

BUSINESS — Information Systems

Role of IS · IT vs IS · Key Elements · Types of IS · Levels of IS

PAGE 1 · CHAPTER ROADMAP, DEFINITIONS & CORE CONCEPT

1 CHAPTER OVERVIEW — THE ROADMAP

CENTRAL IDEA Information is critical for effective & efficient **decision-making** and achieving goals — the chapter covers the **roles, types and levels** of IS in business.

AREA 1 Role of IS

AREA 2 General system concepts of IT

5 uses · IT vs IS

AREA 3 Key elements of IS

Data → security

AREA 4 Types of IS

TPS · MSS · DSS · EIS · ES

AREA 5 Levels of IS

Operational · middle · senior

2 KEY DEFINITIONS

Teal terms = high exam priority

Information system (IS)

Networks of **software & hardware** to **collect, filter, process, create & distribute** data & information.

Information technology (IT)

Application of **computers & telecommunications equipment** to store, retrieve, transmit & manipulate data.

System

A set of **interacting components** operating together to accomplish a purpose.

Business system

A collection of **people, machines and methods** organised to accomplish specific functions.

Information management

The **planning, environment, control and technology** involved in managing information.

Data

Raw, unorganised facts processed into meaningful, useful information for specific purposes.

Database

An **electronic filing system** that collects & organises data — the **core** of business IS.

DBMS

Software to **enter, store, organise, select & retrieve** data; the **interface** between user and database.

Computer network

Two or more computer systems **linked by communication channels** to share data and information.

VPN

Connects two or more **private networks over a public network** (internet) securely.

Integration

A **holistic view** of data & information across areas and functions of the organisation.

Batch processing

Collecting **similar transactions over a period** and processing them together (e.g. monthly payroll).

Real-time processing

Handling **individual transactions as they occur** — master files updated **immediately**.

ERP

A **cross-functional** system of integrated software modules supporting core internal processes in **real time**.

3 CORE CONCEPT — FROM DATA TO DECISIONS

INPUT Data

Raw facts — e.g. sales figures, customer contacts, website traffic

PROCESS Information system

Collects & processes data

OUTPUT Meaningful information

Provided to users

USED FOR Strategic planning · decision making · performance monitoring · production

4 INFORMATION TECHNOLOGY vs INFORMATION SYSTEM

Basis	INFORMATION TECHNOLOGY	INFORMATION SYSTEM
Scope	The equipment — computers & telecommunications (and TV, telephone, radio)	Broader — ICT (hardware + software) plus how people interact with it to support business processes
Does what	Capture, store, transmit, present data	Collection, storage, production & distribution of information; supports operations, management & decision making

PAGE 2 · ROLE OF IS, USES OF INFORMATION, DATA, DBMS & NETWORKS

5 ROLE OF INFORMATION SYSTEMS

WHAT IS DO

- Give companies & consumers access to **vast information**
- Facilitate **communication** with staff and internal & external stakeholders
- Let new companies compete in **geographically dispersed markets**
- Store, access & analyse data; improve customer communication; enhance employee collaboration

HOW IT BOOSTS EARNINGS

Improve efficiency

→ reduce expenses → earnings ↑

Attract customers / offer more products

→ raise revenue → earnings ↑

Self-Test Q3: reduce expenses & increase earnings.

⚠ BUT — COST-BENEFIT FIRST

IS investment can be **costly**. Carry out a **cost-benefit analysis** to ensure a **net positive return** within their **relatively short useful lives** (rapid technological change).

6 5 USES OF INFORMATION

Irrespective of level — strategic, tactical or operational

Use	Description / Study Text examples
1. Planning	Establish appropriate resources & time scales ; forecast alternative outcomes
2. Controlling	Ensures processes are implemented as planned
3. Recording transactions	Sales, purchases, errors, returns, customer complaints, quality inspections, deposits, cash movements
4. Performance measurement	Compare actual vs planned (budgeted) → identify variances → corrective action
5. Decision making	Purchase & production volumes, pricing, make or buy , switch suppliers, when to replace assets, organise operations to minimise tax

7 THE 6 KEY ELEMENTS OF AN INFORMATION SYSTEM

① DATA

raw facts

② DATABASE

electronic filing

③ DBMS

manage & retrieve

④ NETWORKS

connect & share

⑤ INTEGRATION

holistic view

⑥ SECURITY & PRIVACY

protect data

8 DATA → DATABASE → DBMS

DATA

Values of **qualitative or quantitative variables** about persons or objects. Forms: numbers/text on **paper**, **bits/bytes** in memory, or **facts in a person's mind**. Business data — sales figures, customer contacts, website traffic → processed into **meaningful & useful information** (Q4).

DATABASE

Core of business IS. Users access it for inventory orders, production scheduling, long-range forecasts. e.g. **customer database** (names, addresses, payment methods, orders, prices, histories) serves many departments. Large firms: **data warehouses & data marts**.

DBMS

Software to quickly & efficiently enter, store, organise, select, retrieve. **Interface between end user and database**; manages the data, database engine & **schema** (Q6).

Main types:

Hierarchical

Network

Relational

Object-oriented

Popular examples: cloud-based, in-memory (IMDBMS), columnar (CDBMS), NoSQL

9 NETWORKS

COMPUTER NETWORK

Most businesses use networks to **deliver information to employees, suppliers & customers** (Q10). Links thousands of users; carries audio, video & data. Best-known network: **the internet** (Q11).

USES OF NETWORKS

World wide web

Sharing software (databases, worksheets)

Email

Sharing printers, fax, scanners

Online booking

Instant messaging

Internet-based communication

VIRTUAL PRIVATE NETWORK (VPN)

Connects **private networks** (e.g. LANs) over a **public network** securely (Q12); strong security → only authorised users. For **dispersed offices**, often **more cost-effective** than buying equipment & leasing private lines.

PAGE 3 · INTEGRATION, SECURITY & TRANSACTION PROCESSING

10 INTEGRATION

WHY INTEGRATE?

- Firms cannot operate effectively with **separate departmental systems**
- Requires a **team effort** across the organisation
- Company-wide **ERP** (HR, operations, technology) is becoming integral to strategy
- Manage **collective knowledge** — e.g. via **data warehouses**
- Integrated IT system**: all modules linked & working in a coordinated way

STUDY TEXT EXAMPLE — INTEGRATED FINANCE SYSTEM

Accounts payable Accounts receivable Accruals & prepayments
Bank & cash Inventory Purchases Sales

New sales order

Recorded simultaneously in receivables, sales & inventory

11 SECURITY & PRIVACY

THE COST OF UNAUTHORISED ACCESS

Monetary + reputational risk. Most damaging threats: worms, viruses & Trojan horses; computer theft; financial fraud; unauthorised network access.

Criminals now **professional gangs** (not lone amateurs); internet anonymity → identity theft; **remote working** adds concerns.

MAJOR CATEGORIES OF COMPUTER CRIME TO PREVENT

- Unauthorised access & security breaches
- Viruses, worms & Trojan horses
- Deliberate damage to equipment/information
- Spam
- Software & media piracy

FIRST STEP

Formal **written information security policies** — set standards & basis for enforcement. Without them firms stay **reactive** (crisis response) instead of **preventive**.

PRIVACY Collecting personal data across platforms challenges privacy → balance **collecting needed information** with **protecting consumer rights**. Many firms' privacy policies promise not to misuse data; **regulators** increasingly act against breaches.

12 TYPES OF INFORMATION SYSTEMS — OVERVIEW

IS collect & store key data and generate information for **analysis, control & decision-making** — e.g. factories (automate production, track inventory), order processing, billing & vendor payments, banks (deposits, ATM withdrawals, loan payments). **Each type serves a level** of decision-making: operational, tactical or strategic.

TPS
Transaction Processing

MSS
Management Support

DSS
Decision Support

EIS
Executive Information

ES
Expert System

Office automation
communication flow

13 TRANSACTION PROCESSING SYSTEM (TPS)

FOUNDATION OF AN INTEGRATED IS

- Receives **raw data** (internal & external) → prepares it for a **large central database** managed by a **DBMS**; users query when required
- Automates **routine tasks** — accounting, order processing, financial reporting
- Reduces clerical costs**; quick operational insights
- Data entry: manual, or **OCR / MICR**

DATA ENTRY — EXAMPLES OF DATA

Sales information Purchase information
New employee details Updates to employee details

A database is updated in **two main ways**: (i) **batch processing**, (ii) **online / real-time processing**.

Basis	BATCH PROCESSING	REAL-TIME (ONLINE) PROCESSING
How	Collect similar transactions over a period ; process together (Q5)	Each transaction handled as it occurs ; master files updated immediately (Q8)
Example	Monthly payroll	Airline information systems (Q9), online banking
Status / cost	Traditionally centralised mainframes; less dominant now but still used	More expensive ; essential where up-to-date info is critical
✓ / ✗	—	✓ Always up to date; more data online ✗ Higher development/maintenance cost; more hardware capacity

PAGE 4 · TPS EXAMPLES, MSS, DSS, EIS, ES & COMPARISON

14 EXAMPLES OF TPS

Study Text

FINANCE & ACCOUNTING TPS

Functions: budgeting · nominal ledger · invoicing · management accounting

Nominal ledger Accounts payable Accounts receivable
Budgeting Treasury management

HUMAN RESOURCES TPS

Functions: personnel records · benefits · salaries · labour relations · training

Payroll Employee records Employee benefits
Career path systems (appraisal)

15 MANAGEMENT SUPPORT SYSTEM (MSS)

HOW IT WORKS

- Uses the **internal master database** for high-level analyses
- Core: an **information-reporting system** — regular & special reports from **TPS summary data**, tailored to users
- Tools include **data warehouses** — CRM, fraud detection, product-line analysis, asset management
- e.g. **retailers**: customer demographics & shopping patterns; **banks**: detect fraud, usage trends

A MANAGEMENT INFORMATION SYSTEM...

- Supports **structured** decisions
- Reports on **existing** operations
- **Little analytical capability**; relatively **inflexible**
- Focuses on **internal** operations
- **Regular reports**; online access for many users
- **Current + historical** information

16 DECISION SUPPORT SYSTEM (DSS)

WHAT & WHY

Related programs & data for analysis & decisions. Developed to **overcome MIS limitations** — quantitative data, **predictive models**, interactive models simulating real processes. Uses internal data but **focused on the issue**. Ideal for “**what if**” questions.

e.g. marketing executives forecast **customer furniture preferences** from sales & demographic data.

CHARACTERISTICS

- Assists **tactical-level** managers — where estimates/judgement needed
- Formulas & equations → **mathematical modelling**
- **Real-time**; queries & modelling
- Intuitive interface; often a **natural language** interpreter
- Integrates data management + modelling software
- Can be built with **spreadsheet packages**

17 EXECUTIVE INFORMATION SYSTEM (EIS) & EXPERT SYSTEM (ES)

EIS

- Like a DSS but **customised for an individual executive** → **strategic** decisions
- e.g. CEO's EIS: spreadsheets comparing with **competitors**; graphs of economic & industry trends
- **Internal + external data**; **forward-looking**
- Graphical **dashboard**; **drill-down** for detail
- **Unstructured** decisions (e.g. **price fixing**)
- **Very expensive**, real-time; used by **few senior managers**

EXPERT SYSTEM

- **Simulates judgement** of an expert; database of experience + **rules**
- Advice like a **human consultant**; AI → reason & learn (what-if)
- e.g. legal & medical diagnostics, **loan applications**, chess, oil exploration, shift scheduling
- **Expensive & difficult** to create; may **replace or assist** experts

MOST EFFECTIVE WHEN problem well-defined · expert can define rules · not solvable by TPS · expert freed for harder problems · **cost-justified**

18 COMPARING THE TYPES OF IS

Built only from Study Text points

Basis	TPS	MSS / MIS	DSS	EIS
Level / user	Operational	Middle (tactical)	Middle (tactical)	Senior (strategic) — individual executive
Decisions	Routine transactions	Structured	Estimates & judgement; “what if”	Unstructured
Data	Raw internal & external data → central database	TPS summary data; internal; current + historical	Internal data focused on the issue; models	Internal + external ; forward-looking
Output style	Recorded transactions	Regular & special reports	Interactive modelling	Dashboard with drill-down

PAGE 5 • FRS, ERP & LEVELS OF INFORMATION SYSTEMS

19 OTHER SPECIALISED SYSTEMS

FINANCIAL REPORTING SYSTEM (FRS)

Financial accounting & reporting involve (Q14):

- ① **maintaining accounting records** of transactions
- ② **reporting financial position & performance** in financial statements

Book-keeping/ledger system = foundation; summarised (usually **annually**). Must be **reliable, accurate, complete**; data entry for authorised personnel only.

ENTERPRISE RESOURCE PLANNING (ERP)

Cross-functional, integrated software modules; **real-time view** of core processes (order processing, inventory management). Continuously updated whichever department enters data → hence '**enterprise**'.

Tracks resources: cash • raw materials • production capacity • personnel

Tracks commitments: purchase orders • employee costs • customer orders

ERP in Pakistan	Typical systems	Features
Small firms	QuickBooks	Affordable, simple — accounting, inventory, payroll
Medium firms	SAP Business One, Microsoft Dynamics 365, Odoo	Finance, CRM, inventory, operations
Large firms	SAP S/4HANA, Oracle ERP Cloud, Dynamics 365 Finance & Operations	Global finance, procurement, HR, supply chain; advanced analytics & real-time processing (Q7)

20 LEVELS OF INFORMATION SYSTEMS

Study Text table

SENIOR • strategic • **EIS**

MIDDLE • tactical • **MIS, DSS**

OPERATIONAL • operational • **TPS**

OPERATIONAL LEVEL

Day-to-day transactions — cashiers at point of sale, bank tellers, hospital nurses, customer care staff. **Defined rules** → **structured** decisions.

Operational information: daily sales reports • daily production reports • latest inventory levels • customer complaint details

MIDDLE LEVEL

Middle managers, heads of department, supervisors — **oversee operational management**. Tactical decisions **partly based on set guidelines & partly on judgement**.

e.g. bank **credit manager** checks limit & payment history, then makes an **exception** to raise a limit — **partly structured**.

Tactical information: fee to quote on an order • discounts to clear excess inventory • switching suppliers

SENIOR LEVEL

Unstructured, strategic decisions (Q13); **long-term planning**; use tactical managers' information + **external data**.

Strategic information: long-term (e.g. **3-5 years**); for senior management & directors; **internal + external** (competitors, market, business environment)

▲ **NOTE ON WORDING** The Study Text calls middle-level decisions “tactical, **unstructured** decisions partly based on set guidelines”, then describes its own example as “**partly structured**”. Safest exam reading: middle level = **tactical, partly structured**; senior = **unstructured**; operational = **structured**.

21 BUSINESS APPLICATION — IDENTIFY THE SYSTEM

Examples from the Study Text

Business situation	System / method
Airline information system / online banking	Real-time processing
Monthly payroll	Batch processing
Retailer studies customer demographics & shopping patterns	MSS — data warehouse
Forecast customer furniture preferences (“what if”)	DSS
CEO compares company with principal competitors on a dashboard	EIS
Processing a loan application / medical diagnosis	Expert system
New sales order hits receivables, sales & inventory at once	Integrated (finance) system

PAGE 6 · EXAM PATTERNS, TRAPS & DECISION TREE

22 HOW THIS CHAPTER CAN BE TESTED

- 1 **Definition-based** — IS, IT, data, database, DBMS, VPN, ERP, batch vs real-time
- 2 **"Which is NOT..."** — paper-based filing is NOT part of IT (Q1)
- 3 **Function identification** — DBMS = interface between user & database (Q6)
- 4 **Classification** — match IS type to level: EIS-senior, MIS/DSS-middle, TPS-operational
- 5 **Comparison** — IT vs IS; batch vs real-time; MIS vs DSS vs EIS
- 6 **Scenario** — identify the IS or processing method from a business example

23 ⚠ EXAM TRAPS

- 1 **IT vs IS** — IS is **broader** — includes **how people interact** with the technology; IT is the **equipment**.
- 2 **What is IT?** — Includes computers, networks, telecoms, even **TV, telephone, radio** — but **not paper-based filing** (Q1).
- 3 **Data vs information** — Data = **raw facts**; processed into **meaningful & useful information** (Q4).
- 4 **Database vs DBMS** — Database = the **electronic filing system**; DBMS = the **software interface** managing it (Q6).
- 5 **Batch vs real-time** — Batch = **group** over a period (payroll); real-time = **immediate** master-file update (Q8).
- 6 **Real-time example** — **Airline information system** (Q9) — not monthly payroll or inventory batch updates.
- 7 **Real-time cost** — **More expensive** — complex to develop & maintain; needs more hardware.
- 8 **Best-known network** — **The internet** (Q11) — not LAN or VPN.
- 9 **VPN purpose** — Connect **private networks over a public network securely** (Q12) — not speed or free access.
- 10 **MIS limits** — **Structured** decisions, little analysis, **inflexible**, internal — DSS was built to overcome this.
- 11 **DSS vs EIS** — DSS: tactical, "what if" models. EIS: **strategic**, individual executive, **internal + external**, dashboard.
- 12 **EIS decisions** — **Unstructured** (e.g. price fixing); very expensive; few senior users.
- 13 **Expert system conditions** — Well-defined problem, rules definable, not solvable by TPS, **cost-justified**.
- 14 **Security first step** — **Written information security policies** — else firms stay reactive.
- 15 **Level ↔ system** — Senior-EIS; middle-MIS, DSS; operational-TPS.
- 16 **Strategic horizon** — Strategic information: long-term, e.g. **3-5 years**; internal + external.

24 DECISION TREE — WHICH INFORMATION SYSTEM?

STEP 1 · WHO USES IT, AND WHAT KIND OF DECISION?

OPERATIONAL • structured		MIDDLE • tactical		SENIOR • unstructured	
A	Records routine transactions → TPS	C	Regular reports from TPS summary data, structured → MSS / MIS	E	Customised dashboard, internal + external data → EIS
B	Grouped over a period → BATCH; each as it occurs → REAL-TIME	D	Interactive models, “what if” → DSS		

CHECK Cross-functional, real-time, all modules linked → **ERP / integrated system**. Records & financial statements → **FRS**. Mimics a human expert's judgement using rules → **EXPERT SYSTEM** (the Study Text does not assign ES to a level).

PAGE 7 • MCQ CLUES, MEMORY MAP & 60-SECOND REVISION

25 MCQ QUICK-CLUE SECTION

All 14 Self-Test questions

NOT part of IT	Paper-based filing (Q1)	Key function of IS	Support operations, management & decisions (Q2)
Benefit of using IT well	Reduce expenses, raise earnings (Q3)	Business data processed into	Meaningful & useful information (Q4)
Batch processing	Group similar transactions together (Q5)	Function of DBMS	Interface user ↔ database; manages schema (Q6)
High-end ERP feature	Real-time processing & analytics (Q7)	Key feature of real-time	Update master files immediately (Q8)
Real-time example	Airline information system (Q9)	Businesses use networks to	Deliver info to employees, suppliers, customers (Q10)
Best-known network	The internet (Q11)	VPN purpose	Connect private networks over public network securely (Q12)
Senior-level decisions	Unstructured, strategic (Q13)	Financial accounting & reporting	Maintaining accounting records (Q14)

26 QUICK MEMORY MAP

Concept	Key words	Core idea
Role of IS	data → information · communication · earnings	better decisions, lower costs
5 uses	planning · controlling · recording · performance · decisions	how information is used
IT vs IS	equipment vs equipment + people	IS is broader
Key elements	data · database · DBMS · networks · integration · security	building blocks of IS
TPS	raw data · routine · batch/real-time	operational foundation
MSS / DSS	reports · structured / models · what if	middle-level support
EIS / ES	dashboard · external / expert rules	strategic & expert advice
Levels	EIS · MIS/DSS · TPS	senior · middle · operational

MNEMONIC — 6 KEY ELEMENTS

“Do Data Designers Need Integrated Security?”

D Data
D Database
D DBMS
N Networks
I Integration
S Security & privacy
Memory aid only.

27 BUSINESS — INFORMATION SYSTEMS IN 60 SECONDS

CONCEPTS

- IS: data → information for decisions
- IT = equipment; IS = IT + people
- 5 uses: plan, control, record, measure, decide
- Cost-benefit before investing

ELEMENTS

- Database = filing; DBMS = interface
- Networks; internet best-known; VPN
- Integration → ERP (real-time)
- Security policy = first step

TYPES & LEVELS

- TPS: batch (payroll) / real-time (airline)
- MIS: structured reports; DSS: what if
- EIS: senior, dashboard; ES: expert rules
- Senior-EIS · Middle-MIS/DSS · Ops-TPS