1.1 Introduction

Business processes are pervasive in any organization and represent all activities that an organization undertakes. Business Process Management evaluates the efficacy and usefulness of business processes for reducing costs and ensures value creation. This chapter provides key concepts, terms, methodologies, techniques and life cycle of Business Process Management.

1.2 Overview of Business Processes

The key concept of Business Process Management (BPM) is the convergence of technologies with process management theories.

1.2.1 What is a Process?

From a business perspective, a **Process** is a coordinated and standardized flow of activities performed by people or machines, which can traverse functional or departmental boundaries to achieve a business objective and creates value for internal or external customers.

1.2.2 What is a Business Process?

A **Business Process** consists of a set of activities that are performed in coordination in an organizational and technical environment. These activities jointly realize a business goal. Each business process is enacted by a single organization, but it may interact with business processes performed by other organizations.

**Process Management** is based on a view of an organization as a system of interlinked processes, which involves concerted efforts to map, improve and adhere to organizational processes. It is the ensemble of activities of planning and monitoring the performance of a process.

1.2.3 Business Process flow

Examples of key business processes life cycle pertaining to accounting, sales and purchase are explained below:
1.2 Information Technology

A. Accounting

<table>
<thead>
<tr>
<th>Source Document</th>
<th>Financial Statement</th>
<th>Closing Entries</th>
</tr>
</thead>
<tbody>
<tr>
<td>(A document that captures data from transactions and events)</td>
<td>(The accounts are organized into the financial statements)</td>
<td>(Appropriate entries are passed to transfer accounts to financial statements)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ledger</th>
<th>Trial Balance</th>
<th>THE ACCOUNTING CYCLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Entries are posted to the ledger from the journal)</td>
<td>(Unadjusted trial balance containing totals from all account heads is prepared)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Adjusted Trial Balance</th>
<th>Adjustments</th>
</tr>
</thead>
<tbody>
<tr>
<td>(The trial balance is finalized post adjustments)</td>
<td>(Appropriate adjustment entries are passed)</td>
</tr>
</tbody>
</table>

B. Sales

<table>
<thead>
<tr>
<th>Customer Order</th>
<th>Recording</th>
<th>Reconciliation</th>
</tr>
</thead>
<tbody>
<tr>
<td>(A purchase order received from a customer specifying type, quantity and agreed prices for products)</td>
<td>(Availability of items is checked and customer order is booked)</td>
<td>(The bank reconciliation of all the receipts is performed)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pick Release</th>
<th>Receipt</th>
<th>Invoice</th>
</tr>
</thead>
<tbody>
<tr>
<td>(The items are moved from the warehouse to the staging area)</td>
<td>(Money is received from the customer against the invoices)</td>
<td>(Invoice of transaction is generated and sent to customer)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Shipping</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>(Items are loaded onto the carrier for transport to customer)</td>
<td></td>
</tr>
</tbody>
</table>

C. Purchase

<table>
<thead>
<tr>
<th>Purchase Requisition</th>
<th>Request for Quote</th>
<th>Payments</th>
</tr>
</thead>
<tbody>
<tr>
<td>(A document is prepared requesting the purchase department to place an order with vendor specifying quantity and time frame)</td>
<td>(An invitation is sent to vendors to join a bidding process for specific products)</td>
<td>(The payments are made against invoices)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Quotation</th>
<th>Receipts</th>
</tr>
</thead>
<tbody>
<tr>
<td>(The vendors provide cost quotations for the supply of products)</td>
<td>(The physical receipt of goods and invoices)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Purchase Order</th>
</tr>
</thead>
<tbody>
<tr>
<td>(A commercial document is issued to the vendor specifying the type, quantity and agreed prices for products)</td>
</tr>
</tbody>
</table>
Business Process Management (BPM) is defined as the achievement of an organization’s objectives through the improvement, management and control of essential business processes. It refers to the closed loop, iterative management of business processes over their complete life cycle.

### 1.4.1 Business Process Management Principles and Practices

**PRINCIPLES**
- Processes are Assets
- Value to Customers
- Continuous improvement of processes

**PRACTICES**
- Process-oriented organizational structure
- Appoint Process Owners
- Top-Down Commitment, bottom up execution
- Use Information Technology to Manage Processes
- Collaborate with Business Partners
- Continuous Learning and Process Improvement
- Align Employee Rewards to Process Performance
- Utilize BPR, TQM and other process improvement tools

---

Organizational Business Process

These are the high-level processes that are typically specified in textual form by their inputs, their outputs, their expected results and their dependencies on other organizational business processes.

Operational Business Process

These are the basis for developing implemented business processes that contain information on the execution of the process activities and the technical and organizational environment in which they will be executed.
## 1.4 Information Technology

### 1.4.2 Business Process Management Life Cycle

This has five phases – Analysis, Design, Implementation, Run & Monitor, and Optimize phase.

### 1.5 Theories of Process Management

BPM is a combination of systems, methods and tools for ensuring processes that are improved on a continuous basis to achieve enterprise objectives. Under the BPM framework, Business Process Re-engineering (BPR) and incremental process improvement methodologies (i.e., Six Sigma, TQM, etc.) are tools that organizations can use to implement process improvement.

#### 1.5.1 Six Sigma

It follows a life-cycle having phases: Define, Measure, Analyze, Improve and Control (or DMAIC).

#### 1.5.2 Total Quality Management (TQM)

TQM is based on quality management from the customer's point of view. TQM processes are divided into four sequential categories: Plan, Do, Check, and Act (the PDCA cycle).

(i) **Plan**: In the planning phase, people define the problem to be addressed, collect relevant data, and ascertain the problem's root cause;

(ii) **Do**: In the doing phase, people develop and implement a solution, and decide upon a measurement to gauge its effectiveness;

(iii) **Check**: In the checking phase, people confirm the results through before-and-after data comparison;

(iv) **Act**: In the acting phase, people document their results; inform others about process changes, and make recommendations for the problem to be addressed in the next PDCA cycle.

#### 1.5.3 Business Process Reengineering (BPR)

**Business Process Reengineering (BPR)** is the fundamental rethinking and radical redesign of processes to achieve dramatic improvement, in critical, contemporary measures of performance such as cost, quality, service and speed. BPR aims at major transformation of the business processes to achieve dramatic improvement. The success factors of BPR are: Organization wide commitment, BPR Team composition, Business need analysis, Adequate IT infrastructure, effective change management, and ongoing continuous improvement.

### 1.6 BPM Implementation

BPM implementation can make an organization process – centric.
1.6.1 Key factors to consider in implementing BPM

<table>
<thead>
<tr>
<th>Factors</th>
<th>Key Considerations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scope</td>
<td>A single process, a department, the entire company</td>
</tr>
<tr>
<td>Goals</td>
<td>Process understanding, Process Improvement, Process Automation/Optimization and Process re-engineering</td>
</tr>
<tr>
<td>Methods to be used</td>
<td>Six Sigma, BPM Life Cycle Method, TQM, Informal methods</td>
</tr>
<tr>
<td>Skills Required</td>
<td>Consultants, Train Employees, Formal Certification, Basic Education, Existing Skill sets</td>
</tr>
<tr>
<td>Tools to be used</td>
<td>White-Boards, Sticky Notes, Software for Mapping, Documenting, Software for Simulation, Comprehensive BPMS</td>
</tr>
<tr>
<td>Investments to Make</td>
<td>Training, Tools, Time</td>
</tr>
<tr>
<td>Sponsorship/Buy-in Needed</td>
<td>Executive Level, Department Level, Process Owner Level, Employee Level</td>
</tr>
</tbody>
</table>

1.6.2 Need for a BPM implementation

The volume of work and the complexity of the business process demand that organizations look for possible IT applications to support and automate their processes. Business Process Management is a prerequisite for organizational competitiveness. It includes establishing and maintaining an environment in which people working together perform a specific job efficiently. For example – The marketing department has its Enterprise Content Management (ECM) system used to inform the consumer of the organization’s products or services; the sales department has a Customer Relation Management (CRM) system to allow the company to up- and cross-sell; and the delivery department has an Enterprise Resource Planning (ERP) system to process the order and send an invoice.

1.6.3 Automation of the functional units

Consumer is becoming more and more demanding with respect to delivery time – where customers used to expect and accept days or weeks for delivery, same time, the consumer is demanding higher quality of the products or services. Finally, the product or service is becoming more and more personalized (and thus more complex), supported by increased customer services.

1.6.4 Challenges in implementing BPA

Organizations rely on a complex, interrelated information systems infrastructure to effectively thrive in the ever-increasing, competitive digital world. The product, service, price, competition etc. have increased the complexity of the business.
1.6 Information Technology

1.6.5 BPM Technology
BPM technology can complement existing (and future) investments in applications and give organizations the ability to implement a real – time process improvement without the extensive process conversion efforts as the original business processes already exist. To achieve these benefits, Business Process Layer is introduced in the Traditional IT architecture. The traditional IT architecture contains three layers: Database, Application and Presentation.

1.6.6 Value Chain Automation
Value chain is defined as a chain of activities that a firm operating in a specific industry performs in order to deliver a valuable product or service for the market. Research and development; Design of products, services, or processes; Production; Marketing and sales; Distribution and Customer service are some of the business functions of the value chain.

1.6.7 Business Process Automation (BPA): Benefits & Risks
Saving on costs, staying ahead in competition and fast service to customers are some of the benefits along with risk to jobs and false sense of security as risks.

1.7 Accounting Systems Automation
Accounting Information System (AIS) is defined as a computer based system of collection, storage and processing of financial and accounting data that is used by decision makers. An important function of AIS is to efficiently and effectively collect and process the data about a company’s transactions.

1.7.1 Basic functions of an Accounting Information System (AIS)
- **Collect and store data** - Source documents such as sales order, sales invoice, order processing, purchase order etc. are used to capture transaction data.
- **Record Transaction** - Transactions data are recorded into journals that provide management with information useful for decision making.
- **Safeguard Organizational Assets** - Provide adequate controls to ensure that data is recorded and processed accurately by safeguarding organizational assets (data and systems) by providing adequate documentation of all business activities and an effective segregation of duties.

1.7.2 Processing Cycles of Accounts BPM
(i) **Financing Cycle** – provides a clear view of firm’s processing framework and involves activities of obtaining necessary funds to run the organization, repay creditors, and distribute profits to investors.
(ii) **Revenue Cycle** - involves activities of selling goods or services and collecting payment for sales.

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(iii) **Expenditure Cycle** - involves activities of buying and paying for goods or services used by the organization.

(iv) **Human Resource Cycle/Payroll Cycle** - involves activities of hiring and paying employees.

(v) **Production Cycle** - involves the recurring set of business activities and related data processing operations associated with the manufacturers of products including activities like converting raw materials and labor into finished goods.

**Accounting Information Systems and its Subsystems**

**General Ledger & Reporting System** – This involves the information processing operations involved in updating the general ledger and preparing reports that summarize the results of an organization’s activities.

**Data Processing Cycle** - The Data Processing Cycle consists of following basic steps with alerts, controls and feedback at each step:

- **Data input** - Involves the activities like capturing the data, implementing control procedures, recording in journals, posting to ledgers and preparation of reports.
- **Data storage** - Involves organizing the data in master file or reference file of an automated system for easy and efficient access.
- **Data processing** - Involves addition, deletion and updating of the data in the transaction file, master file or reference file.
- **Information output** - Involves generation of documents and managerial reports in printable or electronic form for addressing queries, to control operational activities and help the management in decision making.

### 1.8 Impact of IT on BPM and Risks of failure of IT

BPM solutions that are process – centric integrate People, Systems and Data.

#### 1.8.1 Benefits of BPMS

BPMS mainly automates repetitive business processes; monitors, extracts formats and distributes information to systems and people; optimizes processes; reduces the administrative activities involved in compliance and ISO activities and frees up employees’ time.

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1.8 Information Technology

1.8.2 Business Risks of failure of IT
Superficial or deficient executive involvement; deficient project management; breakdown in gap analysis; limited options for customization of the BPM software; too complicated to be customized; failure to identify future business needs; inadequate assessment of the need for change management etc. are some of the major business risks of failure of IT.

1.8.3 Information as a Business Asset
Information becomes an asset for an organization if it is useful, digital, accessible, relevant, accurate, trust-worthy, searchable, understandable, spatially enabled and shareable at the time when required.

1.9 Approaches to Mapping System
Insufficient and deficient documentation costs organizations time, money and, therefore, documentation is as important as the product is. Some of the commonly used documentation methods are summarized below:

1.9.1 Entity Relationship Diagram
Entity-Relationship (E/R) Modeling is defined as a data modeling technique that creates a graphical representation of the entities, and the relationships between entities, within an Information System. ER diagrams repeatedly bring into play symbols to symbolize three dissimilar types of information.

- **Entity** is represented by Rectangle labeled with a singular noun and denotes a physical object, an event or a concept.
- **Relationship** is represented by Diamonds that denotes an association that exists between two entities.
- **Attributes** are represented by Ovals.

1.9.2 Data Flow Diagram
A Data Flow Diagram (DFD) illustrates technical or business processes with the help of the external data stored, the data flowing from a process to another, and the results. The four major DFD component’s symbols are as follows:

<table>
<thead>
<tr>
<th>Term</th>
<th>Symbols</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entity</td>
<td><img src="image" alt="Rectangle" /></td>
<td>An entity is the source or destination of data; also referred to as agents, terminators, or source/sink.</td>
</tr>
<tr>
<td>Process</td>
<td><img src="image" alt="Diamond" /> or <img src="image" alt="Rectangle" /></td>
<td>A process receives input and generates some output.</td>
</tr>
<tr>
<td>Data Store</td>
<td><img src="image" alt="Rectangle" /> or <img src="image" alt="Diamond" /></td>
<td>A data store is where a process stores data between processes for later retrieval by that same process or another one. Files and tables are considered data stores.</td>
</tr>
<tr>
<td>Data Flow</td>
<td><img src="image" alt="Arrow" /></td>
<td>Data flow is the movement of data between the entity, the process and the data store.</td>
</tr>
</tbody>
</table>
Any system in general is too complex to be shown on a single DFD. Decomposition is an iterative process of exploding DFDs to create more detail. Data Flow Diagrams can be expressed as a series of levels. We begin by making a list of business activities to determine the DFD elements (external entities, data flows, processes, and data stores). Context Diagram shows the interaction between the system and external agents.

- The Context Diagram is a high-level DFD that shows the entire system as a single process and shows the interaction between the system and external agents which act as data sources and data sinks and gives no clues as to its internal organization.
- The context-level DFD is next "exploded," to produce Level 1 DFDs for each process that shows how the system is divided into sub-systems (processes), each of which deals with one or more of the data flows to or from an external agent, and which together provide all of the functionality of the system as a whole.

### 1.9.3 Flowchart

A Flowchart is a diagram prepared by the programmer of the sequence of steps involved in solving a problem. It is an essential tool for programming and it illustrates the strategy and thread of logic followed in the program. Flowcharts may be divided into four categories and as such they may be likened to the geographical map about the extent of detail:

<table>
<thead>
<tr>
<th>Type of Flowchart</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>System Outline Chart</td>
<td>Lists the inputs, files processed and outputs without regard to any sequence whatever.</td>
</tr>
<tr>
<td>System Flowchart</td>
<td>Presents an overview of the data flow through all parts of a data processing system.</td>
</tr>
<tr>
<td>Run Flowchart</td>
<td>Are prepared from the system flowcharts and show the reference of computer operations to be performed.</td>
</tr>
<tr>
<td>Program Flowchart</td>
<td>Most detailed and are concerned with the logical/arithmetic operations on data within the CPU and the flow of data between CPU on one hand and the input/output peripherals on the other.</td>
</tr>
</tbody>
</table>

### 1.9.4 Decision Tree

Also, termed as an Inference or Logical tree, it is a tree-like representation and is defined as a collection of a basis (condition) and a conclusion (action) and is a one way to display an algorithm. It is a decision support tool that uses a tree-like graph or model of decisions and their possible consequences, including chance event outcomes, resource costs, and utility.

### 1.9.5 Decision Table

A Decision Table is a table which may accompany a flowchart defining the possible contingencies that may be considered within the program and the appropriate course of action for each contingency. A Decision Table is divided into four quadrants — Condition Stub, Condition Entries, Action Stub and Action Entries.
Question 1

Define Business Process Re-engineering. Explain it with suitable example.

Answer

Business Process Reengineering (BPR) is defined as the fundamental rethinking and radical redesign of processes to achieve dramatic improvement, in critical, contemporary measures of performance such as cost, quality, service and speed. It involves changes in structures and in processes within the business environment. The entire technological, human, and organizational dimensions may be changed in BPR. Information Technology plays a major role in BPR as it provides office automation; allows the business to be conducted in different locations; and provides flexibility in manufacturing, permits quicker delivery to customers and supports rapid and paperless transactions. In general, it allows an efficient and effective change in the way work is performed. Business Process Re-engineering is also known as Business Process Redesign, Business Transformation, or Business Process Change Management.

An example of BPR application

If a bank customer enters the bank determined to apply for a loan, apply for an ATM card and open a savings account, most probably s/he must visit three different desks in order to be serviced. When BPR is applied to an organization, the customer communicates with only one person, called "case manager", for all three inquiries. Under BPR, while the loan application team processes the loan application, the case manager "triggers" the account team to open a savings account and the ATM team to supply the customer with an ATM card. The customer leaves the bank having a response for his loan application, a new savings account and an ATM card, and all these without having to move around the desks for signatures and documents. All the customer’s requests were satisfied at the same time in parallel motion.

Question 2

Discuss the following:
(a) Six Sigma
(b) BPM Life Cycle

Or

Name the various phases of Business Process Management Life Cycle (BPM–L Cycle) in logically correct order.

(c) Total Quality Management (TQM)

Or

Write short note on Total Quality Management.

Answer

- Six Sigma – Six Sigma employs quality management and statistical analysis of process outputs by identifying and removing the causes of defects (errors) and minimizing variability in manufacturing and business processes. Each Six Sigma project carried out
within an organization follows a defined sequence of steps and has quantified value targets, for example: reduce process cycle time, reduce pollution, reduce costs, increase customer satisfaction, and increase profits. It follows a life-cycle having phases: Define, Measure, Analyze, Improve and Control (or DMAIC) which are described as follows.

(i) **Define:** Customers are identified and their requirements are gathered. Measurements that are critical to customer satisfaction (Critical to Quality, (CTQ)) are identified for further project improvement.

(ii) **Measure:** Process output measures that are attributes of CTQs are determined and variables that affect these output measures are identified. Data on current process are gathered and current baseline performance for process output measures are established. Variances of output measures are graphed and process sigma are calculated.

(iii) **Analyze:** Using statistical methods and graphical displays, possible causes of process output variations are identified. These possible causes are analyzed statistically to determine root cause of variation.

(iv) **Improve:** Solution alternatives are generated to fix the root cause. The most appropriate solution is identified using solution prioritization matrix and validated using pilot testing. Cost and benefit analysis is performed to validate the financial benefit of the solution. Implementation plan is drafted and executed.

(v) **Control:** Process is standardized and documented. Before and after analysis is performed on the new process to validate expected results, monitoring system is implemented to ensure process is performing as designed. Project is evaluated and lessons learned are shared with others.

◊ **BPM Life Cycle (BPM-L)** - Business Process Management-Life cycle establishes a sustainable process management capability that empowers organizations to embrace and manage process changes successfully. Because it incorporates both human resources and technology—culture, roles and responsibilities, as well as data content, applications and infrastructure—the approach enables fully informed decision-making right across an organization. Phases are Analysis, Design, Implementation, Run & Monitor and Optimize.

(i) **Analysis phase:** This involves analysis of the current environment and current processes, identification of needs and definition of requirements.

(ii) **Design phase:** This involves evaluation of potential solutions to meet the identified needs, business process designing and business process modeling.
1. Information Technology

(iii) Implementation phase: This involves project preparation, blue printing, realization, final preparation, go live and support.

(iv) Run and Monitor phase: This involves business process execution or deployment and business process monitoring.

(v) Optimize: Iterate for continuous improvement.

Total Quality Management (TQM) is a management mechanism designed to improve a product or process by engaging every stakeholder and all members of an organization as well as the customers and aims at improving the quality of the products produced and the process utilized. TQM ultimately aims at complete customer satisfaction through ongoing improvements.

Question 3
Classify each of the following items as belonging in the revenue, expenditure, human resources/payroll, production, or financing cycle.

(a) Purchase raw materials  
(b) Decide how many units to make next month  
(c) Pay for raw materials  
(d) Disburse payroll checks to factory workers  
(e) Hire a new assistant controller  
(f) Update the allowance for uncollectible accounts  
(g) Establish a ₹ 10,000 credit limit for customer XYZ Company

Answer
Note: Refer to Section 1.7.2 in summary for better understanding.

(a) Expenditure Cycle  
(b) Production Cycle  
(c) Expenditure Cycle  
(d) Payroll Cycle  
(e) Payroll Cycle  
(f) Financial Reporting Cycle  
(g) Revenue Cycle

Question 4
Explain different types of relationships in Entity-Relationship Model with suitable examples.

Answer
Relationship: It is defined as an association between two or more entities.

Types of Relationships in E-R Model are as follows:

(i) One-to-One relationship (1:1) - A One-to-One relationship is shown on the diagram by a line connecting the two entities.
Example: A Teacher may be in-charge of a class. Each class must be in-charge of by one teacher.

A student has one and only one Report card. Each report card is owned by one and only one student.

(ii) One-to-Many relationships (1:N) – A One-to-Many relationship is shown on the diagram by a line connecting the two entities with a “crow’s foot” symbol denoting the ‘many’ end of the relationship.

Example: A student may borrow some books from the library. A book in the library may be borrowed by at most a student.

A class is formed by a group of atleast one student. Each student is allocated to one and only one class.

(iii) Many-to-One relationships (M:1) – It is the reverse of One-to-Many relationship.

Example: As in two or more parent records to a single child record. For example,

When three administrators in a small town report to one minister.

(iv) Many-to-Many relationships (M:N) - A Many-to-Many relationship is shown on the diagram by a line connecting the two entities with 'crow's foot' symbols at both ends.

Example: A student enrolls in atleast one course. A course is enrolled by at least one student.

A student may apply for more than one scholarship. Each scholarship may receive some applications from student, or none.
Question 5

A university consists of a number of departments. Each department offers several courses. A number of modules make up each course. Students enroll in a particular course and take modules towards the completion of that course. Each module is taught by a lecturer from the appropriate department, and each lecturer tutors a group of students. Draw an E-R Diagram.

Answer

First, we will identify entities which are - Department, Course, Module, Student, Lecturer.

Further, following are the relationships:

(a) Each department offers several courses;
(b) A number of modules make up each course;
(c) Students enroll in a particular course;
(d) Students take modules;
(e) Each module is taught by a lecturer;
(f) A lecturer from the appropriate department; and
(g) Each lecturer tutors a group of students.

Question 6

Draw a Context Level Diagram for Payroll Processing System that interacts with the following five agents: Government Agencies; Employees; Management; Time Keeping and Human Resources.

Answer

[Diagram of Payroll Processing System]

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The DFD shown in the figure displays the inputs and outputs of the payroll processing application as well as the data sources and destinations external to the application. Thus this context diagram uses rectangles to identify Timekeeping and Human Resources as external entities, despite the fact that these departments are internal to the company. This is because those entities are external to the Payroll Processing System under study.

**Question 7**

_Differentiate between Flowchart and Data Flow Diagram._

**Answer**

<table>
<thead>
<tr>
<th>Flowchart</th>
<th>Data Flow Diagram (DFD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow chart presents steps to complete a process.</td>
<td>Data Flow Diagram presents the flow of data.</td>
</tr>
<tr>
<td>Flow chart does not have any input from or output to an external source.</td>
<td>DFD describes the path of data from an external source to internal source or vice versa.</td>
</tr>
<tr>
<td>The timing and sequence of the process is aptly shown by a flowchart.</td>
<td>Whether processing of data is taking place in a particular order or several processes are taking place simultaneously is described by a DFD.</td>
</tr>
<tr>
<td>Flow chart shows how to make a system function.</td>
<td>DFD defines the functionality of a system.</td>
</tr>
<tr>
<td>Flow chart is used in designing a process.</td>
<td>DFD is used to describe the path of data that will complete the process.</td>
</tr>
</tbody>
</table>

**Question 8**

A company has 2,500 employees. Their salaries are stored as \( J(s), 1, 2, 2500 \). The salaries are divided in four categories as under:

(i) Less than \( ₹1,000 \)
(ii) \( ₹1,000 \) to \( ₹2,000 \)
(iii) \( ₹2,001 \) to \( ₹5,000 \)
(iv) Above \( ₹5,000 \).

Draw a flow chart for finding the percentage of the employees in each category.

**Answer**

The flow chart is as follows:
A bicycle shop in Delhi hires bicycles by the day at different rates as shown in table:

<table>
<thead>
<tr>
<th>Season</th>
<th>Charges per day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spring (March - May)</td>
<td>₹ 8.00</td>
</tr>
<tr>
<td>Summer (June - August)</td>
<td>₹ 9.50</td>
</tr>
<tr>
<td>Autumn (Sept - Nov.)</td>
<td>₹ 5.00</td>
</tr>
<tr>
<td>Winter (Dec. - Feb.)</td>
<td>₹ 6.00</td>
</tr>
</tbody>
</table>

To attract his customers, the proprietor also gives a discount on the number of days a bicycle is hired for. If the hire period is more than 10 days, a reduction of 15% is made. For every bicycle hired, a deposit of ₹ 20 must be paid. Develop a flowchart to print out the details for each customer such as name of customer, number of days a bicycle is hired for, hire-charges and total charges including the deposit. It is also assumed that there are 25 customers and complete details for each customer such as name of customer, season and number of days the bicycle is required for is inputted through console.

Answer

The required flowchart is shown in Fig.
Question 10

Discuss benefits and limitations of Flowchart.

Answer

The benefits of flowcharts are elucidated below:

(i) Quicker grasp of relationships – Before any application can be solved, it must be understood, the relationship between various elements of the application must be
identified. The programmer can chart a lengthy procedure more easily with the help of a flowchart than by describing it by means of written notes.

(ii) **Effective Analysis** – The flowchart becomes a blueprint of a system that can be broken down into detailed parts for study. Problems may be identified and new approaches may be suggested by flowcharts.

(iii) **Communication** – Flowcharts aid in communicating the facts of a business problem to those whose skills are needed for arriving at the solution.

(iv) **Documentation** – Flowcharts serve as a good documentation which aid greatly in future program conversions. In the event of staff changes, they serve as training function by helping new employees in understanding the existing programs.

(v) **Efficient coding** – Flowcharts act as a guide during the system analysis and program preparation phase. Instructions coded in a programming language may be checked against the flowchart to ensure that no steps are omitted.

(vi) **Orderly check out of problem** – Flowcharts serve as an important tool during program debugging. They help in detecting, locating and removing mistakes.

(vii) **Efficient program maintenance** – The maintenance of operating programs is facilitated by flowcharts. The charts help the programmer to concentrate attention on that part of the information flow which is to be modified.

The **limitations** of flowcharts are given below:

(i) **Complex logic** – Flowchart becomes complex and clumsy where the problem logic is complex. The essentials of what is done can easily be lost in the technical details of how it is done.

(ii) **Modification** – If modifications to a flowchart are required, it may require complete redrawing.

(iii) **Reproduction** – Reproduction of flowcharts is often a problem because the symbols used in flowcharts cannot be typed.

(iv) **Link between conditions and actions** – Sometimes it becomes difficult to establish the linkage between various conditions and the actions to be taken there upon for a particular condition.

(v) **Standardization** – Program flowcharts, although easy to follow, are not such a natural way of expressing procedures as writing in English, nor are they easily translated into Programming language.

**Question 11**

*What are the various key factors to be considered in implementing Business Process Management (BPM) in an enterprise?*

**Answer**

Various key factors to be considered in implementing Business Process Management (BPM) in an enterprise are as follows:
<table>
<thead>
<tr>
<th>Factors</th>
<th>Key Considerations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scope</td>
<td>A single process, a department, the entire company.</td>
</tr>
<tr>
<td>Methods to be used</td>
<td>Six Sigma, BPM Life Cycle Method, TQM, Informal methods.</td>
</tr>
<tr>
<td>Skills Required</td>
<td>Consultants, Train Employees, Formal Certification, Basic Education, Existing Skill sets.</td>
</tr>
<tr>
<td>Tools to be used</td>
<td>White-Boards, Sticky Notes, Software For Mapping, Documenting, Software for Simulation, Comprehensive BPMS.</td>
</tr>
<tr>
<td>Investments to Make</td>
<td>Training, Tools, Time.</td>
</tr>
<tr>
<td>Sponsorship/Buy-in Needed</td>
<td>Executive Level, Department Level, Process Owner Level, Employee Level.</td>
</tr>
</tbody>
</table>

**Question 12**

*What are the major reasons for failure of Business Process Management System (BPMS)?*

**Answer**

Major reasons for the failure of Business Process Management Systems (BPMS) include the following:

- Inadequate investment in ongoing training for involved personnel;
- Lack of corporate policy protecting the integrity of the data in the BPM Systems;
- Superficial or deficient executive involvement;
- Deficient project management;
- Breakdown in gap analysis;
- Limited options for customization of the BPM software are required;
- Not flexible enough or too complicated to be customized to meet the precise workflow and business process;
- Failure to identify future business needs;
- Inadequate assessment of the need for change management;
- Persistent compatibility problems with the diverse legacy systems of the partners;
- Resources not available when desirable;
- Software fails to meet business needs;
- System may be over-engineered when compared to the actual requirements; and
- Technological obsolescence.

**Question 13**

*What are the key benefits of Business Process Automation (BPA)?*
1.20 Information Technology

Answer

The key benefits of Business Process Automation are as follows:

- **Saving on costs**: Automation leads to saving in time and labor costs through higher efficiency and better management of the people involved.
- **Staying ahead in competition**: Today, to survive, businesses need to adopt automation.
- **Fast service to customers**: Automation shortens cycle times in the execution of processes through improved and refined business workflows and help enterprises to serve their customers faster and better.
- **Reducing the impact of human error**: BPA removes human participation in the process, which is the source of many errors.
- **Transforming data into information**: BPA can, apart from collecting and storing data also analyze data and make it available in a form that is useful for decision-making.
- **Improving performance and process effectiveness**: In many cases, tasks that must be done manually are the bottlenecks in the process. Automating those manual tasks, speeds up the effective throughput of the application.
- **Making users more efficient and effective**: People can focus their energies on the tasks they do best, allowing the computers to handle those that machines are best suited for.
- **Making the business more responsive**: Enterprises can easily automate new applications and processes as they are introduced that provide greater control over business and IT processes.
- **Improving collaboration and information sharing**: Business processes designed through a collaborative mean IT can integrate its processes with the business -side logic that drives day-to-day operations.

Question 14

ABC Limited is a software development company, which appointed 50 software engineers in August' 2014 at a monthly salary of ₹30,000. All these engineers shall be entitled for an increment in their monthly salary after six months. The increment on present monthly salary shall be based on their performance to be evaluated on a 100 marks scale as per detains given below:

- Performance Marks < 70, then increment shall be 10% of present salary.
- 70 ≤ Performance marks < 80, then increment shall be 20% of present salary.
- Performance marks ≥ 80, then increment shall be 30% of present salary.

Draw a Flow-Chart to enable to print the details like name of the engineer, performance marks, monthly increment amount and revised monthly salary for each of these 50 engineers.

Answer
(a) Let us define the variables first:

- **PM**: Performance Marks
- **RESAL**: Revised Monthly Salary
- **INCAMT**: Increment Amount
- **NAME**: Name of Engineer
- **N**: Pointer to track number of Engineers
- **INCREMENT**: 0

```plaintext
Start

CAWL

Set N = 0, INCREMENT = 0

Read NAME, PM

N = N + 1

PM < 70

Yes

INCREMENT = 0.10

PM < 80?

Yes

INCREMENT = 0.20

No

INCREMENT = 0.30

INCREMENT = 30000* INCREMENT

RESAL = 30000 + INCAMT

Print NAME, PM, INCAMT, RESAL

N < 50

Yes

Stop

No
```

Question 15

Write short note on the following:
1.22 Information Technology

(a) Radical Redesign

(b) Entity-Relationship Diagram

(c) Business functions of Value Chain

Answer

(a) **Radical Redesign:** Radical redesign means that Business Process Reengineering (BPR) is reinventing and not enhancing or improving. In other words, BPR is based on the understanding that the products and services a company offers to the market are provided through business processes, and a radical redesign of these processes is the road to success. A radical rethinking on the way the business is run brings the finest out of the organization.

(b) **Entity-Relationship Diagram:** An Entity-Relationship (ER) diagram is a data modeling technique that creates a graphical representation of the entities, and the relationships between entities, within an information system. ER diagrams repeatedly bring into play symbols to symbolize three dissimilar types of information. Boxes are commonly used to represent entities. Diamonds are normally used to represent relationships. A relationship is an association that exists between two entities.

(c) Business functions of the Value Chain are as follows:
- Research and Development;
- Design of products, services, or processes;
- Production;
- Marketing and Sales;
- Distribution; and
- Customer Service

**Question 16**

*Mention the challenges in implementing ‘Business Process Automation’.*

**Answer**

Some of the challenges in implementing Business Process Automation (BPA) are as follows:
- The number of interfaces with the customers is growing (e.g. phone, fax, email, sms, PDA, etc.);
- The product, service and price options have increased the complexity of the business;
Most organizations have a whole suite of ‘build and buy’ systems and applications, often each with its own data format; and

Budgets are being cut.

Question 17

An E-commerce site has the following cash back offers.

(i) If the purchase mode is via website, an initial discount of 10% is given on the bill amount.

(ii) If the purchase mode is via phone app, an initial discount of 20% is given on the bill amount.

(iii) If done via any other purchase mode, the customer is not eligible for any discount.

Every purchase eligible to discount is given 10 reward points.

(a) If the reward points are between 100 and 200 points, the customer is eligible for a further 30% discount on the bill amount after initial discount.

(b) If the reward points exceed 200 points, the customer is eligible for a further 40% discount on the bill amount after initial discount.

Taking purchase mode, bill amount and number of purchases as input; draw a flowchart to calculate and display the total reward points and total bill amount payable by the customer after all the discount calculation.

Answer

(a) Let us define the variables first:

PM: Purchase Mode

BA: Bill Amount

TBA: Total Bill Amount

NOP: Number of Purchases

TRP: Total Reward Points

IN_DISC: Initial Discount

ET_DISC: Extra Discount on purchases eligible to Initial Discount

N: Counter (to track the number of purchases)
ABC Limited is planning to implement Business Process Management Systems (BPMS). The Management asked you to briefly explain some benefits of BPMS to help them to take a decision on BPMS.
Answer

Some of the benefits of Business Process Management Systems (BPMS) are as follows:

(a) **Automating repetitive business processes:** Processes such as report creation and distribution or the monitoring of or reporting on company’s Key Performance Indicators (KPI) reduces the manual operational costs and helps employees to concentrate on activities that are important to the success of business.

(b) **BPMS works by 'loosely coupling' with a company’s existing applications:** This enables it to monitor, extract, format and distribute information to systems and people; in line with business events or rules.

(c) **Operational Savings:** BPM focuses on optimization of processes. The processes that are repetitive are optimized and lead to reduced expenses which translate to immediate cost savings. By automating a task, ROI of BPM that requires six hours of manual intervention, one can expect to cut that time to half. Thus, three hours multiplied by the number of times the process is completed in a cycle will yield significant cost saving.

(d) **Reduction in the administration involved in Compliance and ISO Activities:** Be it a quality assurance initiative such as the ISO standards, a financial audit law, or an IT systems best-practice implementation, companies worldwide are seeing the need to manage compliance as part of their everyday business activities. The BPM is ideally suited to help support companies in their quest for process improvement and compliance/governance certification. It gives full control over process and document change, clarity of inherent risks, and ease with which process knowledge is communicated across the company.

(e) **Freeing-up of employee time:** While the euphuism “time is money” is often over-used, it is very relevant to this topic, because in business, for each additional hour it takes to complete a manual business process, there is a hard cost associated with employee time as well as soft costs associated with losing business or lowered productivity. Another area where time comes into play is in opportunity costs.

**Question 19**

A company ABC Ltd. is engaged in selling consumer goods to different categories of customers. In order to increase its sales, different types of discounts are offered to customers. The policy of discount is as given below:

(i) **On cooking range, a discount of 12 percent is allowed to dealers and 9 percent to retailers irrespective of the value of the order.**

(ii) **A discount of 12 percent is allowed on washing machine irrespective of the category of customer and the value of the order.**
(iii) On decorative products, dealers are allowed a discount of 20 percent provided that the value of the order is ₹10,000 and above. Retailers are allowed a discount of 10 percent irrespective of the value of the order.

Draw a flow chart to calculate the discount for the above policy.

Answer

Question 20

A bank has 500 employees. The salary paid to each employee is sum of his basic pay, Dearness Allowance and House rent allowance. For the purpose of computing house rent allowance bank has classified his employees into three classes A, B and C. The house rent allowance for each class is computed at the rate of 30 percent, 20 percent and 10 percent of the basic pay respectively. The dearness allowance is computed at a flat rate of 60 percent of
the basic pay. Draw a flow chart to determine the percentage of employee falling in each of the following salary slabs:

(i) Above ₹ 30,000
(ii) ₹ 15,001 to ₹ 30,000
(iii) ₹ 8,001 to ₹ 15,000
(iv) Less than or equal to ₹ 8,000.

Answer

Abbreviations used are as follows:

\[ P_1 \] : Percentage of employees falling in salary slab (salary\(\leq8,000\));
\[ P_2 \] : Percentage of employees falling in salary slab (8,001\(\leq\) salary\(\leq15,000\))
\[ P_3 \] : Percentage of employees falling in salary slab (15,001\(\leq\) salary\(\leq30,000\))
\[ P_4 \] : Percentage of employees falling in salary slab (salary \(\geq30,000\))

I: Count of number of employees

The required flowchart is given below in Fig. 1:

Question 21

Write in brief the advantages and limitations of using E-R Diagram.

Answer

Advantages of using Entity-Relationship (E-R) Diagram are as follows:

- **ER Modeling is simple and easily understandable. It is represented in business users’ language and it can be understood by non-technical specialist.**
- **Intuitive and helps in Physical Database creation.**
- **Can be generalized and specialized based on needs.**
- **Can help in database design.**
- **Gives a higher-level description of the system.**

Limitations of using E-R Diagram are as follows:

- **Physical design derived from E-R Model may have some amount of ambiguities or inconsistency.**
- **Sometime diagrams may lead to misinterpretations.**
Question 22

Discuss the Data Flow Diagram (DFD) and its components. Also, briefly mention about its types.
Answer

Data Flow Diagram (DFD) is a graphical representation of the flow of data through an information system. A DFD illustrates technical or business processes with the help of the external data stored, the data flowing from a process to another, and the results. DFDs may be partitioned into levels that represent increasing information flow and functional detail. Therefore, the DFD provides a mechanism for functional modeling as well as information flow modeling.

The major components of DFD are as follows:

(i) **Entity:** An entity is the source or destination of data. The entities either provide data to the system (Source) or receive data from it (Sink).

(ii) **Process:** The process is the manipulation or work that transforms data, performing computations, making decisions (logic flow), or directing data flows based on business rules.

(iii) **Data Store:** A data store is where a process stores data between processes for later retrieval by that same process or another one.

(iv) **Data Flow:** Data flow is the movement of data between the entity, the process and the data store.

The types of Data Flow Diagrams (DFDs) are as follows:

- **Logical Data Flow Diagram:** A Logical DFD focuses on the business and how the business operates. It describes the business events that take place and the data required and produced by each event. The logical model reflects the business.

- **Physical Data Flow Diagram:** A Physical DFD shows how the system will be implemented. The physical model depicts the system.

Question 23
Discuss the reasons why documentation is important to Information Systems.

Answer

Some of the reasons why documentation is important to Information Systems are as follows:

- **Depicting how the system works:** In computerized systems, the processing is electronic and invisible. Therefore, documentation is required to help employees understand how a system works, assist accountants in designing controls for it, demonstrates to managers that it will meet their information needs, and assists auditors in understanding the systems that they test and evaluate.

- **Training users:** Documentation also includes user guides, manuals, and similar operating instructions that help people learn how an Information System operates. These documentation aids help train users to operate Information systems hardware and software, solve operational problems, and perform their jobs better.
Designing new systems: Documentation helps system designers develop new systems in much the same way that blueprints help architects design buildings. Well-written documentation and related graphical systems-design methodologies play key roles in reducing system failures and decreasing the time spent correcting emergency errors.

Controlling system development and maintenance costs: Personal computer applications typically employ prewritten, off-the-shelf software that is relatively reliable and inexpensive. Good documentation helps system designers develop object-oriented software, which is software that contains modular, reusable code that further avoid writing duplicate programs and facilitate changes when programs must be modified later.

Standardizing communications with others: Documentation aids such as E-R Diagrams, System Flowcharts, and Data Flow Diagrams are more standardized tools, and they are more likely to be interpreted the same way by all parties viewing them. Thus, documentation tools are important because they help describe an existing or proposed system in a common language and help users communicate with one another about these systems.

Auditing Information Systems: Documentation helps depict audit trails. For example—when investigation in an Accounting Information system, the auditors typically focus on internal controls. In such circumstances, documentation helps auditors determine the strengths and weaknesses of a system's controls and therefore the scope and complexity of the audit.

Documenting business processes: Understanding business processes can lead to better systems and better decision. Documentation helps managers better understand how their businesses operate what controls are involved or missing from critical organizational activities, and how to improve core business activities.

Question 24
Discuss in brief the success factors of Business Process Re-engineering (BPR).

Answer
Some of the Business Process Re-engineering (BPR) Success factors are as follows:

(i) Organization wide commitment: Changes to business processes would have a direct impact on processes, organizational structures, work culture, information flows, infrastructure & technologies and job competencies. This requires strong leadership, support and sponsorship from the top management. Top management not only has to recognize the need for change but also must convince every affected group about the potential benefits of the change to the organization as a whole and secure their commitment.

(ii) BPR team composition: A BPR team is formed which would be responsible to take the BPR project forward and make key decisions and recommendations. The BPR team would include active representatives from top management, business
process owners, technical experts and users. It is important that the teams must be kept of manageable size (say 10 members) to ensure well-coordinated, effective and efficient completion of the entire BPR process.

(iii) **Business needs analysis:** It is important to identify exactly what current processes need reengineering. This would help determine the strategy and goals for BPR. A series of sessions are held with the process owners and stakeholders and all the ideas would be evaluated to outline and conceptualize the desired business process. The outcome of this analysis would be BPR project plan – identifying specific problem areas, setting goals and relating them to key business objectives. This alignment of the BPR strategy with the enterprise strategy is one of the most important aspects.

(iv) **Adequate IT infrastructure:** Adequate investment in IT infrastructure in line is of vital importance to successful BPR implementation. An IT infrastructure is a set of hardware, software, networks, facilities, etc. (including all of the information technology), in order to develop, test, deliver, monitor, control or support IT services. Effective alignment of IT infrastructure to BPR strategy would determine the success of BPR efforts.

(v) **Effective change management:** BPR involves changes in people behavior and culture, processes and technologies. Hence, resistance would be a natural consequence which needs to be dealt with effectively. An effective change management process would consider the current culture to foster a change in the prevailing beliefs, attitudes and behaviors effectively. The success of BPR depends on how effectively management conveys the need for change to the people.

(vi) **Ongoing continuous improvement:** BPR is an ongoing process hence innovation and continuous improvement are key to the successful implementation of BPR.

Question 25

**Draw a Flowchart for the following process:**

Leebay is a new e-commerce web site that is setting up business in India. Leebay and their partner bank Paxis have come up with a joint promotion plan for which the following offers are proposed. Customers can either log in through a mobile app or directly from the website:

1. If the payment mode chosen is ‘Paxis Credit’, then a 20% discount is given to the user.
2. If the payment mode chosen is ‘Paxis Debit’, then a 10% discount is given to the user.
3. If other payment modes are used, then no discount is given.

Also, to promote the downloads of its new smartphone app, the company has decided to give the following offer:

1. If the purchase mode is 'Mobile App', then no surcharge is levied on the user.
(2) If any other purchase mode is used, then additional 5 surcharge is levied on the user. This surcharge is applied on the bill after all necessary discounts have been applied.

With bill amount, payment mode and purchase mode as inputs, draw a flowchart for the billing procedure for Leebay.

Answer

Variables need be defined implying following:


Start

TOT_BILL_AMT = 0, FIN_BILL_AMT = 0

Read BILL_AMT, PMT_MODE, PU_MODE

If PU_MODE = Mobile App?

Yes

SCHG = 0.00

No

SCHG = 0.05

If PMT_MODE = 'Paxis Credit'?

Yes

DISC = 0.20

No

If PMT_MODE = 'Paxis Debit'?

Yes

DISC = 0.10

No

DISC = 0.0

TOT_BILL_AMT = BILL_AMT – (DISC * BILL_AMT)

FIN_BILL_AMT = TOT_BILL_AMT + (SCHG * TOT_BILL_AMT)

Print/Display DISC, SCHG, FIN_BILL_AMT

Stop
Exercise

1. What are the key goals of Business Process Management?

2. Discuss the benefits of Business Process Management System.

3. In a school, students are allocated to different classes. Each student must be allocated to exactly one class, and a class is formed by at least 30 students. Each class must be managed by several different students, namely, prefect, 1st monitor, 2nd monitor and 3rd monitor. Draw an E-R diagram for the school, indicating cardinality.

4. For computing custom duty, the imported items are classified into 4 categories. The rate of duty to be levied on each category of items is given below:

<table>
<thead>
<tr>
<th>Category (K)</th>
<th>Class of Goods</th>
<th>% Custom duty on the value of goods (V)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Food and Beverages</td>
<td>10</td>
</tr>
<tr>
<td>2</td>
<td>Textile and Leather goods</td>
<td>15</td>
</tr>
<tr>
<td>3</td>
<td>Heavy Machinery</td>
<td>20</td>
</tr>
<tr>
<td>4</td>
<td>Luxury Items</td>
<td>40</td>
</tr>
</tbody>
</table>

Draw a flowchart to compute the custom duty.

5. Draw a flowchart to compute and print the income-tax and surcharge on the income of a person, where income is to be read from terminal and tax is to be calculated as per the following rates:

<table>
<thead>
<tr>
<th>Upto ₹40,000</th>
<th>No Tax</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upto ₹60,000</td>
<td>@ 10% of amount above ₹40,000</td>
</tr>
<tr>
<td>Upto ₹1,50,000</td>
<td>₹2,000 + 20% of amount above ₹60,000</td>
</tr>
<tr>
<td>Above ₹1,50,000</td>
<td>₹20,000 + 30% of amount above ₹1,50,000</td>
</tr>
</tbody>
</table>

Charge surcharge @ 2% on the amount of total tax if the income of a person exceeds ₹2,00,000.

6. Discuss advantages and limitations of the following:

(a) Decision Table  (b) Data Flow Diagram  (c) Decision Tree