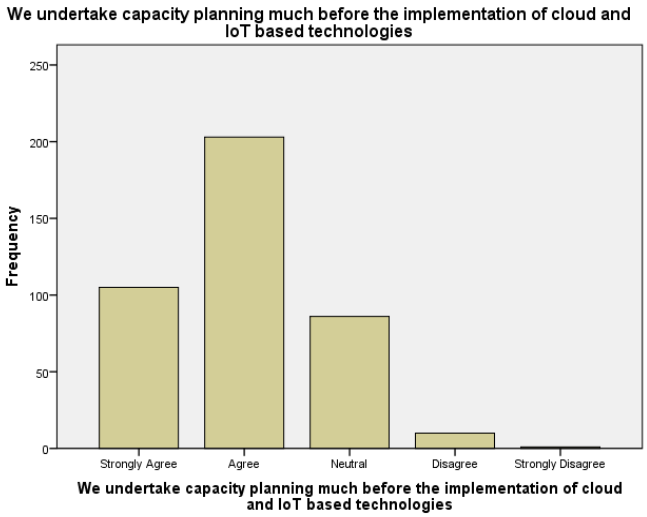

Fig 51

In accord to the data computed in Fig.48 and 49, the number of people who responded to the notion stating that as CIOs We constantly track the resources used up by our cloud and IoT products and take steps to minimize resource loss, was 405. About 104 of these respondents representing 25.7 percent of the total respondents strongly agreed with this notion, while 203 respondents accounting for a whopping 50.1 percent of the total respondents did agree but not strongly with this notion. However, a few number of respondents, not more than 12 in number did disagree with the notion, with only four more respondent strongly disagreeing. About 82 respondents representing 20.2 percent of the total respondents were neutral as concerns this notion.

In accord to the data computed in Fig.50 and 51, the number of people who responded to the notion stating that as CIOs We undertake capacity planning much before the implementation of cloud and IoT based technologies, was 405. About 105 of these respondents representing 25.9 percent of the total respondents strongly agreed with this notion, while 203 respondents accounting for a whopping 50.1 percent of the total respondents did agree but not strongly with this notion. However, a few number of respondents, not more than 10 in number did disagree with the notion, with only a single more respondent strongly disagreeing. About 86 respondents representing 21.2 percent of the total respondents were neutral as concerns this notion.

	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly Agree	105	25.9	25.9	25.9
Agree	203	50.1	50.1	76.0
Neutral	86	21.2	21.2	97.3
Disagree	10	2.5	2.5	99.8
Strongly Disagree	1	.2	.2	100.0
Total	405	100.0	100.0	

Fig 50: We undertake capacity planning much before the implementation of cloud and IoT based technologies

	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly Agree	118	29.1	29.1	29.1
Agree	189	46.7	46.7	75.8
Neutral	83	20.5	20.5	96.3
Disagree	14	3.5	3.5	99.8
Strongly Disagree	1	.2	.2	100.0
Total	405	100.0	100.0	

Fig 52: We are constantly innovating means to reduce resource use and improve productivity

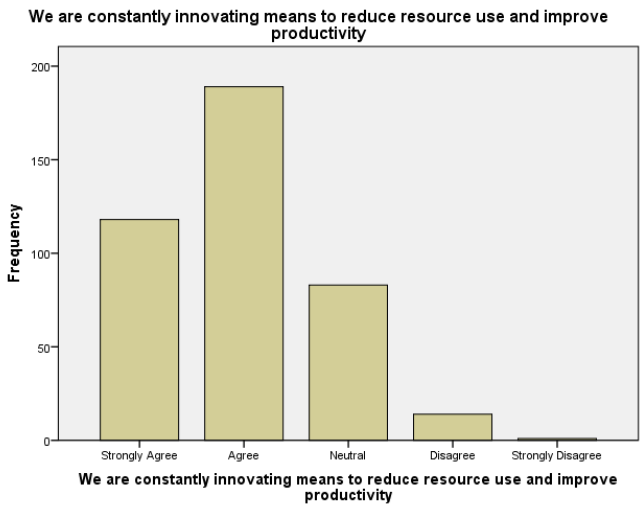

Fig 53

In accord to the data computed in Fig.52 and 53, the number of people who responded to the notion stating that as CIOs We try to eliminate errors, in order to avoid resource loss, was 405. About 118 of these respondents representing 29.1 percent of the total respondents strongly agreed with this notion, while 189 respondents accounting for a whopping 46.7 percent of the total respondents did agree but not strongly with this notion. However, a few number of respondents, not more than 14 in number did disagree with the notion, with only a single more respondent strongly disagreeing. About 83 respondents representing 20.5 percent of the total respondents were neutral as concerns this notion.

	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly Agree	113	27.9	27.9	27.9
Agree	187	46.2	46.2	74.1
Neutral	88	21.7	21.7	95.8
Disagree	14	3.5	3.5	99.3
Strongly Disagree	3	.7	.7	100.0
Total	405	100.0	100.0	

Fig 54: We try to eliminate errors, in order to avoid resource loss

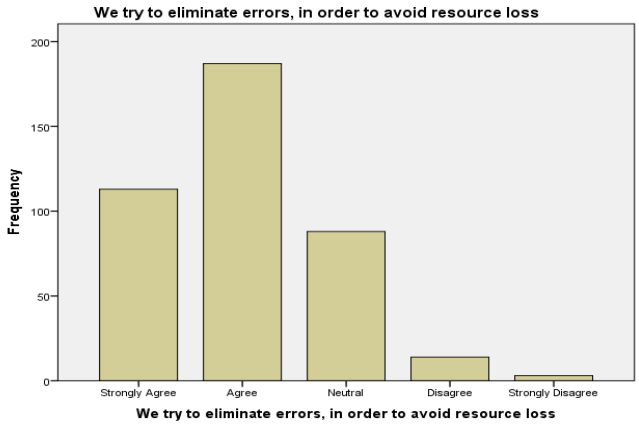

Fig 55

In accord to the data computed in Fig.54 and 55, the number of people who responded to the notion stating that as CIOs We try to eliminate errors, in order to avoid resource loss, was 405. About 113 of these respondents representing 27.9 percent of the total respondents strongly agreed with this notion, while 187 respondents accounting for a whopping 46.2 percent of the total respondents did agree but not strongly with this notion. However, a few number of respondents, not more than 14 in number did disagree with the notion, with only three more respondent strongly disagreeing. About 88 respondents representing 21.7 percent of the total respondents were neutral as concerns this notion.

	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly Agree	99	24.4	24.4	24.4
Agree	205	50.6	50.6	75.1
Neutral	87	21.5	21.5	96.5
Disagree	13	3.2	3.2	99.8
Strongly Disagree	1	.2	.2	100.0
Total	405	100.0	100.0	

Fig 56: We allocate only required resources to cloud or IoT platforms to avoid losses

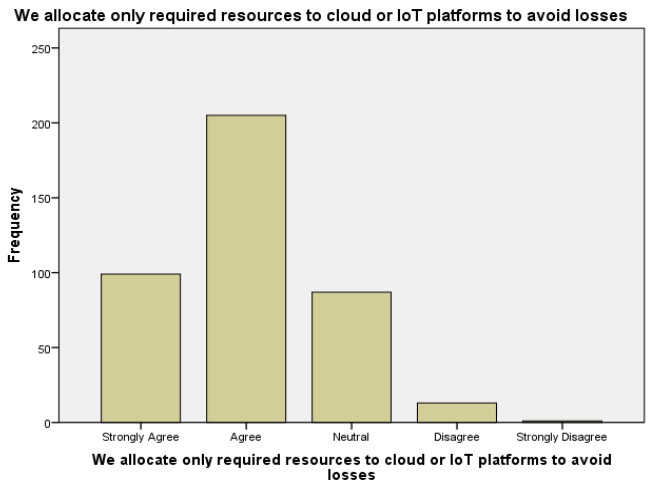

Fig 57

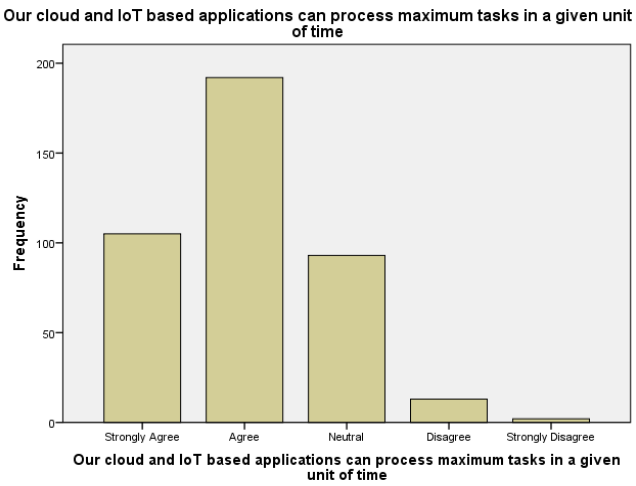

Fig 59

In congruence to the data computed in Fig.56 and 57, the number of people who responded to the notion stating that as CIOs We allocate only required resources to cloud or IoT platforms to avoid losses, was 405. About 99 of these respondents representing 24.4 percent of the total respondents strongly agreed with this notion, while 205 respondents accounting for a whopping 50.6 percent of the total respondents did agree but not strongly with this notion. However, a few number of respondents, not more than 13 in number did disagree with the notion, with only one more respondent strongly disagreeing. About 87 respondents representing 21.5 percent of the total respondents were neutral as concerns this notion.

	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly Agree	105	25.9	25.9	25.9
Agree	192	47.4	47.4	73.3
Neutral	93	23.0	23.0	96.3
Disagree	13	3.2	3.2	99.5
Strongly Disagree	2	.5	.5	100.0
Total	405	100.0	100.0	

Fig 58: Our cloud and IoT based applications can process maximum tasks in a given unit of time

In congruence to the data computed in Fig.58 and 59, the number of people who responded to the notion stating that as CIOs our cloud and IoT based applications can process maximum tasks in a given unit of time, was 405. About 105 of these respondents representing 25.9 percent of the total respondents strongly agreed with this notion, while 192 respondents accounting for a whopping 47.4 percent of the total respondents did agree but not strongly with this notion. However, a few number of respondents, not more than 13 in number did disagree with the notion, with only two more respondent strongly disagreeing. About 93 respondents representing 23.0 percent of the total respondents were neutral as concerns this notion.

	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly Agree	107	26.4	26.4	26.4
Agree	199	49.1	49.1	75.6
Neutral	83	20.5	20.5	96.0
Disagree	11	2.7	2.7	98.8
Strongly Disagree	5	1.2	1.2	100.0
Total	405	100.0	100.0	

Fig 60: We make sure we respond to the requests of every user within minimum possible time

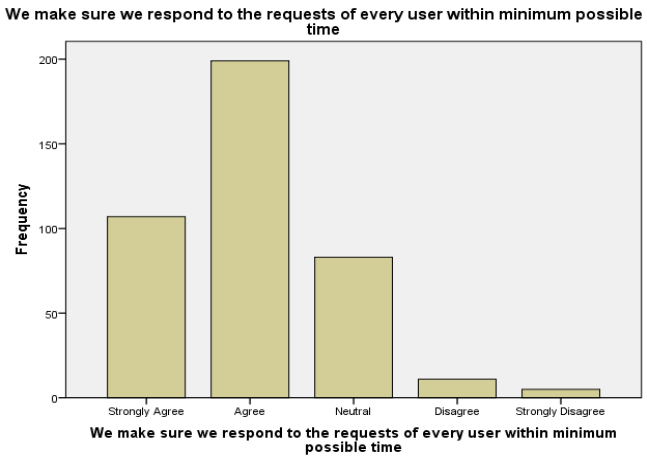

Fig 61

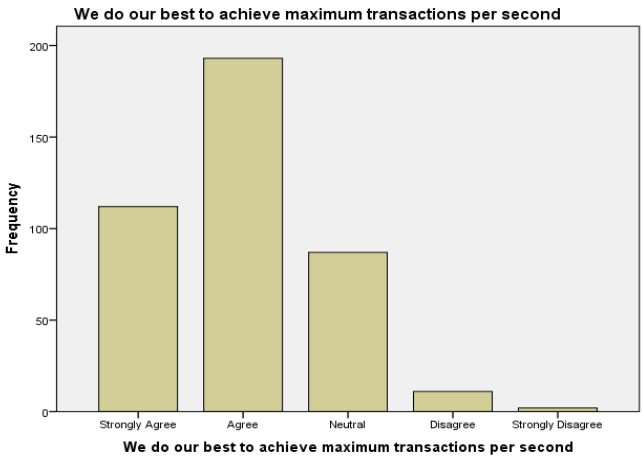

Fig 63

In congruence to the data computed in Fig.60 and 61, the number of people who responded to the notion stating that as CIOs We make sure we respond to the requests of every user within minimum possible time, was 405. About 107 of these respondents representing 26.4 percent of the total respondents strongly agreed with this notion, while 199 respondents accounting for a whopping 49.1 percent of the total respondents did agree but not strongly with this notion. However, a few number of respondents, not more than 11 in number did disagree with the notion, with only five more respondent strongly disagreeing. About 83 respondents representing 20.5 percent of the total respondents were neutral as concerns this notion.

In congruence to the data computed in Fig.62 and 63, the number of people who responded to the notion stating that as CIOs We do our best to achieve maximum transactions per second, was 405. About 112 of these respondents representing 27.7 percent of the total respondents strongly agreed with this notion, while 193 respondents accounting for a whopping 47.7 percent of the total respondents did agree but not strongly with this notion. However, a few number of respondents, not more than 11 in number did disagree with the notion, with only two more respondent strongly disagreeing. About 87 respondents representing 21.5 percent of the total respondents were neutral as concerns this notion.

	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly Agree	112	27.7	27.7	27.7
Agree	193	47.7	47.7	75.3
Neutral	87	21.5	21.5	96.8
Disagree	11	2.7	2.7	99.5
Strongly Disagree	2	.5	.5	100.0
Total	405	100.0	100.0	

Fig 62: We do our best to achieve maximum transactions per second

	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly Agree	107	26.4	26.4	26.4
Agree	197	48.6	48.6	75.1
Neutral	85	21.0	21.0	96.0
Disagree	13	3.2	3.2	99.3
Strongly Disagree	3	.7	.7	100.0
Total	405	100.0	100.0	

Fig 64: Our throughput has been consistently improving over the years

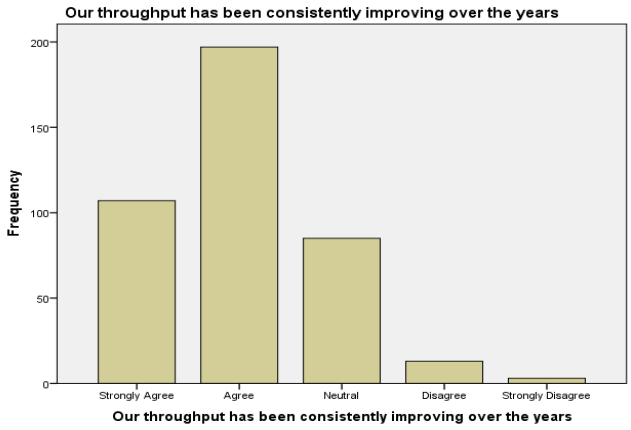

Fig 64b

In congruence to the data computed in Fig.64 and 64b, the number of people who responded to the notion stating that as CIOs our throughput has been consistently improving over the years, was 405. About 107 of these respondents representing 26.4 percent of the total respondents strongly agreed with this notion, while 197 respondents accounting for a whopping 48.6 percent of the total respondents did agree but not strongly with this notion. However, a few number of respondents, not more than 13 in number did disagree with the notion, with only three more respondent strongly disagreeing. About 85 respondents representing 21.0 percent of the total respondents were neutral as concerns this notion.

	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly Agree	109	26.9	26.9	26.9
Agree	198	48.9	48.9	75.8
Neutral	85	21.0	21.0	96.8
Disagree	12	3.0	3.0	99.8
Strongly Disagree	1	.2	.2	100.0
Total	405	100.0	100.0	

Fig 65: We are constantly on the lookout for new mechanisms to improve our throughput

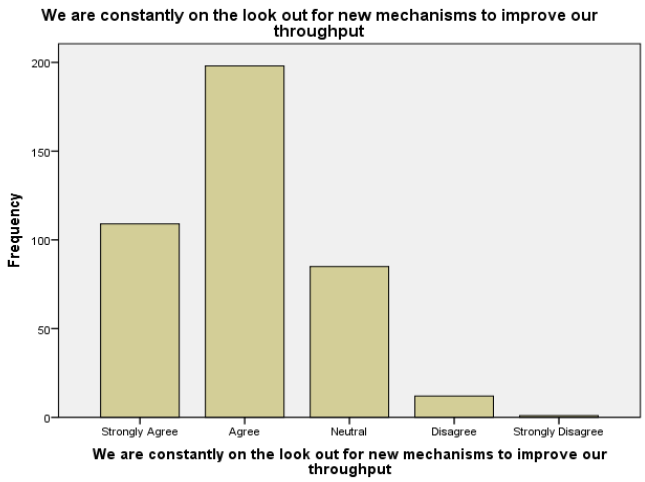

Fig 66

In congruence to the data computed in Fig.65 and 66, the number of people who responded to the notion stating that as CIOs We are constantly on the lookout for new mechanisms to improve our throughput, was 405. About 109 of these respondents representing 26.9 percent of the total respondents strongly agreed with this notion, while 198 respondents accounting for a whopping 48.9 percent of the total respondents did agree but not strongly with this notion. However, a few number of respondents, not more than 12 in number did disagree with the notion, with only a single more respondent strongly disagreeing. About 85 respondents representing 21.0 percent of the total respondents were neutral as concerns this notion.

d. Lower Costs

	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly Agree	99	24.4	24.4	24.4
Agree	204	50.4	50.4	74.8
Neutral	85	21.0	21.0	95.8
Disagree	14	3.5	3.5	99.3
Strongly Disagree	3	.7	.7	100.0
Total	405	100.0	100.0	

Fig 67: Our cloud and IoT platforms offer integrated data storage solutions, hereby helping reduce data storage costs

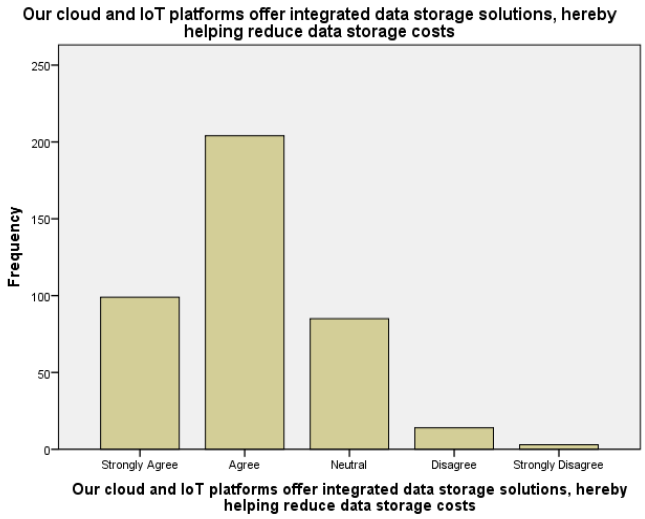

Fig 68

In congruence to the data computed in Fig.67 and 68, the number of people who responded to the notion stating that as CIOs our cloud and IoT platforms offer integrated data storage solutions, hereby helping reduce data storage costs, was 405. About 99 of these respondents representing 24.4 percent of the total respondents strongly agreed with this notion, while 204 respondents accounting for a whopping 50.4 percent of the total respondents did agree but not strongly with this notion. However, a few number of respondents, not more than 14 in number did disagree with the notion, with about 3 more respondent strongly disagreeing. About 85 respondents representing 21.0 percent of the total respondents were neutral as concerns this notion.

	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly Agree	109	26.9	26.9	26.9
Agree	195	48.1	48.1	75.1
Neutral	84	20.7	20.7	95.8
Disagree	12	3.0	3.0	98.8
Strongly Disagree	5	1.2	1.2	100.0
Total	405	100.0	100.0	

Fig 69: As cloud based programs can be accessed anywhere, it saves logistics and data transfer costs

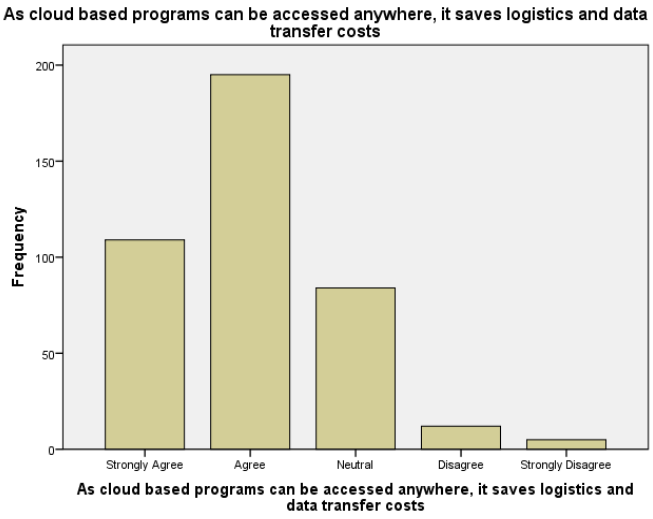

Fig 70

In congruence to the data computed in Fig.69 and 70, the number of people who responded to the notion stating that As cloud based programs can be accessed anywhere, it saves logistics and data transfer costs, was 405. About 109 of these respondents representing 26.9 percent of the total respondents strongly agreed with this notion, while 195 respondents accounting for a whopping 48.1 percent of the total respondents did agree but not strongly with this notion. However, a few number of respondents, not more than 12 in number did disagree with the notion, with about 5 more respondent strongly disagreeing. About 84 respondents representing 20.7 percent of the total respondents were neutral as concerns this notion.

	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly Agree	115	28.4	28.4	28.4
Agree	191	47.2	47.2	75.6
Neutral	76	18.8	18.8	94.3
Disagree	19	4.7	4.7	99.0
Strongly Disagree	4	1.0	1.0	100.0
Total	405	100.0	100.0	

Fig 71: As our cloud and IoT technologies can be expanded for large number of users, the cost of additional infrastructure is saved

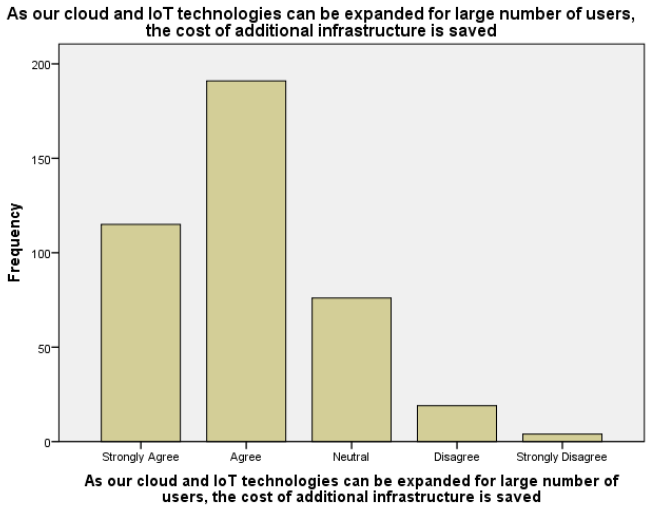

Fig 72

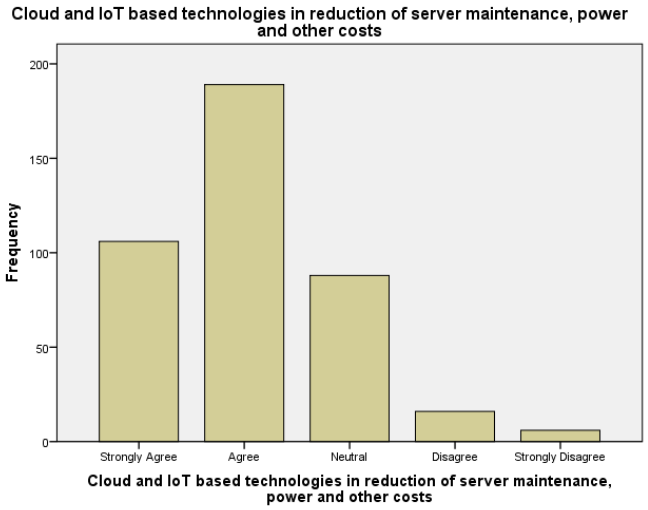

Fig 74

In congruence to the data computed in Fig.71 and 72, the number of people who responded to the notion stating As our cloud and IoT technologies can be expanded for large number of users, the cost of additional infrastructure is saved, was 405. About 115 of these respondents representing 28.4 percent of the total respondents strongly agreed with this notion, while 191 respondents accounting for a whopping 47.2 percent of the total respondents did agree but not strongly with this notion. However, a few number of respondents, not more than 19 in number did disagree with the notion, with about 4 more respondent strongly disagreeing. About 76 respondents representing 18.8 percent of the total respondents were neutral as concerns this notion.

In congruence to the data computed in Fig.73 and 764, the number of people who responded to the notion stating that Cloud and IoT based technologies in reduction of server maintenance, power and other costs, was 405. About 106 of these respondents representing 26.2 percent of the total respondents strongly agreed with this notion, while 189 respondents accounting for a whopping 46.7 percent of the total respondents did agree but not strongly with this notion. However, a few number of respondents, not more than 16 in number did disagree with the notion, with about 6 more respondent strongly disagreeing. About 88 respondents representing 21.7 percent of the total respondents were neutral as concerns this notion.

	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly Agree	106	26.2	26.2	26.2
Agree	189	46.7	46.7	72.8
Neutral	88	21.7	21.7	94.6
Disagree	16	4.0	4.0	98.5
Strongly Disagree	6	1.5	1.5	100.0
Total	405	100.0	100.0	

Fig 73: Cloud and IoT based technologies in reduction of server maintenance, power and other costs

	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly Agree	117	28.9	28.9	28.9
Agree	188	46.4	46.4	75.3
Neutral	83	20.5	20.5	95.8
Disagree	14	3.5	3.5	99.3
Strongly Disagree	3	.7	.7	100.0
Total	405	100.0	100.0	

Fig 75: Cloud based data backup saves the cost of retrieving lost data during system crashes or natural calamities

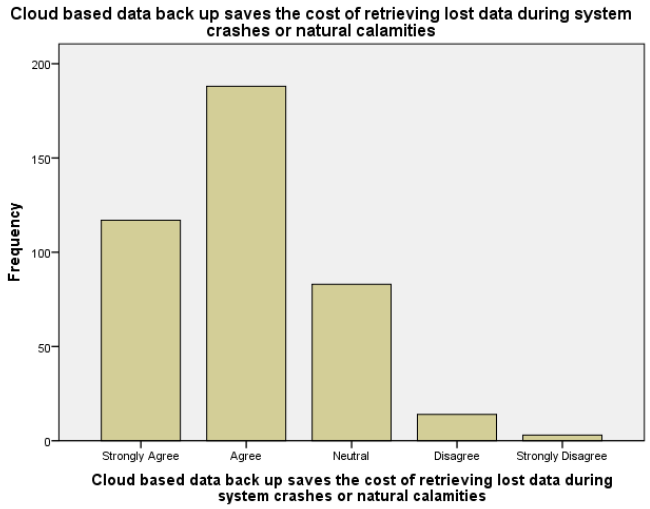

Fig 76

In congruence to the data computed in Fig.75 and 76, the number of people who responded to the notion stating that Cloud based data backup saves the cost of retrieving lost data during system crashes or natural calamities, was 405. About 117 of these respondents representing 28.9 percent of the total respondents strongly agreed with this notion, while 188 respondents accounting for a whopping 46.4 percent of the total respondents did agree but not strongly with this notion. However, a few number of respondents, not more than 14 in number did disagree with the notion and about 83 respondents representing 20.5 percent of the total respondents were neutral as concerns this notion.

V. CONCLUSION AND RECOMMENDATIONS

Cloud services could give a business relative favorable position over its rivals and cost advantage, through the advantages they give i.e. enhanced business agility and diminished capital use. The multifaceted nature of the Cloud was observed to be a noteworthy challenge in the adoption procedure, however, it ought to be noticed that Cloud arrangements are getting less mind boggling with the improvement of the innovation. Similarity was distinguished as another test that a business is probably going to confront. Two similarity issues were perceived – similarity with existing framework, what's more, a similarity with other Cloud framework. The examination set up excess as a factor. The discoveries proposed that any expenses of the current foundation must be considered before an official choice to receive Cloud processing can be made in light of the fact that some of the time utilizing the current foundation could be the more productive choice.

The results shows that the new role of the CIO has resulted in successful implementation of cloud and IoT based technologies. The study also states that the most of the companies cloud and IoT platforms has less chance of failure and they are set up in such a way that they have adequate methods for recovery. To have the best availability and reliability most of the cloud infrastructures are using effective tools to address the issues which can give higher confidence rate to the cloud adopters. The confirmation from IT and business leaders states that they have taken the necessary measure to backup and store data to be easily retrieved during emergencies. The results shows that the availability of the cloud is high with minimal downtime and server failures. The infrastructure is designed with enough redundancy so that resiliency is achieved in case of failures. The automated backup mechanisms are helping the organizations from any data loss.

The analysis on the scalability and security aspects states that the cloud and IoT platforms are capable to scale and it is built with the required capacity so that the performance doesn't get affected during peak operation period. The organizations are spending considerable effort to bring in improvement to the cloud and IoT platforms to improve the scalability. This can also give an idea that there is huge amount of research or innovations are going on in this area. The organizations are trying to explore options to improve the scalability by innovative methods. The platforms are designed with proper business goals so

that any change in the business environment can be effectively addressed by the cloud infrastructures. This also gives a learning to the companies implementing and adopting cloud to make sure that they are doing the required business forecasting and planning for designing the cloud and IoT infrastructures. A poor planning in this area can negatively affect the future business of any organization. So the organizations has to give utmost importance to match up with the environmental changes in the business. The organizations are concerned about the security of their infrastructures and they are doing the best possible measures to safeguard their infrastructure. The organizations are constantly monitoring their cloud and IoT platforms to identify any potential security threats that would impact their business. From this study it gives a reference that there is huge scope for research in scalability and security aspects of the cloud and IoT. Assessing the scalability and security of cloud-IoT technologies, including its capacity, throughput and additional lower costs, it is concluded that the targeted successful implementation of cloud-IoT based technologies will be very much easier to accomplish by improving cloud throughputs frequently by looking out for newer operating mechanisms.

The analysis of the capacity and throughput parameters states that the organizations are showing more interest in optimizing the existing resources. The organizations implementing the cloud and IoT has to prepare a roadmap of the capacity well in advance before the implementation of cloud and IoT. A proper planning would help the organizations to optimise the resources when the volume of transactions increases in the infrastructure. An architects and designers also need to consider the chances of error rates and do the required resource planning to avoid any losses. The results of this study states that there is huge scope for research in the area of digital optimization.

Moreover, the result analysis unveiled that the overall experience and/or exposure, and the industry sector of one's present organization plus his/her background education status goes a long way in the successful implementation of Cloud-IoT based technologies. Also, it became obviously necessary that cloud-based data back-up saves the cost of retrieving lost data during system crashes or any natural calamity, as well as helps in the reduction of server maintenance, power and other costs. It is important that as cloud & IoT technologies are being expanded to be accessible by large number of users, the cost of all additional infrastructures is being saved. The results also reveals that as cloud-based programs are being accessed anywhere, it saves logistics and data transfer costs much more importantly. It proved that cloud & IoT platforms offer integrated data storage solutions, thereby helping to reduce data storage costs in the atmosphere of its successful implementation.

In the same vein, as business leaders willing to successfully implement and integrate cloud technologies, it is necessary to achieve maximum transaction per seconds and respond to the requests of each user within the shortest possible timeframe, thus enhancing good customer satisfaction and service. It is also quite important to allocate only the required resources to cloud-IoT based platforms to avoid critical losses. As business and IT leaders, it becomes essential to constantly innovate, thus improving productivity while minimising the use of scarce resources and eliminating unnecessary errors. It is also essential to indulge in capacity planning and tracking of the available resources. Furthermore, it will do the company good to update data-safety mechanisms frequently, and checking any breach in network security or security threats, as a way of enhancing optimal usage of resources, i.e, network security and data security. In addition, cloud technologies can multi-task in terms of application requests without slowing down, and it is built to

accommodate changing business objectives (flexibility).

The cloud-IoT platforms should be able to withstand server failures, endure power outages, network failures and any form of environmental damage one again. These and many more will surely enhance the reliability, availability, scalability, security, capacity, throughput and cut operating costs of cloud-Iot based technologies in the quest of its successful implementation and integration. The execution was another issue that was recognized as a factor. The discoveries recommended it needs thought in light of the fact that receiving Cloud services could influence the system execution and accessibility of the services is outside of the business control. Likewise, security was distinguished as the best mechanical test. The discoveries contradicted that by recommending that substantial organizations have their very own foundation that needs thought and it would be less demanding for little organizations to receive cloud services as a result of the moderately little set-up expense. Considering the constraints to the exploration of this examination a proposal for further research can be made. With the end goal to address these issues, a further research could be made utilizing a quantitative technique that could look at a bigger example of the populace.

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