V20PCA107 - IT INFRASTRUCTURE MANAGEMENT

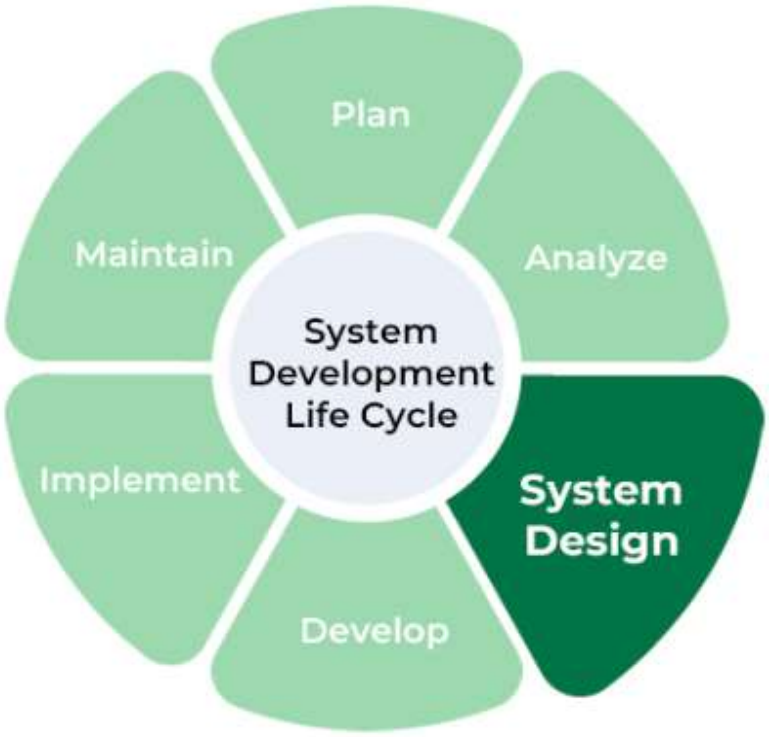
UNIT-I_WEEK- 3

Information System Design Process

- Systems Design is the process of defining the architecture, components, modules, interfaces, and data for a system to satisfy specified requirements.
- The goal is to create a well-organized and efficient structure that meets the intended purpose while considering factors like scalability, maintainability, and performance.

Why learn System Design

- ❑ In any development process, be it Software or any other tech, the most important stage is Design.
- ❑ Systems Design not only is a vital step in the development of the system but also provides the backbone to handle exceptional scenarios because it represents the business logic of software.



Reasons to Learn System Design

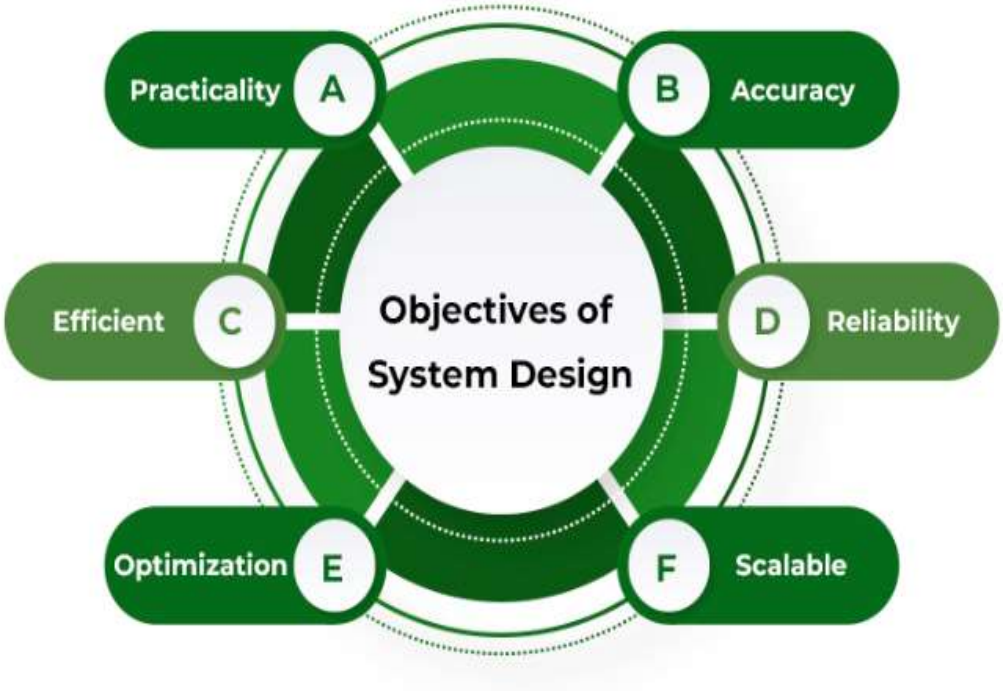
The main 5 reasons why to learn system design:

i. System design is crucial in interviews.

ii. You need to have good expertise in system design to be hired for senior positions.
iii. System design proficiency enhances job security.
iv. Understanding system design will help you to have good communication.
v. Learning system design improves decision-making.

Objectives of Systems Design

- **Practicality**
- **Accuracy**
- **Completeness**
- **Scalable(flexibility)**
- **Efficient**
- **Reliability**
- **Optimization**

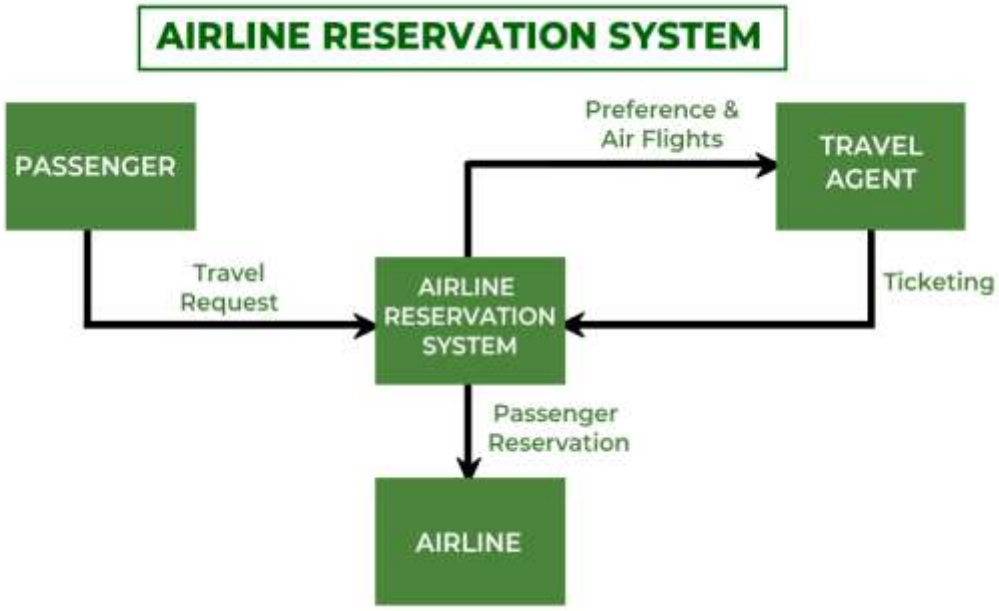


Note: System Design also helps us to achieve fault tolerance which is ability of a software to continue working where even its 1 or 2 component fails.

System Design Example

Design through a basic example – Airline Reservation System.

To understand better about the components and design of Airline Reservation System, let us first review its context-level flow diagram:



Advantages of System Design

Some of the major advantages of System Design include:

Reduces the design cost of a product.

Speedy software development process.

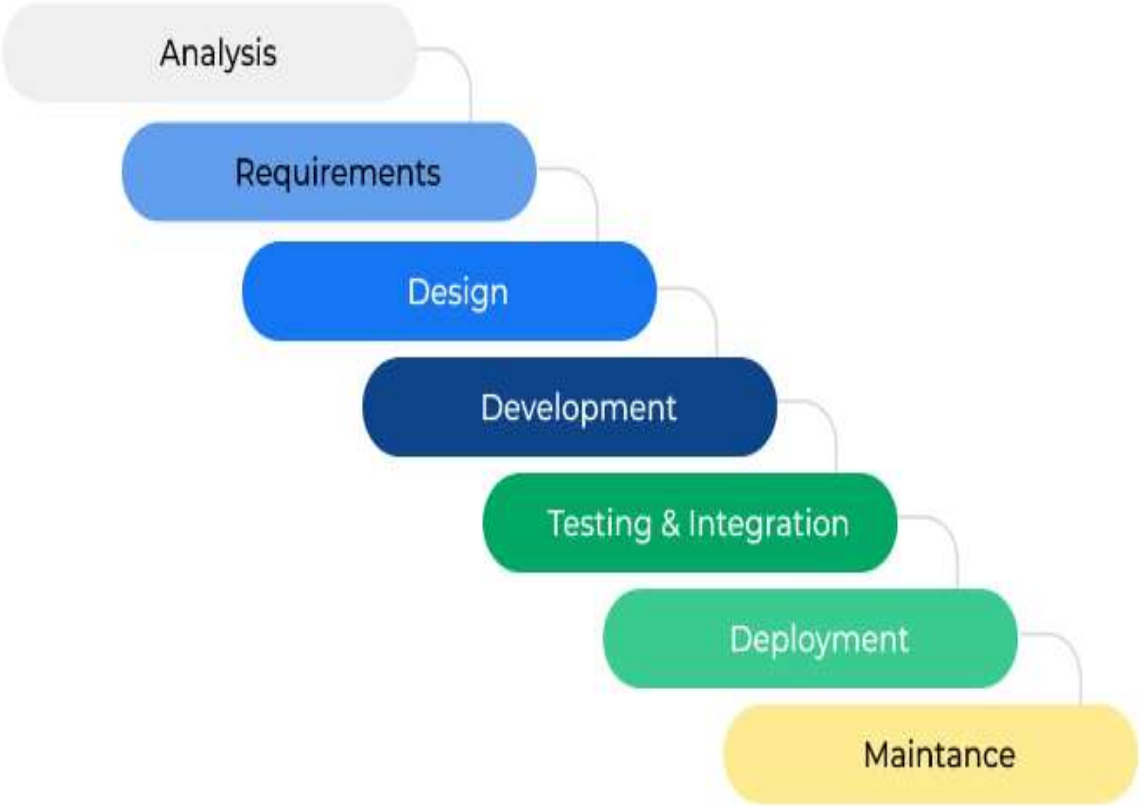
Saves overall time in SDLC.

Increases efficiency and consistency of a programmer.

Saves resources.

System Design Life Cycle (SDLC)

- Information systems are designed using the systems development life cycle.
- The system design life cycle is a process that involves planning, creating, testing, and implementing a system.



- System Design Life Cycle (SDLC) is defined as the complete journey of a System from planning to deployment. The System Design Life Cycle is divided into 7 Phases or Stages, which are:

SDLC – Phases

- ❑ The system design life cycle progresses through 7 stages, It ensures that the final system meets user needs, is scalable, and can be maintained efficiently throughout its lifecycle.
- ❑ *Imagine it as a recipe for making a cake. You start by planning what kind of cake you want, gathering the ingredients, mixing them together, baking the cake, making sure it tastes good, and finally, sharing it with others.*
- ❑ Similarly, the SDLC helps professionals in software development follow a clear plan from the beginning of the idea of a system to its ongoing maintenance.

1. Planning Stage

2. Feasibility Study Stage

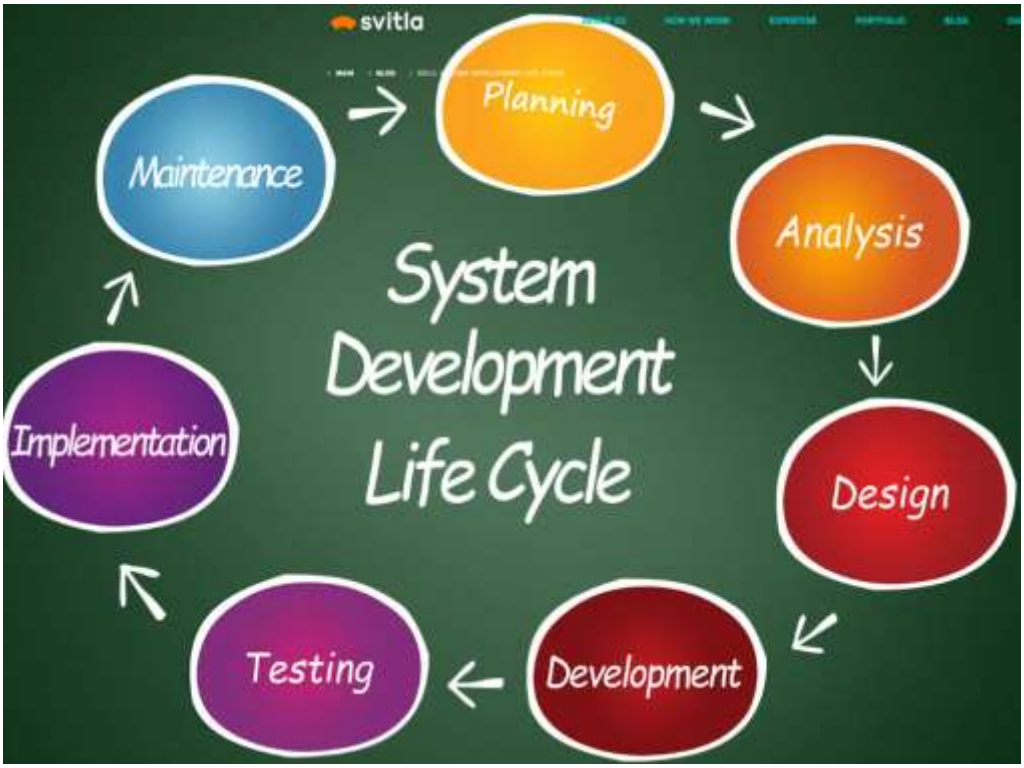
3. System Design Stage

4. Implementation Stage

5. Testing Stage

6. Deployment Stage

7. Maintenance and Support



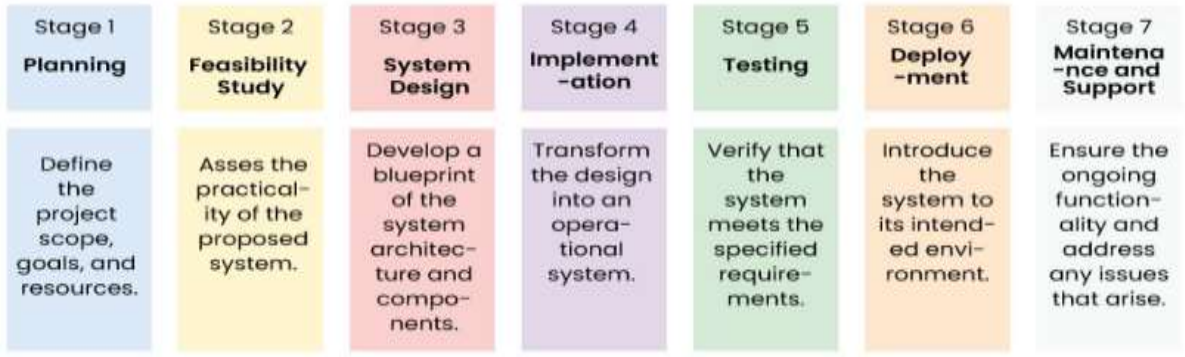
What is meant by System Design Life Cycle (SDLC)?

The System Design Life Cycle (SDLC) is a comprehensive process that outlines the steps involved in designing and developing a system, be it a software application, hardware solution, or an integrated system combining both.

- Phases (Stages) of the It encompasses a series of phases that guide engineers through the creation of a system that aligns with the user's needs and organizational goals.
- The SDLC aims to ensure that the end product is reliable, scalable, and maintainable.

System Design Life Cycle

System Design Life Cycle is defined as the complete journey of a System from planning to deployment. The System Design Life Cycle (SDLC) involves following phases:



Phases of (Stages) SDLC

Stage 1. Planning

Objective: Define the project scope, goals, and resources.

Example: Imagine a company initiating a project to develop a new customer relationship management (CRM) system. The planning phase would involve outlining the functionalities, budge constraints, and identifying the team responsible.

Stage 2. Feasibility Study

Objective: Asses the practicality of the proposed system.

Example: Before committing to the CRM project, a feasibility study would analyze factors like technical, operational, and economic viability.

This involves evaluating whether the benefits outweigh the costs.

Stage 3. System Design

Objective: Develop a blueprint of the system architecture and components.

Example: For the CRM system, this involves creating a detailed design that outlines the database structure, user interfaces, and system functionalities. It serves as a guide for the developers during the coding phase.

Stage 4. Implementation

Objective: Transform the design into an operational system.

Example: Developers write the code for the CRM system based on the design specifications. This phase involves rigorous testing to identify and rectify any bugs or errors.

Stage 5. Testing

Objective: Verify that the system meets the specified requirements.

Example: The CRM system undergoes various testing procedures, such as unit testing, integration testing, and user acceptance testing, to ensure its functionality, performance, and security.

Stage 6. Deployment

Objective: Introduce the system to its intended environment.

Example: The CRM system is deployed for use by the organization's employees. This may involve training sessions to familiarize users with the new system.

Stage 7. Maintenance and Support

Objective: Ensure the ongoing functionality and address any issues that arise.

Example: Regular updates, bug fixes, and user support for the CRM system to adapt to changing business requirements and address any emerging issues.

Challenges in System Design Life Cycle

- **Unclear Requirements:** Sometime, the initial requirements for a system might be unclear or ambiguous, leading to difficulties in designing the system accurately.
- **Changing Requirements:** Requirements may change during the design process, posing a challenge to maintain consistency and ensuring that the system still meets the user's needs.
- **Technological Changes:** Rapid advancements in technology can make it challenging to choose the most suitable and up-to-date technologies for system design.
- **Integration Issues:** Ensuring seamless integration of various system components can be complex, especially when dealing with different technologies and platforms.
- **Budget Constraints:** Designing a system within budgetary constraints can be challenging, as incorporating certain features or technologies might be cost-productive.

- **Security Concerns:** Designing a system that is secure from potential threats and vulnerabilities is an ongoing challenge, as new security risk continually emerges.
- **Scalability and Performance:** Designing a system to handle scalability and ensuring optimal performance, especially under heavy loads, can be challenging.

Models Used for System Design Life Cycle

- **Waterfall Model:** A linear and sequential model where each phase must be completed before moving on to the next. It's a straightforward approach but can be inflexible in the face of changing requirements.
- **Iterative Model:** Involves repeating cycles, with each iteration refining and improving the system based on feedback. It's adaptable to changing requirements.
- **Prototyping Model:** Involves building a prototype (a preliminary version) of the system to gather feedback refine the design before building the final product.
- **Spiral Model:** Incorporates elements of both iterative and prototyping models. It involves cycles of planning, designing, constructing, and evaluating.
- **Agile Model:** Emphasizes flexibility and collaboration, with frequent iterations and continuous feedback. It's well suited for projects where requirements may evolve.

Best Practices in System Design Life Cycle

- **Clear Requirement Elicitation:** Invest time in thoroughly understanding and documenting requirements to provide a solid foundation for the design process.
- **Regular Stakeholder Communication:** Maintain open communication with stakeholders to ensure their needs are understood and to address any changes promptly.
- **Modular Design:** Design systems in a modular fashion, allowing for easier maintenance, updates, and scalability.

- **Risk Assessment and Management:** Identify potential risks early in the design process and develop strategies to mitigate or manage them effectively.
- **User-Centric Design:** Prioritize user experience by incorporating feedback, usability testing, and a focus on intuitive interfaces.
- **Documentation:** Keep comprehensive documentation through the design process to facilitate communication, knowledge transfer, and future maintenance.

Use Cases of System Design Life Cycle

The SDLC is used in a wide variety of projects, from developing small applications to building large enterprise systems. Some common use cases for the SDLC includes:

- Developing new software applications.
- Enhancing existing software applications.
- Integrating different systems together.
- Replacing legacy systems.
- Developing custom solutions for specific business needs.

By following the best practices and using the appropriate SDLC model, organizations can increase their chances of successfully completing their system development projects the System Design Life Cycle (SDLC) plays a pivotal role in shaping the development of robust and efficient systems. By focusing on the design aspects, it provides a blueprint for constructing systems that meet user requirements and adhere to industry standards.

Throughout the exploration of Software Design Life Cycle, we've highlighted key aspects, including the differences between the System Design Life Cycle and the broader System Development Life Cycle, the stages of the System Design Life Cycle, challenges faced during the process, commonly used models, best practices, and practical use cases.

Information Technology Infrastructure Library (ITIL)

Information Technology Infrastructure Library (ITIL) is provided with a framework of best practices for delivering IT services. The ITIL is an appropriate method to management of IT service and also management can help businesses

manage risk, strengthen customer relations, establish cost-effective practices, and build a stable IT environment that provides for growth, scale and change.

The Information Technology Infrastructure Library (ITIL)is used to standardize the selection process, planning, and delivery and standardize the maintenance of IT services within a business. The goal of the ITIL is to improve efficiency and achieve predictable service delivery

ITIL stands for Information Technology Infrastructure Library. The acronym was first used in the 1980s by the British government's Central Computer and Telecommunications Agency (CCTA) when it documented dozens of best practices in IT service management and printed them for distribution.

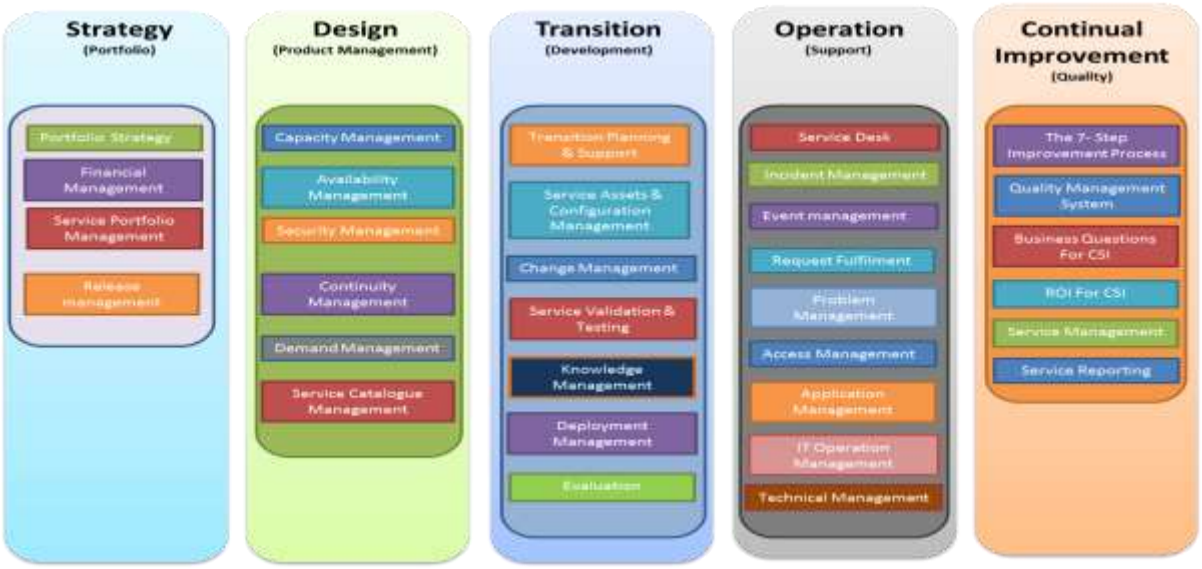
- The IT Infrastructure Library (ITIL) is a library of volumes describing a framework of best practices for delivering IT services.
- ITIL is a library of best practices for managing IT services and improving IT support and service levels.

Goal – ITIL

- ✓ One of the main goals of ITIL is to ensure that IT services align with business objectives, even as business objectives change.
- ✓ ITIL, or Information Technology Infrastructure Library, offers a comprehensive framework of best practices for IT service management.
- ✓ It outlines guidelines and procedures for efficiently managing and delivering IT services to align with business needs and meet customer expectations.
- ✓ Definition: IT Infrastructure can also be termed as “All of the hardware, software, networks, facilities, etc., that are required to develop, test, deliver, monitor, control or support IT services.
- ✓ Why is ITIL needed: It equips a service provider with a clear capability model, aligning them to the business strategy and customer needs.
- ✓ • Microsoft standardized on ITIL to help develop its Microsoft Operations Framework.
- ✓ • One of the most essential parts of ITIL is the configuration management database (CMDB -used by an organization to store information about hardware and software assets).

✓ CMDB, which provides the central authority for all components — including services, software, IT components, documents, users, and hardware — that must be managed to deliver an IT service.

ITIL Service Phases



- Some Basics Terminology of ITIL: Some terminology of it services which are used. These are given below:
- **Service:**

  Service is defined as delivering value to customers without requiring the customer to own specific costs and risks.
- **ServiceManagement:**

  Service management is defined as a set of specialized capabilities for delivering value to customers in the form of services.
- **ServiceAssets:**

  Service assets are defined as refers to the 'resources' and 'capabilities' which a Service Provider must allocate to offer a service.

- **Processes:**

  The process is defined as structured sets of activities designed to achieve a specific objective. There are 4 basic characteristics of processes are:

  1. The process generally transforms inputs into outputs.
  2. It delivers results to a specific customer or stakeholder.
  3. The process is measurable.
  4. They are triggered by specific events.

Information Technology Infrastructure Library (ITIL) has the following features:

- It is the best practice framework for managing IT services.
- It is the only extensive, openly available guidance on IT.
- It consists of the codes of practice of IT services and infrastructure for quality management.
- It has its own definition for key terms.
- It is developed in 1980 by the United Kingdom's Office of Government Commerce (OCG).
- ITIL is considered as a service provision.
- It defines quality with the evolving business needs and user requirements.
- It is an industry of products, services and organisations.
- It is designed to improve management of IT services.
- It is contributed over the world by skilled IT practitioners.

Benefits of ITIL:

There are many benefits of Information Technology Infrastructure Library (ITIL) which are given below:

- It is generally supported organizations and individuals to gain optimal value from IT and digital services.
- It is inherently flawed perspective can lead to serious consequences.
- Best Practice provides a best framework for a common language and tools that power collaboration within IT teams, to deliver value across a business.
- It is the global standard in IT best practice and is used globally by millions of practitioners.

- It is a highly respected ITSM tool, utilized by IT and project management professionals the world over.
- The fact that it was community-driven ensured that AXELOS had invaluable insight to work with.

ITIL Service Lifecycle

- ❖ The ITIL service lifecycle is a framework made up of all the processes needed to effectively manage the whole service lifecycle of any product or service offered by an organization.
- ❖ Its scope encompasses the entire lifecycle of IT services, from their initial concept to day-to-day management and operations, and their final retirement.
- ❖ It comprises five core stages or phases, each focusing on specific activities and processes.

Key Components of ITIL

Five phases comprise the ITIL

1. ITIL Service Strategy
2. ITIL Service Design
3. ITIL Service Transition
4. ITIL Service Operation
5. ITIL Continual Service Improvement

Service Strategy

As the center and origin point of the ITIL Service Lifecycle, the ITIL Service Strategy volume provides guidance on clarification and prioritization of service-provider investments in services. More generally, Service Strategy focuses on helping IT organizations improve and develop over the long term. In both cases, Service Strategy relies largely upon a market-driven approach. Key topics covered include service value definition, business-case development, service assets, market analysis, and service provider types. List of covered processes:

- Service Portfolio Management
- Demand Management
- IT Financial Management
- Supplier Management

Service Design

The ITIL Service Design volume provides good-practice guidance on the design of IT services, processes, and other aspects of the service management effort. Significantly, design within ITIL is understood to encompass all elements relevant to technology service delivery, rather than focusing solely on design of the technology itself. As such, Service Design addresses how a planned service solution interacts with the larger business and technical environments, service management systems required to support the service, processes which interact with the service, technology, and architecture required to support the service, and the supply chain required to support the planned service. Within ITIL v2, design work for an IT service is aggregated into a

single Service Design Package (SDP). Service Design Packages, along with other information about services, are managed within the service catalogs. List of covered processes:

- Service Catalogue Management
- Service Level Management
- Risk Management
- Capacity Management
- Availability Management
- IT Service Continuity Management
- Information Security Management
- Compliance Management
- IT Architecture Management
- Supplier Management

Service Transition

  - Service transition, as described by the ITIL Service Transition volume, relates to the delivery of services required by a business into live/operational use, and often encompasses the "project" side of IT rather than "BAU". This area also covers topics such as managing changes to the "BAU" environment. List of processes:

- Service Asset and Configuration Management
- Service Validation and Testing
- Evaluation
- Release Management
- Change Management
- Knowledge Management

Service Operation

Best practice for achieving the delivery of agreed levels of services both to end-users and the customers (where "customers" refer to those individuals who pay for the service and negotiate the SLAs). Service operation, as described in the ITIL Service Operation volume, is the part of the lifecycle where the services and value is actually directly delivered. Also the monitoring of problems and balance between service

reliability and cost etc are considered. The functions include technical management, application management, operations management and Service Desk as well as, responsibilities for staff engaging in Service Operation. List of processes:

- Event Management
- Incident Management
- Problem Management
- Request Fulfillment
- Access Management

Continual Service Improvement (CSI)

Aligning and realigning IT services to changing business needs (because standstill implies decline). Continual Service Improvement, defined in the ITIL Continual Service Improvement volume, aims to align and realign IT Services to changing business needs by identifying and implementing improvements to the IT services that support the Business Processes. The perspective of CSI on improvement is the business perspective of service quality, even though CSI aims to improve process effectiveness, efficiency and cost effectiveness of the IT processes through the whole lifecycle. To manage improvement, CSI should clearly define what should be controlled and measured.

CSI needs to be treated just like any other service practice. There needs to be upfront planning, training and awareness, ongoing scheduling, roles created, ownership assigned, and activities identified to be successful. CSI must be planned and scheduled as process with defined activities, inputs, outputs, roles and reporting. List of processes:

- Service Level Management
- Service Measurement and Reporting
- Continual Service Improvement

CASE STUDY: IT Infrastructure Support for a Private Diversified Business

Industry - Oil & Gas, Real Estate

Customer

The Customer is a European private diversified business. Started as a chain of gas stations, the company now promotes itself as a commercial and residential real

estate developer, whose portfolio includes offices, shopping centers, auto centers, logistics and residential districts.

Challenge

Striving to attract new clients and increase the loyalty of the existing ones, the Customer is continually expanding the scope of online services. Therefore, the company needed long-term professional maintenance of its IT infrastructure to increase the quality and achieve sustainability of online services. With that in mind, the company chose remote IT infrastructure maintenance services by Science Soft's team of certified ICT professionals.

Services

The project engages 7 ICT support specialists, some of them are involved on a part-time basis. In compliance with ITIL standard recommendations, IT infrastructure support services are provided by the 2nd and 3rd line support specialists during the Customer's business hours. The Customer's in-house IT specialists are responsible for the 1st line support.

According to SLA, Science Soft's specialists support 28 IT infrastructure elements and provide corresponding services.

- IT infrastructure elements
- Servers and server hardware
- Databases (MS SQL Server, Oracle, Pervasive SQL, Sybase SQL Anywhere)
- LANs and WANs
- Antivirus and antispam systems
- Virtualization systems (VMware 5.1, and 40 Windows Servers)
- Communication systems (MS Exchange and MS Lync systems)
- MS SharePoint platform
- Backup systems (Symantec BackupExec and Veeam Backup & Replication)
- 20 internal infrastructure services (including Active Directory, DHCP, DNS and VPN)
- Support services

- For servers and server hardware, databases, antivirus and antispam, virtualization, communication, backup systems, SharePoint and internal infrastructure services, we provide:
  - Configuration
  - Monitoring and regular system administration
  - Performance tuning
  - Backup and recovery management
  - Incident management
  - Documentation management

For LANs and WANs, we provide:

- Configuration management
- Bandwidth and response time management
- Logging and regulation of network resource usage
- Access management
- Results

Long-term collaboration between Science Soft's ICT specialists and the Customer continues. Leaving its IT infrastructure in the hands of our certified professionals, the Customer escapes such common problems as frequent network outages, repeated breakdown of critical resources, security breaches and the accumulation of unstructured data. Addressing these challenges, in its turn, ensures flawless performance of the Customer's IT services.

Technologies and Tools

Zabbix 2, ManageEngine ServiceDesk Plus, Jira.

Summary

In this section the definition and various components of IT Infrastructure is given. The major activities happening under the umbrella term of IT infrastructure management is discussed. The various challenges of managing IT infrastructure and the factors to be considered for the Good Organizational Design are listed. The necessity of Infrastructure design document is also discussed