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Data Science for Managerial Decisions (MB 511)

Instructor
Anant Prakash Awasthi

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References/Literature

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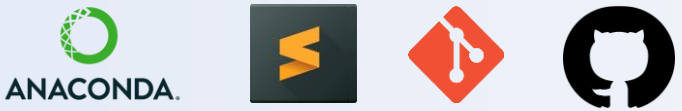
Online Resources

Software Resources



Data Science for Managerial Decisions (MB 511)

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Program Overview

- Introduction to Data Science
- Information Technology An Overview
- Applications of Data Science in various fields
- MIS and Control Systems
- Data Collection and Data Pre-Processing
- Building Information Systems
- Support Systems for Management Decisions

MIS and Control Systems

- Introduction to MIS and Control Systems
- Design and Implementation of MIS
- Control Systems in Action
- Challenges and Future Trends

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MIS and Control Systems

Introduction to MIS

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Definition

- MIS, or Management Information System, is a crucial element in contemporary organizational structures. It refers to a system that collects, processes, stores, and disseminates information to support decision-making and control within an organization. MIS integrates people, processes, and technology to provide managers with relevant information for efficient planning, coordination, and control of business operations.

- Key components
  - Key components of MIS include data collection, processing, storage, and retrieval. It often involves the use of specialized software and hardware systems to analyze and present information in a format that aids managerial decision-making. MIS encompasses various sub-systems, such as decision support systems, executive information systems, and transaction processing systems.

MIS and Control Systems

Designing and Implementing an MIS System – Life cycle of MIS

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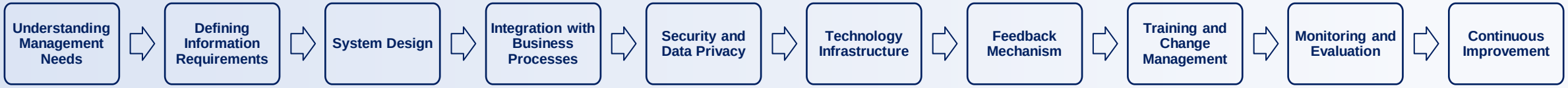
Designing Management Information Systems (MIS) involves creating a structured framework for collecting, processing, storing, and disseminating information within an organization to support decision-making and facilitate managerial activities. The process of designing MIS requires careful consideration of the organization's goals, information needs, and technological capabilities.

Designing an effective MIS from a management perspective involves a holistic approach that considers organizational goals, user needs, technology infrastructure, and continuous improvement processes. The goal is to create a system that provides timely, accurate, and relevant information to support decision-making at all levels of the organization.



MIS and Control Systems

Designing and Implementing an MIS System – Life cycle of MIS

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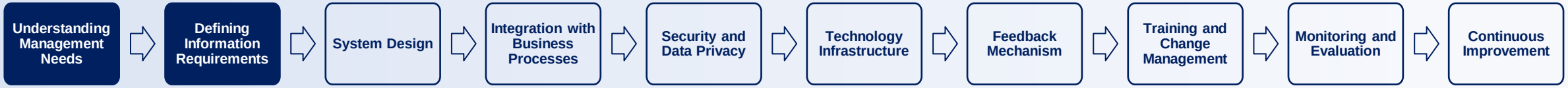
1. Understanding Management Needs:
    - Identify Objectives and Goals: Start by understanding the overall objectives and goals of the organization. What information is critical for achieving these goals?
    - Stakeholder Analysis: Identify the key stakeholders and understand their information needs. Different levels of management may require different types of information.
2. Defining Information Requirements:
    - Data Gathering: Identify the data elements necessary for decision-making. This includes both internal and external sources of data.
    - Information Quality: Ensure the accuracy, relevance, and timeliness of the information. Information should be reliable for effective decision-making.



MIS and Control Systems

Designing and Implementing an MIS System – Life cycle of MIS

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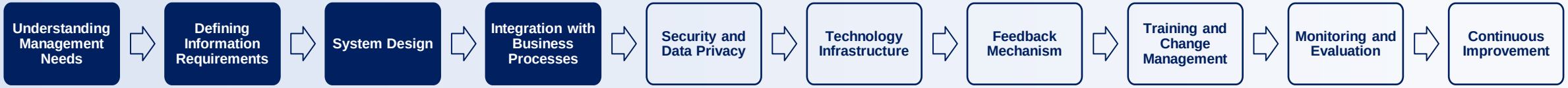
3. System Design:

- Database Design: Develop a robust database structure that can efficiently store and retrieve data. Consider relational database models for organizing information logically.
- User Interface Design: Create user-friendly interfaces that allow easy access to information. Different levels of management may require different dashboards or reports.

4. Integration with Business Processes:

- Align with Business Processes: Ensure that the MIS is integrated into the organization's business processes. Information flow should align with workflow and support operational activities.
- Automation: Automate routine tasks and reporting to improve efficiency and reduce errors.



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Designing and Implementing an MIS System – Life cycle of MIS

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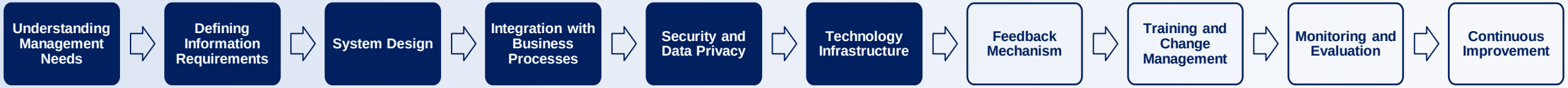
5. Security and Data Privacy:

- Access Control: Implement access controls to ensure that only authorized personnel can access sensitive information.
- Data Encryption: Use encryption techniques to secure data during transmission and storage.

6. Technology Infrastructure:

- Select Appropriate Technology: Choose hardware and software platforms that meet the organization's requirements. Consider scalability for future growth.
- Cloud Integration: Evaluate the feasibility of cloud-based solutions for flexibility and scalability.



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Designing and Implementing an MIS System – Life cycle of MIS

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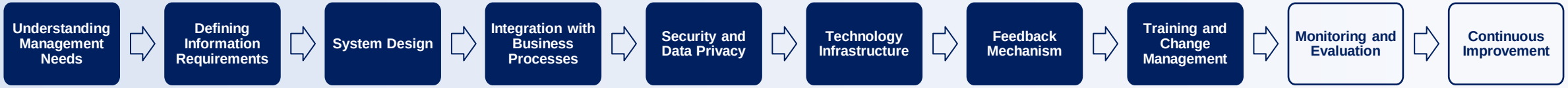
7. Feedback Mechanism:

- User Feedback: Establish mechanisms for obtaining feedback from users to continuously improve the MIS.

  Regularly review and update the system based on changing requirements.

8. Training and Change Management:

- User Training: Provide training programs for employees to ensure they can effectively use the MIS.
- Change Management: Implement change management strategies to help employees adapt to the new system.



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Designing and Implementing an MIS System – Life cycle of MIS

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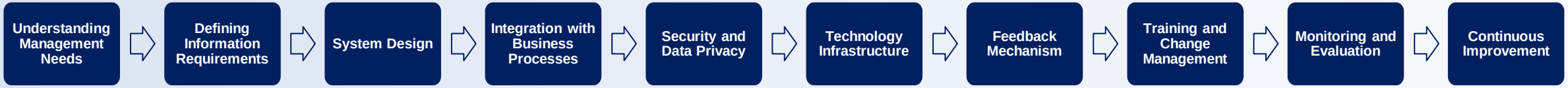
9. Monitoring and Evaluation:

- Key Performance Indicators (KPIs): Define and monitor KPIs to assess the effectiveness of the MIS.
- Regular Audits: Conduct regular audits to ensure data accuracy, system performance, and security compliance.

10. Continuous Improvement:

- Adaptability: Design the MIS with flexibility to adapt to evolving business needs and technological advancements.
- Feedback Loops: Establish feedback loops to gather input from users and management for ongoing improvements.



MIS and Control Systems

Designing and Implementing an MIS System – Best Practices

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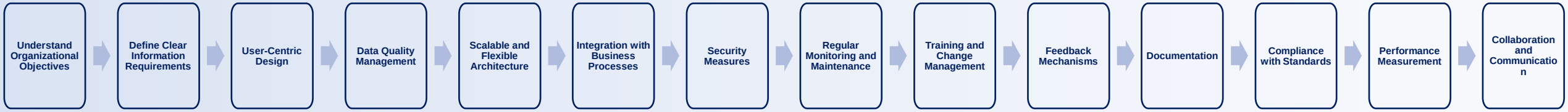
Designing a Management Information System (MIS) involves implementing several best practices to ensure that the system effectively meets the organization's information needs, supports decision-making processes, and aligns with overall business objectives.

By following best practices, organizations can design and implement an MIS that not only meets current requirements but also adapts to the changing needs of the business environment, promoting efficient decision-making and organizational success.



MIS and Control Systems

Designing and Implementing an MIS System – Best Practices

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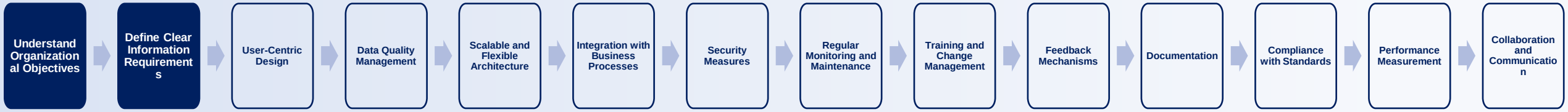
1. Understand Organizational Objectives:

- Align with Business Goals: Ensure that the design of the MIS is closely aligned with the overall objectives and strategic goals of the organization.
- Stakeholder Involvement: Involve key stakeholders at different levels of the organization in the design process to capture diverse perspectives.

2. Define Clear Information Requirements:

- User Needs Analysis: Conduct a thorough analysis of information requirements for each level of management.
- Critical Data Identification: Identify critical data elements that directly impact decision-making processes.



MIS and Control Systems

Designing and Implementing an MIS System – Best Practices

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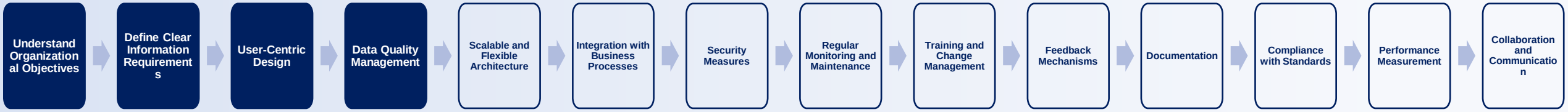
3. User-Centric Design:

- **User-Friendly Interfaces:** Design intuitive and user-friendly interfaces to enhance user adoption.
- **Customization Options:** Provide customization features to allow users to tailor their dashboards or reports according to their specific needs.

4. Data Quality Management:

- **Data Validation and Cleaning:** Implement processes for data validation and cleaning to ensure accuracy and reliability.
- **Data Governance:** Establish data governance policies and procedures to maintain data integrity.



MIS and Control Systems

Designing and Implementing an MIS System – Best Practices

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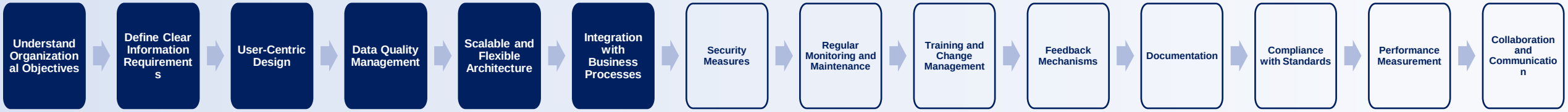
5. Scalable and Flexible Architecture:

- **Scalability:** Design the MIS with scalability in mind to accommodate future growth and increasing data volumes.
- **Flexibility:** Ensure that the system can adapt to changes in business processes and requirements.

6. Integration with Business Processes:

- **Seamless Integration:** Integrate the MIS with existing business processes to support seamless information flow.
- **Automation:** Automate data capture and reporting processes to reduce manual errors and improve efficiency.



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Designing and Implementing an MIS System – Best Practices

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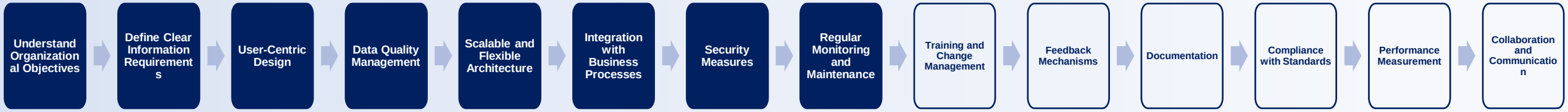
7. Security Measures:

- **Access Controls:** Implement robust access controls to restrict access to sensitive information based on roles and responsibilities.
- **Data Encryption:** Use encryption technologies to secure data during transmission and storage.

8. Regular Monitoring and Maintenance:

- **Performance Monitoring:** Implement monitoring tools to track system performance and identify potential issues.
- **Regular Maintenance:** Schedule routine maintenance to update software, address security vulnerabilities, and optimize system performance.



MIS and Control Systems

Designing and Implementing an MIS System – Best Practices

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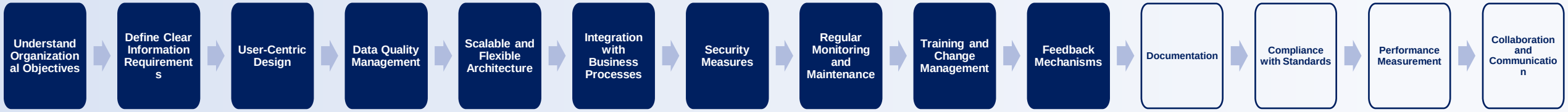
9. Training and Change Management:

- User Training Programs: Conduct comprehensive training programs for users to ensure they can effectively use the MIS.
- Change Management Strategies: Implement change management strategies to facilitate a smooth transition to the new system.

10. Feedback Mechanisms:

- User Feedback Loops: Establish mechanisms for collecting feedback from users to identify areas for improvement.
- Continuous Improvement: Use feedback to iteratively improve the MIS and ensure it remains aligned with evolving business needs.



MIS and Control Systems

Designing and Implementing an MIS System – Best Practices

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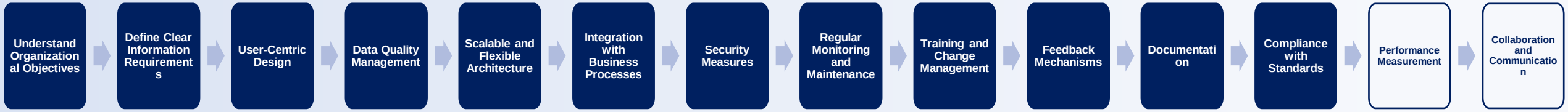
11. Documentation:

- Comprehensive Documentation: Maintain detailed documentation for the MIS, including data dictionaries, system architecture, and user manuals.

12. Compliance with Standards:

- Compliance: Ensure that the MIS design complies with relevant industry standards and regulations.
- Ethical Considerations: Address ethical considerations, especially concerning data privacy and security.



MIS and Control Systems

Designing and Implementing an MIS System – Best Practices

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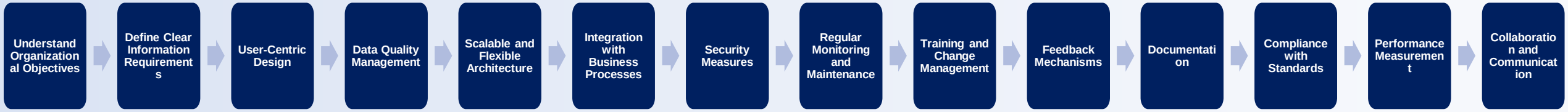
13. Performance Measurement:

- Key Performance Indicators (KPIs): Establish and regularly review KPIs to measure the effectiveness of the MIS.
- Benchmarking: Compare the system's performance against industry benchmarks.

14. Collaboration and Communication:

- Interdepartmental Collaboration: Promote collaboration between different departments to enhance the overall effectiveness of the MIS.
- Communication Channels: Establish effective communication channels for disseminating important information related to the MIS.



MIS and Control Systems

Introduction to Control Systems

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Definition

- In the context of business management, a control system refers to a set of processes, tools, and mechanisms put in place to regulate, monitor, and influence the activities and performance of an organization. The primary goal of a control system is to ensure that the organization's objectives are achieved efficiently and effectively. It involves the establishment of standards, measurement of actual performance, comparison of performance against standards, and the implementation of corrective actions as necessary.

Key components

- A business management control system consists of essential components: standards, setting performance benchmarks; measurement, collecting data through metrics and KPIs; comparison, analyzing actual performance against established standards; feedback, utilizing reporting systems and loops for continuous improvement; corrective actions, adjusting operations based on identified deviations; and adaptability, ensuring flexibility and scalability to accommodate changing business dynamics. These components collectively enable proactive management, efficient decision-making, and the achievement of organizational objectives.

MIS and Control Systems

Designing Control Systems

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Designing a control system involves a systematic process to regulate and optimize organizational performance. Key steps are outlined below:

- Define Objectives: Clearly articulate organizational goals to align control mechanisms with strategic objectives.
- Establish Standards: Set performance standards and benchmarks, defining expected outcomes in various areas.
- Select Metrics: Identify key performance indicators (KPIs) for measuring actual performance against standards.
- Data Collection: Implement systems for collecting relevant data through regular monitoring and reporting.
- Deviation Analysis: Regularly compare actual performance with standards, conducting root cause analysis for deviations.
- Feedback Mechanisms: Create effective communication channels to provide timely feedback on performance.
- Corrective Actions: Develop protocols for adjusting strategies and operations based on performance analysis.
- Adaptability: Design the control system to be flexible and scalable, capable of evolving with changing business dynamics.
- Ethical Considerations: Ensure that control mechanisms comply with ethical standards and legal requirements.
- Continuous Improvement: Establish feedback loops for ongoing evaluation and improvement of the control system.

MIS and Control Systems

Designing Control Systems – Best Practices

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Designing an effective control system in business management involves implementing best practices to ensure it aligns with organizational objectives, promotes efficiency, and facilitates continuous improvement.

By incorporating best practices, organizations can design and implement control systems that not only monitor performance but also contribute to strategic success, employee engagement, and continuous organizational improvement.

- Clear Objectives and Standards: Define precise organizational objectives and establish clear performance standards.
- Strategic Alignment: Ensure that the control system is closely aligned with the overall strategic goals of the organization.
- Selecting Appropriate Metrics: Choose relevant Key Performance Indicators (KPIs) that directly reflect organizational performance and goals.
- Real-time Monitoring: Implement real-time monitoring tools for prompt identification of deviations and immediate corrective actions.
- Regular Reporting: Establish regular reporting mechanisms to keep stakeholders informed and promote transparency.

MIS and Control Systems

Designing Control Systems – Best Practices

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- Data Accuracy and Quality: Ensure data accuracy and quality through rigorous validation processes and data governance.
- Employee Involvement: Involve employees in the control process, fostering a sense of ownership and responsibility for performance outcomes.
- Balanced Approach: Utilize a balanced mix of feedforward, concurrent, and feedback controls for comprehensive management.
- Adaptability and Flexibility: Design control systems that can adapt to changing business environments and requirements.
- Continuous Improvement: Foster a culture of continuous improvement by using feedback loops to make incremental adjustments.

MIS and Control Systems

Designing Control Systems – Best Practices

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- Ethical Considerations: Ensure that control practices adhere to ethical standards and comply with legal requirements.
- Clear Communication Channels: Establish clear communication channels for disseminating control-related information to relevant stakeholders.
- Risk Management: Integrate risk management practices to identify and mitigate potential risks in a proactive manner.
- Employee Training: Provide comprehensive training to employees on control processes and systems to enhance effectiveness.
- Regular Audits: Conduct regular audits to assess the effectiveness of the control system and identify areas for improvement.

MIS and Control Systems

Control Systems – Types

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Management control systems are tools and processes that organizations use to guide, monitor, and evaluate their activities to ensure that they align with organizational goals. There are various types of control systems in management, each serving a specific purpose.

Organizations often use a combination of these control systems to create a comprehensive approach to managing and optimizing their operations. The selection of control systems depends on the nature of the organization, its goals, and the specific challenges it faces.

- Feedforward Control System
- Concurrent Control System
- Feedback Control System
- Financial Control System
- Strategic Control System
- Operational Control System
- Behavioral Control System
- Cybernetic Control System
- Cultural Control System
- Market Control System

MIS and Control Systems

Control Systems – Types

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Feedforward Control:

- Purpose: Anticipates and prevents problems before they occur.
- Implementation: Establishes controls in advance based on forecasts and planning.
- Example: Pre-employment background checks to prevent potential issues.

Concurrent Control:

- Purpose: Monitors activities as they occur to ensure adherence to standards.
- Implementation: Involves real-time monitoring and adjustment during ongoing processes.
- Example: Supervisors overseeing production lines to ensure quality standards are maintained.

Feedback Control:

- Purpose: Assesses performance after the fact and makes adjustments based on results.
- Implementation: Involves reviewing outcomes and taking corrective actions.
- Example: Financial audits conducted after the close of a fiscal year to identify and rectify discrepancies.

MIS and Control Systems

Control Systems – Types

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Financial Control:

- Purpose: Focuses on financial aspects, such as budgets, expenses, and revenue.
- Implementation: Involves budgetary controls, financial reporting, and variance analysis.
- Example: Monthly financial reviews to ensure spending aligns with budgetary constraints.

Strategic Control:

- Purpose: Evaluates the alignment of activities with the organization's long-term strategy.
- Implementation: Involves assessing performance in relation to strategic objectives.
- Example: Regularly reviewing and adjusting business strategies based on market trends.

Operational Control:

- Purpose: Focuses on day-to-day activities to ensure efficiency and effectiveness.
- Implementation: Involves setting operational standards and monitoring processes.
- Example: Quality control checks on production lines to maintain product standards.

MIS and Control Systems

Control Systems – Types

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Behavioral Control:

- **Purpose**: Regulates employee behavior and performance through policies and guidelines.
- **Implementation**: Involves setting expectations and providing incentives or consequences.
- **Example**: Employee performance appraisals and incentive programs.

Cybernetic Control:

- **Purpose**: Uses feedback mechanisms to maintain stability and correct deviations.
- **Implementation**: Involves comparing actual performance to standards and making adjustments.
- **Example**: A thermostat maintaining a set temperature in a room through feedback loops.

Cultural Control:

- **Purpose**: Influences behavior through organizational culture, values, and norms.
- **Implementation**: Involves fostering a culture that aligns with desired behaviors.
- **Example**: Companies promoting a culture of innovation to drive creativity among employees.

Market Control:

- **Purpose**: Relies on competition and market forces to regulate performance.
- **Implementation**: Involves market-driven mechanisms, such as customer feedback and competitive analysis.
- **Example**: Adjusting product prices based on market demand and competition.

Case Studies Groups & Execution

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Team	Business Group (9 Members)			
Roles	Group Leader (1 Member)	Programmers (2 Members)	Experience Professionals (2 Members)	Execution Members (4 Members)
Responsibility	Single point of contact for any query and responsible for coordinating between Programming, Experience and Development Group.	Guiding Development Group member to program the solution	Guiding the development group in designing and implementing the solution	Responsible for Designing & implementation of the solution

Case Study Plan & Execution

Saturday	Group Hour	• Case Study Discussion & End Outcome Definition • Approach Discussion
Sunday	Group Hour	• Approach Discussion (if Needed) • Solution Design & Implementation strategy discussion
Monday	Group Hour	• Development – Day 1
Tuesday	Group Hour	• Development – Day 2
Wednesday	Group Hour	• Development – Day 3 • Presentation Planning
Thursday	Group Hour	• Development – Day 4 & Output Delivery to Presentation Team • Presentation Creation
Friday	Group Hour	• Presentation Creation • Group Review & Feedback • Implementation

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Agenda for Group Hour

- Planning for the day
- Discuss Roadblocks & Solutions
- Planning for any changes in solution
- Discussion on outputs
- Presentation Planning
- Presentation Review
- Any point which is necessary for the project

Building Data Science Solutions

CRISP DM Approach

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About the Company:

Welcome to Corner Market Co., customer friendly neighborhood haven for all daily needs. Nestled in the heart of our community, Corner Market offer a curated selection of quality goods, from fresh produce to household essentials. With its personalized service and a warm atmosphere, store strive to be your go-to destination for convenience and community connection.

Problem Statement:

Corner Market Co., want to establish MIS solution for its executives and there is no existing system setup is available as of now. As a Consultant/Data Scientist you need to identify potential data sources and design & develop best in class MIS for the company.

Building Data Science Solutions

CRISP DM Approach

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Data Overview:

- Store Information
    - This dataset has information about the store and manager. This also have history of store opening and demography of the store.
- Customer Information
    - This dataset provides information about customer enrollment and demographics.
- Order Details
    - This dataset has invoice details like invoice generation date, invoice value and mode of payment.

Building Data Science Solutions

CRISP DM Approach

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Data Snapshot: Store Information

Store-ID	Store-ZIP	Address	Store-Manager	Store-Opening
32639110005	110005	Paharganj	Vikram Malhotra	1981-05-11
89059110021	110021	R.K. Puram	Dev Patel	1982-09-01
59338110025	110025	Safdarjung Enclave	Advait Mishra	1982-12-31
18563110017	110017	Saket	Pranav Iyer	1984-08-22
57986110004	110004	Karol Bagh	Riya Kapoor	1985-05-14
80715110044	110044	Karawal Nagar	Shiv Mehra	1985-11-25
97612110049	110049	East of Kailash	Akshara Gupta	1987-06-08
99744110048	110048	Greater Kailash	Neil Varma	1988-06-05
45422110027	110027	Rajouri Garden	Vivaan Jain	1988-11-19
84122110015	110015	Rajouri Garden	Rahul Gupta	1988-12-12

Building Data Science Solutions

CRISP DM Approach

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Data Snapshot: Customer Information

Customer-ID	Customer-ZIP	Address	Membership-Date
N0001110038	110038	Najafgarh	2020-05-03
R0001110015	110015	Rajouri Garden	1993-08-17
H0001110024	110024	Hauz Khas	2022-09-19
S0001110012	110012	Sarai Rohilla	2010-12-13
K0001110007	110007	Kamla Nagar	2008-04-18
B0001110036	110036	Bawana	2017-04-26
P0001110010	110010	Punjabi Bagh	2007-03-29
P0002110010	110010	Punjabi Bagh	2014-08-13
R0001110027	110027	Rajouri Garden	2002-03-19
T0001110026	110026	Tilak Nagar	2014-09-23

Building Data Science Solutions

CRISP DM Approach

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Data Snapshot: Order Information

Order-ID	Store-ID	Customer-ID	Payment-Method	Invoice-Value	Order-Date
14627110043B0031110040444414180	14627110043	B0031110040	Wallets	752	2021-09-02
60987110024R0070110027452362167	60987110024	R0070110027	Debit Card	208	2023-11-06
18563110017K0057110007451525826	18563110017	K0057110007	Credit Card	822	2023-08-14
23075110016R0003110015446731925	23075110016	R0003110015	UPI	693	2022-04-22
76684110003T0093110026448976030	76684110003	T0093110026	Wallets	123	2022-12-02
58827110002K0018110007451388353	58827110002	K0018110007	UPI	267	2023-07-31
40232110008B0002110040439459392	40232110008	B0002110040	UPI	725	2020-04-24
56502110006G0005110046449624866	56502110006	G0005110046	Credit Card	33	2023-02-05
39725110019S0013110013446345795	39725110019	S0013110013	Wallets	481	2022-03-14
10539110026K0035110014442823024	10539110026	K0035110014	BNPL	786	2021-03-27

Building AI Solutions

Datasets

Sales Data

https://github.com/anantawasthi/IIT-Patna-EMBA-MB511/tree/main/Datasets/001-Sales-Data

EMBA Program
MB-511

Quiz and Assignment

EMBA Program
MB-511

Dear Class your first quiz and assignment will be due as per following schedule.

Please name your submission as "MB511-Assignment-X-YYYYMMDD-Your-Name"

- Quiz 1 February 25, 2024 (1:30 PM – 02:00 PM) – Completed
- Assignment 1 February 25, 2024 (1200 AM) - March 2, 2024 (1159 PM) – Link

- Quiz 2 March 17, 2024 (12:00 AM – 11:59 PM) – Quiz will share before the scheduled time
- Assignment 2 March 15, 2024 (1200 AM) - March 25, 2024 (1159 PM) - Link

EMBA Program
MB-511

Have a question?

Feel Free to Reach out at

- +91-88846-52929 (WhatsApp)
- anant.awasthi@outlook.com (E-Mail)