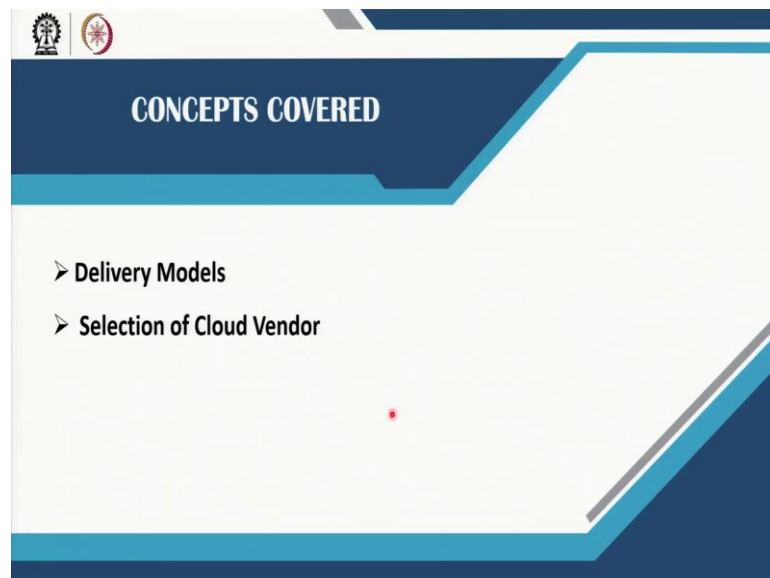


Management Information System
Prof. Kunal Kanti Ghosh
Vinod Gupta School of Management
Indian Institute of Technology, Kharagpur

Week – 07
Module - 05
Lecture - 34
Cloud Computing and Selection of Cloud Vendor

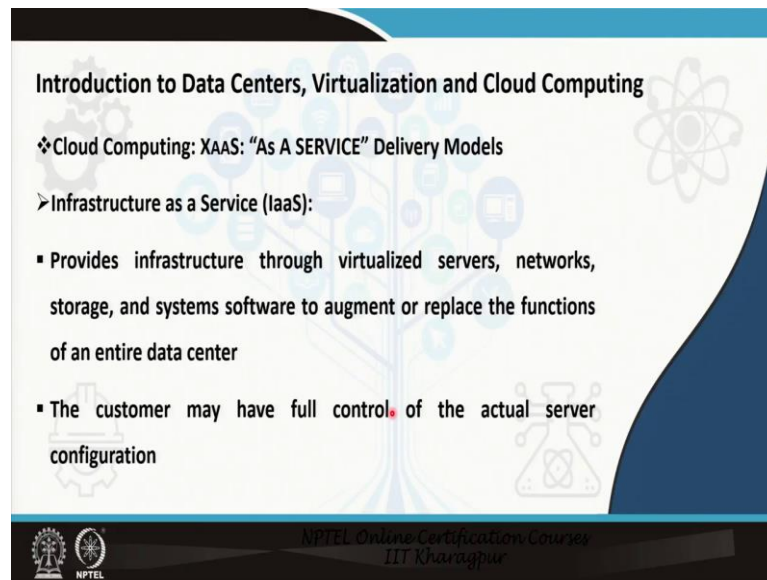
Hi, welcome back to the 5th module of week 7 in our course on “Management Information Systems”! Today’s topic is on types of cloud computing and selection of cloud services provider that is selection of cloud vendor.

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So, the concepts covered will be the different kinds of or types of delivery models that are relevant in the arena of cloud computing and we will be also dealing with this process of selection of cloud service providers or selection of cloud vendor.

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Introduction to Data Centers, Virtualization and Cloud Computing

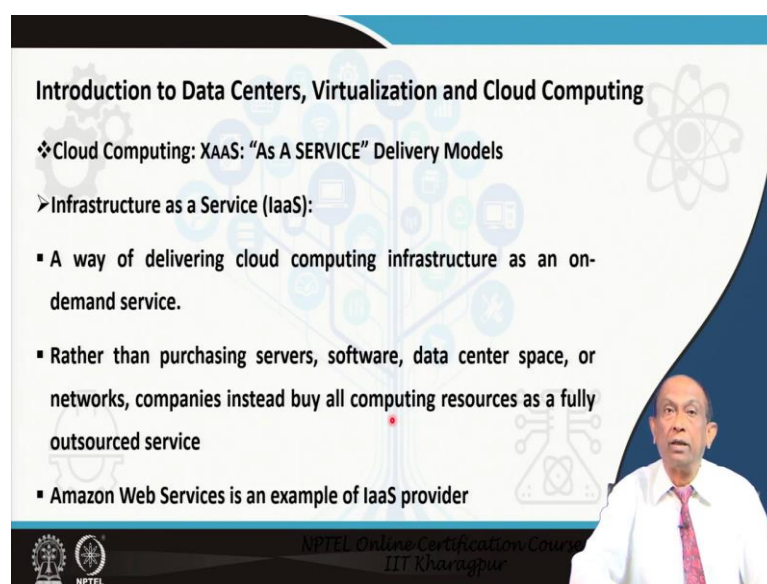
- ❖ Cloud Computing: XAAS: "As A SERVICE" Delivery Models
 - Infrastructure as a Service (IaaS):
 - Provides infrastructure through virtualized servers, networks, storage, and systems software to augment or replace the functions of an entire data center
 - The customer may have full control of the actual server configuration

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So, when we talk about delivery models related to cloud computing, the most popular one is infrastructure as a service, acronymed as IaaS. So, what is infrastructure as a service; what do we mean by that?

This particular delivery model provides infrastructure through virtualized servers, networks, storage, and system software to augment or replace the functions of an entire data center. The customer may have full control of the actual server configuration.

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Introduction to Data Centers, Virtualization and Cloud Computing

- ❖ Cloud Computing: XAAS: "As A SERVICE" Delivery Models
 - Infrastructure as a Service (IaaS):
 - A way of delivering cloud computing infrastructure as an on-demand service.
 - Rather than purchasing servers, software, data center space, or networks, companies instead buy all computing resources as a fully outsourced service
 - Amazon Web Services is an example of IaaS provider

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The next important thing related to delivery models particularly infrastructure as a service is that in here the cloud computing infrastructure is delivered as an on-demand service. So, enough amount of flexibility is there, the capacity can be changed depending on what the users demand.

Rather than purchasing servers, software, data centre space or networks, companies instead buy all computing resources as a fully outsourced service. Amazon Web Services is an example of infrastructure as a service provider.

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Introduction to Data Centers, Virtualization and Cloud Computing

- ❖ Cloud Computing: XaaS: "As A SERVICE" Delivery Models
- Platform as a Service (PaaS):
 - Provides services using virtualized servers on which clients can run existing applications or develop new ones
 - The cloud provider manages the hardware and underlying operating system
 - Tools and services make coding and deployment faster and more efficient, like Google App Engine

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The next delivery model that we are going to discuss in the context of cloud computing is platform as a service, which is acronymed as PaaS. What does this mean? In here, the service is provided again using virtualized servers on which the clients can run existing applications or they may develop new applications on to the platform provided to them. The cloud services provider, it is their basic responsibility to manage the hardware and the underlying operating systems.

So, users they are relieved of this botheration of maintenance of hardware and operating systems and in such an environment that tools and services provided to the users make them easy to code and deploy application systems very quickly in an efficient manner. Most of you are familiar with the Google App Engine that is another example.

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Introduction to Data Centers, Virtualization and Cloud Computing

❖ Cloud Computing: XaaS: "As A SERVICE" Delivery Models

➤ Platform as a Service (PaaS):

- Provides a standard unified platform for app development, testing, and deployment
- Allows the creation of Web applications quickly and easily without the complexity of buying and maintaining the underlying infrastructure

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So, platform as a service provides a standard unified platform for application development, testing, and deployment of the same. It allows the creation of Web applications quickly and easily without the complexity of buying and maintaining the underlying infrastructure.

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Introduction to Data Centers, Virtualization and Cloud Computing

❖ Cloud Computing: XaaS: "As A SERVICE" Delivery Models

➤ Platform as a Service (PaaS):

- Without PaaS, the cost of developing some apps would be prohibitive

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Without platform as a service, the cost of developing some apps would have been prohibitive.

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Introduction to Data Centers, Virtualization and Cloud Computing

❖ Cloud Computing: XaaS: "As A SERVICE" Delivery Models

➤ Software as a Service (SaaS):

- Provides software application functionality through a web browser
- Sometimes known as an ASP, or Application Services Provider
- Apps are designed for end users
- Users can run applications via multiple devices on cloud infrastructure

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Next, let us see what is there in software as a service. This is also another delivery model in the context of cloud computing. What does it mean? In here, the software application functionalities are provided through a web browser.

Sometimes this is known as application services provider or ASP. Here, apps are designed for the end users by the service provider so that the end users can run applications via multiple devices on this cloud infrastructure.

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Introduction to Data Centers, Virtualization and Cloud Computing

❖ Cloud Computing: XaaS: "As A SERVICE" Delivery Models

➤ Software as a Service (SaaS):

- Other terms for SaaS are *on-demand computing* and *hosted services*
- Instead of buying and installing expensive packaged enterprise applications, users can access software apps on demand over a network, with an internet browser *paying the license fee as required*

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Other terms for software as a service are on demand computing and hosted services. So, basically instead of buying and installing expensive packages, software packages which are very costly or package-based enterprise applications; those are also very-very costly, in here, users can access the different kind of software apps that are provided by the services' provider and this access is based on what they need.

So, mind that this particular thing on the slide; users can access software apps on demand over a network with an internet browser and what the users they have to, for work is that, they have to pay the license fee whatever is required; that is all.

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The slide is titled "Introduction to Data Centers, Virtualization and Cloud Computing". It lists "Cloud Computing: XaaS: 'As A SERVICE' Delivery Models" and "Software as a Service (SaaS)". It provides examples: "Salesforce.com is one of the most widely known SaaS providers." and "Another example is Google Docs." A checkmark indicates a benefit: "Instead of installing MS-Word on ones own computer, and then loading Word to create a document, one can use a browser to log into Google Docs. Only the browser uses one's computer resources." The slide includes logos for NPTEL and IIT Kharagpur, and a small video inset of a speaker in the bottom right corner.

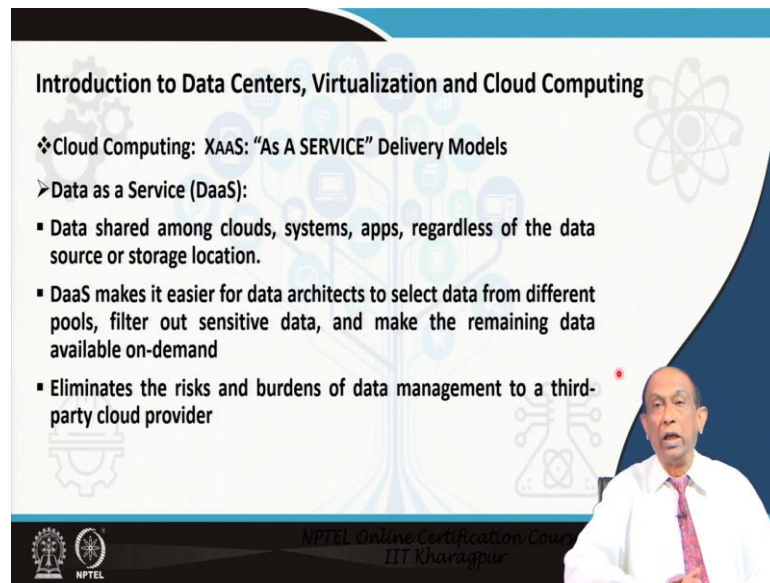
Introduction to Data Centers, Virtualization and Cloud Computing

- ❖ Cloud Computing: XaaS: "As A SERVICE" Delivery Models
- Software as a Service (SaaS):
 - Salesforce.com is one of the most widely known SaaS providers.
 - Another example is Google Docs.
- ✓ Instead of installing MS-Word on ones own computer, and then loading Word to create a document, one can use a browser to log into Google Docs. Only the browser uses one's computer resources.

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We are all familiar with this particular application Salesforce dot com, another example is Google Docs; things instead of installing MS-Word or all Microsoft packages on one's own computer and then, loading word to create a document, one can use a browser to log into Google Docs and his purpose will get served. So, only the browser uses one's computer resources.

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Introduction to Data Centers, Virtualization and Cloud Computing

❖ Cloud Computing: XAAS: "As A SERVICE" Delivery Models

➤ Data as a Service (DaaS):

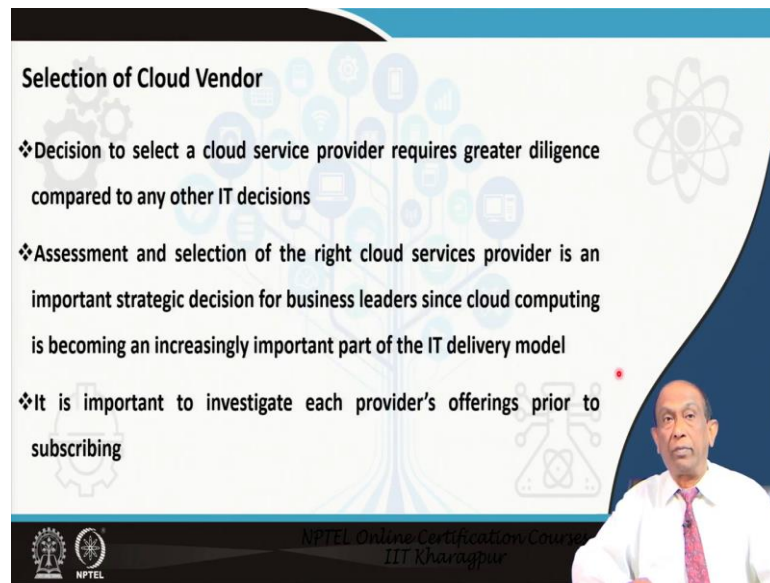
- Data shared among clouds, systems, apps, regardless of the data source or storage location.
- DaaS makes it easier for data architects to select data from different pools, filter out sensitive data, and make the remaining data available on-demand
- Eliminates the risks and burdens of data management to a third-party cloud provider

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So, things are easily accessible and less costly. The fourth delivery model is known as DaaS which is data as a service. Here, data shared among clouds, systems, various apps, regardless of the data source or storage location that is very important. We are not bothered about where the data is stored.

DaaS makes it easier for data architects to select data from different pools, filter out sensitive data, and make the remaining data available on-demand. So, from the user's perspective, data as a service eliminates the risks and the associated effort and burdens of managing data to a third by a third-party cloud provider; the fourth point.

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Selection of Cloud Vendor

- ❖ Decision to select a cloud service provider requires greater diligence compared to any other IT decisions
- ❖ Assessment and selection of the right cloud services provider is an important strategic decision for business leaders since cloud computing is becoming an increasingly important part of the IT delivery model
- ❖ It is important to investigate each provider's offerings prior to subscribing

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Now, we need to know a little bit on what are the factors that need to be kept in mind when an enterprise or a firm is going to select a cloud service provider; because such kind of decisions requires greater diligence compared to any other IT decisions. Assessment and selection of the right cloud services provider is an important step strategic decision for business leaders.

Since, cloud computing is becoming an increasingly important part of information technology delivery model and this selection, once the selection is done, is it is very difficult to again go back and change; it has got a long range effect and hence, it is the strategic decision. It is important to investigate each service provider's offerings prior to subscribing.

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Selection of Cloud Vendor

- ❖ A vendor needs to address several service factors for being selected as the right cloud services provider
- ❖ The move to the cloud is a move to vendor-managed services wherein cloud service-level agreements is the most important element of a contract

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A cloud service provider needs to address several service factors for being selected as the right cloud services provider. The move to the cloud is basically a move to vendor-managed services where in cloud service-level agreements is the most important element of a contract, which we discussed earlier in our last module, when we discussed about SLAs.

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Selection of Cloud Vendor

❖ **Service Level Agreements (SLAs):**

- A negotiated agreement between a company and service provider that can be a legally binding contract or an informal contract.
- The goal is not building the best SLA terms, but getting the terms that are most meaningful to the business.
- Staffs experienced in managing outsourcing projects may have the required expertise for framing and managing SLAs with vendors.


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So, what are; what is SLAs again? Once again, it said negotiated agreement between a company and the cloud service provider that can be a legally binding contract or

sometimes if the supplier relationship management is very strong, it can be an informal contract.

That means, the relationship between the service provider and the company is very good, sometimes the service providers maybe an offshoot of the parent company, sister company. So, in that case the service level agreements maybe based on an informal contract.

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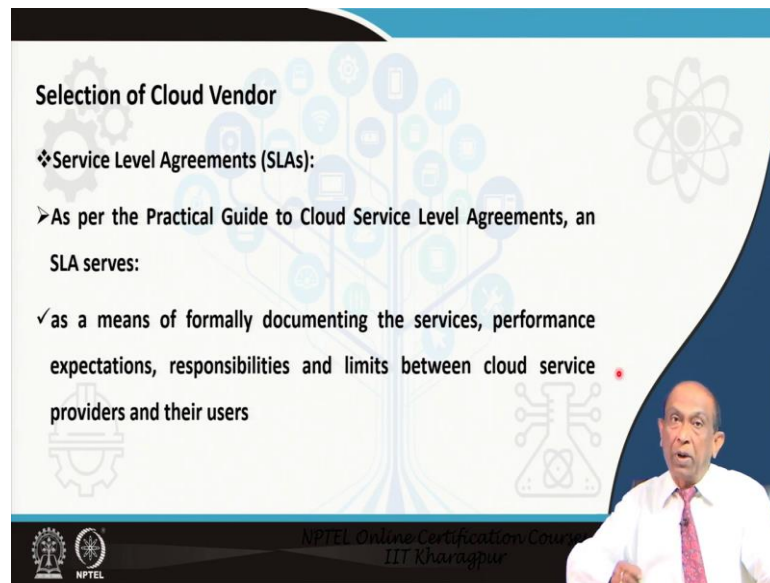
Selection of Cloud Vendor

- ❖ **Service Level Agreements (SLAs):**
 - **The Practical Guide to Cloud Service Level Agreements (published by the Cloud Standards Customer Council) brings together numerous customer experiences into a single guide for IT and business leaders who would like to consider cloud adoption.**

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Sometimes, a Practical Guide to Cloud Service Level Agreements which are published by Standards Customer Council brings together numerous customer experiences into a single book for IT and business leaders, who would like to consider the adoption of cloud computing.

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Selection of Cloud Vendor

❖ **Service Level Agreements (SLAs):**

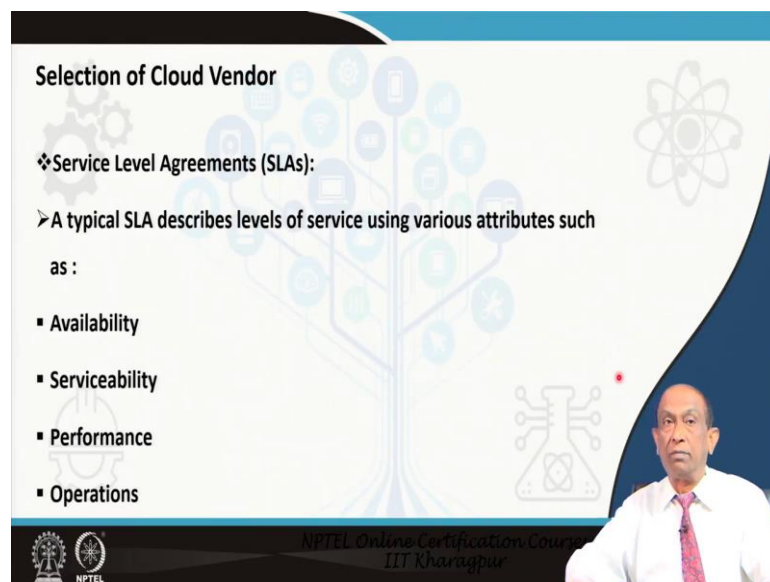
➤ As per the Practical Guide to Cloud Service Level Agreements, an SLA serves:

✓ as a means of formally documenting the services, performance expectations, responsibilities and limits between cloud service providers and their users

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As per that Practical Guide to Cloud Service Level Agreements, the definition of SLA is a means of formally documenting the services. The performance expectations, responsibilities and limits between cloud service providers and their users.

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Selection of Cloud Vendor

❖ **Service Level Agreements (SLAs):**

➤ A typical SLA describes levels of service using various attributes such as :

- Availability
- Serviceability
- Performance
- Operations

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A typical SLA describes levels of service using various attributes such as availability, serviceability, performance and operations.

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Selection of Cloud Vendor

❖ **Service Level Agreements (SLAs):**

➤ A typical SLA describes levels of service using various attributes such as :

- Billing and
- Penalties associated with violations of such attributes

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A typical SLA describes levels of service using other attributes as billing and penalties associated with violations of such attributes.

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Selection of Cloud Vendor

❖ **Service Factors to Consider When Evaluating Cloud Vendors or Service Providers**

Factors	Examples of Questions to Be Addressed
Delays	What are the estimated server delays & network delays
Workloads	What is the volume of data & processing that can be handled during a specific amount of time
Costs	What are the costs associated with workloads across multiple cloud computing platforms?

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So, in summary, when we look at different service factors to consider when we need to evaluate cloud vendors are first of all delays and in here, the question that need to be addressed are what are the estimated server delays and network delays.

From the viewpoint of workloads, what is the volume of data and processing that can be handled during a specific amount of time? The next thing is the costs; what are the costs that are associated with workloads across multiple cloud computing platforms?

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Selection of Cloud Vendor

❖ Service Factors to Consider When Evaluating Cloud Vendors or Service Providers

Factors	Examples of Questions to Be Addressed
Security	How are data and networks secured against attacks? Are data encrypted & how strong is the encryption? What are network security practices?

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Security; how are data and network secured against attacks? Are data encrypted and how strong is this encryption? What are network security practices?

(Refer Slide Time: 22:30)

Selection of Cloud Vendor

❖ Service Factors to Consider When Evaluating Cloud Vendors or Service Providers

Factors	Examples of Questions to Be Addressed
Disaster recovery & business continuity	How is service outage defined? What level of redundancy is in place to minimize outages, including backup services in different geographical regions? If a natural disaster or outage occurs, how will cloud services be continued?

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Disaster recovery and business continuity; how is service outage defined?

What level of redundancy is in place to minimize service outages, including backup services in different geographical regions? If a natural disaster or outage occurs, then how will cloud services be continued?

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Selection of Cloud Vendor

❖Service Factors to Consider When Evaluating Cloud Vendors or Service Providers

Factors	Examples of Questions to Be Addressed
Technical expertise and understanding	Does the vendor have expertise in one's industry or business processes? Does the vendor understand what one needs to do Does the vendor have the technical expertise to fulfill those obligations?

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Technical expertise and understanding; does the vendor have adequate expertise in one's industry or business processes? Does the vendor understand what one needs to do? Does the vendor have the technical expertise to fulfill the required obligations?

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Selection of Cloud Vendor

❖Service Factors to Consider When Evaluating Cloud Vendors or Service Providers

Factors	Examples of Questions to Be Addressed
Insurance in case of failure	Does the vendor provide cloud insurance to mitigate user losses in case of service failure or damage? This is a new and important concept

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And off late, is another factor that is considered is insurance in case of failure; does the vendor provide cloud insurance to mitigate the losses incurred by users in case of service failure or damage?

This is a very new and important concept and when companies, they try to compare between different cloud services provider to select the right one. They also today use lot of mathematical models.

For example, analytic hierarchy process models, AHV techniques, they are using considering the various factors that we have enlisted. Lots of papers, they exist; wherein, they have given details of how this technique has been deployed, using these factors for selecting the right cloud services provider.

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Selection of Cloud Vendor

❖ Service Factors to Consider When Evaluating Cloud Vendors or Service Providers

Factors	Examples of Questions to Be Addressed
Third-party audit or an unbiased assessment of the ability to rely on the service provided by the vendor	Can the vendor show objective proof with an audit that it can live up to the promises it is making?

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The slide features a background with various icons representing technology and data. A small inset image shows a man in a white shirt and red tie, likely the speaker, positioned in the bottom right corner of the slide area.

The other factors can be related to the service providers showing objective proof with an audit that if can live up to the promises that they are making or it is making. It will provide enough amount of assurance to those who are buying those services.

So, third-party audit or an unbiased assessment of the ability of the service providers is very important. This certificate gives enough amount of assurance or confidence in the minds of the user, when they are trying to evaluate the right cloud vendor.

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Selection of Cloud Vendor

- ❖ Cloud services can advance the core business of delivering superior services to optimize business performance
- ❖ Cloud can cut costs and add flexibility to the performance of critical business apps.
- ❖ Cloud can improve responsiveness to end-consumers, application developers, and business organizations.

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The slide features a background with a stylized tree of icons representing various cloud services and a speaker overlay of a man in a white shirt and tie.

So, cloud services can advance the core business of delivering superior services to optimize business performance. Cloud computing or cloud services can minimize the entire operational costs adding lot of flexibility to the performance of critical business apps. Cloud services can improve responsiveness to end consumers, application developers, and as well as business enterprises.

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Selection of Cloud Vendor

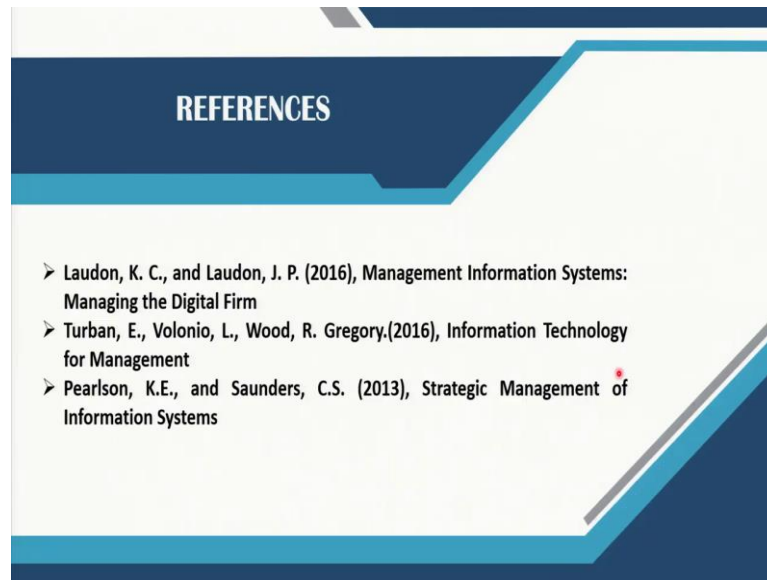
- ❖ In order to achieve those benefits, there must be IT, legal, and senior management oversight because a company still must meet its
 - legal obligations and responsibilities to
 - employees,
 - customers,
 - business partners, and
 - society.

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The slide features a background with a stylized tree of icons representing various cloud services and a speaker overlay of a man in a white shirt and tie.

In order to achieve those benefits, there must be IT, legal and senior management oversight because a company still must meet its legal obligations and responsibilities to employees, customers, business partners, and the society as a whole.

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These are the references that have been used in preparing this particular module.

Thank you all for your patience!