BCE
(CVE 102B)

Module 2 – Infrastructure and Project management

Dr. Vishwanath Karad
MIT WORLD PEACE UNIVERSITY | PUNE
TECHNOLOGY, RESEARCH, SOCIAL INNOVATION & PARTNERSHIPS
MIT-WPU
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Topics

- Interdisciplinary infrastructure provisions
- monitoring and maintaining projects,
- Management and control of resources
- Project feasibility studies
- software used in project management
- Drone Survey
- Smart cities.

Introduction to Project management & organization

Management

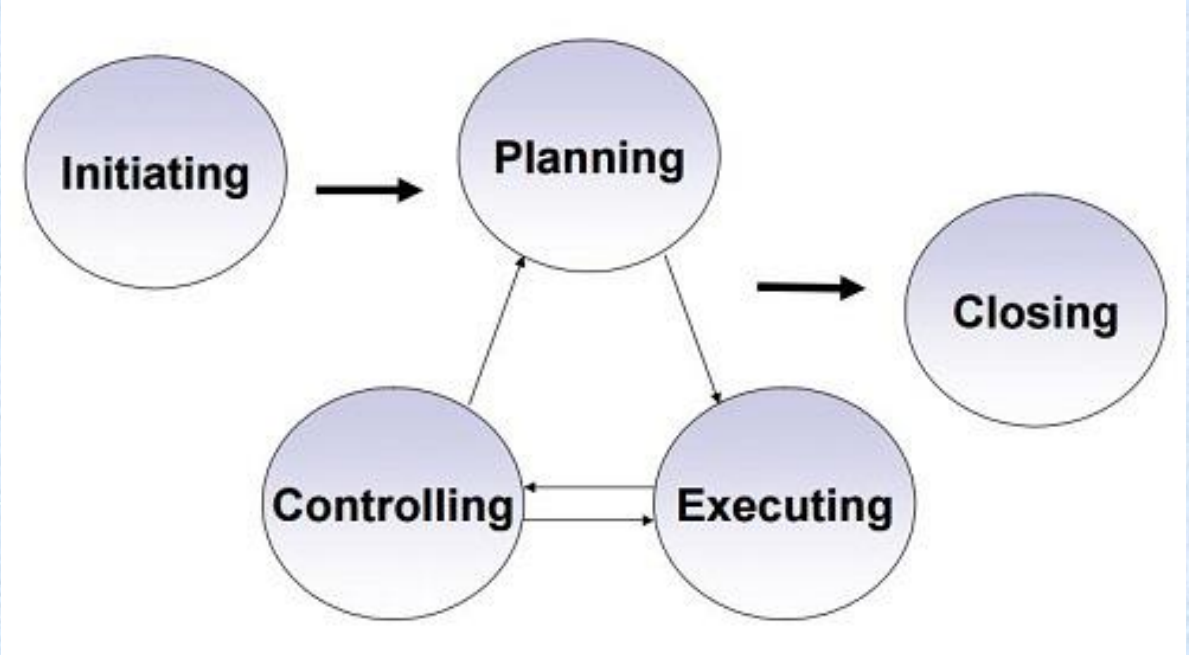
•Art of getting work done through people with satisfaction of employer, employees and public.

•**Management – Art as well as science**

- Scientific basis – technique can be measured
- Art – getting work done from others.

Concept of Project

- A **project** is a temporary endeavor undertaken to create a unique product or service
- Projects can be large or small and take a short or long time to complete
- Project Attributes / Characteristics



- A project:
  - Has a unique purpose: every project should have a well defined **objective**.
  - each project has a **definite beginning and a definite end**.
  - Requires **resources**, often from **various areas**
  - Should have a **primary customer or sponsor**
  - Involves **uncertainty**

Project Management

Project management is “the application of knowledge, skills, tools and techniques to project activities to meet project requirements”

- Categories of project

1. National
2. International

- National project

1. Non industrial
2. Industrial – Non conventional R n D
   High technology
   Conventional technology
   Low technology

Saryu Nahar National Project

Dec 11, 2021

Total cost of more than Rs. 9,800 Crore

Project entails the interlinking of five rivers and will provide assured water for irrigation of over 14 lakh hectares of land and benefit about 29 lakh farmers of over 6200 villages.

International Project:

High technology

- Mega
- Major
- Medium
- Mini

- Major Project

  Grass root, Expansion or modification

- Expansion project

  Normal, Crash or disaster

Mega Project

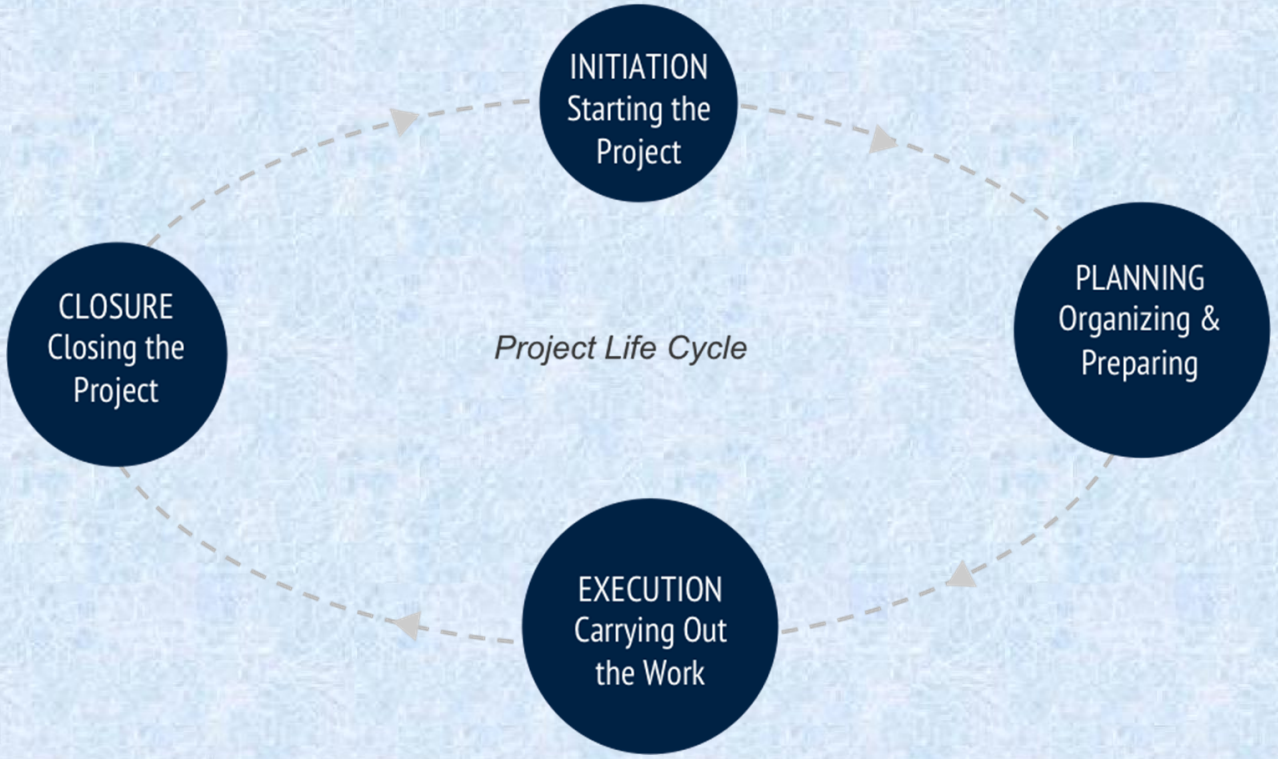
Major Project

Medium Project

Mini Project

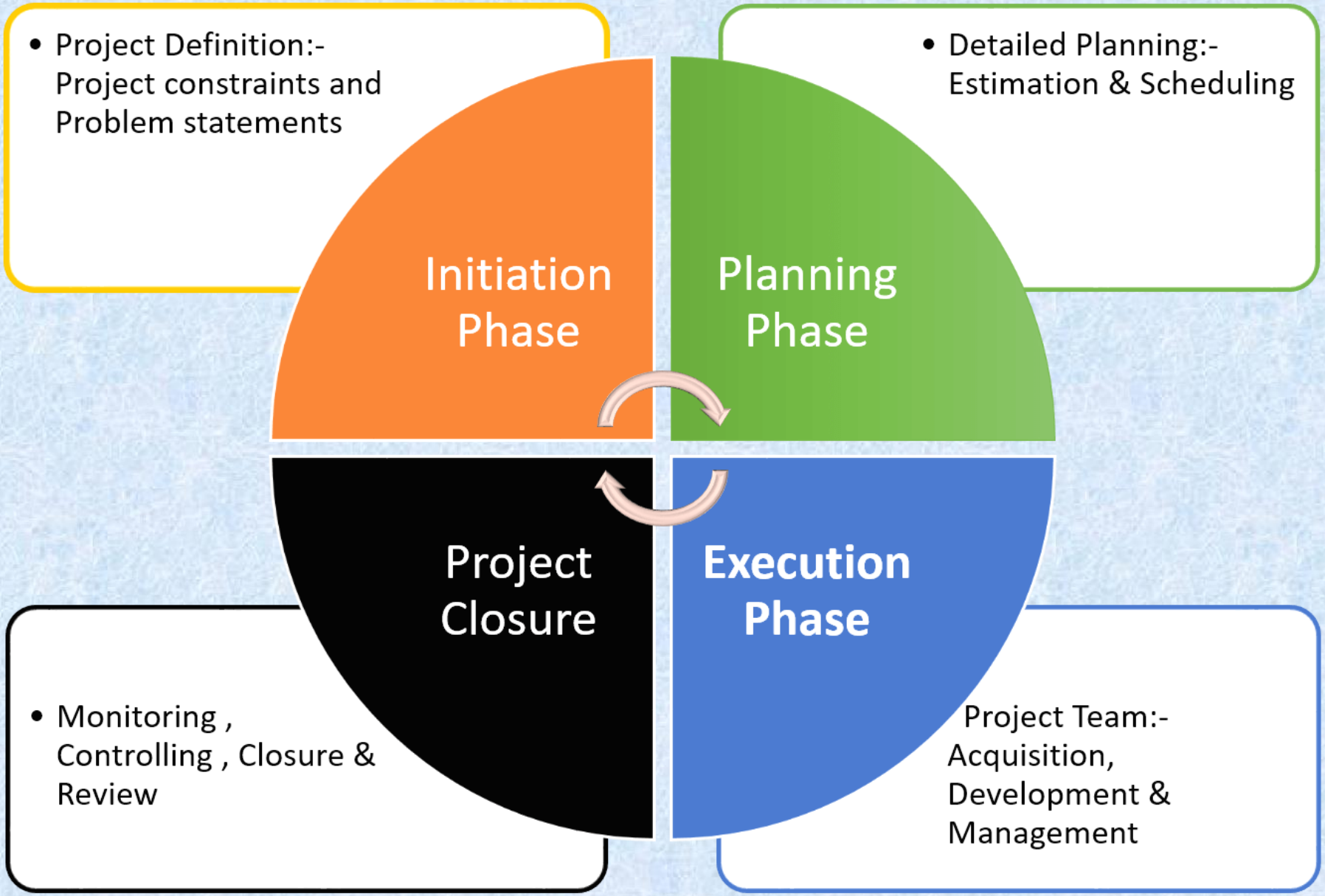

FCS Complex
THIS DRDO BUILDING WAS BUILT
IN 45 DAYS TO DEVELOP FIGHTER JETS

Project Life Cycle



- A **project life cycle** is a collection of project phases that defines:
  - What work will be performed in each phase
  - What deliverables will be produced and when
  - Who is involved in each phase
  - How management will control and approve work produced in each phase

- A **deliverable** is a product or service produced or provided as part of a project


• Project Definition:- Project constraints and Problem statements
• Detailed Planning:- Estimation & Scheduling
Initiation Phase
Planning Phase
Project Closure
Execution Phase
• Monitoring , Controlling , Closure & Review
Project Team:- Acquisition, Development & Management

Importance of Management

- No enterprise can survive without management
- Guide and control activities
- Coordinates different activities of departments
- Provide new ideas and vision
- Tackles business problems
- Meet challenge of change
- Provides stability to the enterprise
- Helps personality development.


Accomplishment of goals
Cordial Industrial Relations and Competitive Strengths
Effective Utilization of Resources
Importance of Management
National Growth and Prosperity
Establishes Sound Organization
Reduces Cost
Establishes Equilibrium

Functions of Management

1. Forecasting
2. Planning
3. Organizing
4. Staffing
5. Directing
6. Coordinating
7. Controlling
8. Decision making

1. Forecasting

- Estimates future work – sales or production
- Relates to cost, finance, purchase, profit or loss.

2. Planning

- Manager anticipates future and discovers alternatives.
- Systematic way of making decisions.
- Essential for utilizing available facilities.

3. Organizing

- Organizing people, materials, jobs, time, etc
- Determining activities

4. Staffing

- Manager select, train, promote and retire their subordinates
- Developing and placing of qualified people in jobs

Steps of Staffing Function Management

5. Directing

- Motivating, guiding and supervising subordinates
- It involves

➢ **Leadership**

- Quality of behaviors of manager
- Get max cooperation from subord and guide them

➢ **Communication**

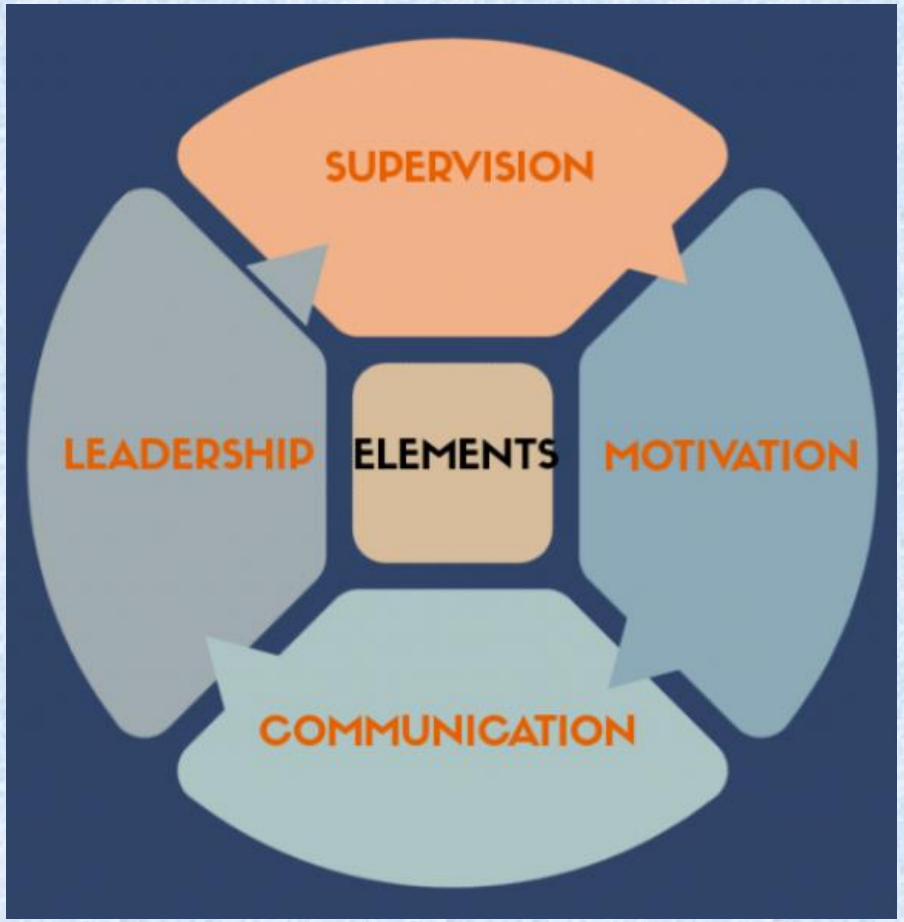
- Process –ideas are transmitted
- Verbal, written, orders, reports, instruction
- Ineffective communication – confusion, misunderstanding, dissatisfaction or strike.

➢ **Motivation**

- Inspiring subordinates – work effectively and efficiently

➢ **Supervision**

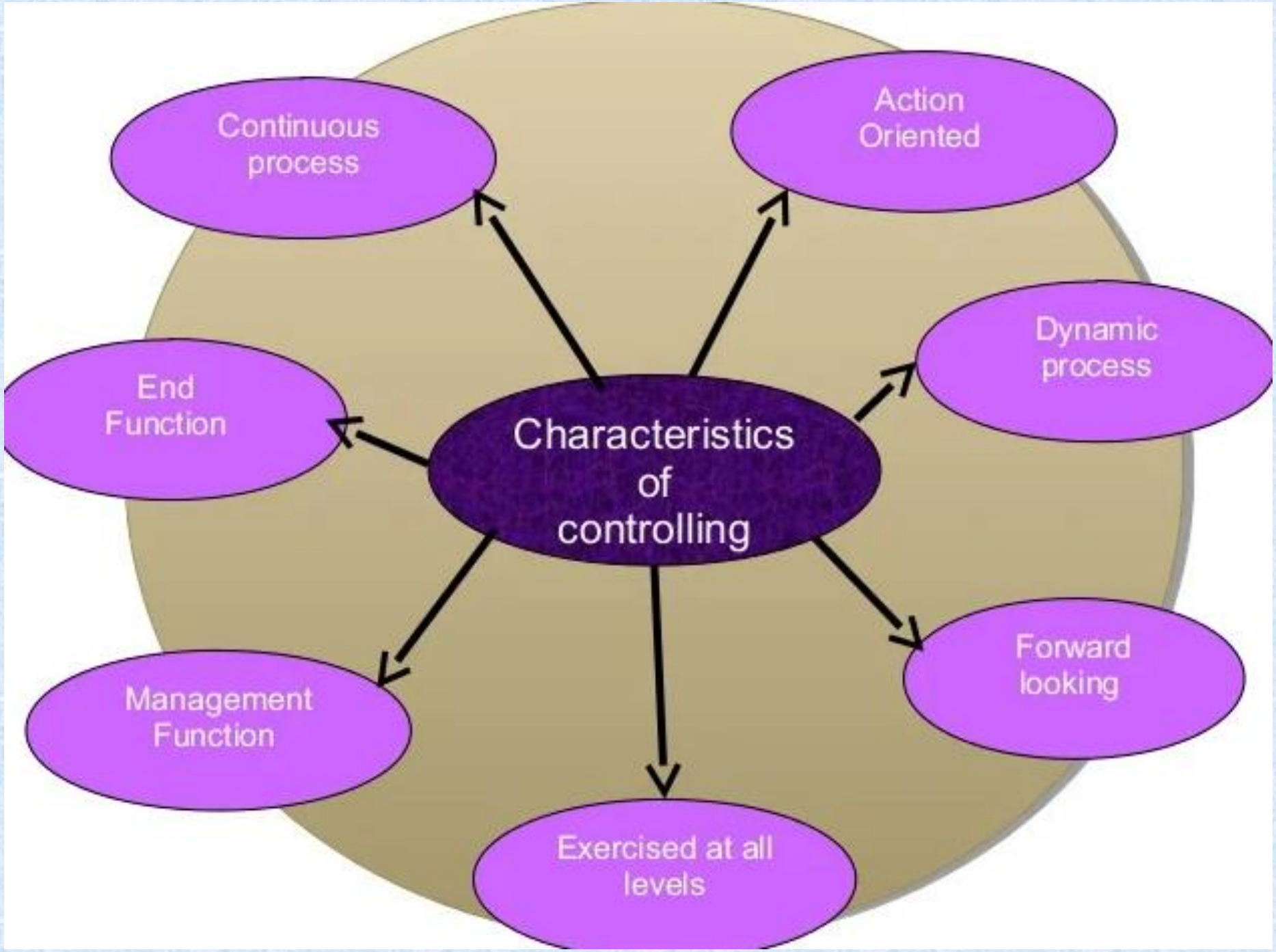
- Work is going as plan
- Workers are doing as they directed



6. Coordinating

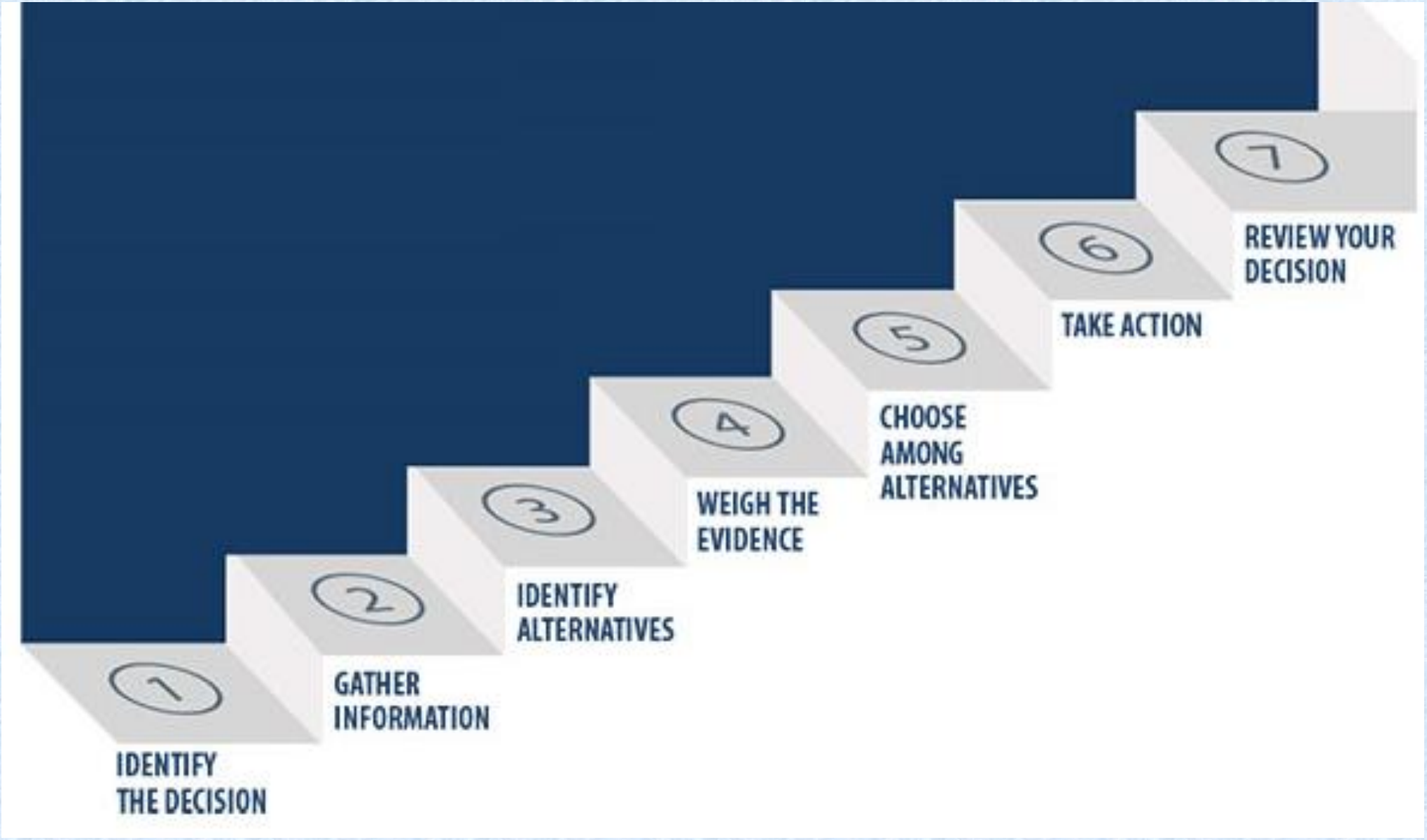
- Achieving harmony of individual effect towards the accomplishment of company objectives
- Making plan to coordination activities of subord.

- 7.Controlling
- Measures current performance
- Controlling set stds, measure job perf, take correct action.


Continuous process
Action Oriented
End Function
Characteristics of controlling
Dynamic process
Management Function
Forward looking
Exercised at all levels

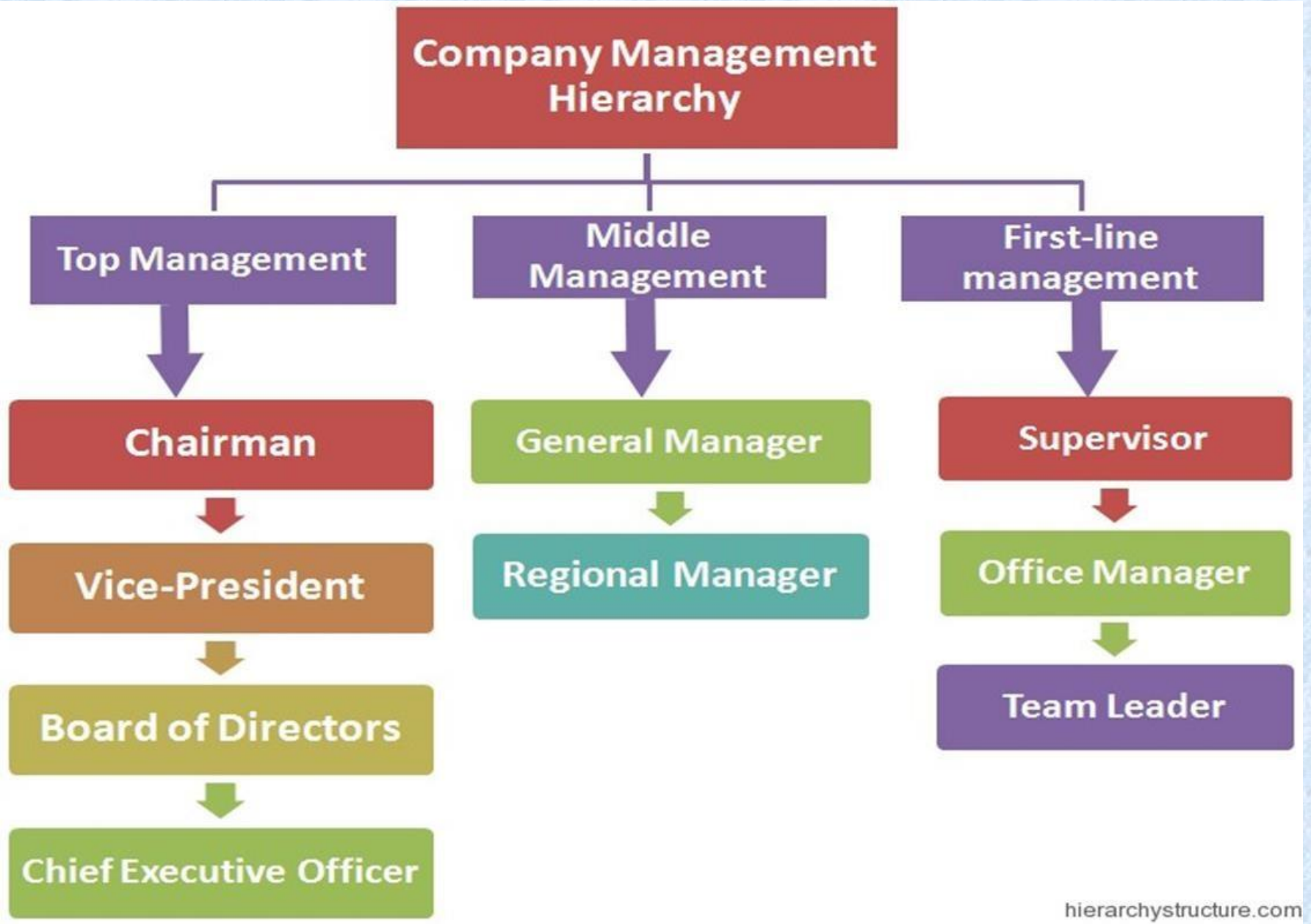
8. **Decision making**

- Selecting course of action for getting desired results.



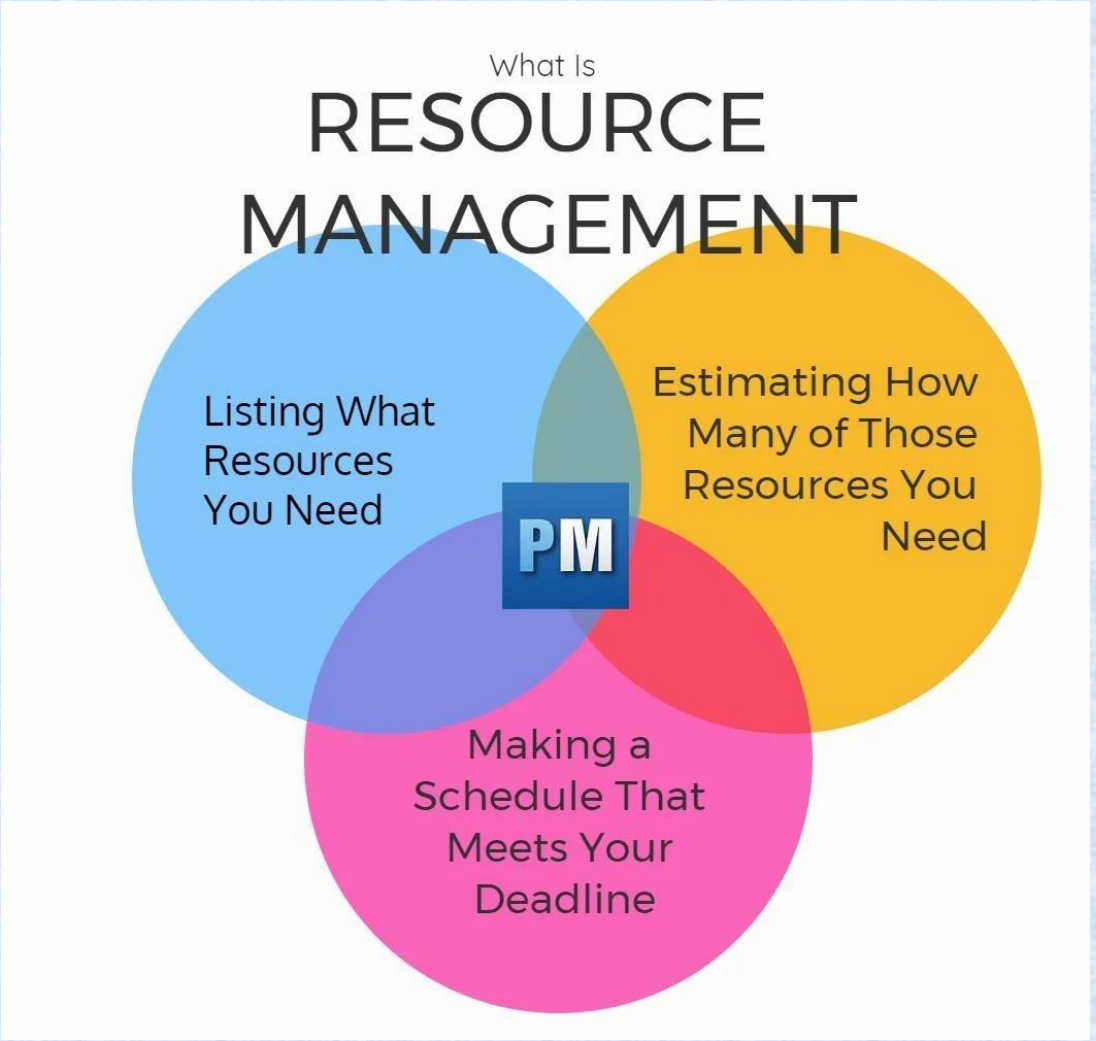
Management Hierarchy

- An organization can have many different managers, across many different titles, authority levels, and levels of the management hierarchy.
- **The three levels of management typically found in an organization are low-level management, middle-level management, and top-level management.**
- Top-level managers are responsible for **controlling and overseeing** the entire organization.
- Middle-level managers are **responsible for executing organizational** plans which comply with the company's policies. These managers act at an intermediary between top-level management and low-level management.
- Low-level managers focus on **controlling and directing**. They serve as role models for the employees they supervise.


Company Management Hierarchy
Top Management
Middle Management
First-line management
Chairman
Vice-President
Board of Directors
Chief Executive Officer
General Manager
Regional Manager
Supervisor
Office Manager
Team Leader
hierarchystructure.com

Resource Management

- Resource management is the process of planning, scheduling, and allocating resources in the best possible way.
- The ultimate aim is to maximize your resources' efficiency. This in turn will help the success of your project, task, or monthly goals.
- Resources can be anything from people to machinery.



Creating a Resource Management Plan

- So those are the basic terms and processes. But how can you use them to create a process, schedule your resources throughout the project cycle, and monitor those resources within the boundaries of your budget, without overburdening them and risking team burnout? Lucky for you, we've covered the basics of resource planning before, and it can be distilled into a super basic three-step process:
- First, note all your resources, including people, equipment and material.
- Next, figure out how many of those resources are needed to get the project done.
- Finally, make a schedule for the resources.

Drilling down, however, it's important to make sure you have all the components of a good resource plan. It should include:

Creating a Resource Management Plan

1. **All the resources necessary to complete the project:-** That's everything from people to machines and even any office space you'll need. Spend a good amount of time with this list, the more complete it is, the more accurate your schedule will be.
2. **Timeframes for the planned effort of each resource:-** By noting the duration of time needed for each resource, you have a clearer picture of how it will fit into your overall schedule.
3. **Number of each resources you'll need per day/week/month:-** Again, you want to break your resource needs out on a daily, weekly and monthly rotation to better grasp what you'll need and when.
4. **Quantity of resource *hours* required per day/week/month**. You've figured how what you need, but how many hours for each of those resources are you going to allocate over time?
5. **Identify assumptions and constraints.** An assumption is what you think might be true, while the constraints are the schedule, cost and scope of your project. So, you want to know what they are and how they'll potentially impact your plan. Think strategically. Are you assuming a team will be available in 3 months? Do you know for a fact they won't get assigned by another group leader for a separate project? Have you taken into account holidays and scheduling shifts? Identifying all your assumptions is a critical component to planning your resources wisely.

Importance of Resource management

- It provides you with an overview of everyone and everything involved in your project;
- It enables utilization planning;
- It makes the planning and management process more transparent;
- It helps you see problems before they start;
- It gives you control over your project.

Management control Resources

The Control Resources process relates to the management of resources assigned to the project.

This includes physical resources such as IT systems, hardware, office space and materials but does not include human resources as these are dealt with in the Manage Team process.

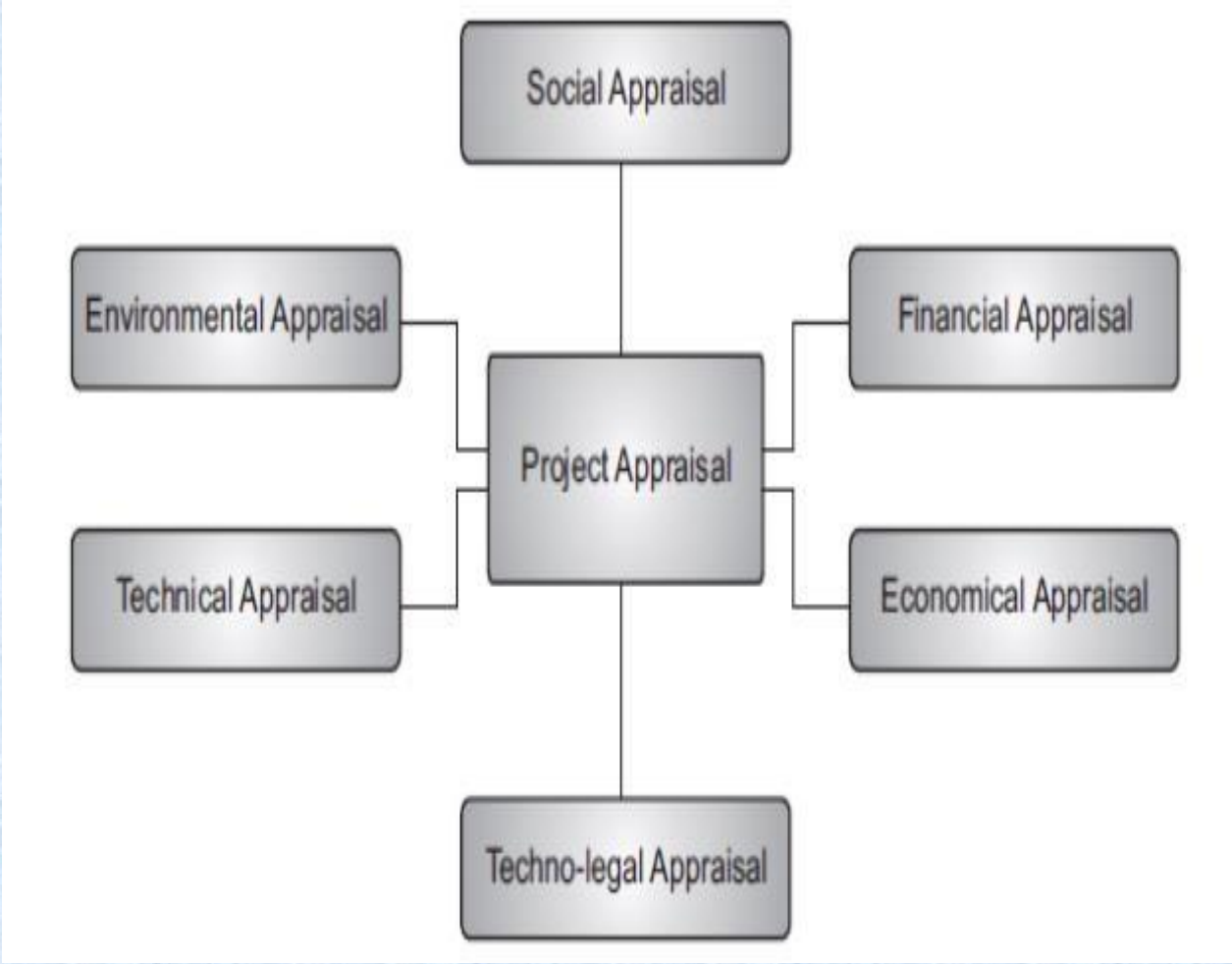
1. Controlling Resources commences with using the **Project Plan** to determine what resources are **needed**, then **assigning them to the various tasks** on the project at the correct time.
2. The Control Resources process also **monitors the utilization of the resources** against the plan and where necessary will result in **corrective action to shorten or extend the time** that the resources are needed.
3. The Control Resources process is applied from the start of the project and throughout on a regular basis to provide **efficient and timely use of project resources**.
4. This process extends beyond the scheduling and availability of resources. The **quality, quantity and usability of the resources** need to be managed as well to ensure the products meet the quality expectations of the project.
5. The resources required by a project can be **scarce and expensive**, so the Control Resources process also needs to ensure resources are not wasted or unused as this will have an **adverse impact** on the **project budget**.

Project feasibility studies

- A feasibility study is an assessment of the practicality of a proposed project or system.
- A feasibility study aims to objectively and rationally uncover the strengths and weaknesses of an existing business or proposed venture, opportunities and threats present in the natural environment, the resources required to carry through, and ultimately the prospects for success.
- **Project Appraisal** is a tool used to study the feasibility of project.

Project Appraisal Criteria's

- Project appraisal is the structured process of assessing the viability of a project or proposal.
- It involves calculating the feasibility of the project before committing resources to it.
- It is a tool that company's use for choosing the best project that would help them to attain their goal.



Social Appraisal

- The project undertaken should be beneficial to society and should not be harmful to the society in any case.
- A project can create employment opportunities to the population and can provide better facilities and in general may become a source of uplift of the area and can raise standard of living of the nearby population. In such case project is accepted by the people.
- However , if the project in any way creating difficulties in any manner to the population in adjoining area and adverse effect on environment, project will not be accepted by people.

Environmental appraisal

- Environmental appraisal is the process of assessment of environmental effect or consequences of a proposed project.
- Project Should not detrimental to environment.
- Review and suggestions must be considered before commencement of project.
- Two types of approaches are followed

a . Reactive Approach:- Sole purpose of getting clearance.

b. Proactive Approach:- Environmental Impact Assessment

Technical appraisal

- Technical appraisal is an in-depth study to ensure that a project is soundly designed, appropriately engineered and follows accepted standards.
- Technical appraisal of the project consist of knowing the complete requirement of technical staff required, technical work to be carried out, requirement of needed machinery and materials and the method of procurement of the same before commencement of the project.
- These considerations differ from project to project.

Financial appraisal

- Thus financial appraisal means knowing the periodical supply of money needed for the project from start to end without any kind of interception.
- Financial appraisal – approximate estimate of the expenditures on the project and the income receivable from the sale of the finished product of the project.
- After knowing material and manpower required for project, duration is estimated.
- Depending upon duration of project, proper escalation in price of material, increase in salary has to be considered
- Now organization is aware of financial outlay needed for completion of the project.

Economic appraisal

- It is a type of decision method applied to a project, programme or policy that takes into account a wide range of costs and benefits, denominated in monetary terms or for which a monetary equivalent can be estimated.
- Economic appraisal is a key tool for **achieving value for money and satisfying requirements for decision accountability**.
- It is a systematic process for examining alternative uses of resources, focusing on assessment **of needs, objectives, options, costs, benefits, risks, funding, affordability and other factors relevant to decisions.**
- The main types of economic appraisal are:

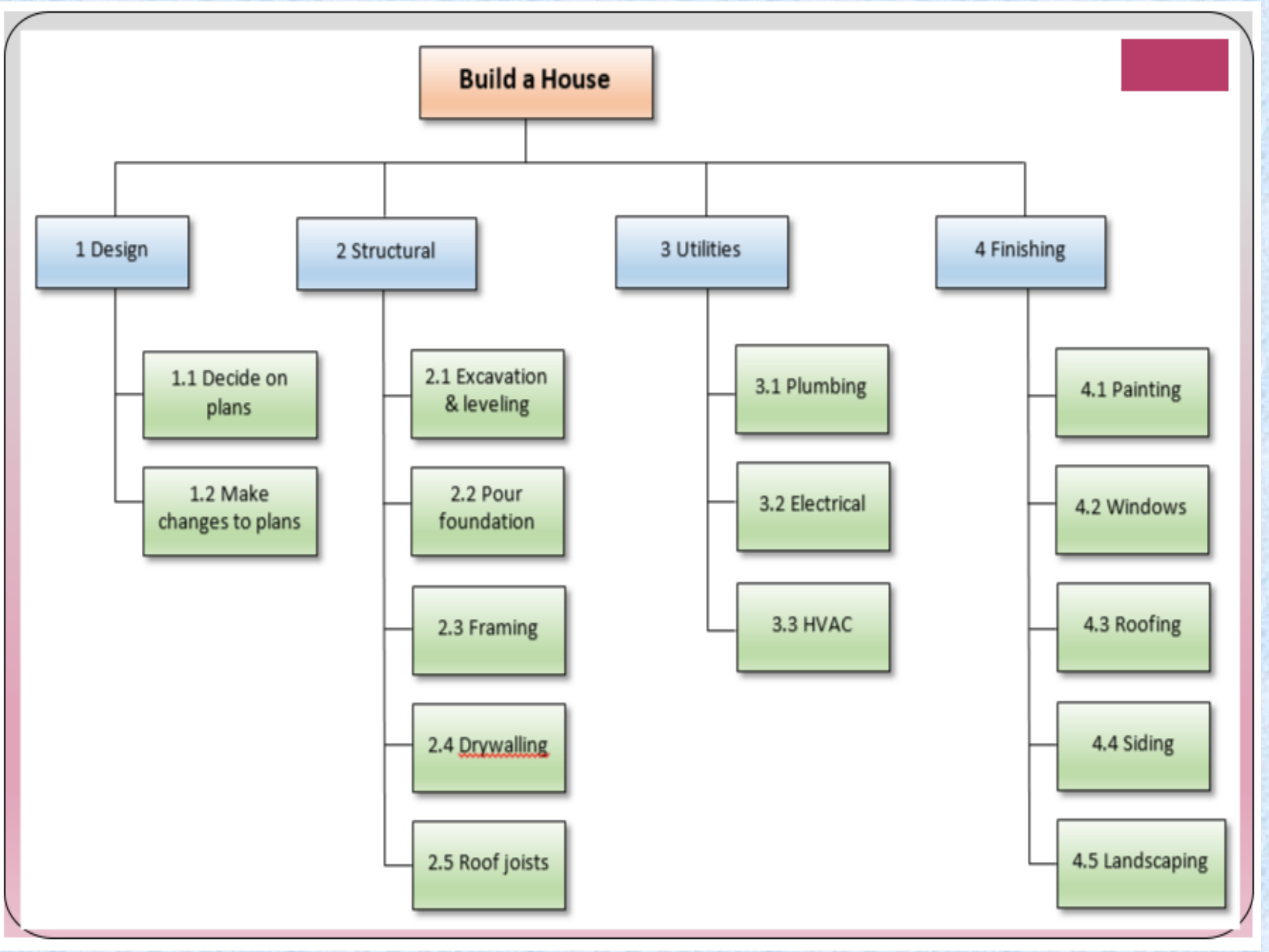
1. Cost-benefit analysis
2. Cost-effective analysis

Software used in project management

- WBS
- BAR chart
- Network Analysis- C. P. M. Activity on Arrow (AOA)
- Critical path & type of floats,
- Activity on, P. E. R. T.,
- Nodes-Precedence network analysis,
- Line of balance techniques

WORK BREAKDOWN STRUCTURE (WBS)

- Breaking work into smaller tasks is a common productivity technique used to make the work more manageable and approachable.
- For projects, the **Work Breakdown Structure (WBS)** is the tool that utilizes this technique and is one of the most important project management documents.
- It singlehandedly integrates scope, cost and schedule baselines ensuring that project plans are in alignment.
- **Dividing complex projects in to simpler & manageable task.**
- It is developed by starting with end objective.
- It can assist key personnel in effective **allocation of resources, project budgeting, procurement management, scheduling, quality assurance, quality control, risk management, product delivery and service oriented management.**


Build a House
1 Design
2 Structural
3 Utilities
4 Finishing
1.1 Decide on plans
1.2 Make changes to plans
2.1 Excavation & leveling
2.2 Pour foundation
2.3 Framing
2.4 Drywalling
2.5 Roof joists
3.1 Plumbing
3.2 Electrical
3.3 HVAC
4.1 Painting
4.2 Windows
4.3 Roofing
4.4 Siding
4.5 Landscaping

Advantages/Importance of WBS:

1. Easy to define, organize and manage the project.
2. Improves the efficiency of the project.
3. Helps to estimate the resources required, such as cost, time, staff, etc.
4. Easy allocation of resources based on the importance of the task/sub-task.

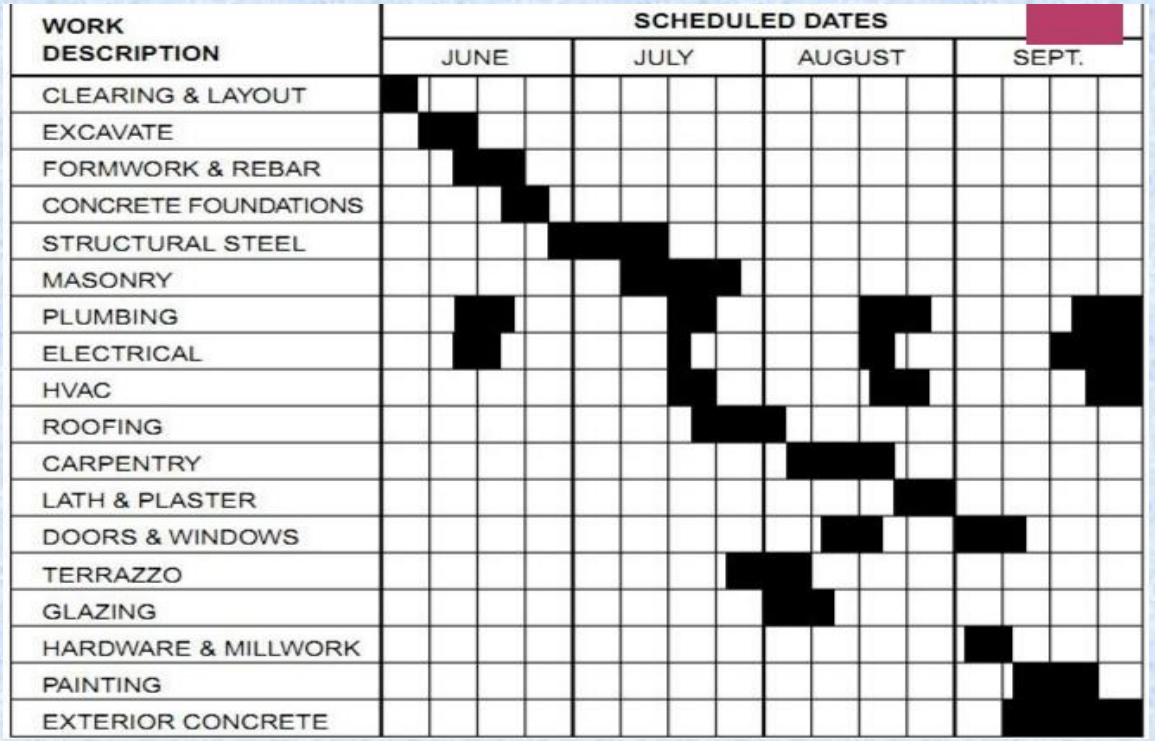
Bar chart

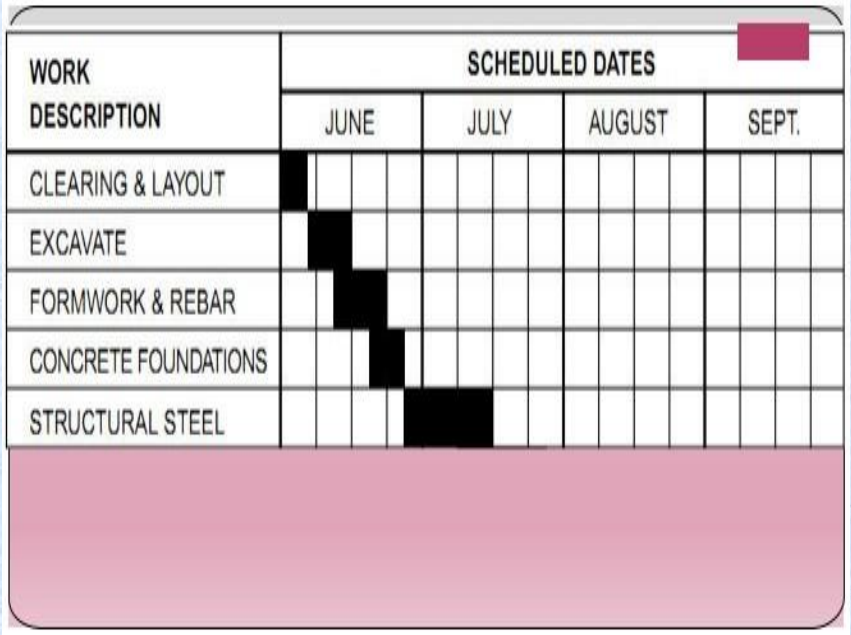
Developed by H L Gantt

Pictorial representation of various activities of a project.

Two coordinate axes

Bar represent one activity





Advantages of Bar chart

1 Time-scaled

2 Simple to prepare

3 Can be more effective and efficient if CPM based - Still the most popular method

4 Bars can be dashed to indicate work stoppage.

Limitation of Bar chart/Gantt chart

1. **Lack of degree of details**

Bar shows only major activities and not sub activities

Showing sub activities become clumsy

2. Interdependencies between activities

Does not show interdependencies between activities

3.Review of project progress

Does not show progress of work

Cannot be used as a control device

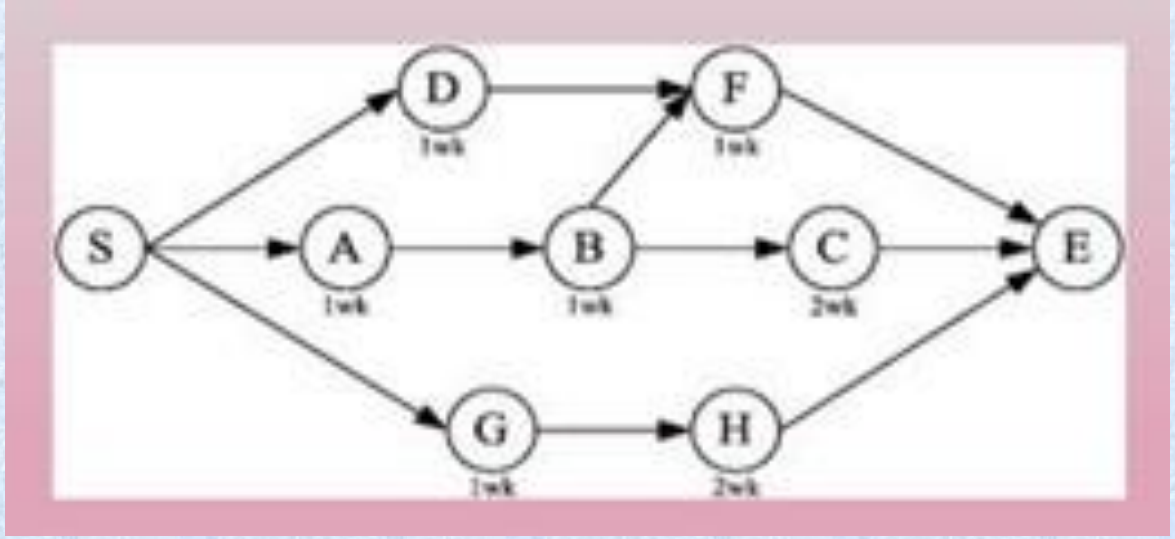
4. Time uncertainties

Unable to reflect uncertainty in estimation of time, mainly in R n D project

Used for small conventional project

NETWORKING

- **Network** is a flow diagram consisting of *activities* and *events* connected logically and sequentially.



- **Activity**

Actual work or task to be performed

Requires time and resources

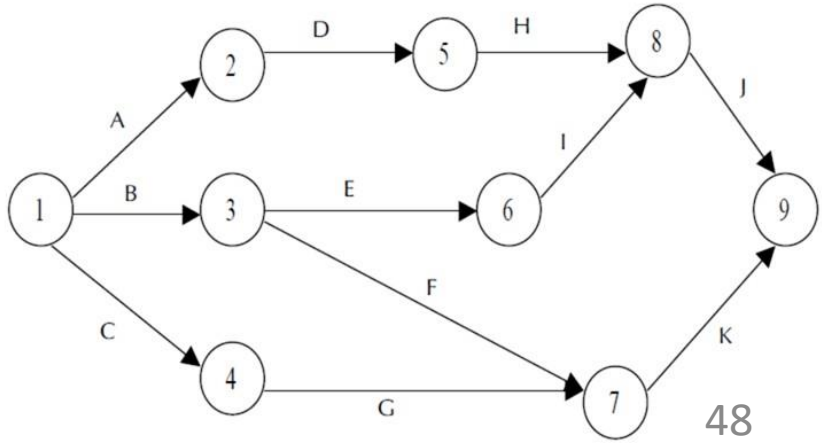
Definite start and finish time

Denoted by arrow

E.g excavating earth

Guidelines for construction of network

- A network has only **one starting node** and only **one ending node.**
- Initial event has only **outgoing arrows.**
- Final event has only **incoming arrows.**
- No activity can start until it's tail event occure.
- An event can not occure until all the activity leading up to it are completed.
- The network should be drafted such that all activities are completed **to reach end objective**.
- All Constrained and interdependencies should be shown properly on the network using **dummies.**
- Network flow is usually shown from **Left to Right.**
- No event occur twice and hence network looping is not permitted



Critical Path Method (CPM)

- The critical path method (CPM) is an **algorithm for scheduling** a set of project activities.
- CPM is a **step-by-step project management technique** to identify activities on the **critical path.**

Developed in the late 1950's **By Morgan R. Walker and James E. Kelley**

Main objectives of CPM

1. Planning **the project so that it is completed as quickly as possible**

2. Identifying activities where a delay in their execution will effect the overall end.

CPM (Critical Path Method)

- **Critical path:- The longest path in a network is nothing but critical path.**
- **Earliest occurrence time (Eot)(TE)**

  "It is the earliest time at which **an event** can occur in a network."
- **Latest Occurrence Time (LOT)(TL)**

  "It is the latest time by which **an event** must occur to keep the project on schedule."

Float

1. The amount of time that a task can be delayed **without affecting the deadlines** of other **subsequent tasks**, or the **project's final delivery date**.
2. It can be **positive or negative**
3. Activity for **which float is zero** are known as **critical activities & Path is known as critical path.**

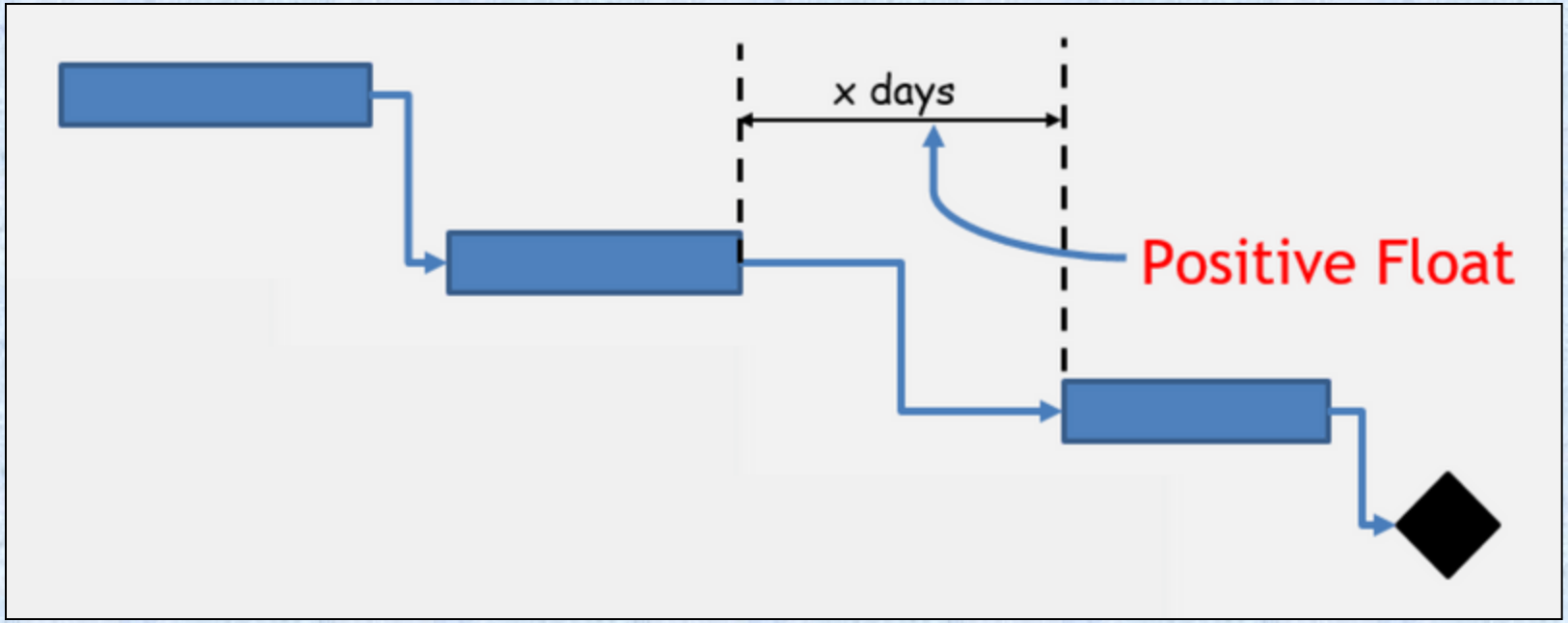
Types of float

Total float

Free float

Independent float

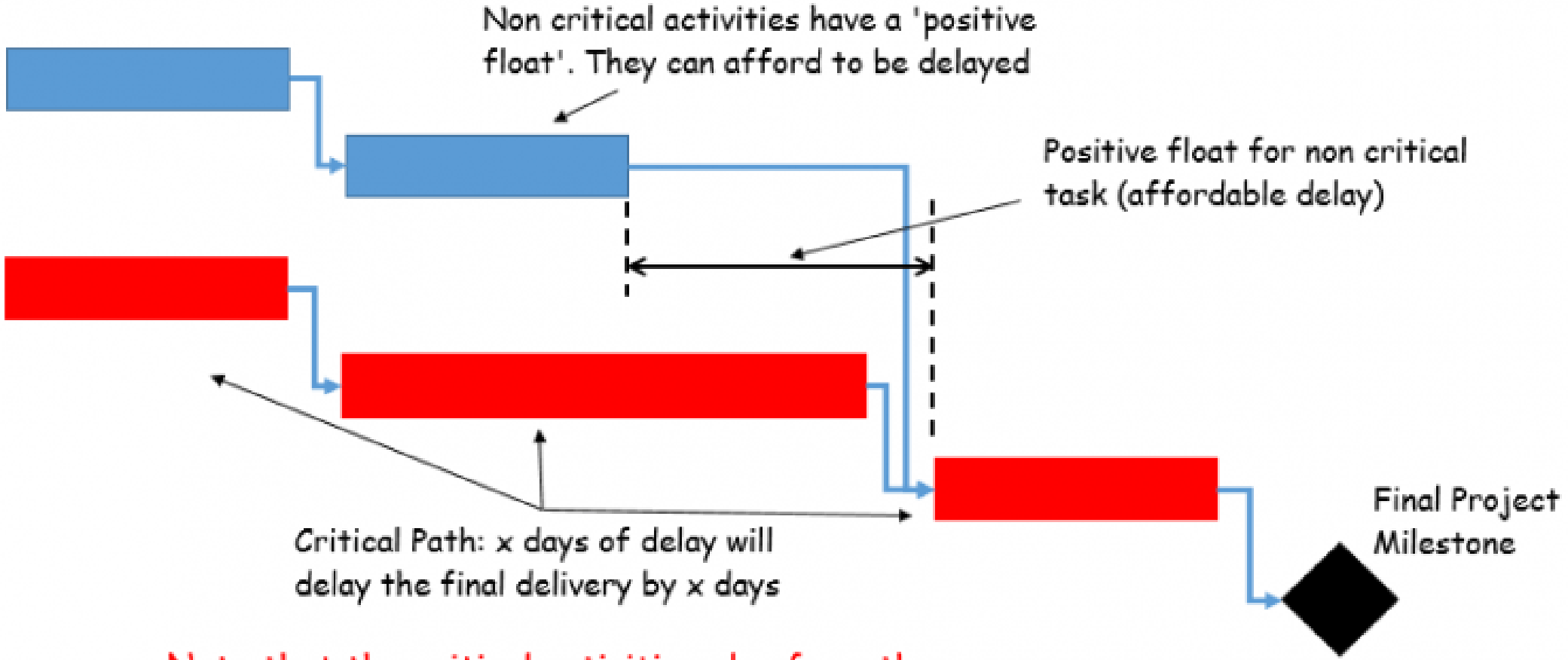
Interfering float



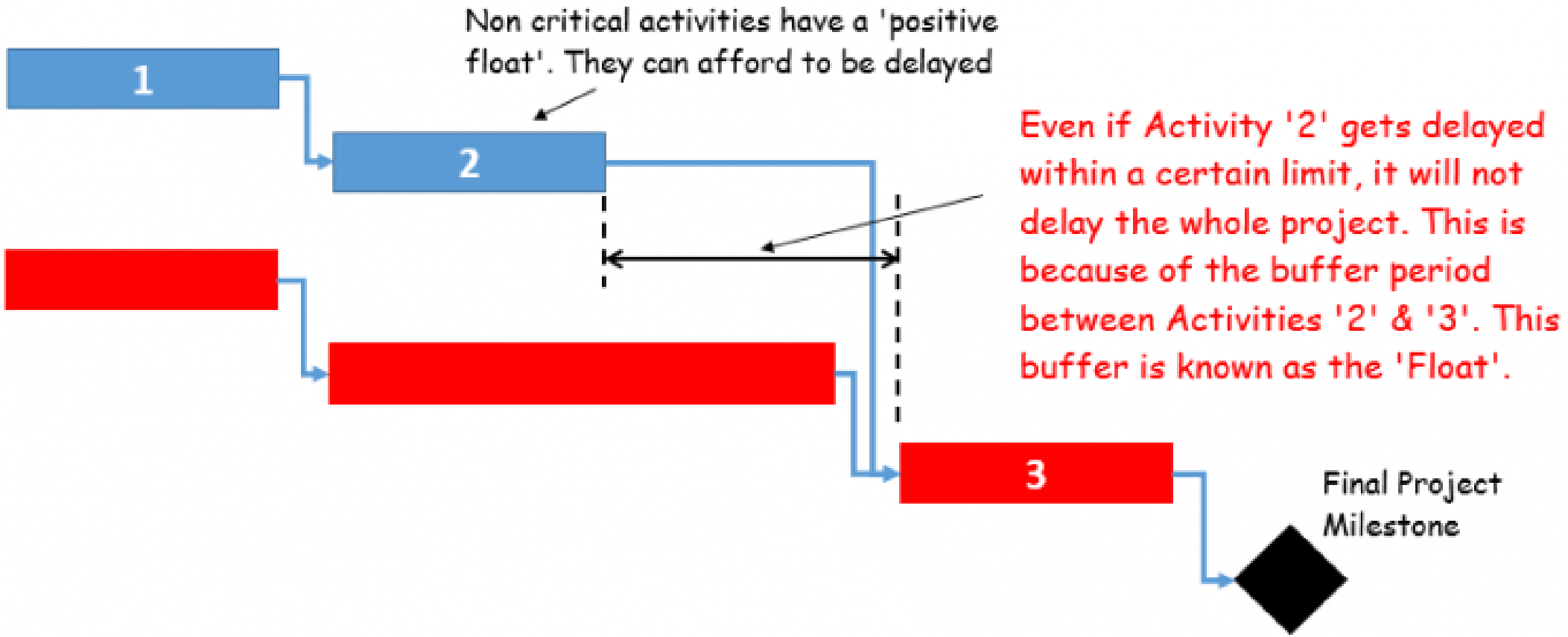
- **Total Float** :- Time span by which starting/finishing of an activity can be delayed without affecting completion of project
- **Free float** :- Positive portion of total float that can be used by an activity without delaying any succeeding activity.
- **Independent float** :- Excess of min time available over the required activity duration.
- **Interfering float** :- Difference between total float and free float.

Critical Path

- Critical path refers to the **duration wise longest path**
- It is Path with **zero float or slack. i.e** **(TE=TL)**
- Activities on a critical path are called critical activities while remaining activities are non-critical
- If **critical activity is delayed, the completion of the project will be delayed by an equal amount.**
- Non-critical activities have some cushion available and delay of these activities will not delays project completion.
- A project can have more than one critical path as well.



Note that the critical activities also form the longest chain in terms of duration on Gantt chart


Non critical activities have a 'positive float'. They can afford to be delayed
1
2
3
Final Project Milestone
Even if Activity '2' gets delayed within a certain limit, it will not delay the whole project. This is because of the buffer period between Activities '2' & '3'. This buffer is known as the 'Float'.

CPM analysis

- Draw the CPM network
- Analyze the paths through the network
- Determine the float for each activity

  1. Compute the activity's float

  2. Float = LS - ES = LF – EF

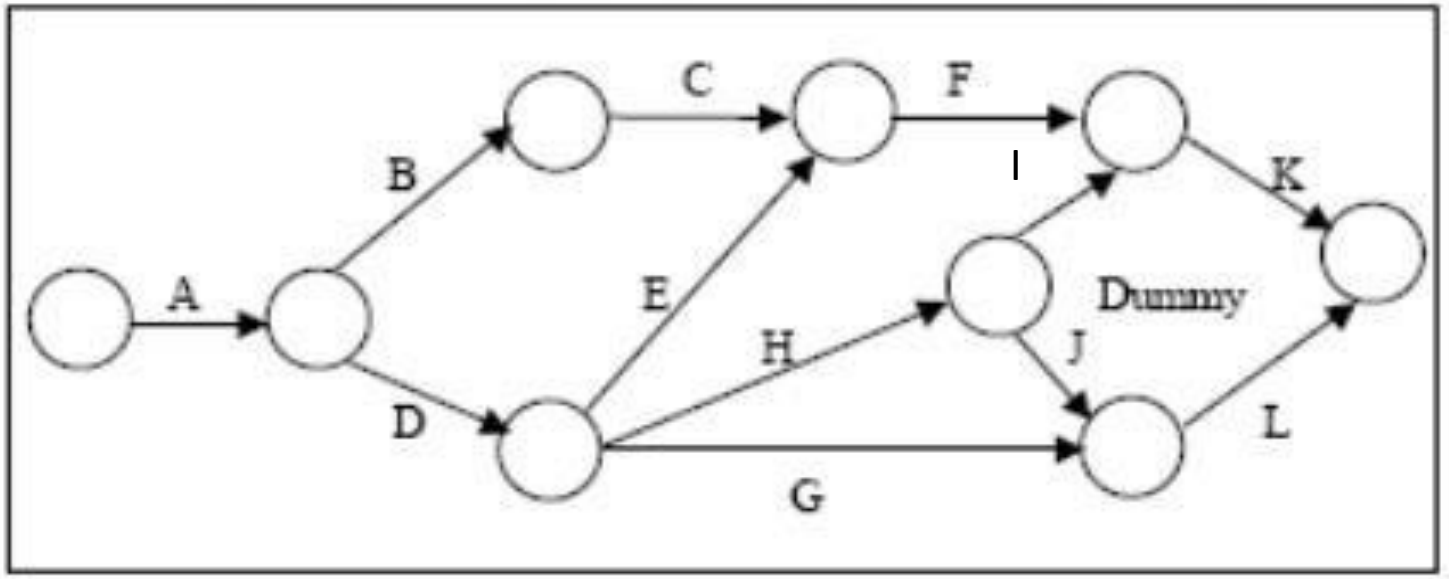
  {Late Start (LS), Late Finish (LF), Early Start (ES) and Early Finish (EF)}.

- Float is the maximum amount of time that this activity can be delay in its completion before it becomes a critical activity, i.e., delays completion of the project
- Find the critical path is that the sequence of activities and events where there is no "slack" i.e.. Zero slack
- **Longest path through a network**
- Find the project duration is minimum project completion time

Table 8.4: Project Activity Sequence

Activity	A	B	C	D	E	F	G	H	I	J	K	L
Immediate Predecessor	-	A	B	A	D	C, E	D	D	H	H	F, H	G, J

***Solution: An activity network diagram describing the project is shown in Figure*, below:**



Construct a network for a project whose activities and their predecessor relationship are given in Table .

Table 8.3: Activity Sequence for a Project

Activity	A	B	C	D	E	F	G	H	I	J	K
Predecessor	-	-	-	A	B	B	C	D	E	H, I	F, G

Solution: *The network diagram for the given problem is shown in Figure with* activities A, B and C starting simultaneously.

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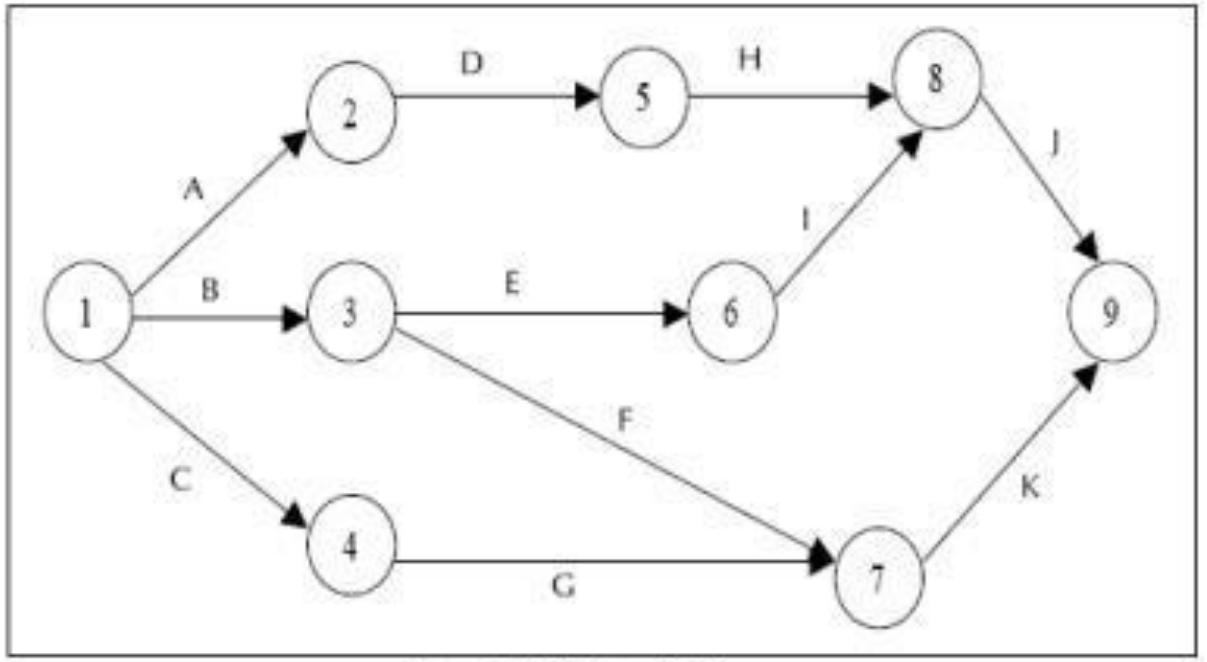


Figure 8.14: Network Diagram

Programme Evaluation and Review technique (PERT)

- Developed by U S Navy in collaboration with a consulting firm of engineers Booz, Allen and Hamilton
- Used for non repetitive type projects (uncertainty)
- Probabilistic approach

Benefits of CPM/PERT

Useful at many stages of project management

Mathematically simple

Give critical path and slack time

Provide project documentation

Useful in monitoring costs

Limitations to CPM/PERT

- Clearly defined, independent and stable activities
- Specified precedence relationships
- Over emphasis on critical paths
- Deterministic CPM model
- Activity time estimates are subjective and depend on judgment PERT assumes a beta distribution for these time estimates but the actual distribution may be different
- PERT consistently underestimates the expected project completion time due to alternate paths becoming critical To overcome the limitation, *Monte Carlo simulations* can be performed on the network to eliminate the optimistic bias

Computer Software for Project Management

- *Microsoft Project* (Microsoft Corp.)
- *MacProject* (Claris Corp.)
- *PowerProject* (ASTA Development Inc.)
- *Primavera Project Planner* (Primavera)
- *Project Scheduler* (Scitor Corp.)
- *Project Workbench* (ABT Corp.)

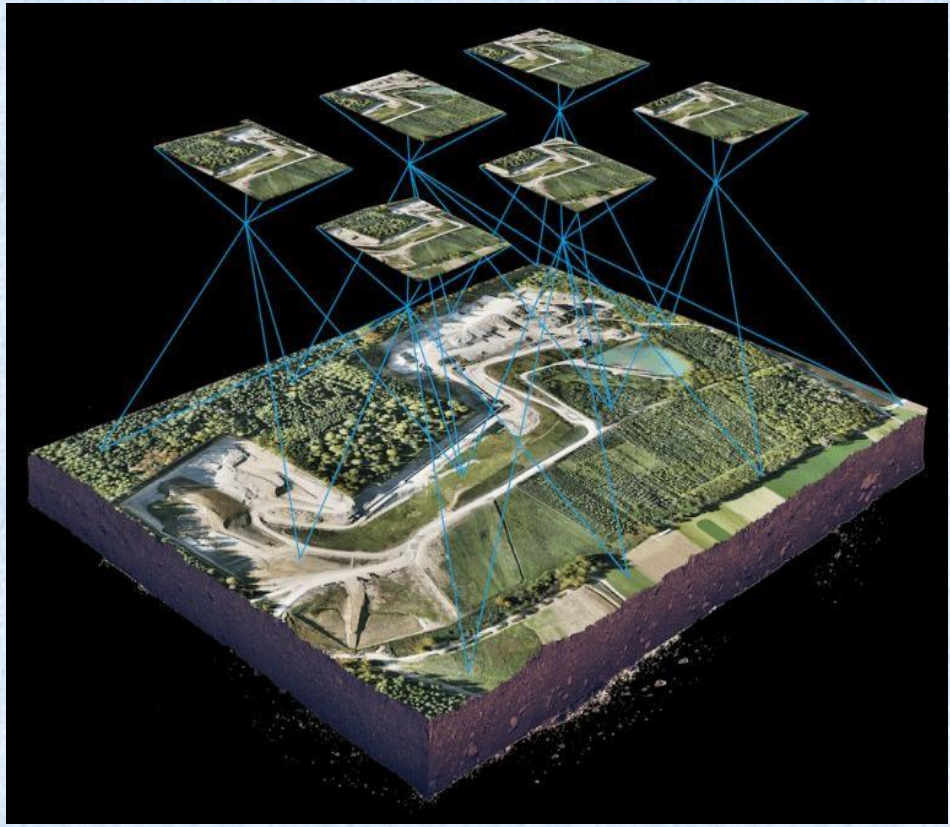
Comparison between CPM and PERT

CPM	PERT
Activity oriented	Event oriented
Only one time estimate required	Three time estimates required
Deterministic approach	Probabilistic approach
Used for repetitive works i.e construction projects	Uncertainty in time estimate involved i.e R&D, satellite launching project.

Drone Technology

- A drone survey refers to the use of a drone, or unmanned aerial vehicle (UAV), to capture aerial data with downward-facing sensors, such as RGB (red, green, blue) or **multispectral cameras**, and LIDAR (**Light Detection and Ranging)** payloads.
- During a drone survey with an RGB camera, the ground is photographed several times from different angles, and each image is tagged with coordinates.
- Photogrammetry combines images that contain the same point on the ground from multiple vantage points to yield detailed 2D and 3D maps.

- From this data, a photogrammetry software can create geo-referenced, elevation models or 3D models of the project area.
- These maps can also be used to extract information such as highly- accurate distances or volumetric measurements.
- Unlike manned aircraft or satellite imagery, drones can fly at a much lower altitude, making the generation of high-resolution, high- accuracy data, much faster, less expensive and independent of atmospheric conditions such as cloud cover.



Advantages of drones in surveying

- **Reduce field time and survey costs**

Capturing topographic data with a drone is up to five times faster than with land-based methods and requires less manpower. With PPK geo-tagging, you also save time, as placing numerous GCPs is no longer necessary. You ultimately deliver your survey results faster and at a lower cost.

- **Provide accurate and exhaustive data**

Total stations only measure individual points. One drone flight produces thousands of measurements, which can be represented in different formats (orthomosaic, point cloud, DTM, DSM, contour lines, etc). Each pixel of the produced map or point of the 3D model contains 3D geo-data.

- **Map of inaccessible areas**

An aerial mapping drone can take off and fly almost anywhere. You are no longer limited by unreachable areas, unsafe steep slopes or harsh terrain unsuitable for traditional measuring tools. You do not need to close down highways or train tracks. In fact, you can capture data during operation without an organizational overhead.

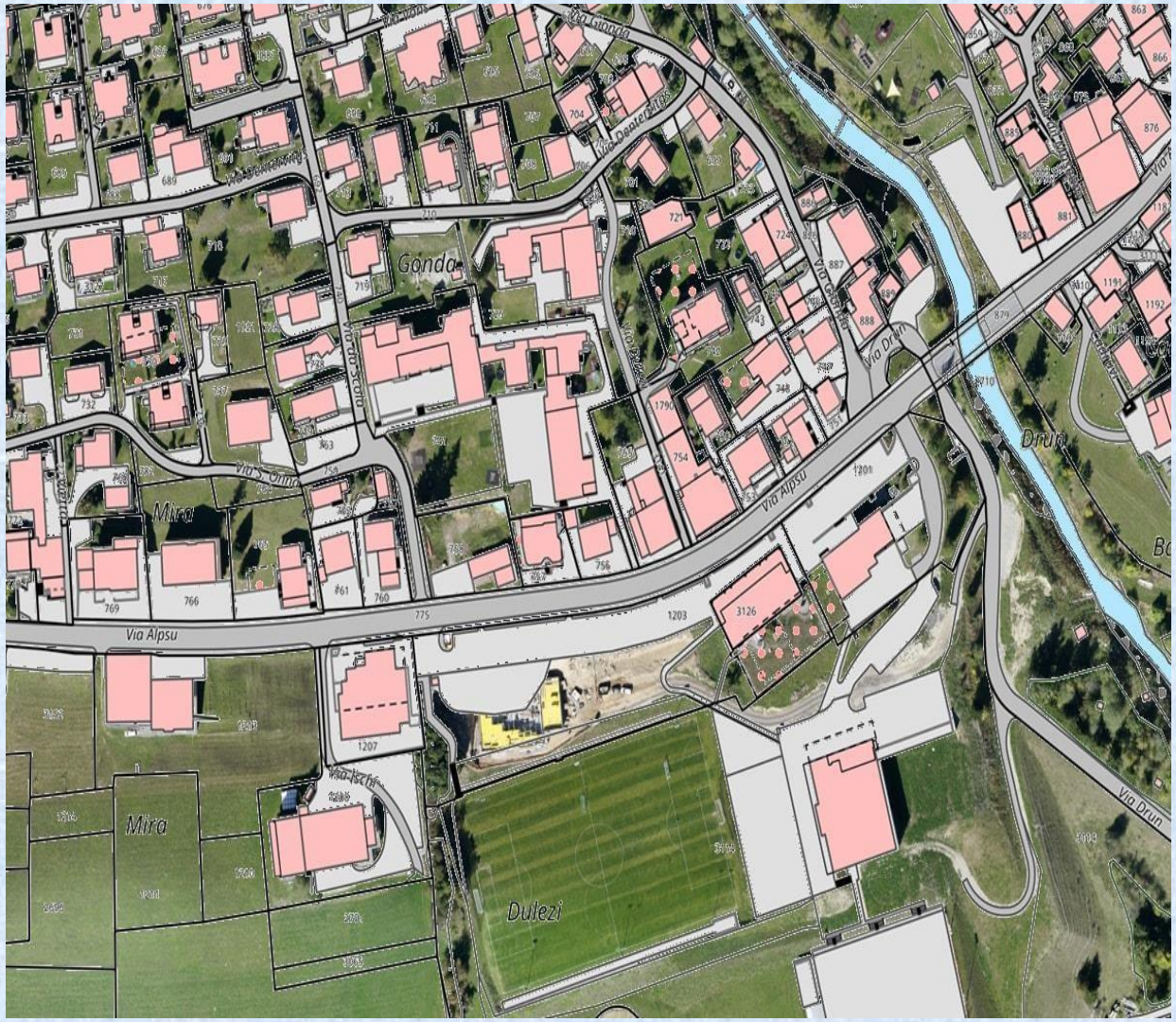
Use of drones in surveying/application

- **Land surveying / cartography**

❖ Survey drones generate high-resolution orthomosaics and detailed 3D models of areas where low- quality, outdated or even no data, are available.

❖ They thus enable high- accuracy cadastral maps to be produced quickly and easily, even in complex or difficult to access environments.

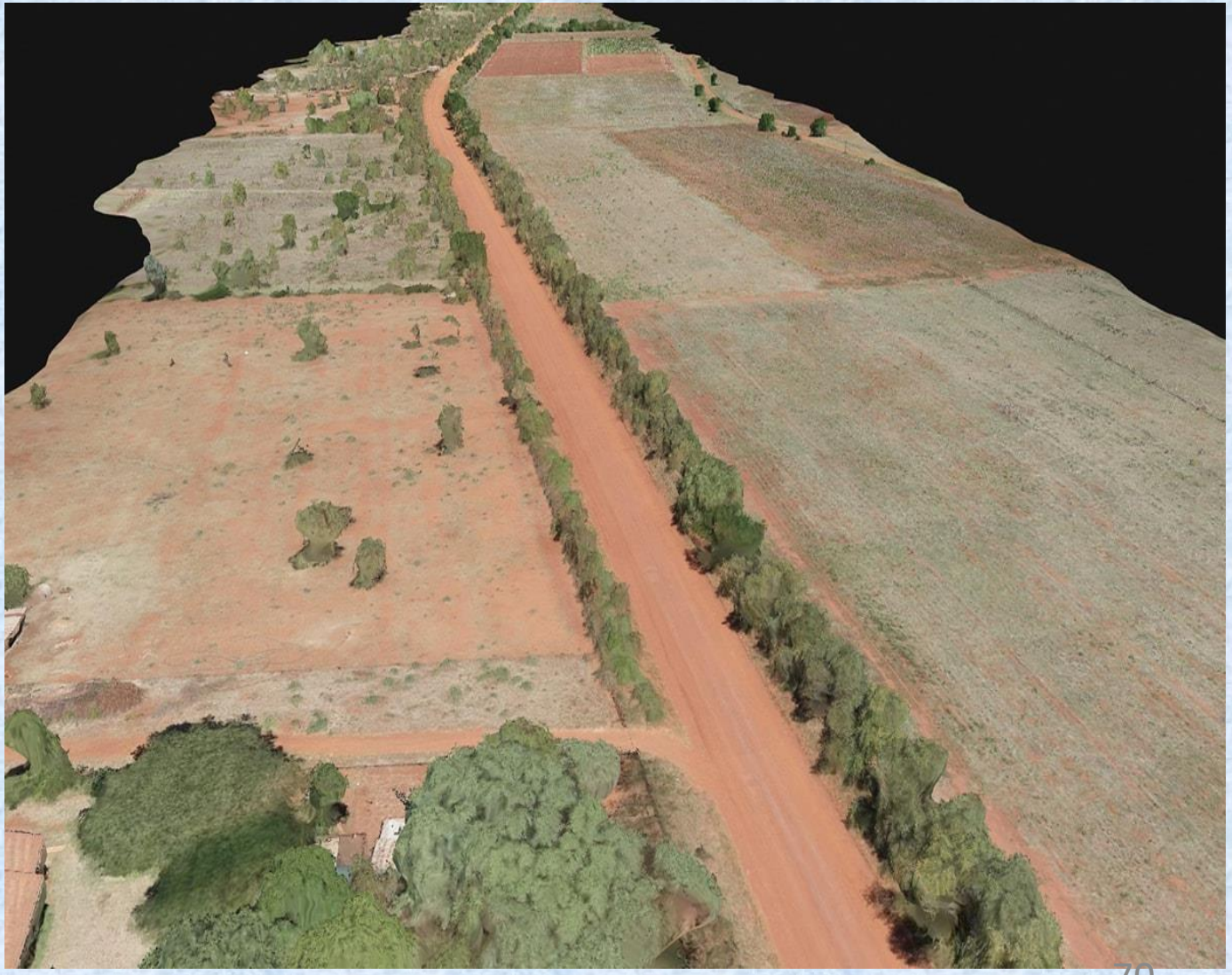
❖ Surveyors can also extract features from the images, such as signs, curbs, road markers, fire hydrants and drains.



Use of drones in surveying/application

- **Land management and development**

Aerial images taken by drones greatly accelerate and simplify topographic surveys for land management and planning. This holds true for site scouting, allotment planning and design, as well as final construction of roads, buildings and utilities.



Use of drones in surveying/application

- **Precise measurements**

High resolution orthophotos enable surveyors to perform highly-accurate distance and surface measurements.

Use of drones in surveying/application

- **Stockpile volumetric measurements**

➢With 3D mapping software, it is also possible to obtain volumetric measurements from the very same images.

➢This fast and inexpensive method of volume measurement is particularly useful to calculate stocks in mines and quarries for inventory or monitoring purposes.

➢With a drone, surveyors can capture many more topographic data points, hence more accurate volume measurements.

➢They can also do this in a much safer way than if they had to manually capture the data by going up and down a stockpile. Since drones are capturing the data from above, operations on site won't be interrupted. The short acquisition time enables capturing a site snapshot at a specific point in time.

Use of drones in surveying/application

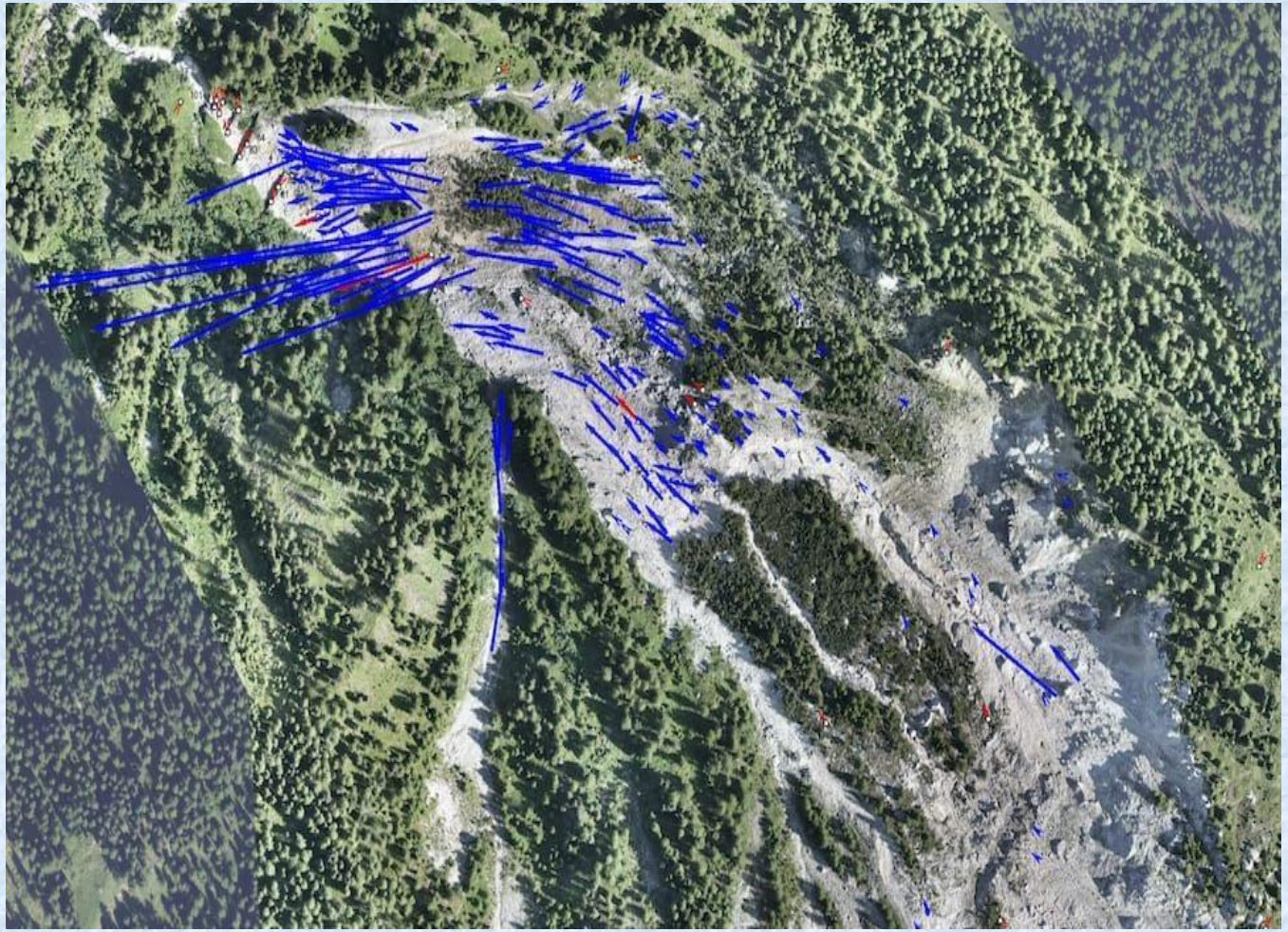
- **Slope monitoring**

❖ With automated GIS analysis, it is possible to extract slope measurements from DTMs (Digital Terrain Model) and DSMs (Digtal Surface Model) generated by drone imagery.

❖ Knowing the steepness of the ground's surface, the areas can be classified and used for slope monitoring purposes, including landslide mitigation and prevention.

❖ With orthomosaics taken at different times, it is possible to detect changes in earth movement and to measure its velocity.

❖ This data can help predict landslides and prevent potential damage to roads, railways and bridges.



Use of drones in surveying/application

- **Urban planning**

❖ The development of increasingly dense and complex urban areas requires intensive planning and therefore time- consuming and expensive data collection. Thanks to drones, urban planners can collect large amounts of up-to-date data in a short period of time and with far less staff.

❖ The images produced in this way allow planners to examine the existing social and environmental conditions of the sites and consider the impact of different scenarios.

SMART CITY

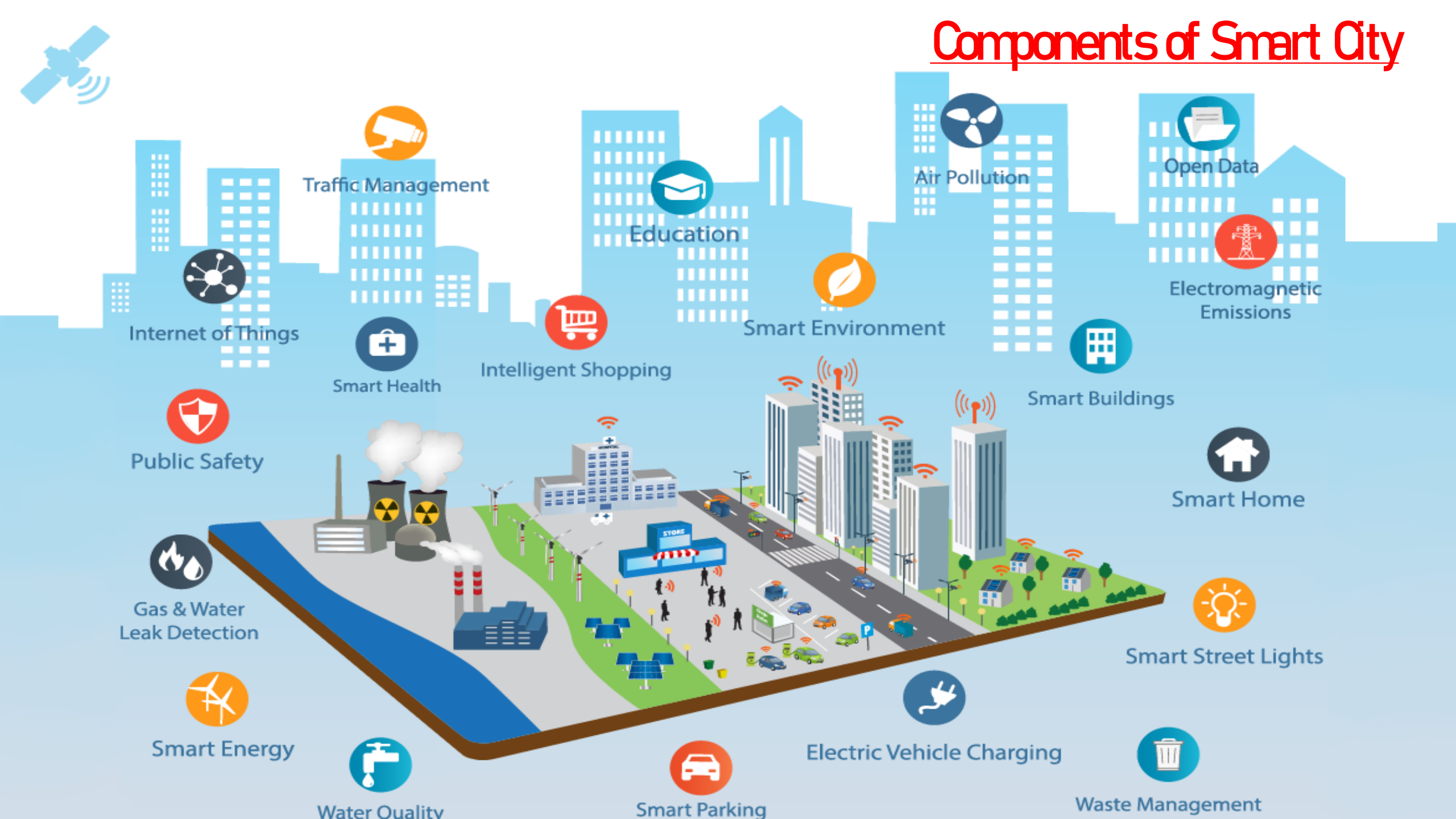
BUILDING TOMORROW'S CITIES

What is smart city?

A smart city is an urban development using Information and Communication Technology (ICT) and Internet of Things (IoT) to provide useful information to effectively manage resources and assets.

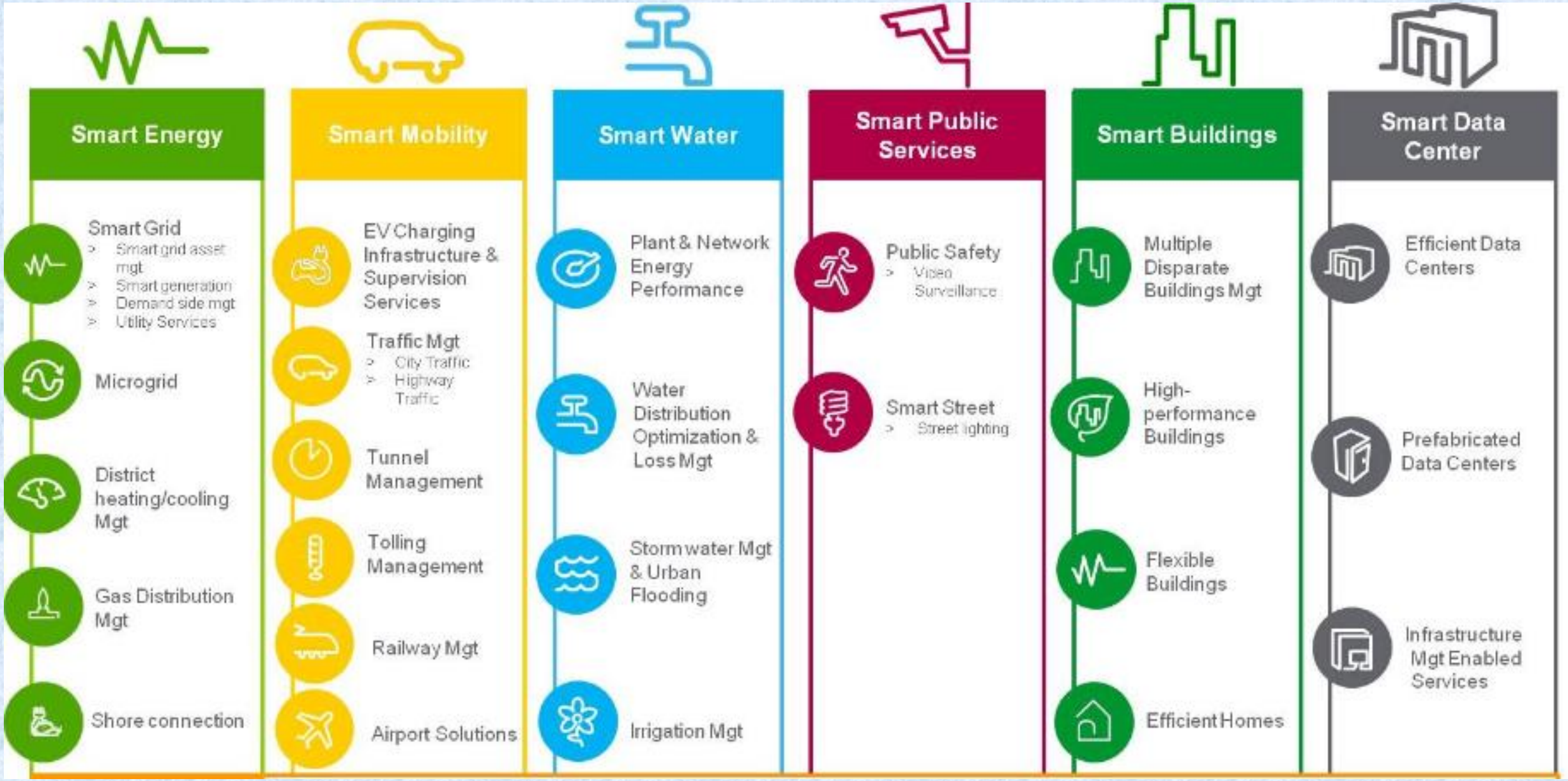
This includes **data collected from citizens and mechanical devices,** that are **processed and analyzed** to **monitor and manage traffic and transport systems, power plants, water supply networks, waste disposal**, etc.

Components of Smart City



Why do we need smart cities?

- Urbanization is a non-ending phenomenon.
- Today, 54% of people worldwide live in cities, a proportion that's expected to reach 66% by 2050.
- Combined with the overall population growth, urbanization will add another 2.5 billion people to cities over the next three decades. **Environmental, social, and economic sustainability** is a must to keep pace with this rapid expansion that is taxing our cities' resources.
- **193 countries** have agreed upon the agenda of the **Sustainable Development Goals** (SDGs), in **September 2015 at the United Nations.** But we all know how centralized decisions and actions can take time, and the clock is ticking.
- Citizens and local authorities are certainly more agile to launch swift initiatives, and smart city technology is paramount to success and meeting these goals.


Smart Energy
Smart Grid
> Smart grid asset mgt
> Smart generation
> Demand side mgt
> Utility Services
Microgrid
District heating/cooling Mgt
Gas Distribution Mgt
Shore connection
Smart Mobility
EV Charging Infrastructure & Supervision Services
Traffic Mgt
> City Traffic
> Highway Traffic
Tunnel Management
Tolling Management
Railway Mgt
Airport Solutions
Smart Water
Plant & Network Energy Performance
Water Distribution Optimization & Loss Mgt
Storm water Mgt & Urban Flooding
Irrigation Mgt
Smart Public Services
Public Safety
> Video Surveillance
Smart Street
> Street lighting
Smart Buildings
Multiple Disparate Buildings Mgt
High-performance Buildings
Flexible Buildings
Efficient Homes
Smart Data Center
Efficient Data Centers
Prefabricated Data Centers
Infrastructure Mgt Enabled Services

Smarter Cities: Turning Big Data Into Insight

City Planning and Operations

$1 Trillion
global annual savings could be attained by optimizing public infrastructure.
Source: McKinsey

$57 Trillion
in infrastructure investments will be needed between 2013-2030.
Source: McKinsey

Transportation Analytics

50 Hours
of traffic delays per year are incurred, on average, by travelers.

30 Billion
people all over the world travel approximately 30 billion miles per year. By 2050, that figure will grow to over 150 billion miles.

Water Management

60%
of water allocated for domestic human use goes to urban cities.

$14 Billion
in potable water is lost every year because of leaks, theft and unbilled usage.
Source: World Bank

Open Cloud

37,000
cloud experts support IBM's industry team alone.

$6 Billion
has been invested by IBM in more than a dozen acquisitions to accelerate its cloud initiatives.

- Bhubaneshwar
- Pune
- Surat
- Kochi
- Vishakhapatnam
- Indore
- Coimbatore
- Guwahati
- Bhopal

Specificities

- Also called eco-city or sustainable city, the smart city aims to improve the quality of urban services or reduce its costs.
- It stands out for its specificities:

  smart management, lifestyle,

  mobility,

  housing,

  smart economy.
- Their main goal is to reconcile technological innovation with the economic, social and ecological challenges of the city of tomorrow.
- Their motive is the quality of life: how to live better together while respecting our environment.

Typical features of smart city

- Some typical features of comprehensive development in Smart Cities are described below.

1. **Promoting mixed land use in area based developments**–planning for 'unplanned areas' containing a range of compatible activities and land uses close to one another in order to make land use more efficient. The States will enable some flexibility in land use and **building bye-laws** to adapt to change;
2. **Housing and inclusiveness** - expand housing opportunities for all;
3. **Creating walkable localities** –**reduce congestion, air pollution and resource depletion**, boost local economy, promote interactions and ensure security. The road network is created or refurbished not only for vehicles and public transport, but also for pedestrians and cyclists, and necessary administrative services are offered within walking or cycling distance;
4. **Preserving and developing open spaces** - **parks, playgrounds, and recreational spaces** in order to enhance the quality of life of citizens, reduce the urban heat effects in Areas and generally promote eco-balance;
5. **Promoting a variety of transport options** - Transit Oriented Development (TOD), public transport and last mile para-transport connectivity;
6. **Making governance citizen-friendly and cost effective** - increasingly rely on online services to bring about accountability and transparency, especially using mobiles to reduce cost of services and providing services without having to go to municipal offices. Forming e-groups to listen to people and obtain feedback and use online monitoring of programs and activities with the aid of cyber tour of worksites;
7. **Giving an identity to the city** - based on its main economic activity, such as local cuisine, health, education, arts and craft, culture, sports goods, furniture, hosiery, textile, dairy, etc;
8. **Applying Smart Solutions to infrastructure and services in area**-based development in order to make them better. For example, making Areas less vulnerable to disasters, using fewer resources, and providing cheaper services.

Strategies for smart city

- The strategic components of area-based development in the Smart Cities Mission are

city improvement (retrofitting),

city renewal (redevelopment),

city extension (greenfield development)

plus a Pan-city initiative in which Smart Solutions are applied covering larger parts of the city.

- The smart city proposal of each shortlisted city is expected to encapsulate either a retrofitting or redevelopment or greenfield development model, or a mix thereof and a **Pan-city feature with Smart Solution(s).** It is important to note that pan-city is an additional feature to be provided.
- Below are given the deions of the three models of Area-based smart city development:

Strategies

- **Retrofitting** will introduce planning in an existing built-up area to achieve smart city objectives, along with other objectives, to make the existing area more efficient and liveable.
- In retrofitting, an area consisting of more than **500 acres** will be identified by the city in consultation with citizens. Depending on the existing level of infrastructure services in the identified area and the vision of the residents, the cities will prepare a strategy to become smart.
- Since existing structures are largely to remain intact in this model, it is expected that more intensive infrastructure service levels and a large number of smart applications will be packed into the retrofitted smart city.
- This strategy may also be completed in a shorter time frame, leading to its replication in another part of the city.

Strategies

- **Redevelopment** will effect a **replacement of the existing built-up environment and enable co-creation of a new layout with enhanced infrastructure** using mixed land use and increased density.
- Redevelopment envisages an area of more than **50 acres**, identified by Urban Local Bodies (ULBs) in consultation with citizens.
- For instance, a new layout plan of the identified area will be prepared with mixed land-use, higher FSI and high ground coverage.
- Two examples of the redevelopment model are the

1. Saifee Burhani Upliftment Project in Mumbai (also called the Bhendi Bazaar Project)
2. East Kidwai Nagar in New Delhi

being undertaken by the National Building Construction Corporation.

Delhi

Mumbai

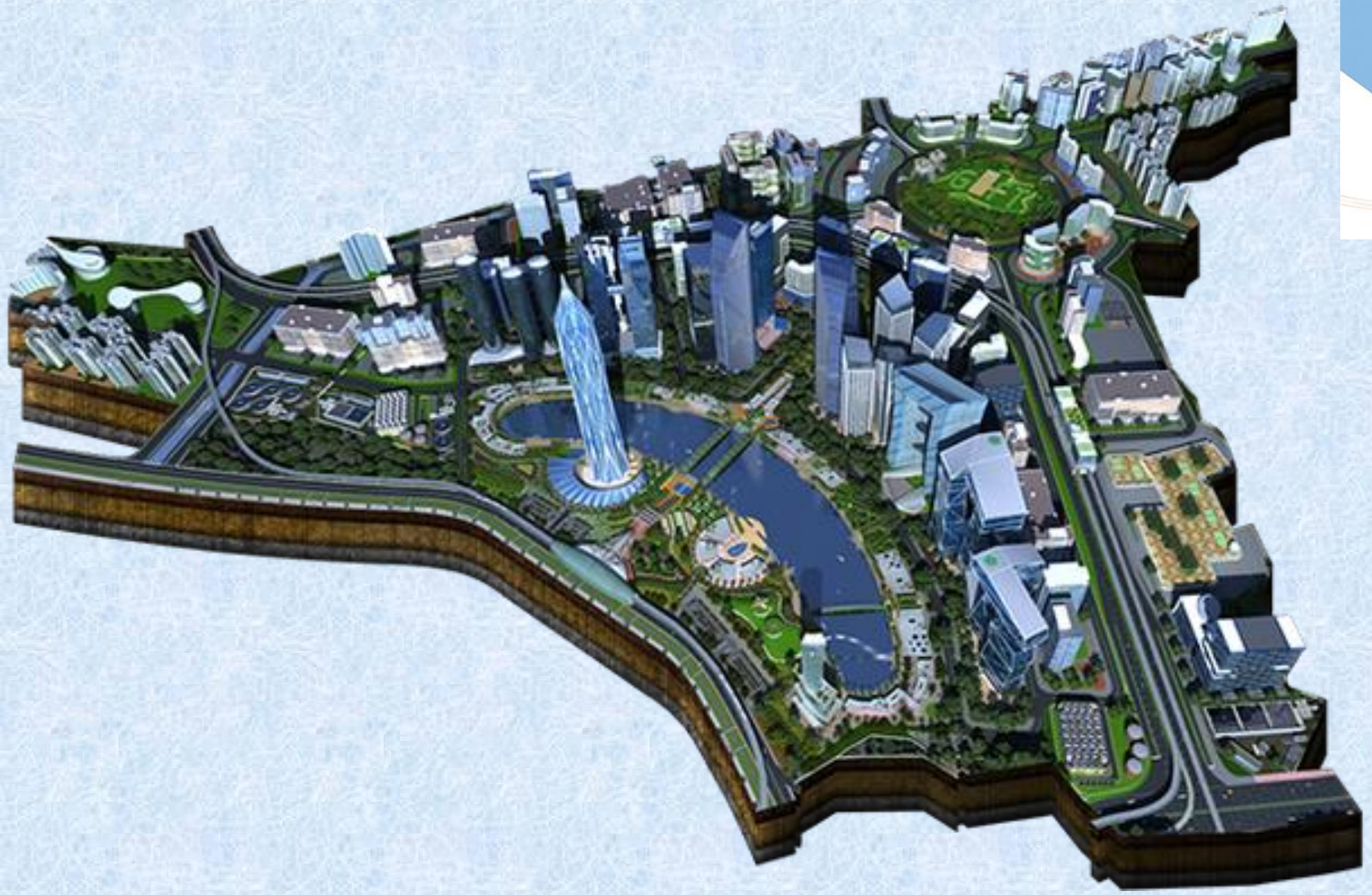
Strategies

- **Greenfield development** will introduce most of the Smart Solutions in a previously vacant area (more than **250 acres**) using innovative planning, plan financing and plan implementation tools (e.g. land pooling/ land reconstitution) with provision for affordable housing, especially for the poor.
- Greenfield developments are required around cities in order to address the needs of the expanding population. One well known example is the **GIFT City in Gujarat.** Unlike retrofitting and redevelopment,
- Greenfield developments could be located either within the limits of the ULB or within the limits of the local Urban Development Authority (UDA).
- **Pan-city development envisages application of selected Smart Solutions to the existing city-wide infrastructure.**
- Application of Smart Solutions will involve the use of technology, information and data to make infrastructure and services better.

For example,

1. Applying Smart Solutions in the **transport sector** (intelligent traffic management system) and reducing average commute time or cost of citizens will have positive effects on productivity and quality of life of citizens.
2. **Waste water recycling and smart metering** which can make a huge contribution to better water management in the city.

GIFT City in Gujarat




GIFT HOUSE

1st Round winners – Selection of 20 Smart Cities in India (Smart City Mission)

Ranking	Cities Shortlisted	Name of State/UT
1	Bhubaneswar	Odisha
2	Pune	Maharashtra
3	Jaipur	Rajasthan
4	Surat	Gujarat
5	Kochi	Kerala
6	Ahmedabad	Gujarat
7	Jabalpur	Madhya Pradesh
8	Visakhapatnam	Andhra Pradesh
9	Solapur	Maharashtra
10	Davangere	Karnataka
11	Indore	Madhya Pradesh
12	New Delhi	Delhi
13	Coimbatore	Tamil Nadu
14	Kakinada	Andhra Pradesh
15	Belagavi	Karnataka
16	Udaipur	Rajasthan
17	Guwahati	Assam
18	Chennai	Tamil Nadu
19	Ludhiana	Punjab
20	Bhopal	Madhya Pradesh

Thank You