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INTRODUCTION TO INFORMATION SYSTEMS

DATA

- Data is the **text and numbers** that an organization gathers in the course of doing business.
- It doesn't really do the firm any good until it is analysed.

INFORMATION

This is data that has been **structured, filtered, reported on**, and is generally in a form that is readily useful.

INFORMATION SYSTEM

- It is a combination of **software, hardware, and telecommunication networks** to collect useful data, especially in an organisation.
- Businesses use information system **to complete and manage their operations, interact with their consumers**, and stay ahead of their competition.

SYSTEMS DEVELOPMENT LIFE CYCLE

PLANNING AND ANALYSIS

- Planning involves setting system **objectives, creating high level project plan** and conducting a feasibility study.
- Analysis also involves **organizing the project team**, gathering business information needs of the system.

DESIGN & DEVELOPMENT

- System elements are designed in this stage, using **methods** such as **prototyping and tools such as computer-aided software engineering (CASE).**

- At this stage development tools **like programming language and deployment environment** like operating system, hardware, are selected.

Tools Used in Design & Development

Programming language

A programming language is a computer language programmer use to **develop software programs, scripts, or other sets of instructions** for computers to execute

Development environment

- The development environment encompasses **all the tools that a programmer uses to create a program.**
- This certainly includes the **compiler (or interpreter)** but it can also include a tool for **computer-aided software engineering (CASE)**.
- CASE tools provide tools for **coordinating groups of programmers**, for managing large programming projects, and for analysing and designing programs.

Operating system and hardware

- An operating system is system software that **manages computer hardware, software resources.**
- Computer hardware includes the **physical parts of a computer like keyboard, Mouse, monitor etc.**

Network

A network consists of **two or more computers that are linked** in order to share resources, exchange files, or allow electronic communications.

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Types of Networks

Centralized

- In this participant must **communicate with a central authority** to communicate with one another.
- All participants must go through a single centralized source, the **loss of that source would prevent all participants from communicating**.

Distributed

- This generally involves **attaching PCs acting as terminals to a departmental mini-computer**. The mini-computer is used to run departmental applications.
- The minis-computer then might **communicate** periodically with a **central mainframe** to distribute or gather corporate data.

Standards

- Standards are the **set of rules for data communication** that are needed for exchange of information among devices.
- The underlying communication standard of the **Internet is TCP/IP**.

Types of Standards

- **Proprietary standards** This standard is set by one company.
- **Open standards** are set by committees of people from companies and other interested parties.

IMPLEMENTATION

Implementation involves **acquiring the hardware, software, developing and distributing the documentation**, and training personnel to use the system.

Acquiring software, one must look at several factors

- **Compatibility** with existing hardware and software
- Functionality, speed, and error handling
- Ease of use and learning.
- Price, including upgrades and annual maintenance

Models of Software Development

Waterfall

The user must **specify the entire system**. This specification is handed off to the **development team which then builds the system** and gives it back to the user.

Spiral

- The **user specifies part of the system**. The development team builds this part of the system using this specification.
- The **user specifies another part of the system**. The development team builds this part of the system using this specification.

Prototype

- The **user describes what the system is going to be used for**. The development **team makes up a simple version** and the user describes what he/she likes and dislikes.
- The team takes this into consideration, modifies the prototype, and shows it to the user.

TESTING & ACCEPTANCE

This stage refers to the **testing of the product** where product **defects are reported, tracked, fixed and retested**, until the product reaches the quality standards defined in the initial phase.

OPERATION AND MAINTENANCE

Once the system has been developed, it must be deployed to users.

Deployment Method

Parallel deployment

In this method **old system and new system run concurrently** for some time and old one is discontinued once new system is stabilized.

Phased deployment

In phased deployment **the new system in introduced in phases** rather than whole system at a time.

Pilot method

In the pilot method of deployment, the **whole system is introduced and tested over period of time**.

ACQUISITION PROJECTS

- Organizations often employ structured **acquisition methodologies for** acquiring significant **hardware and software products**.
- Organizations replace the SDLC design and development phases with a bid solicitation process.
- It involves developing detailed lists of **functional, security, and system requirements** and distributing them to third parties.

CASE TOOLS & SDLC

- CASE tools are **set of software application programs**, which are used to automate SDLC activities.
- CASE tools are used by software project managers, analysts and engineers to **develop software system**.

COMPONENTS OF CASE TOOLS

Diagram tools
These tools are used to **represent system components, data and control** flow among various software components and system **structure in a graphical form**.

Process Modelling Tools
It is used to develop the software. Process modelling tools help the managers to **choose a process model or modify** it as per the requirement of software product.
Example
EPF Composer

Project Management Tools
- These tools are used for **project planning, cost and effort estimation, project scheduling and resource planning.**
- It helps in storing and sharing project information **in real-time throughout the organization.**

Example
Creative Pro Office, Trac Project, Basecamp.

Documentation Tools
- It **generates documents** for technical users and end users.
- Technical users are mostly **in-house professionals of the development team** who refer to system manual, reference manual, training manual, installation manuals, etc.
- The end user documents describe the **functioning and how-to use of the system** such as user manual.
- It includes **Doxygen, DrExplain, Adobe RoboHelp** for documentation.

Analysis Tools

- These tools help to gather requirements, automatically check for any **inconsistency**, **inaccuracy** in the diagrams, data redundancies or **erroneous omissions**.
- It includes **Accept 360, Accompa, CaseComplete etc**.

Design Tools

These tools help software designers to design the block structure of the software.

Example

Animated Software Design

Change Control Tools

They deal with **changes made to the software** after its baseline is fixed or when the **software is first released**.

Programming Tools

These tools provide comprehensive aid in **building software product** and include features for simulation and **testing.**

Prototyping Tools

Prototype **provides initial look and feel of the product** and simulates few aspects of actual product.

Web Development Tools

- These tools assist in **designing web pages** with all allied elements like forms, text, and script, graphic and so on.
- Web tools also provide live preview of **what is being developed** and how will it **look after completion**.

Quality Assurance Tools

- Quality assurance in a software organization is **monitoring the engineering process** and methods adopted to develop the software product in order to ensure conformance of **quality as per organization standards.**
- It includes **change control tools** and **software testing tools** like SoapTest, AppsWatch, JMeter.

Maintenance Tools

Software maintenance includes **modifications in the software product** after it is delivered.

TYPES OF INFORMATION SYSTEMS

TRANSACTION PROCESSING SYSTEM (TPS)

- TPS is a type of information system that **collects, stores, modifies and retrieves the data transactions of an enterprise**.
- TPS handle transactions that affect the firm like paying bills, selling goods, receiving goods, shipping goods.
- There is usually a **master file and a transaction file**.

MANAGEMENT INFORMATION SYSTEM (MIS)

- It is an information system **used for decision-making,** and for the coordination, control, analysis, and visualization of information in an organization.
- An MIS generally **help its users identify problems**.

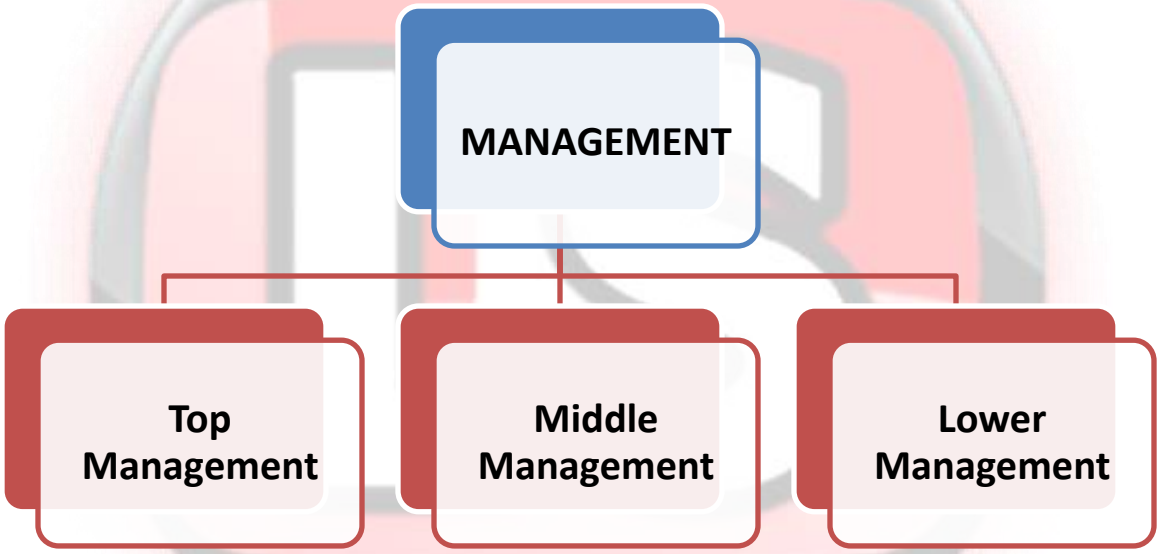
DECISION SUPPORT SYSTEM (DSS)

- It provides **support for people making decisions** generally, **semi-structured decisions.**
- These systems are highly interactive, allowing the **user to query data and analyse it using many tools and model**s.

- This system does not make the decision - **it helps the user make the decision**, providing information and analysis where the user sees fit.

MANAGEMENT INFORMATION SYSTEM STRUCTURE

Information system is directed towards **assisting management in planning and controlling bank activities**.



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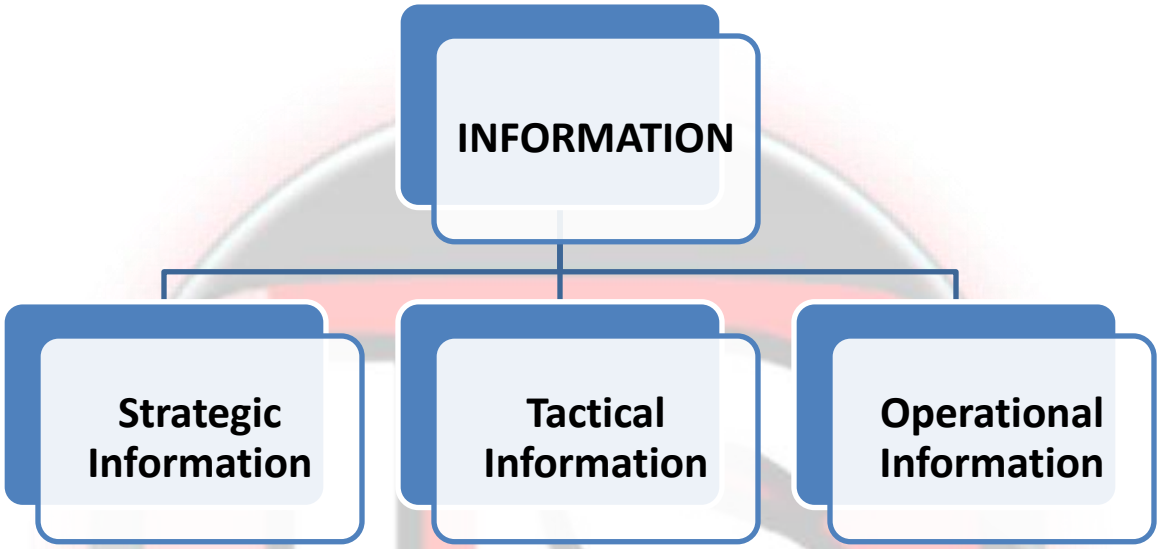
TYPES OF INFORMATION



STRATEGIC INFORMATION

- Strategic information is **used primarily by top management** and its staff to cover a long-time span, **generally one to five years**.
- This type of information is employed for planning purposes and for analysis of problem areas to discover the underlying reasons for specific problems or conditions.

TACTICAL INFORMATION

Tactical information that covers **relatively short periods is used by middle management** to implement and **highest-level strategic plans at the functional levels**.

OPERATIONAL INFORMATION

- It is used primarily by **lower management to measure performance against predetermined objectives**, including standards and budgeted figures.
- This information allows lower management to comment on **how operating standards and policies can be improved** to assist day-to-day operations.

DECISION SUPPORT SYSTEM (DSS)

A decision support system (DSS) is an information system that **supports business or organizational decision-making activities**.

COMPONENTS OF A DSS

Database Management System (DBMS)

- To solve a problem the **necessary data may come from internal or external database.**
- Internal data are generated by a system such as **Transaction Processing System and Management Information Systems**.
- External data come from a variety of sources such as **newspapers, online data services, databases.**

Model Management System

- It stores and accesses models that managers **use to make decisions**.
- Models are used for **designing manufacturing facility**, analysing the **financial health** of an organization, **forecasting demand** of a product or service.

Support Tools

Support tools **facilitates the user interactions with the system**.

ESSENTIAL CHARACTERISTICS OF DSS

- **Broad-based approach** to supporting decision making
- **Human retains control** over the decision-making process
- Support decision making for **solving structured, semi-structured and unstructured problems**
- Utilization of appropriate **mathematical and statistical models**
- Output directed to **organization personnel at all levels**
- **Comprehensive data base**

EXECUTIVE INFORMATION SYSTEMS (EIS)

- EIS have been developed to serve the information needs of **managers at the highest organizational levels**.
- They combine data from **both internal and external sources** to help senior managers solve unstructured problems

CATEGORIES

- That which focus on **executive communications and office work**
- That which provides a more **convenient interface to corporate data**
- Those that focus on developing elaborate scenarios, **applying statistical models to company forecasts.**

GROUP DECISION SUPPORT SYSTEMS (GDSS)

- In an organization there are many decisions that need to be taken by a **collective group of people** rather than one individual.
- A GDSS is an interactive computer- based system to facilitate the **solution of organizational problems** by a **set of decision-makers working together.**

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GROUPWARE

- Groupware is a software that **helps groups of people work together** more efficiently and effectively.
- GDSS must support both **decisions making support and process support.**
- Groupware include **Lotus Notes, Novell Groupwise, and Microsoft Exchange.**

PROJECT

- The process of **planning, designing and implementing computer system** is called as a project.
- It is directed by a **project manager** who uses available resources to produce systems.

PROJECT MANAGEMENT

- Project management is a technique **used by a manager to ensure successful completion of a project**.
- It includes estimating **resource requirements, scheduling tasks and events**, providing for training and monitoring the project's program etc.

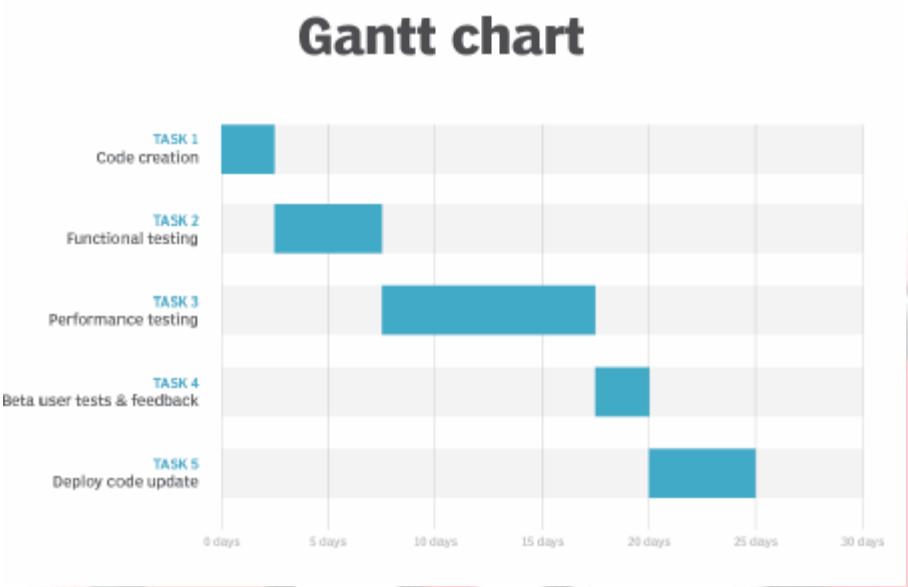
PLANNING TOOLS

Planning is required developing a road map **structure** or a network based on analysis of the **tasks that must be performed to complete the project.**

Gantt chart

- It **uses bar charts** that **show project activities and the amount of time they will take**.

- The Gantt chart uses horizontal bars to show the **duration of actions or tasks.**



Steps in Gantt charts

- Identify the **activities** in the stage.
- Determine the **tasks for each activity** and **estimated completion times.**
- Plot activities on the Gantt chart, review and record **the progress periodically.**

Program Evaluation and Review Technique (PERT)

- Each task must have a beginning and ending event. **A task can start only after the tasks it depends** on have been completed.
- The arrow length is not significant but the **sequence and interconnections** must give a true picture of the **precedence of activities** to be completed.

PERT chart shows

- The activities that must be **completed before initiating a specific activity.**
- **Inter-dependencies** of the tasks.

- The activities that **cannot be initiated** until after **specific activities** are **completed**.

ROLE OF PROJECT MANAGER

- **Flexibility and adaptability** to changing situations.
- Ability to **communicate and persuade people** working on it as well as the users.
- **Planning of the system** development aspect of the project.
- **Understanding technical problems** and design details.
- Understanding the **motivations and interests of members** of the project.

CAPABILITY MATURITY MODEL (CMM)

- **CMM** was developed by the Software Engineering Institute (SEI) at Carnegie Mellon University in **1987**.
- It is a framework that is used to **analyse** the **approach and techniques** followed by any organization to **develop software products.**
- This model describes a **strategy for software process improvement** that should be followed by moving **through 5 different levels**.

STRUCTURE OF CMM

MATURITY LEVELS

A maturity level can be viewed as a **set of structured levels** that describe **how well the behaviors, practices and processes of an organization** can reliably and sustainably produce required outcomes.

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FIVE MATURITY LEVELS

Initial (Level-1)

- Processes followed are and **immature and are not well defined**.
- **Unstable environment** for software development.
- No basis for **predicting product quality, time for completion**

Repeatable (Level-2)

- Focuses on **establishing basic project management policies**.
- **Experience** with **earlier projects** is used for managing **new similar natured projects.**
- It presents a **detailed plan** to be followed **systematically for the successful completion of good quality software**.
- The focus is on **maintaining the performance of the software product**, including all its components, for the entire lifecycle.
- It guarantees a good quality software product by **following certain rules and quality standard guidelines while developing**.

Defined (Level-3)

- At this level, **documentation** of the standard guidelines and procedures takes place.
- It is a **well-defined** integrated set of project-specific software engineering and management processes.
- In this method, **defects are removed** by using a number of **review methods like walkthroughs, inspections, buddy checks,** etc.
- It consists of planned **interactions between different development teams** to ensure efficient and proper fulfillment of customer needs.

- Its key focus is on the **development and maintenance of the standard development processes**.
- It focuses on the **enhancement of knowledge and skills of the team**

Managed (Level-4)

- At this stage, **quantitative quality goals** are set for the organization for software products as well as software processes.
- The **measurements** made help the organization to **predict the product and process quality** within some limits defined quantitatively.
- It includes the **establishment of plans and strategies** to develop **quantitative analysis** and understanding of the product's quality.

Optimizing (Level-5)

- This is the **highest level** of process maturity in CMM
- Use of **new tools, techniques**, and evaluation of **software processes is done.**
- Its focus is on the continuous improvement of the organization's software processes to improve productivity, quality, and cycle time for the software product.

PROCESS CAPABILITY

Software process capability describes the **range of expected results that can be achieved** by following a software process.

KEY PROCESS AREAS

Key process area identifies a cluster of **related activities that, when performed collectively, achieve a set of goals** considered important for establishing process capability at that maturity level.

GOALS

The goals summarize **the key practices of a key practice area** and can be used to determine whether an organization or **project has effectively implemented the key process area**.

COMMON FEATURES

- The common features are attributes that indicate whether the **implementation and institutionalization of key process area are effective, repeatable, and lasting.**
- The key practices are divided among five Common Features sections Commitment to Perform, Ability to Perform, Activities performed, Measurement and Analysis, and Verifying Implementation.

KEY PRACTICES

The key practices describe the **infrastructure and activities** that **contribute most to the effective implementation** and institutionalization of the key process area.

BENEFITS OF CMM

- CMM helps build an **understanding of software process** by describing the practices that contribute to a level of process maturity.
- It provides a consistent basis for **conducting appraisals of software** processes by allowing an organization to **accurately compare its process capability to that of another organization**.
- It serves a **blueprint for software process improvement**.

DATA CENTERS

Data center is a facility **composed of networked computers, storage systems and computing infrastructure** that organizations use to assemble, process, store and disseminate large amounts of data.

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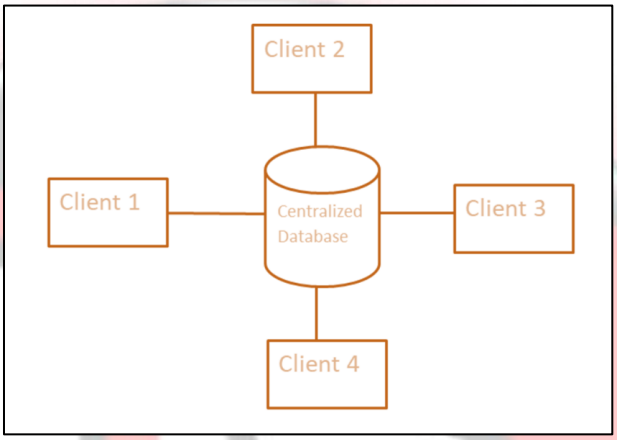
CENTRALIZED DATA ENVIRONMENT

- It is basically a type of database that is **stored, located as well as maintained** at a **single location only**.
- This permit both **management and operations personnel** to obtain required information **without regard to its origins**.



FEATURES

Data Integration

Data integration is the process of **combining data from different sources into a single point.**

Management Awareness

The data interaction, flow, and usage provide a clearer framework for understanding **how the various functions interact**.

Minimal Data Redundancy

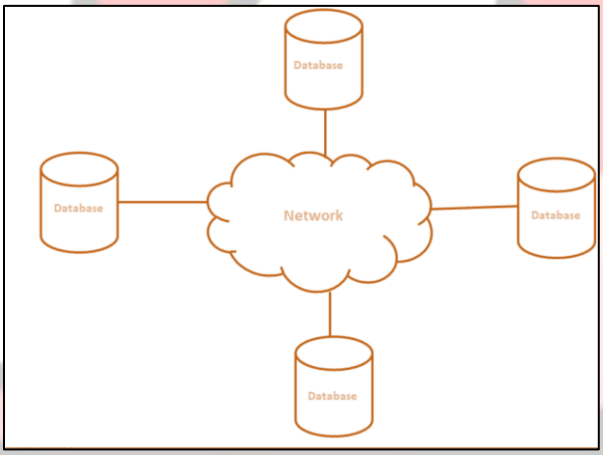
Data redundancy refers to the practice of **keeping data in two or more places** within a database or **data storage system**.

Organizational Impact of Change

A **radical change** take place in the business or the entities with which it deals, this impact now affects **all areas because of their reliance on the central data pool.**

DECENTRALIZED DATA ENVIRONMENT

- It consists of **multiple databases that are connected** with each other and are spread across **different physical locations**.
- The data that is stored in **various physical locations** can thus be managed **independently of other physical locations**.
- Multiple **independent or semi-independent** organizational units are controlled, directed or **linked** in some manner by a **parent unit**.



ADVANTEGES

- Database can be easily expanded as data is **already spread across different physical locations**.
- User can easily be accessed from **different networks**.
- This database is **more secure in comparison** to a centralized database.

DISADVANTAGES

- This database is **very costly and is difficult to maintain because of its complexity.**

- In this database, it is difficult to provide a **uniform view to users** since it is spread across different physical locations.
- **Data redundancy** occurs when the same piece of data exists in multiple places.

DATA CENTER IN BANKS

- There are two ways: **build their own or use the services** of an outsourced data center provider.
- In building a new data center or evaluating an existing one, it is important to understand the **geographic environment and the threats that it poses.**

GEOGRAPHIC AND REGIONAL RISKS

- The ideal time to consider geographic and regional risks is **when selecting a new site for a business.**
- The most common geographic and regional risks to consider are **weather-related**, including distinctive events such as **earthquakes, floods, hurricanes, snowstorms, and lightning.**

General mitigation techniques to anticipate any emergency

- Create **emergency communication plans**.
- Install a **generator for emergency power** in the event of an extended outage.
- Have computer **data backed up off site**.

SITE-RELATED RISKS

- Site-related characteristics could significantly drive the **availability of the business.**
- This includes **facts about the site**, its **community, and potential man-made risks.**

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BUILDING RISKS

- The building itself will have a huge impact on the **availability of the business.**
- This includes factors such as complying with wiring standards, age of the building, types of loads running, and the **type and quality of the facility.**

ECONOMIC RISKS

When selecting a new site, there are **many economic issues** to consider.

- Electric utility's rate structure; the cost of electricity is typically the **largest operating cost of a data center**.
- **Tax and other incentives** that may be offered.
- Overall **operating costs** of the site relative to other sites.
- Land and **construction costs**.
- The availability of **skilled labour in the region**.

REDUNDANCY OF A DATA CENTRE

- **Single point of failure** (SPOF) is a part of a system which if fails, will stop the entire system from working.
- Some examples of SPOFs are **database and application servers, network, power and storage systems.**
- SPOFs are undesirable and **redundancy needs to be maintained for all SPOFs in a DC.**