**Google Certification and Udemy Learning.**

Innovation does not come in a linear pattern; it comes in waves, and each wave is powered through a breakthrough technology. A fundamental and irreversible change in the way that humans work and engage with the world is **Paradigm Shift.**

We are in the middle of one more paradigm shift i.e. Digital transformation.

**Digital transformation**

When an organization uses new technologies, such as public, private, and hybrid cloud platforms to create or modify business processes, culture, and customer experiences to meet the needs of changing business and market dynamics.

Organizations pursue DT because of;

1. Foster innovation
2. Generate new revenue streams
3. Adapt to the market change
4. Adapt to customer needs.

DT helps organizations;

1. How do they operate?
2. Redefine relationship wtih partners, clients, and employees.
3. Modernize applications.
4. Create new services.
5. Deliver a value.

50% of IT spending will be going to Digital transformation by 2024 and 90% of enterprise apps will have AI embedded in them by 2025.

**What is a cloud?**

It is a metaphor for a network of datacenters that stores and computes the information that is available through the internet.

A Complex web of software, servers, computers, networks, and security systems, all together forms one word i.e. cloud.

Types of IS different companies have;

1. On premises
   1. Hardware or software applications hosted on site.
   2. Located and operated within the organization’s data centers.
   3. Traditional way of managing IS.
   4. Does not require the 3rd party access (Owners have physical control of H/W and S/W)
   5. No payment for ongoing access.
   6. Organizations must buy the physical infrastructure through procurement processes that can take months.
   7. Requires physical space (Land)
   8. Specialized room with needed power and cooling.
   9. Need expert personnel to manage.
   10. Scalability is a challenge, and often organizations acquire more resources than they need.
       1. Low utilization and higher overhead.

Cloud addresses all these issues by giving scalable, on demand services.

1. Private cloud
   1. Type of cloud computing where infrastructure is dedicated to single organization instead of the public.
   2. Known as single tenant or a corporate cloud.
   3. It is hosted within an organization’s own private servers.
      1. Own data center.
      2. 3rd party colocation center.
      3. Private cloud provider.
   4. Following public cloud benefits are given in private cloud.
      1. Self-service.
      2. Scalability.
      3. Elasticity.
      4. More customizations available.
   5. It is a good approach if organizations have already made investments in resources or for some reasons data should be on-premises.
2. Public cloud.
   1. Computing services, and infrastructure are managed by 3rd party providers like Google cloud, Azure, AWS.
   2. Shared with multiple organizations or tenants through the public internet.
   3. Multi-tenant cloud infrastructure.
   4. Each tenant's data/ application is hidden from other tenants.
   5. In general cloud = Public cloud.
   6. On demand availability for the services and resources.
   7. Tenants, no need to acquire, configure, or manage resources themselves.
   8. Pay for your use.
   9. Typically cloud computing service models available:
      1. IaaS (Infrastructure as a service)
         1. Compute and storage services.
      2. PaaS (Platform as a service)
         1. Offers develop, and deploy environment to build cloud app.
      3. SaaS (Software as a service)
         1. Delivers apps as services where users get access to a software on a subscription basis.
3. Hybrid cloud.
   1. Combination of different environments.
   2. Like combining public and private cloud env.
      1. On premises
      2. Google cloud
4. Multicloud
   1. Architecture must combine at least 2 public cloud providers
      1. On premises.
      2. Multiple cloud providers.

Most of the organizations use the multi-cloud strategy. 80% of the tenants use hybrid and 89% multi-cloud.

**Benefits of cloud.**

1. **Scalable.**
   1. Access to scalable resources.
   2. Latest technology on demand.
   3. Accelerates the infrastructure deployment time.
2. **Flexible**
   1. Services can be accessed from anywhere with an internet connection.
   2. Scaling services up and down.
3. **Agile**
   1. Develop new applications
   2. Rapidly get them into production
   3. No worries about underlying infrastruture.
4. **Strategic value**
   1. Competitive advantages like CP are synced with latest Technolgies and practices.
   2. Higher return on investments.
   3. Innovate and try new ideas.
5. **Secure**
   1. Security is stronger than the on-prem data centers.
   2. Depth and breadth of mechanism and dedicated teams for security.
6. **Cost effective**
   1. Pay for what is used.
   2. No overbuilding data centers.
   3. IT staff can work on strategic initiatives.

**Cloud era.**

1. VM cloud era
   1. No need to buy hardware/ software.
2. Infrastructure cloud era.
   1. Organizations migrated their IT infra to the cloud.
   2. This saved money because scaling was easy and quick.
   3. Faster development was possible.

**Digital transformation** is more than just migrating or shifting to the cloud for cost saving and convenience.

1. Transformation era.
   1. Organizations are not only deciding on infrastructure but also focusing on transformations.
   2. Digitalization is now fundamental.
   3. This era is about spreading transformation among all teams in an organization.

A **transformation cloud** is a new approach to DT. It provides an environment for app and infrastructure modernization, data democratization, people connections and trusted transactions.

**Challenges that lead to Digital transformation**

Following are biggest challenges and needs to accelerate to DT.

1. They want to be the best in understanding and using data.
   1. Organizations must unify data across streams, lakes, warehouses, DBs, so they can quickly and easily breakdown data silos (A data silo is a repository of data that's controlled by one department or business unit and isolated from the rest of an organization), generate real-time insights, and make better business decisions.
2. They want the best technology infrastructure.
   1. Organization needs a cloud platform that serves their foundation for growth, has flexibility to innovate securely and adapt quickly based on market needs.
3. They want to create the best hybrid workplace.
4. Security (Data, systems, and users)
5. Prioritize sustainability.

These are top drivers of digital transformation.

**5 primary capabilities that form the basis of transformation cloud.**

1. Data
   1. It is a key for unlocking value from AI.
   2. It is important for innovation and differentiation.
   3. Becoming a data driver company is difficult if the data is siloed across operational and analytical data stores.
   4. A data cloud is a unified solution to manage data across the entire data lifecycle.
   5. This lets organizations identify and process data with great scale, speed, security, and reliability.
   6. Companies like Ford, Spotify, Wayfair, UPS use a **data cloud** to encourage data driven transformation quickly, securely, and at scale.
2. Open Infrastructure
   1. Modernize the IT systems.
   2. This gives them freedom to securely innovate and scale from prem to edge to cloud on an easy, transformative, and open platform.
   3. This cloud brings the Google cloud services to different physical locations while leaving the operation, governance, evolution of services to google cloud.
   4. It facilitates faster innovation and reduces lock into a single cloud provider by giving organizations a choice and flexibility to build, migrate and manage the application.

Open standard vs Open source (Often confused)

Open standard: A s/w with specifications accessed and usable by anyone. They have guidelines for software functionality.

Ex. HTTP, XML.

Open source: A s/w whose source code is publicaly available. Free for anyone to use, share, and modify. Create through public collaboration.

Ex. Linux. Kubernetes, Tenson Flow, etc.

1. Collaboration
   1. Google workspace – Gmail, Docs, Sheet, Meet, etc.
2. Trust
   1. Protect what’s important with advanced security tools.
3. Sustainable technology.

Cloud computing is estimated to save 1 billion metric tons of CO2 emissions by 2024.

**Google cloud adoption framework** serves as a map to help organizations adopt the cloud quickly and effectively by creating a comprehensive action plan for accelerating cloud adoption.

It helps organizations identify where the organization is at its cloud journey with action plan that will take it to where it wants to be,

A **cloud maturity assessment** helps to establish where an organization is currently regarding the cloud adoption themes recognized by Google Cloud. It can quickly reveal any areas where an organization might be weaker or underinvested.

**Quiz.**

1. An organization has made significant investments in their own infrastructure and has regulatory requirements for their data to be hosted on-premises. Which cloud implementation would best suit their needs?

=> Private Cloud.

2. What is seen as a limitation of on-premises infrastructure, when compared to cloud infrastructure?

=> The on-premises hardware procurement process can take a long time.

3. What is the benefit of implementing a transformation cloud that is based on open infrastructure?

=> Open source software reduces the chance of vendor lock-in.

4. Select the two capabilities that form the basis of a transformation cloud? Select two correct answers.

=> Data cloud provides a unified solution to manage data across the entire data lifecycle, Open infrastructure gives the freedom to innovate by running applications in the place that makes the most sense.

5. An organization has a new application, and user subscriptions are growing faster than on-premises infrastructure can handle. What benefit of the cloud might help them in this situation?

=> It's scalable, so the organization could shorten their infrastructure deployment time.

6. Select the definition of digital transformation.

=> When an organization uses new digital technologies to create or modify on-premises business processes.

7. What is the cloud?

=> A metaphor for a network of data centers.

8. As the world and business changes, organizations have to decide between embracing new technology and transforming, or keeping their technology and approaches the same. What risks might an organization face by not transforming as their market evolves?

=> Focusing on ‘how’ they operate can prevent organizations from seeing transformation opportunities.

9. Which item describes the goal of an organization seeking digital transformation?

=> Break down data silos and generate real time insights.

**Fundamentals of cloud.**

TCO (Total cost of ownership) analysis is performed when organizations decide on moving to the cloud. This aims to weigh the cost of cloud adoption against the cost of running their current on premises system.

For on prem, TCO is associated with,

1. Assessing Cost of static resources for the lifetime.

A common mistake organization make when doing TCO is to compare the running cost of the cloud against their on-prem system. These costs are not equivalent.

The cost of on-prem is dominated by the initial purchase of hardware and software, however cloud computing cost is based on subscription or pay per use models.

Some key elements.

1. Initial migration cost
   1. Expenses related to planning and executing migration.
   2. Data transfer cost.
2. Cloud service cost
   1. Subscription fees.
   2. Pricing models.
3. Integration and customization cost.
4. Training and skill development
5. Operational cost

All these factors must be considered in TOC analysis when migrating to the cloud.

**Capital expenditure (CapEx) versus Operational Expenditure (OpEx)**

With organizations moving from On-prem infra to on-demand cloud services ther is a major shift in spending from capital expenditure to operating expenses.

Difference?

* CapEx iis an upfront expense put toward the fixed assets. Organizations buy these items once and they benefit their business for many years. In context of it example would be buying hardware like servers, printers, coolinng systems and maintainance of each one of them is also considered to be CapEx as this increases their life and usefulness.
* Small businesses can find CapEx spending challenging because large one-time purchases are often high cost. More money you put on CapEx less money for the business.
* OpEx is a recurring cost for more immediate benefit. This represents day-to-day expenses to run a business. In context of IT, these expenses might be yearly hosting, domain registrations, or subscription fee.
* OpEx covers spending on Pay-as-you-go items, and it is not a long-term investment like CapEx items.

Cloud gives the organizations the ability to start small and grow organically instead of having to guess at what is needed next week, month, and next year.

**Private cloud.**

* Org has its own virtualized servers in its own data centers or on those of private cloud providers where it creates its own private dedicated environment.
* On premises servers are often referred as a private cloud, but a distinction can be made as on prem software runs in a local environment whereas on private cloud is accessed via internet.
* Benefits of private cloud includes.
  + Self service
  + Scalability
  + Ellasticity
* Requires a good amount of initial investment.
* The private cloud resources are located.
  + On premises data centers.
  + Private hosting providers (Azure stack)

|  |  |
| --- | --- |
| On-prem | Private Cloud |
| Virtualized computing resources | Physical servers in organization’s facility |
| Flexibility and scalability | Investment in hardware |
| Centralized management | Complete control |

Hybrid cloud.

* Combination of different environments. Ex combining a private and public environment. Ex. On prem data center with GCP public cloud.

Multicloud

* Architecture that Combines at least 2 public cloud providers like AWS, Azure, GCP.
* Used in case organizations want to use key strength of each cloud provider into one.
* On-prem + multicloud is also an example.

Networking terms.

1. Bandwidth
   1. Measure how much data a n/w can transfer in a given amount of time.
   2. Think of this as a pipe, the wider the pipe the more the water can be passed at one time.
   3. Measured in GBPS, MBPS.
   4. The greater the bandwidth the more the data can flow allowing faster downloads and streaming.
2. Latency
   1. The amount of time it takes for data to travel from one point to another.
   2. Measured in milliseconds
   3. Referred to as lag, describes the delay in communication.
   4. Consider latency as the time it takes after turning on the pipe and water coming out of it.
   5. Ideally it should be close to zero and as little as possible. Low latency means less delay and faster results. High latency can cause delays in online gaming, video calls, etc.

So having an excellent bandwidth is not only required, but latency is also considered meaning how far from data is travelling. Consider this as the pipe with a good space for water to flow but the second point of pipe is too far and in between it has got some blockers.

So, father the user from the server or more the fragments in the n/w bigger the latency. pla