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CLOUD COMPUTING TECHNOLOGY IN BANGLADESH: A FRAMEWORK OF SOCIAL &ECONOMIC DEVELOPMENT[1]

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Abstract

Cloud computing is currently one the most hyped IT innovations that promises potential opportunities for business and social innovation as well as modernizing ICT. For developing countries like Bangladesh, this technology aims to provide the clients a cost effective and convenient means to manage the huge amount of IT resources and thus offer strong possibility of accelerating social and economic development, even in this time of limited resources. As the information technology industry goes through a major shift, founded on the Internet as a platform, new opportunities for Bangladesh are open to employ technology at a lower cost and with much greater ease and success than in the past. The Main purpose of our strategy is to help organizations of public and private sector in Bangladesh to adopt cloud computing technology opportunities and prevent its obstacles through our proposed framework. In this article, we tried to assess different aspects and strengths, weaknesses, opportunities and threats of these strategies for Bangladeshi organizations and enterprises. In addition some recommendations are provided for Bangladeshi organizations and enterprises to help them to adopt cloud computing technology.

Keywords: Cloud technology, Bangladesh, Opportunity, Weakness, Cloud adoption framework.

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Introduction

Today World relies on Cloud computing to store their public as well as personal information. Cloud computing was first pioneered in the consumer world by companies such as Google, Yahoo!, and Amazon.com. More recently, Web sites such as Facebook, MySpace, YouTube, Wikipedia, and Twitter have given rise to the phenomenon of social networking, communities, and user-generated content. Recently, companies have also started using Facebook-like social networks on the Web for their customers, business partners, and employees. The Goldman Sachs (2005) report indicates that 11 countries; Bangladesh, Egypt, Indonesia, Iran, Korea, Mexico, Nigeria, Pakistan, Philippines, Turkey and Vietnam, commonly referred to as N-11, represent the next platform of new demand and sustained growth that could surpass major markets. From a business perspective, this technology is about improving organizational efficiency and reducing cost, often coupled with the objective of achieving a faster time-to-market. From a technology and engineering perspective, Cloud Computing can help to realize or improve scalability, availability, and other non-functional properties of application architectures. As a driver of economic growth, the Cloud offers great opportunity for Bangladesh can accelerate social and economic development.

Liturature review

Cloud computing is an expression used to describe a variety of computing concepts that involve a large number of computers connected through a real-time communication network such as the Internet. The National Institute of Standards and Technology's definition of cloud computing identifies "five essential characteristics":

On-demand self-service:. A consumer can unilaterally provision computing capabilities, such as server time and network storage, as needed automatically without requiring human interaction with each service provider.

Broad network access: Capabilities are available over the network and accessed through standard mechanisms that promote use by heterogeneous thin or thick client platforms (e.g., mobile phones, tablets, laptops, and workstations).

Resource pooling: The provider's computing resources are pooled to serve multiple consumers using a multi-tenant model, with different physical and virtual resources dynamically assigned and reassigned according to consumer demand.

Rapid elasticity: Capabilities can be elastically provisioned and released, in some cases automatically, to scale rapidly outward and inward commensurate with demand. To the consumer, the capabilities available for

provisioning often appear unlimited and can be appropriated in any quantity at any time.

Measured service: Cloud systems automatically control and optimize resource use by leveraging a metering capability at some level of abstraction appropriate to the type of service (e.g., storage, processing, bandwidth, and active user accounts). Resource usage can be monitored, controlled, and reported, providing transparency for both the provider and consumer of the utilized service.

—National Institute of Standards and Technology

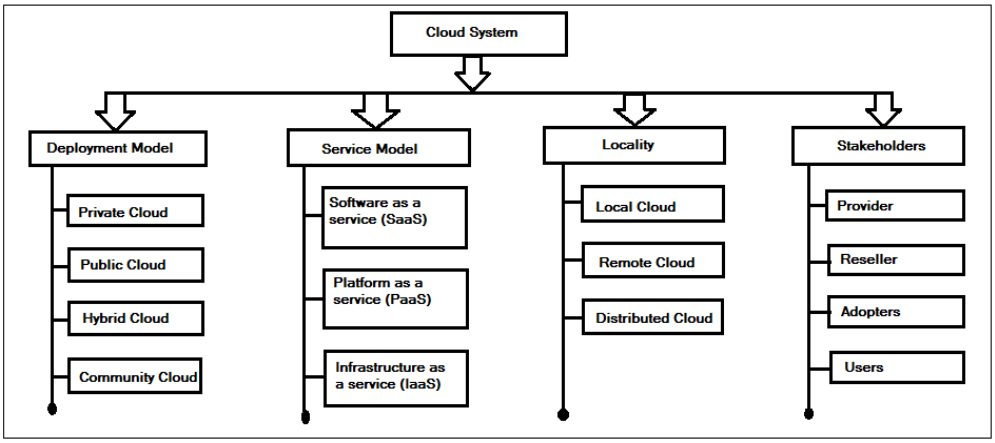

Fig. 1: Non-Exhaustive view on the main aspects forming a Cloud system

Deployment models

Private Cloud: The cloud infrastructure that is managed and operated for one organization only, so that a consistent level of control over security, privacy, and governance can be maintained is called private cloud. It is also known as Internal Cloud or on-premises Cloud. It may be managed by the organization or a third party and may exist on premise or off premise.

Public Cloud: The cloud infrastructure that is made available to the general public or a large industry group and is owned by an organization selling cloud services is called public cloud. It is also known as external cloud or multitenant cloud.

Community Cloud: The infrastructure which is referred to as special-purpose cloud computing environments shared and managed by a number of related organizations participating in a common domain or vertical market is called community cloud. It may be managed by the organizations or a third party and may exist on premise or off premise.

Hybrid Cloud: The cloud infrastructures that is composition of two or more distinct cloud infrastructure (private, community or public) but are bound together by standardized technology that enable data and application portability is called hybrid cloud. It provides benefits of multiple deployment

models and enables the enterprise to manage steady-state workload in the private cloud.

Cloud computing service models

SaaS (Software as-a-Service): The software deployment model, which is the highest form of services that deliver special purpose software to the consumer to use the provider's applications running on a cloud infrastructure through the internet is referred to as Software as-a-Service. It is sometimes referred to as "on-demand software" and is usually priced on a pay-per-use basis. This eliminates the need to install and run the application on the cloud user's own computers, which simplifies maintenance and support. SaaS providers generally price applications using a subscription fee. The main drawback of SaaS is that the users' data are stored on the cloud provider's server.

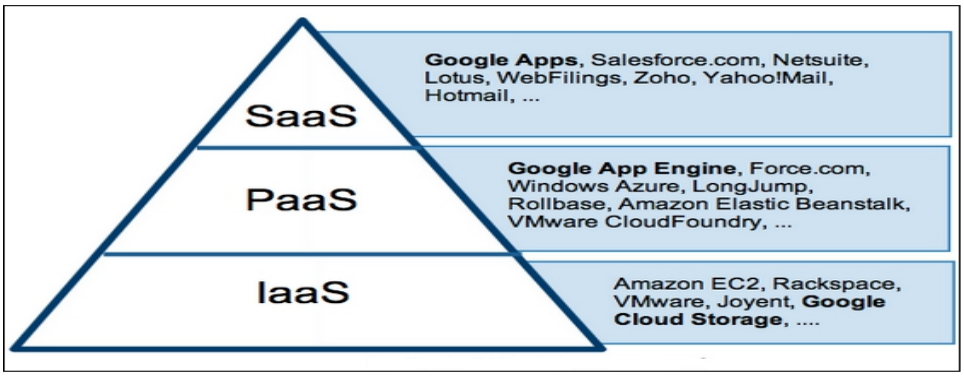

Fig. 2: Presentation of service models of Cloud Computing

PaaS (Platform as-a-service): The software deployment model whereby a computing platform is provided as an on-demand service upon which applications can be developed and deployed is referred to as platform as-a-service .It is built on the top of IaaS and joins with software as a service (SaaS) and infrastructure as a service (IaaS), where application developers can develop and run their software solutions on a cloud platform without the cost and complexity of buying and managing the underlying hardware and software layers.

IaaS (Infrastructure as-a-Service): The software deployment model where the basic computing infrastructure of server, software, and network equipment's are provided as an on-demand service upon which a platform can be developed and execution of applications can be established is referred to as Infrastructure as-a-Service. Its main purpose is to avoid purchasing, housing, and managing the basic hardware and software infrastructure components, and instead obtain those resources as virtualized objects controllable via a service interface.

Cloud computing in developing countries

The advantages of adopting cloud can be profound for government IT departments, starting with the reduction or redirection of on-site IT staff as well as the ability to access IT resources and infrastructure as needed. The importance of having a cloud computing strategy is becoming more obvious on a daily basis. A lot of companies are moving towards this interesting technology. Different organizations and companies from different countries already showed their significant capabilities at the growing business of cloud computing. The growth is based on real business opportunities. Economically some developing countries like Bangladesh also become inclined to the cloud computing technologies. Cloud offers these countries some of its features at low cost and provides more flexibility. For a growing number of organizations worldwide, cloud computing offers a quick and affordable way to tap into IT infrastructure as an Internet service. But obstacles and challenges remain.

Overall statistics of data storage in cloud server

The desire to share content and to access it on multiple devices will motivate consumers to start storing a third of their digital content in the cloud by 2016, according to Gartner, Inc. Gartner said that just 7 percent of consumer content was stored in the cloud in 2011, but this will grow to 36 percent in 2016. Annual global data center IP traffic will reach 8.6 Zettabytes (715 Exabyte [EB] per month) by the end of 2018, up from 3.1 Zettabytes (ZB) per year (255 EB per month) in 2013. Global data center IP traffic will nearly triple (2.8-fold) over the next 5 years. Overall, data center IP traffic will grow at a compound annual growth rate (CAGR) of 23 percent from 2013 to 2018. The growth of the distribution of cloud traffic significantly increases every years. The distributed cloud traffic map of 2012 is pictured below.

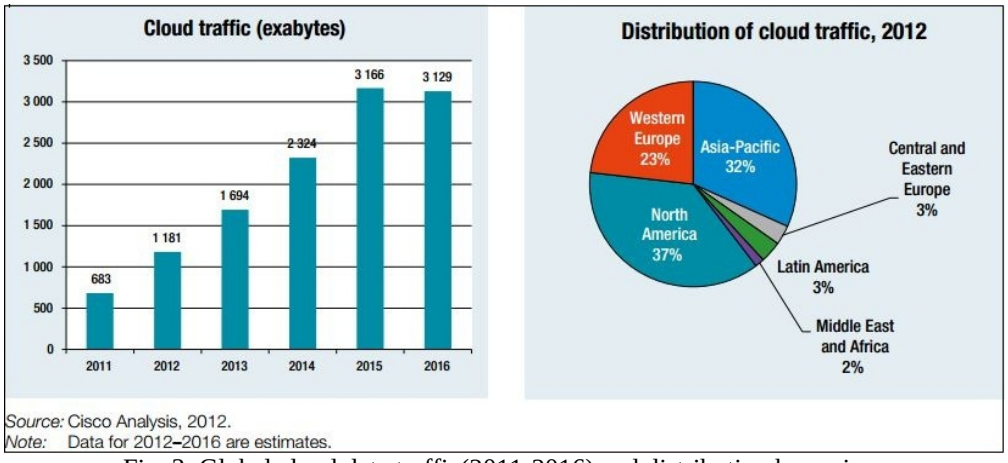

Fig. 3: Global cloud data traffic(2011-2016) and distribution by region

Most of these data are from the developed countries like Japan, Australia, US, Germany, Singapore, France, UK, Korean, Canada, Italy, Spain, Poland, Malaysia, Russia, Mexico, Argentina, India, Turkey, China, Indonesia, Brazil and some other big large countries.

Current situation in developing countries

Developed and large countries manage large amount of data while other countries of the 3rd world really fall backwards than those developed countries. In fact many of the countries did not set up cloud computing servers because of either lack of proficiencies in the management and operating of servers or lack of capacities to bear the cost. For example According to the "Information Economy Report 2013", 28 percent of internet users in the developed countries had taken broadband services in 2012. The rate, however, was a mere 0.3 percent in Bangladesh. On the other hand, 0.5 percent internet consumers use mobile broadband services in Bangladesh. The rate is 67 percent in the developed nations. According to the UN report, a lack of access to affordable broadband and data servers in developing countries severely limits the scope of 'cloud computing' that uses vast, shared virtual servers instead of localized hardware to run applications and store data. In June 2013, more than 60 percent of located IXPs are form Europe and North America. In Africa, which was home to only 6 percent of the world's IXPs. Distribution of co-location data centers, by group, 2013 shows the Co-location data centers for developing economies consumes 85% of storage in the data centers while only 13% of storage remain for the developing countries. Least developed countries consumes no storage in the cloud.

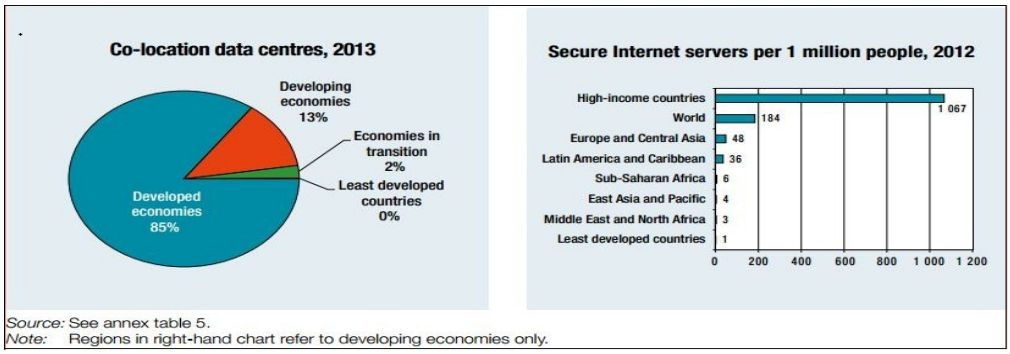

Fig. 4:Distribution of co-location data centers, by group, 2013

Offers of cloud technoloy for developing countries

Cloud computing and cloud services offers potential advantages to the customers in developing countries like Bangladesh. As the cloud computing ecosystem evolves, the organizations and companies from the developing world should consider these offers. These potential offers are the

great opportunities for the developing nations to grow their business in a significant manner. These offers include:

- Reduced costs for rented IT hardware and software compared to in-house equipment and IT management.
- Enhanced elasticity of storage/processing capacity as required by demand.
- Greater flexibility and mobility of access to data and services.
- Immediate and cost-free upgrading of software.
- Enhanced reliability/security of data management and services.

Cloud computing technology in Bangladesh

Cloud computing adoption speed in Bangladesh is not equal to world cloud adoption speed. Limited companies in Bangladesh are working on cloud service provision. Cloud computing strengths and weaknesses can be generalized for Bangladeshi organization and industries. In this section with a focus on cloud computing opportunities and obstacles tried to derive some potential opportunities and obstacles for Bangladeshi organizations and industries. The table given below summarizes the Opportunity and obstacles of cloud in Bangladesh:

Opportunities	Obstacles
• Cost efficiency • Service scalability • Efficiency in the use of IT • Business dimension • Faster-time to market • Innovation • IT development in small and medium size industries(SME's) • Using cloud service in the development of e-learning and e-education • Using cloud service in order to develop and implement enterprise resource planning systems and customers' relationships management • Using cloud computing service in order to realize e-government and e-voting • Using cloud computing in teleworking • Green Computing	• Security • privacy • Change in organizational structure • Performance • Financial • Legal • Learning • Sanctions • Lack of standards

Opportunities of cloud technology in Bangladesh

Cloud computing is a framework for both business and social innovation as well as modernizing ICT. Cloud provides a platform for business units to develop and deploy new processes, systems and offerings that make them more competitive. Cloud also helps turn IT into a more effective and

responsive business service. Ensuring on-demand access to pools of trusted infrastructure and services, cloud promises to de-couple business initiatives from the IT capabilities driving them. Some of the following issues can be treated as the cloud offers a lots of opportunities to its clients. Cloud computing has many strengths and opportunities for Bangladeshi organizations and industries. Some of them are:

- ***Cost efficiency:*** The main objective of cloud computing is to provide the clients a cost-effective convenient means to consume the IT resources in actual amount. As there is no need to install any application in user's computer, cloud also helps to reduce the cost for infrastructure maintenance and acquisition. The visible outward lower barrier is provided by third party mostly and does not need to be purchased for one-time or frequent tasks. Using cloud computing, IT costs such as infrastructure, maintenance and operational costs will be decreased. So, Small organization and companies in Bangladesh who want to start business with low capital can use cloud computing frameworks.
- ***Service scalability***: Aligned with unpredicted service demands, cloud computing shows its better functionality. Cloud computing can respond best to demand changes. Scalability is the provision of this specification for Bangladeshi organizations and industries to be more flexible against IT demand changes. This specification leads to improve IT service provision. In some applications in which this unpredicted demand is associated with a period of time, this specification shows most of its functionalities.
- ***Efficiency in the use of IT***: Bangladeshi organizations and industries can be more efficient with some features such as the increase of IT infrastructure usage, the creation of new technical and economical solution which is not possible without cloud computing, prototyping and acceptance review for new approaches. In addition, IT services will be more resistant against substitution threats.
- ***Business dimensions:*** Cloud computing technologies drives the new business opportunities for developing countries like Bangladesh in a beneficiary ways. It offers various services that leads the organizational business mostly towards rapid growth and nimbleness.
    - ✓ Growth: ***Whether the business challenge is expanding into new markets, attracting and retaining new customers, executing M&A strategy or speeding up time-to-market for new products and services, cloud allows organizations to rapidly and easily scale up their operations to support business goals.***
    - ✓ Agility: ***The cloud model, with its flexible infrastructures and on-demand pricing, is starting to reset the expectations***

for IT within business. It presents the opportunity for IT to be re-cast as an enabler of business agility — rather than an inhibitor of business change.

- ✓ Adaptability: ***it is an essential feature of cloud systems that strongly relate to elastic capabilities. The on-time reaction to changes in the amount of requests and size of resources determine the adaptive capacity of the system of organizations and companies. Adaptation also changes in different environmental conditions such as resources, quality and routes etc.***

- ***Faster-time to market:*** From a business perspective, the purpose of cloud is to achieve a faster time-to-market. Enterprises such as small and medium want to spread their service to adopt with the growing business competitive with the larger industries. They sell their services quickly and easily with little delays by setting up the infrastructure. Larger enterprises compete the market with greater innovation and less overhead.
- ***Innovation:*** The cloud is creating a foundation for a flexible assembly model to accelerate past tech investment that organization have made and transform them into business model. It also fastening the emerging trend of big data and analytics, mobile computing and social business prior to the innovative ideas. Companies are dealing with these services and linking them to create new and innovative business processes. Using innovative feature of cloud computing, Bangladeshi organization and industries can expand their organizational cultures
- ***IT development in small and medium-sized industries(SME's***): Bangladeshi small and medium-sized industries are faced with the problems in their services because of low IT budget. Cloud computing provides some opportunities for organization which have low investment power on IT infrastructures. These organizations can use cloud computing technologies to expand IT services.
- ***Using cloud service in developing e-learning and e-education:*** Using cloud computing technology, Bangladeshi student in school, college & university can access the educational services collaboratively and beyond the geographic. This level of access improves student's educational level.
- ***Using cloud service in order to develop and implement enterprise resource planning systems and customers' relationships management:*** Bangladeshi SME's are faced with many problems in the context of enterprise resource planning (ERP) and customer relationships management (CRM) systems. These problems include: high investment power, security and privacy considerations. ERP service based on cloud computing technology can help organization to acquire cloud

opportunities. In this context, provision of such services is essential and Bangladesh government can play vital role with provision of enterprise resource planning services based on cloud computing technology.

- ***Using cloud computing service to realize e-government and e-voting:*** Cloud computing roles in provision of such services is highlighted every day. Bangladesh government can use these opportunity to improve its e-government and e-voting. Cloud computing can play an important role in this topic by the provision of communication channels and elimination of barriers.
- ***Using cloud computing in teleworking:*** Deployment of teleworking in the world and opportunities that it brings shows the necessity to use cloud computing technology in deployment of teleworking in Bangladesh. With making available the necessary platform to access the programs, data and etc. cloud computing plays an important role in this context.
- ***Green Computing:*** Using power saving mechanisms, cloud computing deploys green IT. The decrease of IT infrastructures and aggregation and transition of these infrastructures into cloud computing service leads to decrease in environmental pollution.

Obstacles of cloud technology in Bangladesh

Cloud computing provides some strengths and opportunities for Bangladeshi organizations and industries; in contrast, cloud computing has some weaknesses and threats. These weaknesses and threats are described as follows:

Security: Cloud computing has already gained a lot of popularity and is considered the future in the IT industry. Therefore hackers are also interested in it. Various attacks such as social engineering attack, XML signature wrapping attack, malware injection, data manipulation, account hijacking, traffic flooding, and wireless local area network attack pose a great risk to cloud computing systems. There have been many instances where companies have fallen victims to cloud computing being hacked. The internet is used by cloud computing technology as a base for service provision. Lack of access to the internet may cause lack of cloud service availability. In addition all risks and threats to the internet for Bangladeshi organizations and industries will also associate with cloud computing technology. In public platforms of cloud computing due to adjacent physical data and users' environments, some threats such as information leakage, side channels, covert channels and etc. may occur.

- ***Privacy:*** Privacy is another key concern data that the service collects about the user (e.g., event logs) gives the provider valuable marketing information, but can also lead to misuse and violation of privacy. Privacy

of users or organization is at risks because of access to sensitive information. Damage that may be caused from security risks for Bangladeshi organizations and industries is very serious that make organizations consider such risks before any decision to adopt cloud computing technology. Providers ensure that all critical data (credit card numbers, for example) are masked or encrypted (even better) and that only authorized users have access to data in its entirety. Moreover, digital identities and credentials must be protected as should any data that the provider collects or produces about customer activity in the cloud.

- ***Change in organizational structure:*** Cloud computing framework will change organizational structure. Organizations and industries in Bangladesh must assess their business processes and organization for compatibility with cloud computing and overcome any obstacles before any decisions. Some skills such as project, change and contract management should be considered.
- ***Financial:*** Cloud computing changes IT budget from capital to operational. This change must be considered in the case of organizations budgeting process.
- ***Legal:*** With storing data in third country, Bangladeshi organizations and industries should be aware of legal issues in the field of international and national law of both source and destination countries.
- ***Learning:*** In cloud computing adoption by Bangladeshi organizations and industries, consider staffs and IT managers' training is important.
- ***Sanctions:*** One of the threats that the Bangladeshi organizations and industries are faced with is the threat of international sanctions. If an organization moves its data and critical applications to provided cloud service by international providers, risk of unavailability due to sanctions would be immense. Therefore, it's recommended that the government provides a framework to stop this threat.
- ***Lack of standards:*** Because of poor standards in cloud infrastructures and services, there is a risk of inconsistent service which is provided by different providers. In this context, governmental agencies are responsible for the task of writing and publishing standards for cloud computing services.

Proposed framework for adopting cloud technology in Bangladesh

The information technology revolution lies at the heart of global economic growth over the last several decades. In order to introduce the benefit and opportunities that cloud computing brings for Bangladeshi organizations and industries, the need to develop a strategy in this area seems critical for responsible organizations. With provision of cloud computing strategies in the world and highlighting its roles and applications in

organizations and industries, responsible organizations and agencies must play their roles in the deployment of this technology with formulation of a systematic and integrated strategy. In this section, we tried to use important strategies in the world and cloud computing opportunities for Bangladesh an organizations and industries to develop a framework in order to help them in developing their own strategies. Organizations and industries can use these guidelines to make decision about cloud computing implementation and also to implement a correct and effective strategy. This framework is provided to prepare a decision making framework and present some steps for cloud computing implementation. In Figure (5) proposed steps for cloud adoption and implementation by Bangladeshi organization and industries are shown.

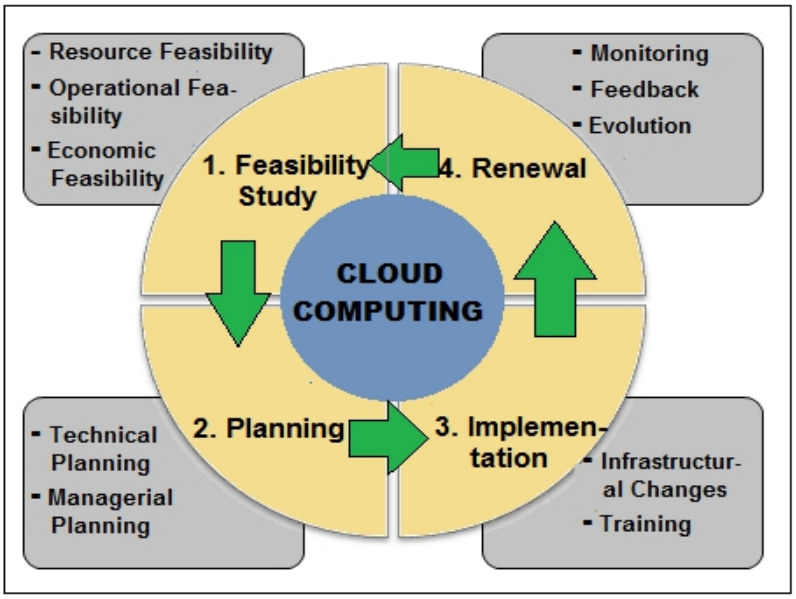

Fig. 5: Proposed Framework for Cloud Adoption

In the proposed framework, the implementation of cloud computing in Bangladeshi organizations and industries is proposed in four steps. For each step, some suggestions are proposed using current cloud computing strategies as a guide for organizations and industries to be used in this context.

Step I: Feasibility Study

The initial investigation points to the question whether the Cloud computing project is feasible for particular organization. This includes an identification description, an valuation of the proposed systems and selection of the best system for the job. The requirements of the system are specified with a set of constraints such as system objectives and the description of the

outputs. It is then duty of the analyst to evaluate the feasibility of the proposed system to generate the above results. Three key factors are to be considered during the feasibility study.

Resource Feasibility: In the first move, the value resources for cloud computing must be determined and justified. These resources include cloud computing strengths and opportunities. These strengths and opportunities are agility, efficiency, cost saving, availability and etc. according to these values and resources, organizations and industries must make decision about the implementation of cloud computing services. Some specifications are provided which can be valuable in identifying suitable service that has high priorities to move in cloud computing services. In order to identify the resources value, the following steps can be used:

- Conducting an extensive and comprehensive analysis of an organization's IT environment to identify cloud computing adoption candidates.
- Candidates' prioritizing based on the benefits and risks.
- Developing a business model to measure the value and benefits derived from the candidates.
- Identifying the models to analyze the value of cloud computing.

Operational Feasibility: The second move in this step is to assess readiness of the organizations to adopt cloud computing. In this field, some factors including: security, market and service specifications, government readiness and technology life cycle can be mentioned. Organization readiness considerations for cloud adoption are mentioned as follows:

- **Security:** laws and organizational needs, Data specifications, Privacy and confidentially, Integration, Data control, Access policies, Governance.
- **Service specifications:** Interoperability, Availability, Performance, Reliability, Portability.
- **Market specification:** Market landscape, Maturing cloud market competition, Ability to move among multiple service providers and distributors.
- **Governmental service specification:** Availability of network infrastructure and needed software, capable managers, negotiation ability, relevant technical experience, Change management culture.

Economic Feasibility*:* Economic feasibility is the most important and frequently used method for evaluating the effectiveness of the proposed system. It is very essential because the main goal of the proposed system is to have economically better result along with increased efficiency. Cost benefit analysis is usually performed for this purpose. It is the comparative

study of the cost verses the benefit and savings that are expected from the proposed system.

Step II: Planning

This step is planning of needed platform for the transition to the cloud computing technology. In this step, some technical and managerial considerations are provided to prepare organizations and industries to adopt cloud computing. These technical and managerial considerations are summarized as follows:

Technical:

- Deciding on the necessary components in order to move data to cloud computing to create a balance between the benefits and risks of cloud computing.
- Evaluation of technology and market perspective to ensure the adoption process and support the transition to cloud computing.
- Identifying and adopting best cloud computing standards.
- Reviewing system engineering processes throughout the organizations life cycle, in order to ensure the adoption and transition process support. [13]
- Checking the compatibility of current software to run on a cloud computing platform.
- Developing a risk assessment of cloud computing in the organization to identify risks associated with IT environment.
- Converting systems and processes to an integrated, cooperative, united and with integrated and data centric organizational data environment.

Managerial:

- Changing IT mindset from equipment thinking to service thinking.
- Creating a risk management plan to address cloud computing challenges.
- Contracting effectively and ensuring that it meets the organizational needs.
- Investing and revising on the organization's IT roadmap
- Creating plan and policies to implement cloud computing.
- Reviewing exiting IT governance model and developing a governance model related to organization's strategy.
  Identifying and reviewing all related policies to ensure support for cloud computing services.

Determining and disseminating of policies to guide all relevant programs.

Step III: Implementation

After the planning for the adoption of cloud computing, organization can implement their suitable cloud computing. In this context, the following considerations can assist organizations in the establishment[23] of the cloud infrastructure. These considerations include:

Infrastructural Changes:

Choosing a suitable platform for cloud computing implementation according to organization's features, opportunities and threats.

Implementing a suitable cloud infrastructure.

Changing the organization to a stable, secure, integrated and etc. cloud environment.

Transferring data to a central data centers in cloud computing environment.

Implementing a security structure in order to defend/IT environment against threats in cyberspace.

Training:

Creating a new set of skills depending on the needs.

Working effectively with key leaders and stakeholder of organization.

Developing guidelines to guide adoption and transition to cloud computing services.

Creating awareness about the security of cloud computing

Step IV: Renewal

After implementing cloud computing technology in Bangladesh, the IT security specialist in Bangladesh will constantly monitor the security issues of cloud. Finally according to the customer requirement, continuous research must be done for improving the current cloud architecture and solving security problems. Some considerations are provided by this step. These considerations include:

Proactively monitoring service level agreements (SLA) and service models periodically, in order to maximize benefits and minimize risks.

Reviewing services and providers, in order to ensure its maximum effectiveness, agility and innovation.

Monitoring the performance of cloud computing and the issues associated with service consumer and provider.

Using cloud services, which are supplied by external providers.

In the implementation of cloud computing in Bangladeshi organizations and industries, responsible organization roles should be identified. These organizations are responsible for establishing standards and frameworks for the adoption of cloud computing in Bangladesh. Ministry of communication and information technology of Bangladesh and Bangladeshi institute of standard should be responsible in this context. These agencies are responsible for the classification and prioritization of standards and guides for cloud computing, software development, monitoring related security issues and defining priorities of cloud computing technology. In this context, Bangladeshi government has an important role in determining responsibilities of each organization and agency to avoid Reduplication.

Expectation

The progress of cloud computing in Bangladesh will create potential opportunity for entrepreneurs, small and large business, researchers, and governments. We strongly hope that, for developing countries e.g. Bangladesh, Sri-Lanka, Nepal, Bhutan in ASIA and developing countries in AFRICA, it will be potential level of playing field because cloud computing offers an opportunity to create entirely new types of business and models that couldn't have been imagined or beyond possibilities few years ago. Most of the developing countries have lacking of dedicated servers for storing important and secure data. In this case cloud store offers them the storing places with low costs or entirely for free. The expectance of developing countries like Bangladesh is to grow their business with highest possible security and nimbleness. The functions of cloud computing would be applied towards development listed as e-education, e-health, e-commerce, e-governance, e-environment, and telecommuting. These functions are areas that governments and aid agencies can devote projects and resources to in order to improve a target socio-economic statistic in developing countries.

Conclusion

Currently Cloud Computing is an emerging discipline that helps the IT industries to get efficient use of their Hardware and Software resources and enabling service-oriented, on-demand network access to rapidly scalable resources with promises to cut operational and capital cost. For developing countries like Bangladesh, cloud computing can be an appealing vision for cheap communications. But with advancement of cloud technologies and the increasing number of cloud users, data security dimensions are continuously increasing. So we think, the major problems of cloud need to be resolved and agreements must be made with service provider before major users will adopt clouds for sensitive data and computations. In this paper, we have

discussed and analyzed cloud computing environment to clarify the opportunity of current cloud computing technology for Bangladesh with its data security risks, vulnerabilities and some possible solutions. Using different cloud computing strategies and their Comparison, We also propose a framework that can be very helpful for organizations to develop their own strategies to adopt cloud computing technology successfully .We immensely hope that our paper will be useful not only for Bangladesh but also for developing countries to adopt cloud computing technology for social and economic growth.

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