اللهم صل وسلم وبارك على سيدنا محمد وعلى آله
وصحبة وسلم تسليماً كثيراًطيباً مباركاً فيه

File Organization

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Outline

This lecture covers DIKW model

DIKW Model

File Organization Syllabus

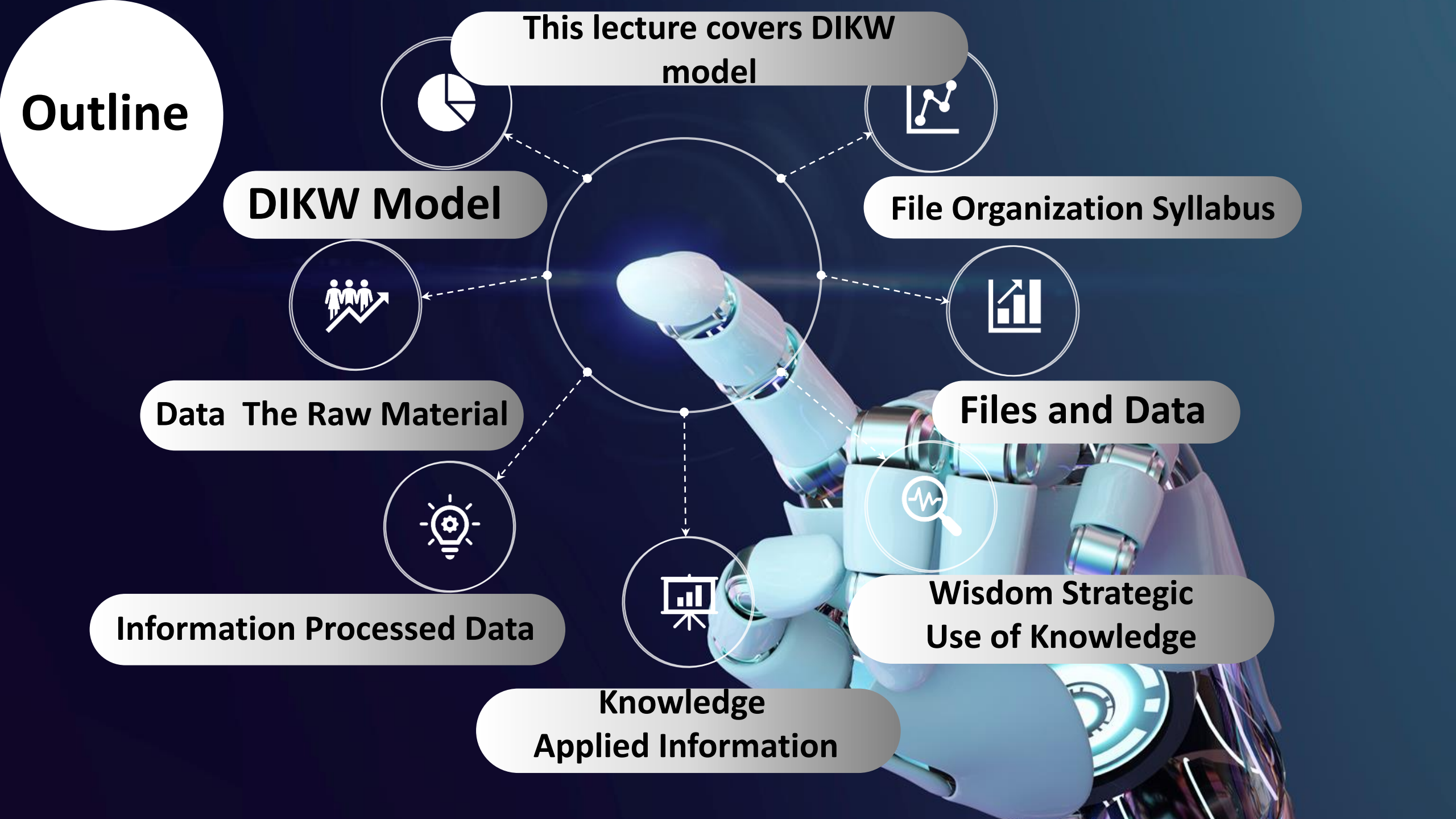
Data The Raw Material

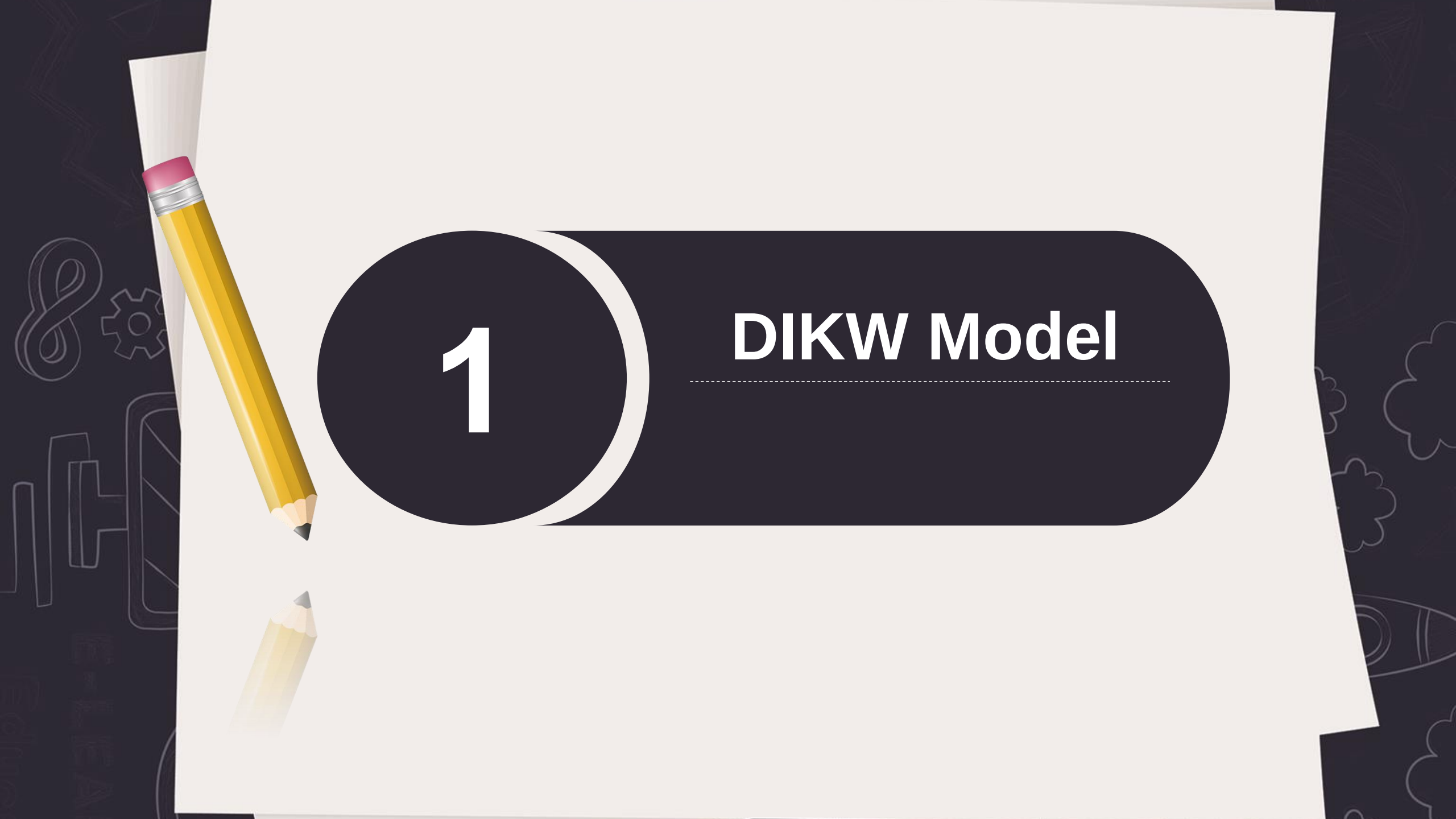
Files and Data

Information Processed Data

Wisdom Strategic Use of Knowledge

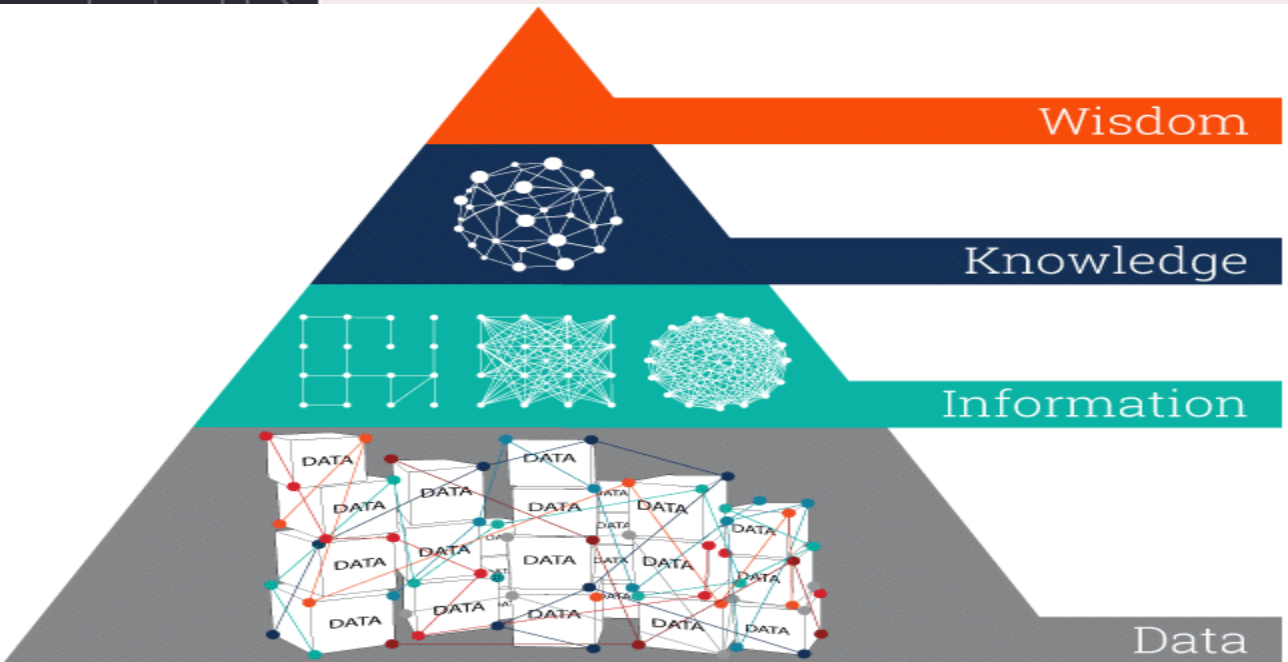
Knowledge Applied Information




1
DIKW Model

DIKW Model

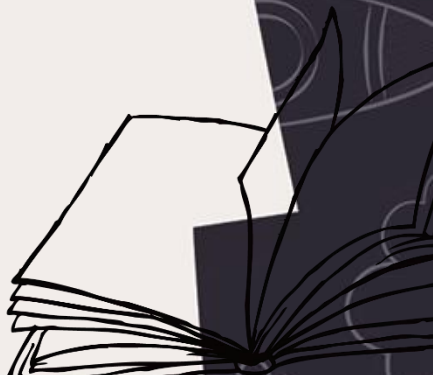
Overview of the DIKW hierarchy
How raw data becomes wisdom through processing and context
- Motivation for File Organization
- Relationship between Data, Information, Knowledge, and Wisdom



Each step up the pyramid answers questions about and adds value to the initial data.

Cont. DIKW Model

The four Similar Terms?
Data, Information, Knowledge, and Wisdom (DIKW) represent a hierarchy where raw data, once processed and organized, becomes information, then knowledge, and finally, wisdom. This progression involves adding context, patterns, and meaning to move from simple facts to a deeper understanding and insightful application. The DIKW pyramid or model illustrates this structured evolution, which is crucial for effective decision-making in various fields.
Data: Raw facts → Information: Processed data → Knowledge: Applied information → Wisdom: Strategic judgment



2

Data
The Raw Material

Data

Definition: Unprocessed facts and observations

- raw material
- basic facts
- supplied substance
- Raw facts, basic observations.

- Examples: sensor readings, transaction logs, names, numbers.
- Role: Input to processing systems.

➔ *Input* to the process!

3
Information
Processed Data

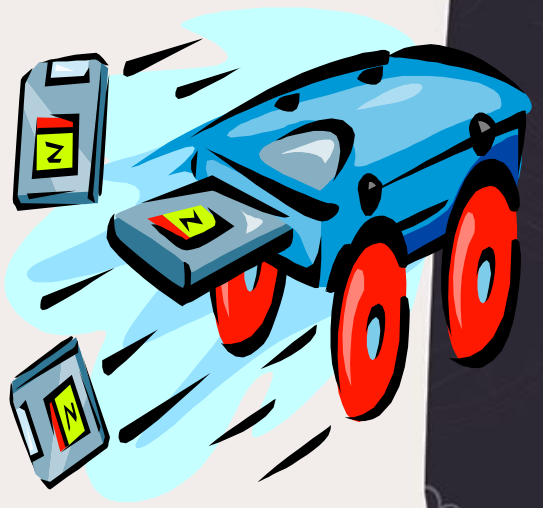
Information

Definition: Data processed to provide meaning

- given answers
- produced results
- derived outcomes

- Examples: monthly sales report, aggregated sensor trends.
- Role: Output of processing; used for reporting and decisions.

➔ *Output* of the process!



4

Knowledge Applied Information

Knowledge

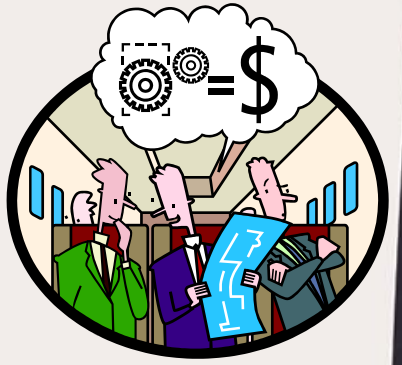
Definition : Rules, relationships and models derived from information

- Algorithmic
- Logic operatives
- Induction/Deduction/Reduction/etc
- Rule/Case/Example-based
- Explanation generation

- Application of information with rules, logic, and experience.
- Examples: business rules, diagnostic procedures, ML models.

Role: Drives automation and intelligent systems

➔ *Driver* of the process(ing)!



5
Wisdom Strategic
Use of Knowledge

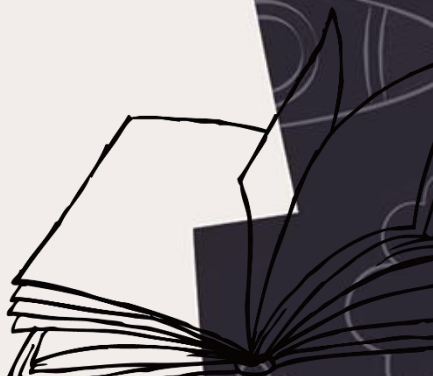
Wisdom

Definition: Sound judgment based on knowledge and context

Importance :

- aligns technical choices with business goals.
- The ability to make sound judgments and decisions based on knowledge.

Examples: choosing architecture for scalability, prioritizing data governance, choosing architectures, trade-offs, governance policies.



6
Files and Data

Files and Data

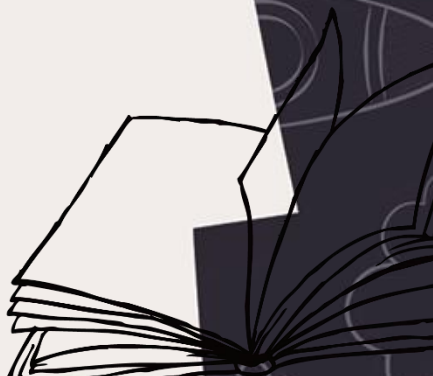
File
Collection of data that have logical connection.

- Concentrate at File Level!
- Interest is only in a Single File!

- A file is a collection of logically related records.
- Focus in File Organization is on how data within files is structured, stored, and accessed efficiently.

Cont. Files and Data

Files are named, persistent collections of data, such as documents, images, or programs, that are stored on a storage device like a hard drive or USB drive.
Data, on the other hand, is the actual information itself, which can be structured (like in a spreadsheet) or unstructured (like an image), and serves to provide insights, convey information, or support decision-making. Files organize and manage this data, making it accessible and useful for users and programs



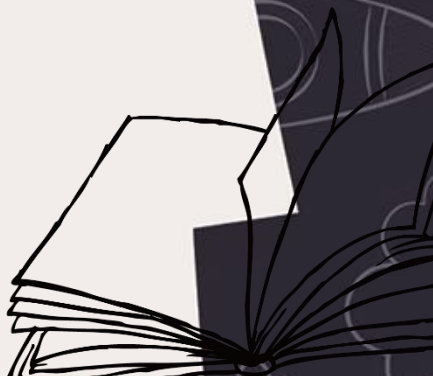
7

File Organization Syllabus

File Organization Syllabus (1)

Motivation for File Organization
Introduction

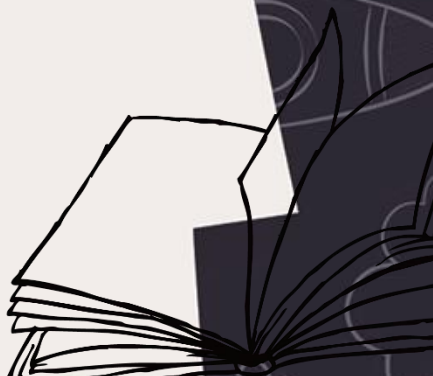
- Data, Information and Knowledge
- Data Units Hierarchy
- The Stream Model
- Internal/External Memory



File Organization Syllabus (2)

Hardware and Its Parameters

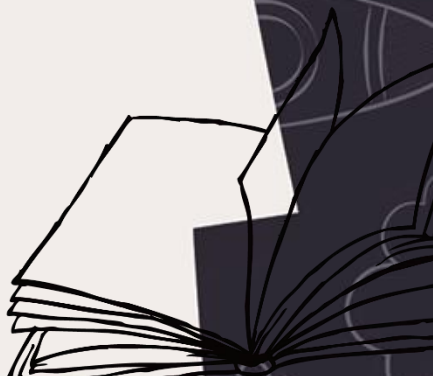
- Internal Memory Technologies
- External Storage Technologies
- Device Interfaces and Management
- Disk Parameters
- Blocking and Buffering
- Data Transfer Rates



File Organization Syllabus (3)

Fundamental File Organizations

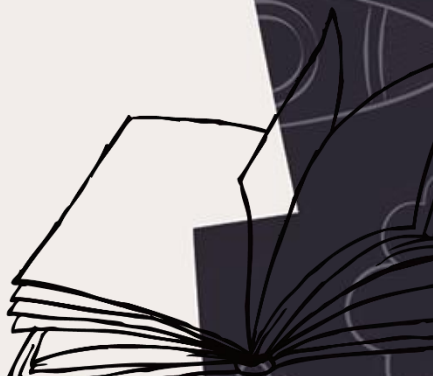
- File Performance Measures
- Basic, Higher-Level and Hybrid File Organizations



File Organization Syllabus (4)

Basic File Organizations

(1) Pile File
(2) Sequential Files
(3) Indexed-Sequential Files
(4) Direct (Access) Files
Summary of Basic Files



File Organization Syllabus (5)

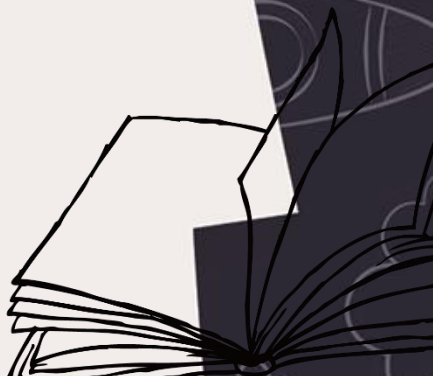
Higher-Level File Organizations

(5) Multi-rings (Linear Files)

(6) B-Trees (Non-Linear Multi-index Files)

Summary of Higher-Level Files

Summary of Six Fundamental File Organizations



Suggested Project Proposals for *File Organization* Course

#	Project Title	Description	Tool / Program	Suggested Performance Metric
1	File Organization Simulation	Develop a small program to simulate how data is stored and retrieved using different file organizations (Sequential, Indexed, Direct, B-Tree).	Python / Java	Access Time, Memory Usage
2	Mini File System Design	Build a prototype file system that supports creating, storing, and searching files with different structures.	C / C++ on Linux	File Search Time, Insert Time
3	Data Structure Comparison for Indexing	Compare the performance of B-Trees, Hash Tables, and Linked Lists in insertion and search operations.	Python (with timeit library)	Time Complexity in Practice (O(n) vs O(log n))
4	DIKW Model Practical Application	Convert raw data (e.g., student records, sales logs) into Information → Knowledge → Wisdom using processing and visualization.	Excel / Power BI / Python (Pandas)	Transformation Speed, Visualization Accuracy

THANK YOU