

Management Information System

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11. Business Intelligence & Data Analytics

Learning Objectives

By the end of this session, students should be able to:

- Explain the role of Business Intelligence (BI) in organizations.
- Describe the BI architecture and data pipeline.
- Differentiate BI from Business Analytics.
- Explain the four categories of analytics.
- Design effective Key Performance Indicators (KPIs).
- Interpret dashboards and BI reports.
- Apply BI concepts to support managerial decision-making.

Part 1:

The Modern Data Dilemma

Understanding why modern enterprises face the strategic paradox of being data-rich yet severely information-poor.



Imagine:

A retail company has thousands of daily transactions.
Managers receive many reports, but still cannot answer:

Which products are most profitable?

Why are sales dropping in one region?

Which customers are likely to stop buying?

The company has data, but lacks insights.

The Problem: Data Glut

- **Siloed Storage:** Point-of-Sale logs, inventory systems, and accounting software exist in isolation and do not "speak" to each other, creating operational and transactional information silos.
- **Lagging Decisions:** Executives routinely receive last month's financial metrics next month, prohibiting agile pricing or market maneuvers.
- **Drowning in Data:** Abundant databases, yet unable to make an immediate pricing decision.



Why BI Matters Today

60%

Decisions Based on Poor Data

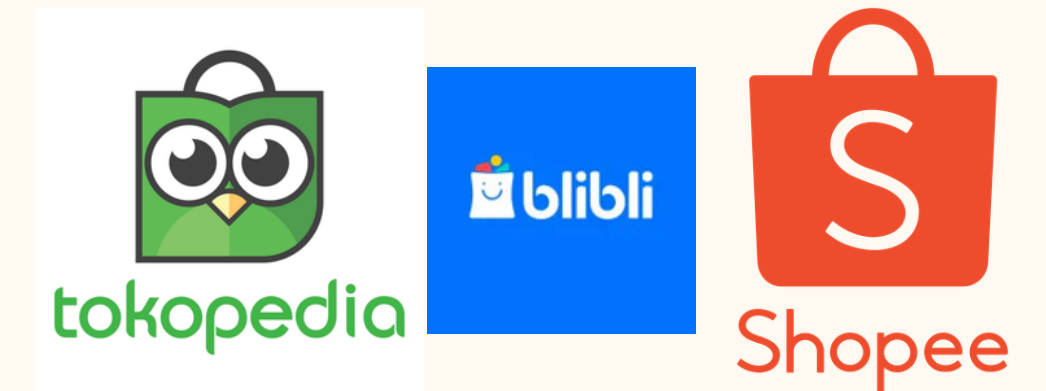
The High Cost of Blind Decisions:

Without structured BI architectures, enterprises operate at immense disadvantages. Manual data collection prevents continuous reconciliation, driving elevated audit and financial statement correction costs.

Lost Opportunity Costs: Delayed detection of localized demand variations leads directly to inventory failures, customer churn, and collapsed profit margins.

BI in Daily Life

- Netflix recommends movies based on viewing history.
- E-commerce platforms suggest products.
- Banks detect suspicious transactions.
- Ride-hailing apps predict demand and pricing.



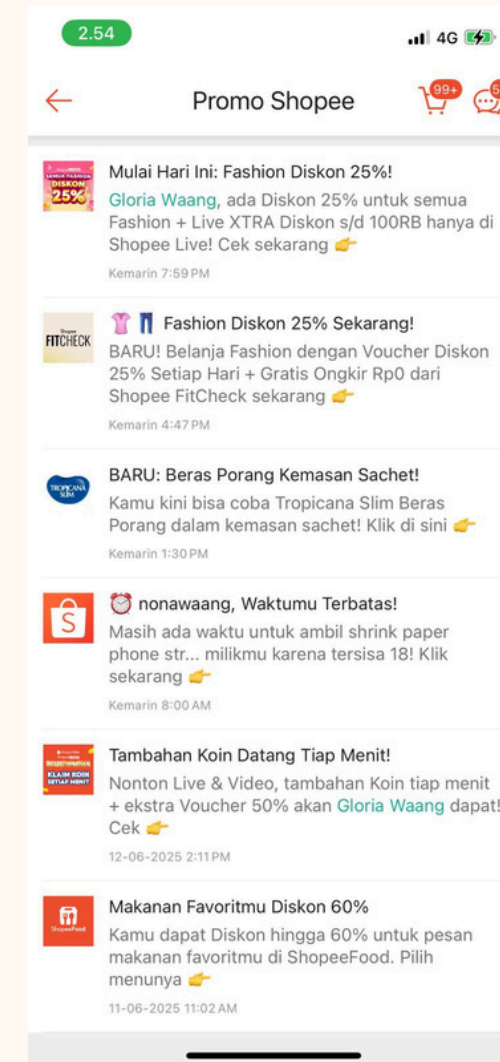
Real-World Example: Shopee

Every day Shopee collects:

- Millions of transactions
- Product searches
- Customer reviews
- Payment records

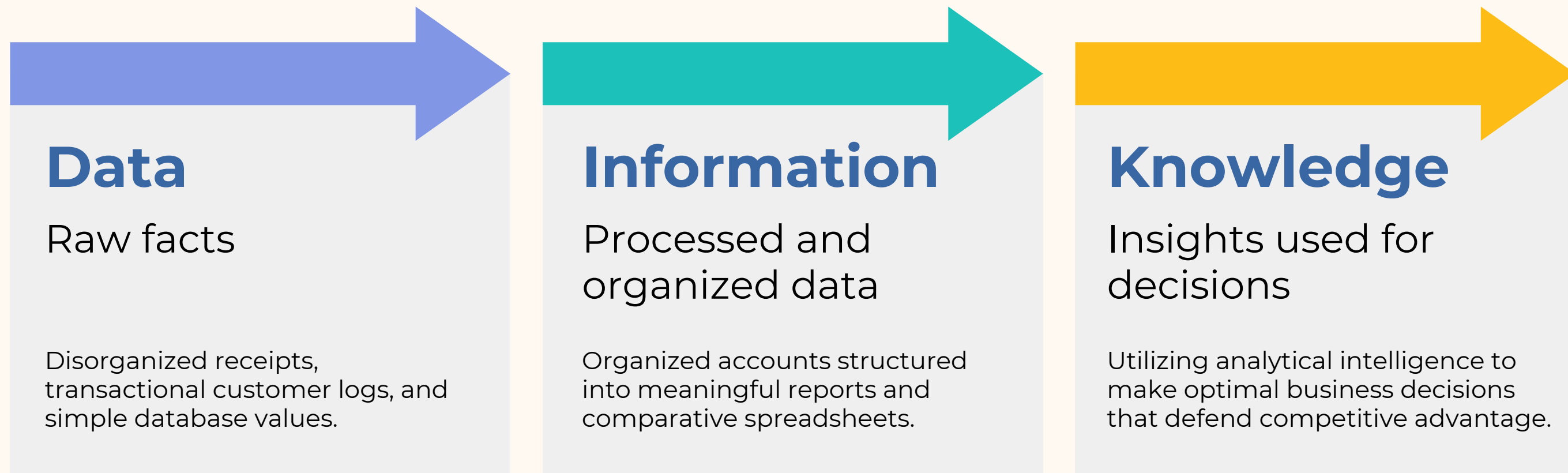
Management wants to know:

- Which products are trending?
- Which sellers generate the most revenue?
- Which customers are likely to stop buying?



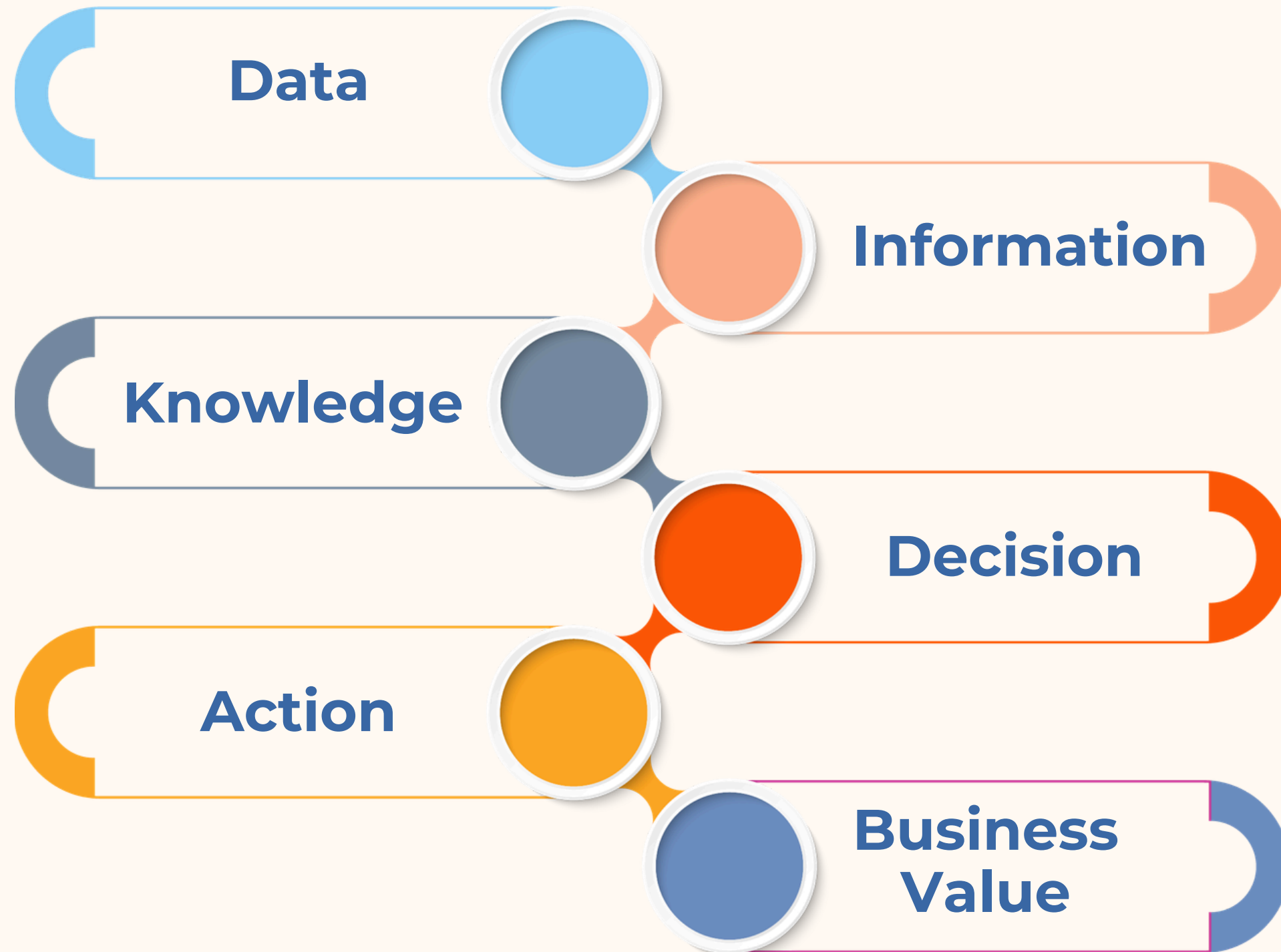
Business Intelligence transforms raw data into actionable insights.

The Strategic Data: Value Ladder



BI helps convert data into knowledge.

From Data to Business Value



Example:

Data:

500 students absent.

Information:

20% absence rate in the MIS class.

Knowledge:

Attendance drops before examinations.

Decision:

Provide review sessions.

Business Value:

Improved student performance.

Part 2:

BI Infrastructure Stack

**A comprehensive examination of back-end corporate architectures:
from operational ingestion to multi-dimensional analysis.**

Diverse Sources of Business Data



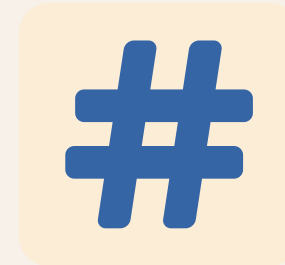
Internal Legacy Systems

Transactional datasets originating within the boundaries of the firm, including core ERP ledgers, CRM records, and Human Resources metrics.



External & Open Feeds

Third-party datasets, public economic indicators, regulatory government databases, competitive intelligence, and demographic trends.



Unstructured Content

Non-relational data formats like social media comments, promotional emails, training videos, and log tracking files.

The Enterprise BI Data Pipeline



Demystifying The ETL Process

Extract & Transform

Extraction: Pulling disparate structured and unstructured inputs out of individual operational repositories.

Transformation: Translating varying schemas, currency parameters, dates, and names into standard organizational models while filtering out corrupt fields.

Load & Solidify

Loading: Delivering the highly organized, standardized database variables into secure, scalable central analytical environments.

Goal: Ensuring that downstream metrics are generated from completely unified, pristine information assets.

The Corporate Data Warehouse

- **Subject-Oriented:** Architected around critical enterprise entities, such as customers, operations, and financials.
- **Integrated:** Unifying all historical databases into a single corporate environment with consistent labels.
- **Non-Volatile:** Historical logs are read-only and static, protecting historical data integrity against daily transactional operations.



Example: University BI

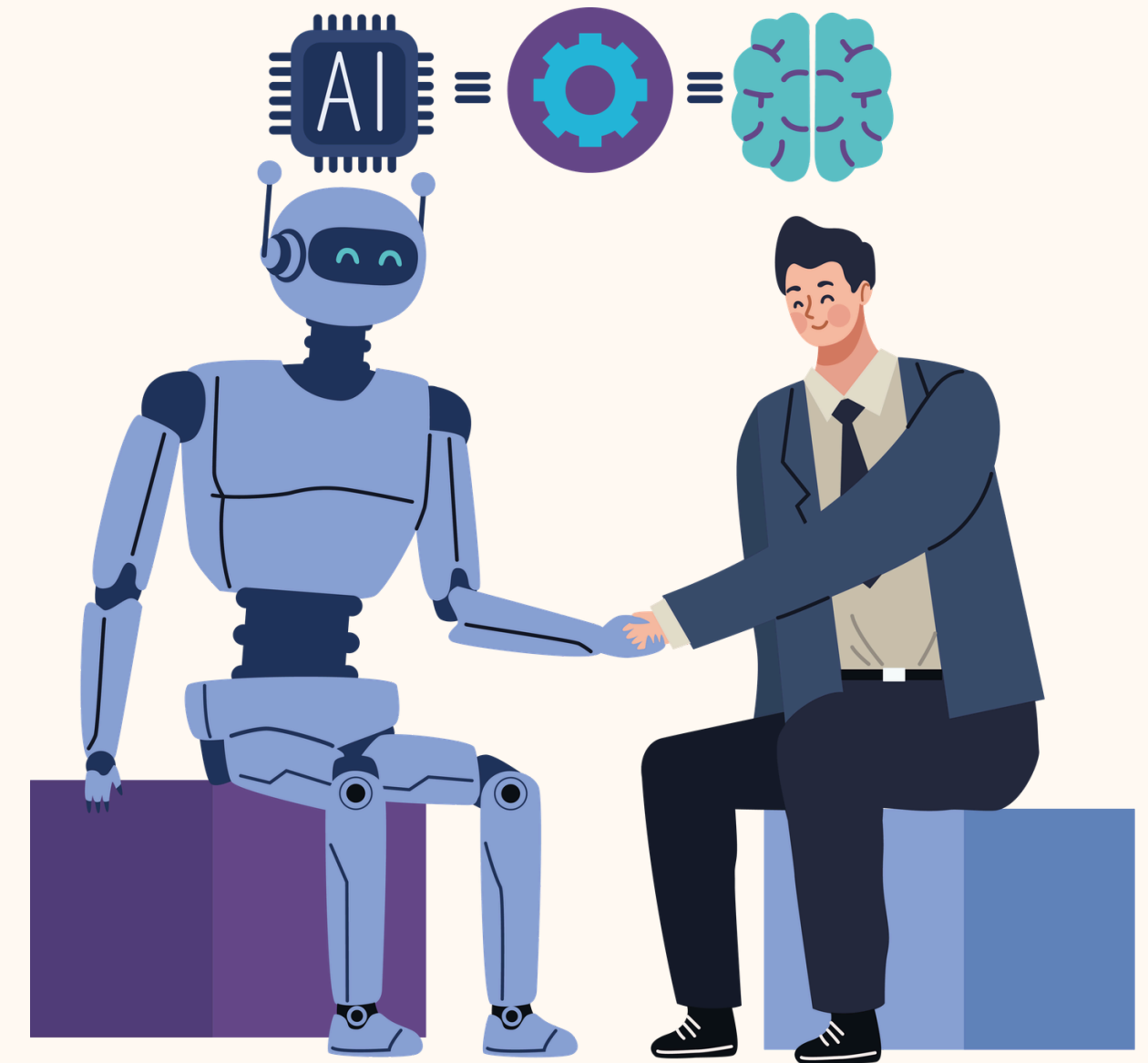
Data Sources

- LMS activity
- Attendance
- Tuition payments
- GPA records
- Library usage

BI Questions:

- Which students are at risk?
- Which courses have highest failure rates?
- Which departments have highest retention?

BI Output: Executive Dashboard for university management.



Part 3:

Categorizing Data Analytics

Investigating the spectrum of analytical options—ranging from legacy operational overviews to predictive model simulation.

Business Intelligence vs Analytics

Business Intelligence (BI)

Focus:

What happened in the past?
Why is it happening right now?

Functionality: Collects and queries structured historical database files to generate daily summaries, audit-ready balance spreadsheets, and visual dashboards.

Role: Drives critical day-to-day tracking, monitoring, and financial review.

Business Analytics (BA)

Focus:

What will happen next?
What is the best possible option?

Functionality: Deploys advanced machine learning, predictive algorithms, statistical models, and trend modeling techniques to parse historical values.

Role: Anticipates future changes and simulates potential outcomes.

Business Intelligence vs Analytics

Business Intelligence

Focus on past and present

Reporting

Dashboards

Monitoring

What happened?

Business Analytics

Focus on future

Prediction

Models

Optimization

What will happen?



**Can an organization have BI without Analytics?
Can it have Analytics without BI?**

Four Pillars of Modern Analytics

1 Descriptive Analytics

What happened?

2 Diagnostic Analytics

Why did it happen?

3 Predictive Analytics

What may happen?

4 Prescriptive Analytics

What should we do?

Deep Dive: Descriptive & Diagnostic

Descriptive Analytics Applications

Provides the baseline reporting layer for standard auditing procedures.

Allows accounting departments to organize quarterly tax filings, check balances, and publish corporate annual results.

Ensures that legal, regulatory, and baseline operational tracking metrics remain compliant.

Diagnostic Analytics Applications

Enables analysts to isolate anomalies from baseline descriptive results.

Identifies why a specific product line overperformed, or why store conversions declined in Q3.

Discovers latent bottlenecks within physical distribution and corporate pipelines.

Deep Dive: Predictive & Prescriptive

Predictive Analytics Power

Uses statistical forecasting models, machine learning patterns, and regression analysis to predict future outcomes.

Enables proactive decision-making—such as predicting which high-value accounts are most likely to stop purchasing.

Supports robust credit rating evaluations and detailed strategic pricing models.

Prescriptive Analytics Solutions

Synthesizes predictive metrics to automatically recommend optimal decisions.

Maintains dynamic pricing algorithms to maximize profit margin based on localized supply-demand curves.

Optimizes logistics, scheduling, and distribution networks in real-time.

Analytics Supports Different Levels of Management

Level	Key Question	Analytics Used
Operational	What happened today?	Descriptive
Tactical	Why did sales decline?	Diagnostic
Strategic	What should we do next year?	Predictive & Prescriptive

Modern Analytics in Practice

Netflix

Predictive Analytics

- Predicts what users want to watch

Grab

Prescriptive Analytics

- Recommends surge pricing
- Optimizes driver allocation

Banking

Predictive Analytics

- Detects loan default risk



Corporate Tiers & Information Needs

Organizational Level	Decision Type	Information Characteristics	Primary BI Tooling
Strategic (Executives)	Unstructured	Aggregate, external, highly speculative	Balanced Scorecards, Portals
Tactical (Middle Managers)	Semi-structured	Internal trends, historical comparisons	Ad-hoc Query, DSS, OLAP
Operational (Staff/Auditors)	Structured	Real-time, detailed, highly structured	Dashboards, Transaction reports

Part 4:

Performance Management

Analyzing how modern enterprises convert strategic roadmaps into operational frameworks via KPIs and dashboards.

Key Performance Indicators (KPIs)

- **Strategic Alignment:** KPIs act as structural anchors, linking daily operational processes directly to the long-term corporate mission.
- **Leading vs Lagging:**
 - **Lagging:** Tells you what happened (e.g., net income).
 - **Leading:** Predicts future performance (e.g., customer satisfaction scores).
- **Measurement Standard:** Every chosen KPI must map directly to clean, objective operational metrics—ensuring progress can be calculated easily.

Designing SMART KPI Metrics

The Core SMART Framework

- **Specific:** Clearly focused on a precise operational goal.
- **Measurable:** Calculated using quantifiable datasets.
- **Actionable:** Drives clear decisions and strategic shifts.
- **Relevant:** Aligns with the core mission of the department.
- **Time-bound:** Tied to a strict execution schedule.

Standard Accounting Examples

Financial Targets: Tracking operational net profit margin, dynamic revenue growth rates, and return on assets.

Non-Financial Metrics: Measuring staff turnover trends, digital client acquisition cost, and average processing speed.

 "We want more students to graduate."

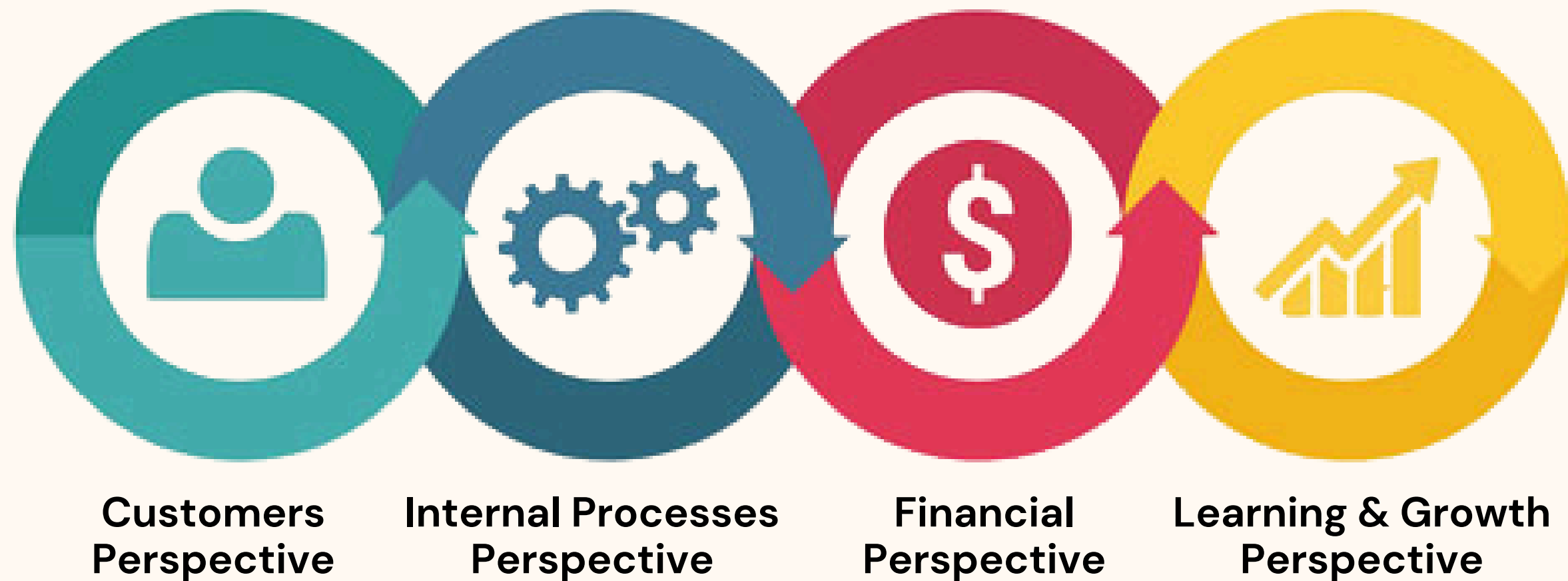
 Increase the graduation rate from 78% to 85% within three academic years.

KPI Examples

Organization	Business Goal	Example KPIs
E-Commerce	Increase sales & customer loyalty	<ul style="list-style-type: none">• Revenue Growth• Customer Acquisition• Customer Retention• Average Order Value
University	Improve student success	<ul style="list-style-type: none">• Student Retention Rate• Graduation Rate• Student Satisfaction• Employment Outcomes
Hospital	Improve patient care	<ul style="list-style-type: none">• Patient Satisfaction• Treatment Success Rate• Average Waiting Time

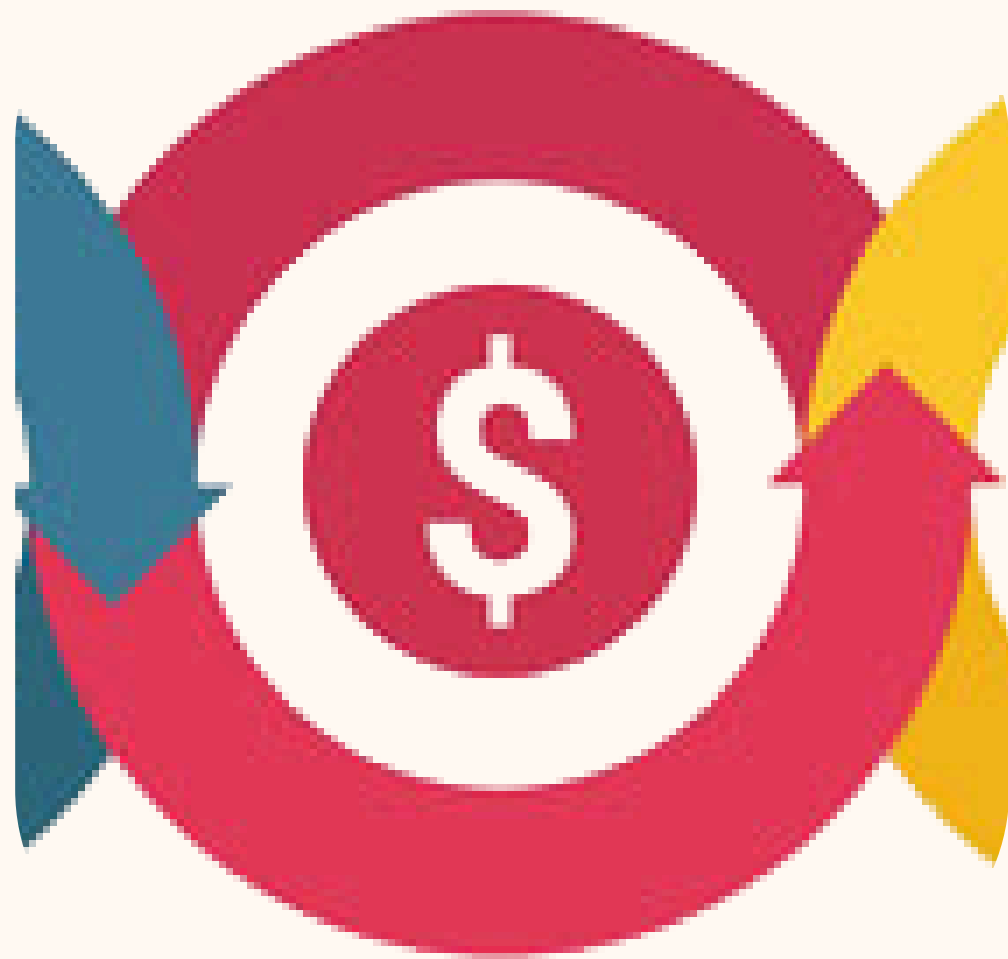
There is no universal KPI for every organization.
The best KPI is the one that helps managers measure progress toward their goals.

Balanced Scorecard Framework








This model forces organizations to balance traditional financial KPIs with customer retention metrics, training investments, and process improvement.

Balanced Scorecard Framework



Financial Perspective:

-  Revenue Growth
-  Profit Margin
-  ROI
-  Cash Flow
-  Operating Costs

Question for Managers:

"Are our strategies creating financial value?"

Balanced Scorecard Framework



Customer Perspective:

Satisfied Customers:

- Repeat Purchases
- Positive Reviews
- Business Growth

Managerial Question

"Are we creating value and positive experiences for our customers?"

Balanced Scorecard Framework



Internal Business Process Perspective:

Efficient Processes



Better Customer Experience



Higher Customer Satisfaction



Stronger Financial Performance

Managerial Question

"Which internal processes have the greatest impact on customer and organizational performance?"

Balanced Scorecard Framework



Learning & Growth Perspective:

Financial



Customer



Internal Processes



Learning & Growth

Learning & Growth is the foundation that enables all other perspectives to succeed.

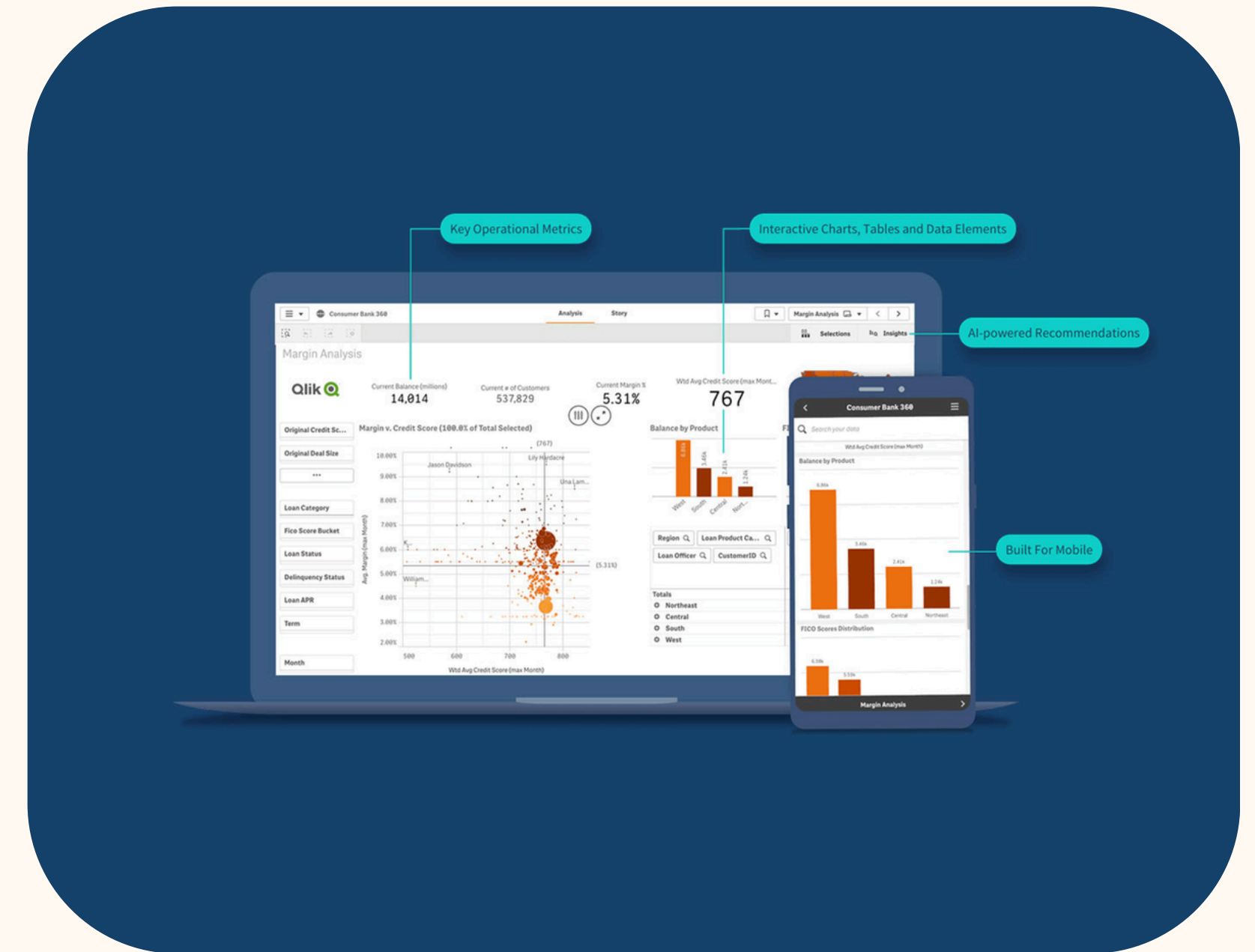
Dashboards: Turning Data into Action

Visual Intelligence in Action

Dashboards compile complex metrics into intuitive, visual, and highly interactive interfaces.

Operational Dashboards: Designed for frontline teams to track real-time logistics and hourly transactions.

Strategic Dashboards: Designed for C-Suite executives to track long-term health and corporate goals.

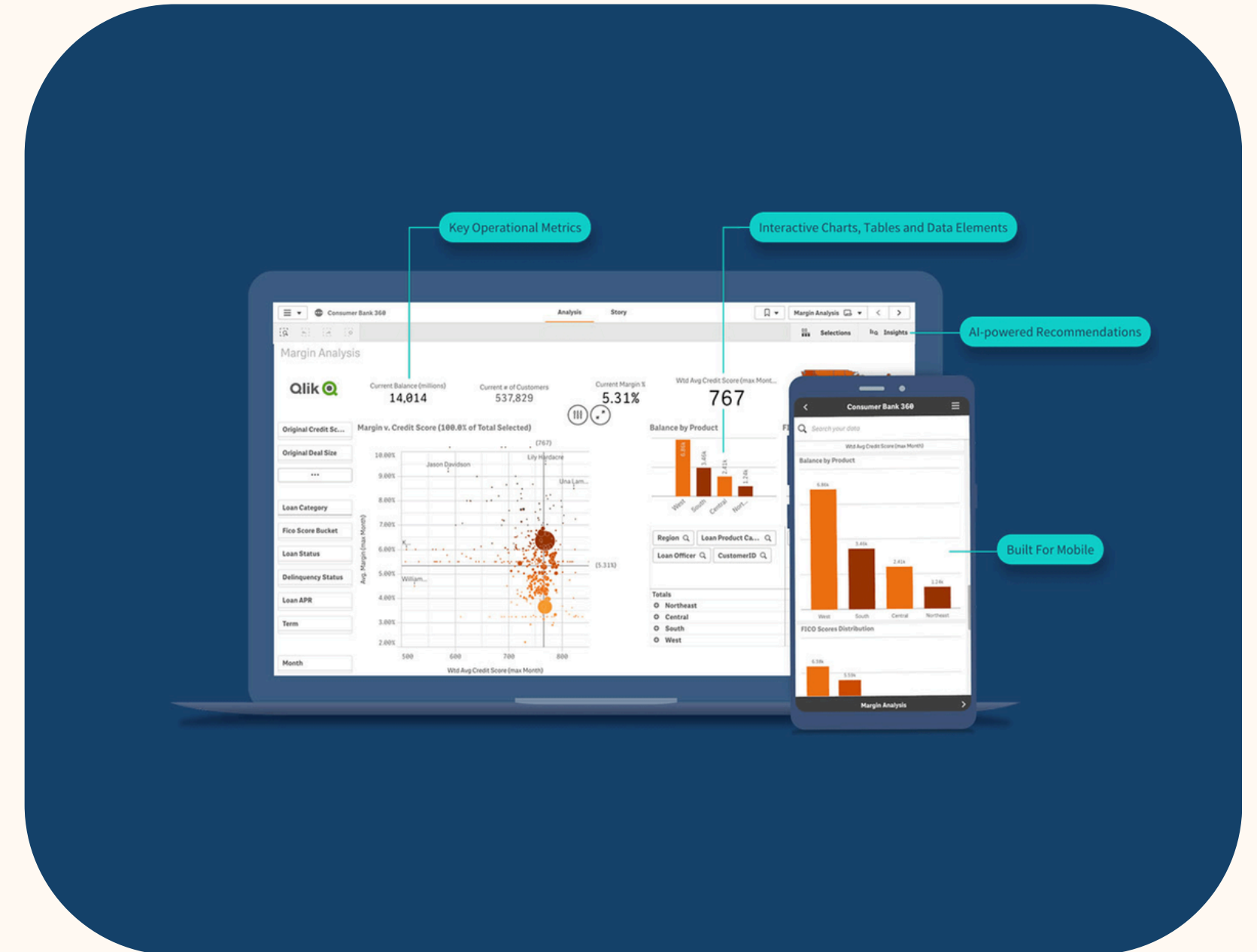


Source: <https://www.qlik.com/us/dashboard-examples/financial-dashboards/>

Dashboard Design Principles

An Effective Dashboard Should Be:

- **Simple:** Easy to understand at a glance
- **Focused:** Displays only critical KPIs
- **Actionable:** Highlights areas requiring attention
- **Visual:** Uses charts and indicators effectively
- **Fast to Interpret:** Supports quick decision-making



Source: <https://www.qlik.com/us/dashboard-examples/financial-dashboards>

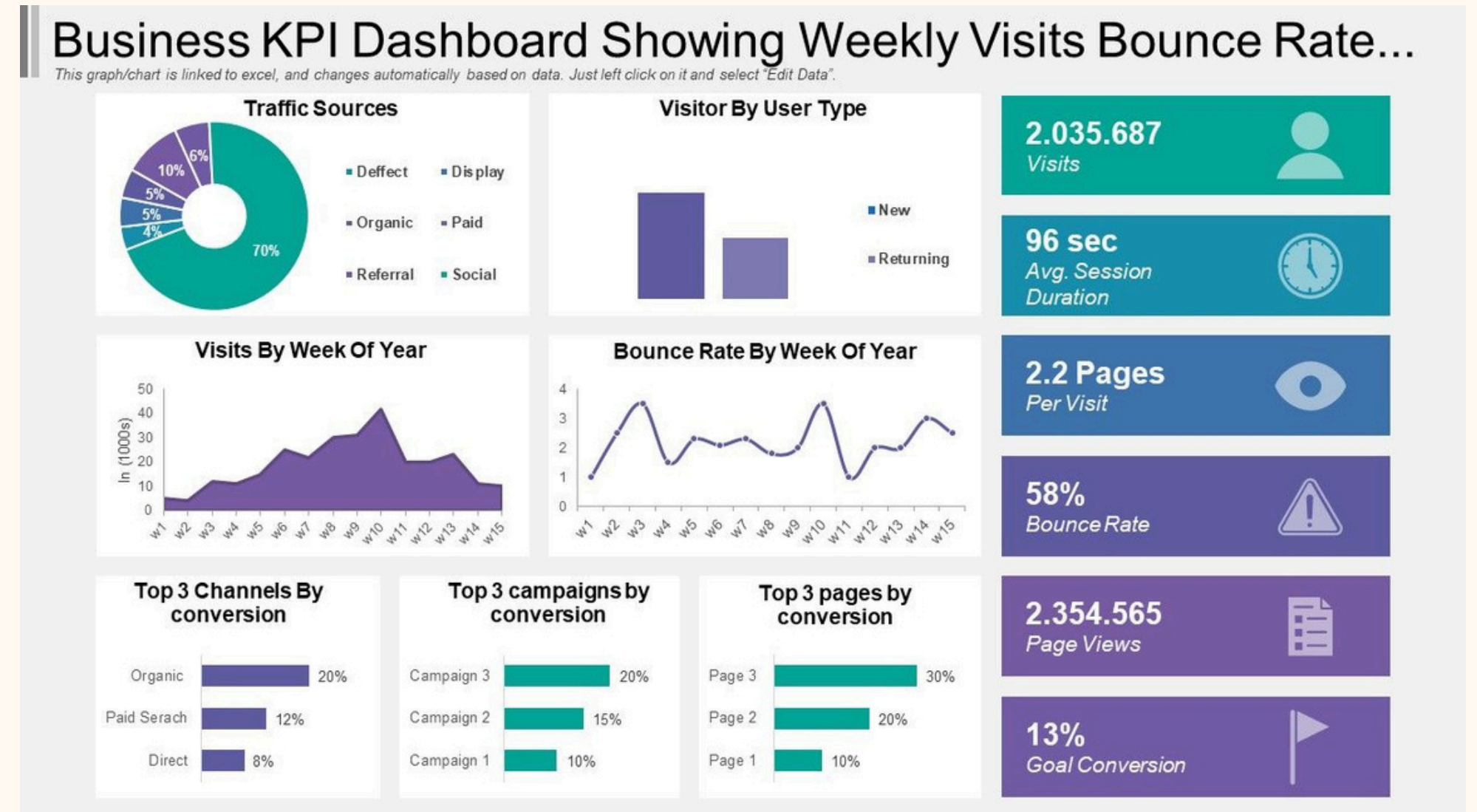
Part 5:

Accounting & Auditing Transformation

Analyzing how business intelligence changes legacy accounting models, audit compliance, and cost frameworks.

Accounting & Auditing Using BI

- **Continuous Auditing:** Moving away from annual random samples to real-time 100% population analysis.
- **Fraud Detection:** AI models flag anomalies in journal entries instantly, preventing significant loss.
- **Cost Control:** Instant activity-based costing dashboards highlight inefficiencies directly.



Source: <https://www.slideteam.net/business-kpi-dashboard-snapshot-showing-weekly-visits-bounce-rate-and-traffic-source.html>

The Paradigm **Shift in Auditing**

Moving away from manual, backward-looking sample testing, modern auditing uses BI to run continuous assessments across 100% of corporate records.

— **Audit Technology Journal**

BI Impact on Decision Latency



Continuous reporting drastically reduces latency, accelerating critical corporate decisions.

Quantifying BI Financial Returns



Trend analysis showing positive cash flow improvement after implementing real-time continuous audits.

Evaluating The BI Investment

$$\text{BI_ROI} = \frac{\Delta \text{Financial Gain}}{\text{BI Investment Cost}}$$

Justifying BI Project Budgets

To secure executive backing, analysts must quantify direct, tangible returns on infrastructure projects.

We calculate incremental gains (Δ) by measuring audit cost reductions, faster reconciliation cycles, and recovered margins.

Part 6:

Risk, Governance, & Roadmap

Mapping the deployment pipeline and navigating the cultural, technical, and compliance risks of BI systems.

Enterprise BI Challenges

Poor Data Quality

Garbage In, Garbage Out:

Aggregating corrupt, duplicate, or unverified operational data directly damages dashboard metrics.

This structural failure leads to inaccurate reports and strategic mistakes.

Organizational Obstacles

Friction & Costs: Resistance from operational teams, high development fees, and a lack of skilled analytics talent.

Without unified management standards, BI tools can become expensive, unused corporate displays.

Critical Success Factors

Strong Governance

Establishing clear, corporate-wide ownership of operational data validation and cleansing.

Value-Focused Design

Developing simple, user-friendly, and actionable dashboard interfaces for executives.

Strategic Alignment

Ensuring all operational dashboard metrics link directly to high-level Balanced Scorecard objectives.

Ethics & Privacy

Maintaining strict regulatory compliance to prevent modeling bias and secure sensitive customer information.

Emerging Trends in BI

AI-Powered BI

Power BI Copilot

Self-Service BI

Managers create reports themselves.

Real-Time Analytics

Live monitoring dashboards.

Natural Language Query

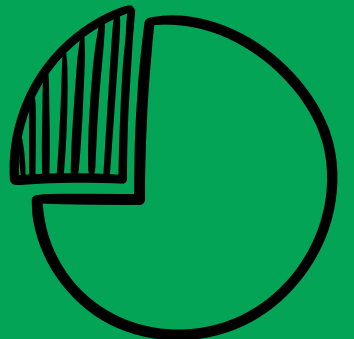
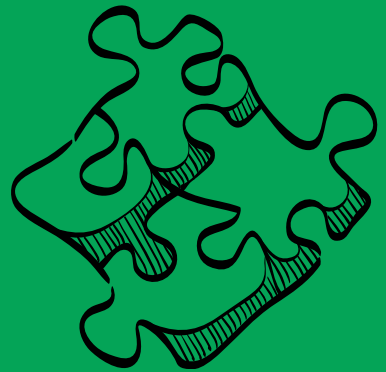
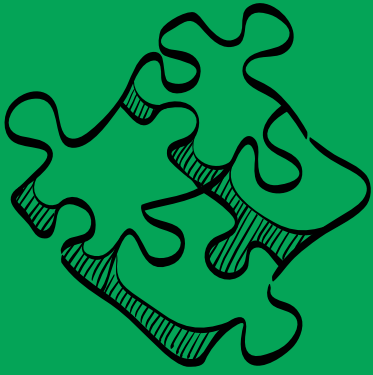
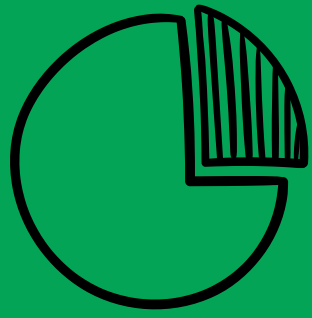
"Show sales by region."

Data Democratization

Everyone can access insights.

Key Takeaways

- Business Intelligence transforms data into insights
- BI Infrastructure: Data Sources → ETL → Warehouse → Dashboard
- Analytics:
 - Descriptive → Diagnostic → Predictive → Prescriptive
- Performance Management:
 - KPIs + Balanced Scorecard + Dashboards
- BI Supports Better Decisions at All Management Levels
- *Data becomes valuable only when it helps organizations make better decisions.*



Thankyou!

Reference

- Management Information System, Hossein Bidgoli. Cengage. 10th Edition. 2020
- Management Information System: Managing the Digital Firm. Kenneth C. Laudon & Jane P. Laudon. Pearson. 16th Edition. 2020.