Hi everyone this is Shoumik, I am an M.Sc. Cyber Security student and this presentation is a research proposal outline on Impact of or implementation of Cloud computing for building effective information systems in Higher Education.

# Problem Statement:

In today’s world, most organizations are moving to cloud computing because of the advantages and scalability provided by the service provider. The following presentation discusses Should higher educational institutes depend on cloud computing to build a cost and security effective Information System.

# Introduction

Cloud computing can be described as a collection of multiple computing components supporting “abstracted virtualized, dynamically-scalable, managed computing power, storage, platforms, and services are delivered on demand to external customers over the Internet” (Foster et al., 2008)

Advantages of cloud computing are Scalability, Mobility, New Services, Storage, Business Resiliency, Security (Pardeshi, 2014), and Paperless and Digitalization (Bouyer & Arasteh, 2014)

Where as the Disadvantages of Cloud Adaptation are Similar Infosec configuration, Shared services. (Nibusinessinfo.co.uk, N.D.)

This are discussed in details in the later section

Moving into the next slide

# Literature Review Outcome

As a part of Literature Review Outcome following are the advantages

Due to a decrease in the budget over the years due to economic slowdown, the cloud has become a major key player to assist higher education to achieve the required infrastructure at a lower cost. This can also help the students from weaker economic sections to avail higher education at a subsidized cost. (Pardeshi, 2014) .

Next topic is scaling up, Pardeshi (2014) states that cloud-based institutes can easily scale up to meet the requirement of the growing demand for systems and computational power. Also provides flexibility to reach out globally to foreign national students. This can also help the professionals to restart their education.

Lets discuss Latest offerings- Latest technology such as AIML, Kubernetes, Quantum, DevOps, DevSecOps, IoT, VR, etc. service is provided by cloud service providers which can be leveraged by higher education institutes to upgrade their courses (Wan et al., 2018). This will help students becoming more industry ready at a lower cost. Since the systems are available with a payment method of pay-as-go which will save cost over hardware and license. Even the cloud service providers have special discount price for the educational institute.

Institutes can leverage the scalable storage provided by cloud providers (Azure, 2022.a) and can easily upgrade for more space as they need.

Next is business resiliency - McKinsey & Company (2022), Pardeshi (2014), AWS (2022), and Azure (2022.b) discussed the importance of data and service redundancy that can be easily opted in the service provided by the cloud service providers which can help in mitigation of disaster scenarios such as ransomware, accidental deletion of data, and hardware crash. Thus reducing the risk of loosing data.

# Literature Review Outcome (Continued)

Cloud service providers deliver inbuild cost analysis while limiting resource utilization and resource consumption analysis alongside the industry best practices. (Winter, 2017). Since the dashboards provided by the cloud providers have all the necessary details required by the admin team to configure and allocate resources accordingly.

Moving to next point, Pardeshi (2014) and Azure (2022.c) states most of the cloud systems comes with inbuilt security which can be leveraged by the institutes to reduce their operational cost. Security features such as Key vault, Build in Firewall,Distributed Denial of service Protection, etc.

Now Lets discuss each in details.,

The key vault provides storage of secure password which can be retrieved whenever required

Distributed Denial of service Protection can stop the attack at the network level while the built in customizable firewall provides internal and external protection at the application level.

Also, the cloud providers provides SIEM i.e. log analysis services and creates and helps in mitigating alerts using AIML.

Now we need to identify the disadvantages, for example if there is a community cloud service which are used by multiple higher education has similar security configuration becomes vulnerable since the malicious users needs only to break thru one of the security system which will provide free access to rest of all the other educational institute.

The other disadvantage of cloud can be stated as the shared resources, where multiple customers use the same server for services, single deadlock in the system resource may create issues for multiple users or institutes.

Similarly if there is a security flaw in the patch update, this will affect multiple customers who are using shared resources since all share the similar architecture.

The most important of all, when higher educational institutes use cloud service for data storage, the Personal Identification Information such as student records, applicant records, etc i.e. the PII data will start residing in the cloud server (both in active and passive servers) , where data lifecycle management is not controlled by the educational institute

Now Moving to the next slide

# Significance of the Research

The current slide will emphasis on the significance of the research

The research will determine if cloud computing can become an integral part of higher education, which might help multiple students around the globe to attain university at subsidized price. We will also try to determine if cloud can help higher education institutes to reduce both capital and operational expense by using the cloud solutions and services.

One of the major focus of the study will try to determine if effective security operations can be attained at an optimal price, if cloud security can help increasing the efficacy of overall infosec posture of the higher education institutes.

The research will also determine if cloud systems can help institutes to achieve compliance such as GDPR, NIST, ISO 27001, etc. and if they can provide better business resiliency.

Moving into the next slide

# Research Methodology

In the current slide we will discuss the research methodology to be adapted for completion of the research.

The research will run into 4 phases, the timeline has been discussed in details in later slide.

The first phase is identification of resources and previous research outcome, here we will try to identify the team members and recruit them.

Next is to identify the recent research papers related to cloud adaptation.

Identify the major cloud providers and their offerings.

Identify requirements of higher institution such as server, storage, services, etc.

Identify Institutes who are currently using cloud or previously used cloud or planning to use cloud solution in order to interview them.

Defining scope of work and research.

Second phase of the project is to set up interview and gather information from institutes shortlisted in the phase 1.

Here each institutes will receive a questionnaire where they will require to provide answers related to

1. Actual change in expense or expected change in expense post implementing cloud.

2. The change in number of students, if it has increased or decreased.

3. If maintaining the compliance has been easier with cloud or traditional IT.

4. how the security posture has been affected by cloud implementation.

Finally If the new service offering had helped in improving the opportunity for the students in getting job placement.

Third phase of the project will help in data analysis, where data received from interview and cloud solutions offerings by service provider will be consolidated to provide In-depth cost-based analysis for cloud solutions and corresponding in-house system

In this phase we will also analyze the security and compliance implementation methodology for both inhouse and cloud-based systems in order to identify the difference.

In the final phase of Research Drafting and Publishing, 3 drafts of final research publish will be created and reviewed.

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# Risk and Control

The current slide will discuss the risks identified for the research.

For example if there is delay in recruiting team members this will lead to change in timeline or may affect the overall project, so to mitigate the scenario, we are already identified potential candidates and are now in process of interview.

Second, if the literature selected are biased either positive or negative this may provide incorrect result thus all the literatures selected will be reviewed by all the team members.

Next Incorrect data analysis, this can lead to failure of the project, since the project will require adequate data to support cost based analysis, so maker-check process will be implemented, where one person will work on the data and the other personnel will check the calculation and sources used. This will help in reducing human error.

Finally, one of the main item for this whole project is to interview institutes who are using cloud or had used cloud in past and try to understand the pitfalls and the advantages. If we don’t get adequate sample data this can lead in failure to the project. So we have already identified institutes and working on appropriate questionnaire to be shared with them.

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# Artifacts to be submitted as a part of the research - Service models for Cloud

The current slide shows different type of cloud and in-house system implementation, such as traditional IT, IaaS, PaaS and SaaS (Paradeshi, 2014), during the research life-time, all the above models will be studied to identify the optimized solution and outcome.

The research will provide cost-based and security-based analysis for all the above-mentioned service modules to get in-depth analysis to identify the best solution.

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# Artifacts to be submitted as a part of the research - Service models for Cloud (Continued)

The current artifact slide discuss a server with “5-year lifetime and an on-premise minimum guaranteed uptime of 99.9% with the following configuration: 14 vCPUs and 72GB of RAM with 1024GB of disk storage” (Azure, 2021). Where the data shows 49% of average monthly savings when cloud has been adapted.

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# Artifacts to be submitted as a part of the research - Service models for Cloud (Continued)

This artifact slide shows the cost difference between On-prem and AWS solution, for a “Windows operating system and Microsoft SQL server and the storage capacity is considered as 3 TB. The future increase is predicted as 15%” (Parthasarathy & Kumar, 2016) The difference is 76037 US Dollar this amount is saved when we are using AWS over on-prem

# Research Time Line

The current slide shows the research time-line, with each item start and end date, with a projected 1 year planning starting from 25th May 2022 till 23rd May 2023. Please let me know if you have any other questions. Thank You for your time.

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