BI SYSTEM QUALITY

Determinate what to do with Shadow systems?

Shadow systems (or “shadow IT”) are unofficial data systems or tools created and used by departments or individuals outside the central IT or BI governance.

1. ID the shadowsystems in the org
2. Describe it: Type, drawbacks (risks), and benefits (value) • Interview owner(s)
3. Evaluaterisk level of shadow system for Sourcing, transformation, and analyses
4. Evaluatebusiness value at local and organizational level
5. Give Overview of shadow systems including recommendations (YOUR JOB)
6. Management ranking based on KPIs contribution.
7. Decideon shadowsystems // BI opportunities

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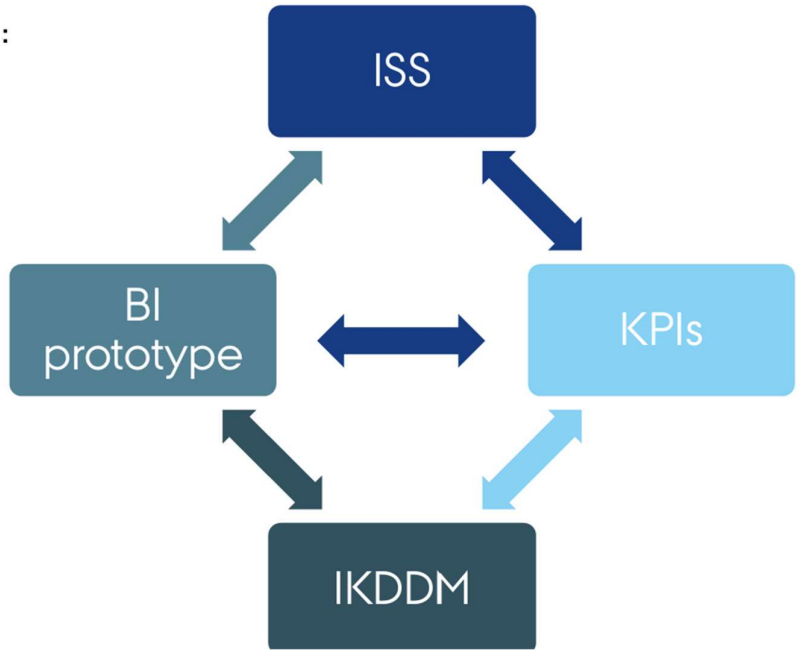


IKDMM — Integrated Knowledge Discovery and Management Model
This usually refers to the **process of discovering, organizing, and managing knowledge** in the organization.
It's the *conceptual framework* behind BI.
In simpler terms:
IKDMM helps you **turn raw data into organizational knowledge** — what people know and can use to make decisions.
Key functions of IKDMM:

- Identify what knowledge (data insights) the company needs.
- Manage how it's collected, stored, and shared.
- Guide how BI should support knowledge creation.

IKDMM = "how we manage knowledge that BI produces."

BI Prototype
A **BI prototype** is an **early version** of a BI solution — like a dashboard or report model — created to test how data and knowledge can be delivered effectively.
Purpose:

- Experiment with data sources and KPIs.
- Validate what information decision-makers actually need.
- Test usability and system design before full rollout.

Think of it as a *draft BI system* that helps connect knowledge (IKDMM) to practical performance tracking (KPIs).

ISS — Information Support System
The **Information Support System** (or sometimes "Information Systems Support") is the **technical and organizational backbone** that supports BI and knowledge use.
Components include:

- Databases and data warehouses
- ETL (Extract, Transform, Load) processes
- Analytical tools and reporting interfaces
- IT policies and governance structures

ISS makes sure the data flow and analysis are reliable and available for decision-making.

KPIs — Key Performance Indicators
KPIs are **quantifiable measures** that reflect how well a business is achieving its objectives.
In this chain:

- BI systems generate KPIs from analyzed data.
- IKDMM uses KPI outcomes to refine knowledge and strategy.
- ISS provides the infrastructure to compute and monitor KPIs.

KPIs close the loop between *data*, *knowledge*, and *performance*.

Interpretation:

- The **IKDMM** defines *what knowledge* and insights are needed.
- The **BI prototype** tests and develops *how to deliver those insights*.
- The **ISS** supports this with *data management and system infrastructure*.
- The **KPIs** measure *how successful the organization is* based on BI output.
- The **results (KPIs)** feed back into the **IKDMM**, improving the next BI iteration.

ISSM

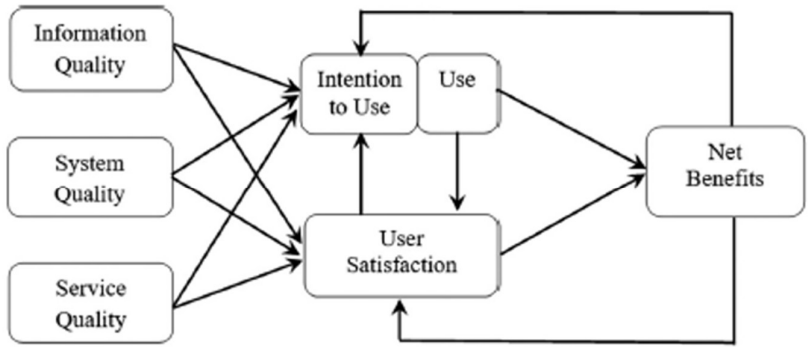
The Information Systems Success Model (ISSM) explains why some information systems succeed — by identifying six key dimensions that together determine success.

In BI, this model helps you evaluate how well your BI system is performing technically, behaviorally, and in business impact.

The Six ISSM Dimensions:

Dimension	Definition (Theory)	BI Example (Practice)	How It Drives Success
1. System Quality	Technical quality: reliability, speed, usability, flexibility, response time.	Power BI dashboard loads quickly, easy to navigate, interactive filters, minimal downtime.	Makes users *want* to use the system (higher adoption).
2. Information Quality	Accuracy, relevance, completeness, timeliness, and consistency of the data/reports.	Clean, verified data from CRM and billing used for churn prediction dashboard.	Builds *trust* in the data and improves decision accuracy.
3. Service Quality	Quality of user support — training, responsiveness, helpdesk, system maintenance.	BI support portal answers user requests within 24 hours; regular training sessions.	Encourages *user confidence* and continuous use.
4. Use / Intention to Use	How much users actually use or intend to use the BI tools.	Marketing managers check dashboards daily to monitor KPIs.	Greater use = greater *organizational learning* and *data-driven decisions*.
5. User Satisfaction	How happy users are with the BI system; meets their expectations.	Post-survey: 90% of users find the BI system "essential."	Satisfaction reinforces *continued use* and *trust in BI*.
6. Net Benefits	Overall positive impact for individuals & organization — performance, productivity, ROI, competitive advantage.	BI reduces customer churn 5%, improves marketing ROI 20%, lowers inventory costs.	Demonstrates *real business value* and *strategic success*.

Model:



Source: DeLone and McLean (2003)

The ISS Model shows:

High System + Information + Service Quality → drives Use & User Satisfaction → which leads to Net Benefits

This means:

If your BI system is technically strong, provides good-quality information, and has good user support, then people will use it more and be happier with it, and this will create real business benefits.

In BI terms

How well the BI system works technically — it should be **fast, reliable, easy to use, and flexible**.
(When the system runs smoothly, users *trust it* and *want to use it regularly*.)

➔ High System Quality

The **data** produced by the BI system should be **accurate, relevant, complete, and up-to-date**.
(If the data is wrong or confusing, people stop relying on BI.)

➔ High Information Quality

The **support and services** that come with the BI system — training, responsiveness, and help when issues occur.
(Good support makes users feel confident and valued → leads to higher **satisfaction and engagement**.)

➔ High Service Quality

Use & User Satisfaction
When the first three qualities are strong (High System Quality, High information Quality, high service quality)

- Users **actually use** the BI tools in their daily work (Use)
- They **enjoy using** them because they're helpful and reliable (User Satisfaction)

Example

A marketing manager logs in every morning to check campaign KPIs because the dashboard is fast, accurate, and easy to read.

Result

Consistent use of BI → better understanding of the business → smarter decisions.

Benefits

- Better and faster decision-making
- Higher productivity
- Cost reduction
- Increased profits
- Improved customer satisfaction
- Stronger data-driven culture

System Success and BI KIP Impact:
Each dimension of system success (from the DeLone & McLean ISS Model) has a success driver — something that makes it work — and that success driver affects a specific measurable BI KPI (Key Performance Indicator).

Dimension	Success Driver	BI KPI Impact
System Quality	Fast, reliable, user-friendly BI tools	Adoption Rate ↑
Information Quality	Accurate, timely, relevant data	Decision Accuracy ↑
Service Quality	Strong BI support & training	User Engagement ↑
Use / Intention to Use	Actual and intended BI usage	BI Adoption ↑
User Satisfaction	Positive user feedback	Trust in BI ↑
Net Benefits	Organizational improvements	Profit, ROI, Efficiency ↑

System Quality → If the BI system performs well and is user-friendly, more people will actually adopt and use it. (Adoption Rate ↑)

Information Quality → When BI delivers trustworthy and current information, decision-makers make fewer mistakes and choose better strategies. (Decision Accuracy ↑)

Service Quality → Good service (helpdesk, documentation, training) keeps users confident, motivated, and engaged with BI tools. (User Engagement ↑)

Use / Intention to Use → The more BI is embedded in daily routines (like checking KPIs every morning), the stronger its organizational presence. (BI Adoption ↑)

User Satisfaction → When users are satisfied — because BI is useful, simple, and accurate — they develop trust in the system and continue to rely on it. (Trust in BI ↑)

Net Benefits → The final outcome of a successful BI system: it creates real business value — better decisions, cost savings, and higher profits. (Profit, ROI, Efficiency ↑)

👉 DATA → DECISIONS → KPIS

DATA — The Foundation

What it means:

All BI begins with data — raw facts and figures collected from systems, processes, and people.

Examples:

- Sales transactions
- Customer interactions
- Website clicks
- Inventory records
- HR data

Goal: Make sure the data is accurate, clean, consistent, and timely.

Why it matters:

Bad or missing data = wrong insights later.

→ “Garbage in, garbage out.”

DECISIONS — Turning Data into Action

What it means:

BI transforms raw data into information and insights (through dashboards, analytics, reports) so managers and employees can make informed decisions.

Examples:

- Deciding to increase stock for high-demand products
- Launching a marketing campaign for customers likely to churn
- Adjusting pricing based on sales trends

Goal: Use BI insights to make smarter, faster, evidence-based decisions.

How it connects:

Clean data → analysis → visualization → understanding → decision.

KPIs — Measuring the Results

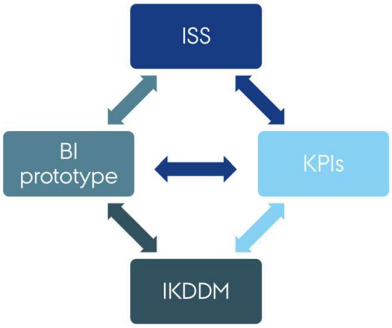
What it means:

After decisions are made and actions are taken, KPIs (Key Performance Indicators) measure the outcomes.

Examples:

- Sales growth rate
- Customer retention rate
- Return on investment (ROI)
- Inventory turnover
- Employee productivity

Goal: Use KPIs to evaluate if the decision was successful and if business objectives are being met.



ISS model = defines what success looks like.
IKDDM model = defines how we get there iteratively (business understanding → data → modeling → decision → feedback).
Prototyping = the bridge between the two — turning data insights into testable, user-centered BI artifacts.

KPIs

KPI stands for Key Performance Indicator.

They are quantifiable measures that show how well an organization, department, or process is performing toward a specific goal.

Purpose of KPIs in Business Intelligence

1. Monitor performance – See if the company is on track to meet targets.
2. Support decisions – Provide data-driven evidence for action.
3. Align goals – Make sure everyone works toward the same objectives.
4. Measure BI success – Evaluate whether BI systems are improving outcomes.

How KPIs Work (Step by Step)

1. Collect Data → from sales, customers, or operations.
2. Make Decisions → based on what the data shows.
3. Measure with KPIs → to see if your decisions are helping.

What Makes a Good KPI

- Clear – easy to understand.
- Measurable – based on numbers or facts.
- Realistic – can actually be achieved.
- Useful – helps you make better decisions.
- Time-based – has a deadline.

KPIs in BI Dashboards

In BI tools like **Power BI, Tableau, or Qlik**, KPIs are:

- Shown as **visual metrics** (gauges, scorecards, trend lines)
- Often compared to **targets or benchmarks**
- Updated **in real-time or periodically**

Example:

A sales KPI dashboard might show:

- 🎯 Target: $1M
- 📈 Actual: $950K
- ⚠️ Status: 95% of goal achieved

Why KPIs Matter for BI Success

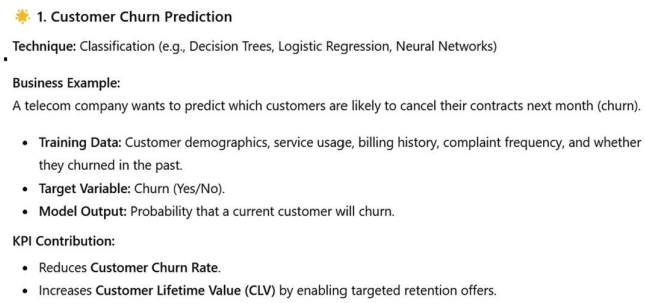
KPIs quantify the "Net Benefits" in the ISS Model.

They show whether the BI system is helping the business achieve measurable improvements, such as:

- Increased revenue
- Reduced costs
- Higher efficiency
- Improved decision accuracy
- Better customer satisfaction

In short: *Without KPIs, you can't prove BI value.*

Examples:



🌟 **1. Customer Churn Prediction**

Technique: Classification (e.g., Decision Trees, Logistic Regression, Neural Networks)

Business Example:
A telecom company wants to predict which customers are likely to cancel their contracts next month (churn).

- **Training Data:** Customer demographics, service usage, billing history, complaint frequency, and whether they churned in the past.
- **Target Variable:** Churn (Yes/No).
- **Model Output:** Probability that a current customer will churn.

KPI Contribution:

- Reduces **Customer Churn Rate**.
- Increases **Customer Lifetime Value (CLV)** by enabling targeted retention offers.

🛍️ Product Recommendation Systems

Technique: Predictive Modeling / Association Rules + Regression

Business Example:
An e-commerce company predicts which products a customer is likely to buy next, based on previous purchases and browsing history.

- **Training Data:** Purchase history, product categories, time between purchases.
- **Target Variable:** Next likely product or category.

KPI Contribution:

- Boosts **Average Order Value (AOV)**.
- Improves **Customer Retention Rate** through personalization.

👷 Employee Turnover Prediction

Technique: Classification (e.g., Decision Trees, Logistic Regression)

Business Example:
An HR department predicts which employees are likely to leave the company based on factors like tenure, salary progression, engagement survey results, and performance ratings.

- **Training Data:** HR records with labeled turnover outcomes.
- **Target Variable:** Attrition (Yes/No).

KPI Contribution:

- Reduces **Employee Turnover Rate**.
- Decreases **Recruitment and Training Costs**.

1. Analytics Techniques and How They Relate to KPIs

Technique	What It Does	Business Example	Possible KPI
Classification	Puts things into groups or categories	Predict whether a customer will **churn** (leave) or **stay**	🔹 Customer Retention Rate 🔹 Churn Prediction Accuracy
Regression	Predicts a **number or value**	Predict future **sales amount**, **revenue**, or **price**	🔹 Forecast Accuracy 🔹 Sales Growth %
Clustering	Groups similar data points together	Group customers by buying habits	🔹 Campaign Conversion Rate 🔹 Segment Profitability
Association Rules	Finds patterns or relationships	"People who buy X also buy Y"	🔹 Cross-sell Rate 🔹 Basket Size Increase
Time Series Forecasting	Uses past data to predict future trends	Predict next month's product demand	🔹 Forecast Accuracy 🔹 Inventory Efficiency

2. Training and Testing Data in BI

When you build BI models using **classification** or **regression**, you use data in two parts:

Data Type	Purpose	Example
Training Data	To **teach the model** patterns from past data	Data from Jan–Sep 2024 used to train sales prediction model
Testing Data	To **check accuracy** of the model on new/unseen data	Data from Oct 2024 used to test how well the model predicts

> 🔁 This ensures your BI model actually works in real business conditions.

3. Business Example with KPIs

Let's take a **Retail Company** example:

Goal:

Reduce customer **churn** (people who stop buying).

Technique:

Classification model (Predict who will churn or stay)

Process:

1. Use **training data** from the past year (customer purchases, complaints, visits).
2. Build a model that predicts who might leave.
3. Use **testing data** to check how accurate it is.
4. Target those at-risk customers with offers.

BI KPIs to Measure Success:

KPI Name	Definition	Why It Matters
Churn Rate	% of customers who stop buying	Shows if fewer customers are leaving
Prediction Accuracy	% of correct predictions by model	Measures model performance
Customer Retention Rate	% of customers who stay	Key business success metric
Campaign ROI	Profit gained from retention campaign	Shows financial benefit of BI

✅ **If churn rate drops** after using the BI model → BI is successful.
✅ **If prediction accuracy is high** → Model quality (System Success).
✅ **If campaign ROI improves** → Net Benefit KPI (from ISS Model).

4. Another Example – Regression

Goal:

Forecast **monthly sales revenue**.

Technique:

Regression (predict continuous value)

Steps:

1. Use **training data** (past 2 years of sales).
2. Test on recent data (last 3 months).
3. Compare predicted vs. actual sales.

BI KPIs:

KPI Name	What It Measures
Forecast Accuracy (%)	How close predictions are to real numbers
Sales Growth (%)	Shows if sales are increasing
Inventory Turnover	Efficiency of stock based on predicted demand
Profit Margin	Business financial performance

✅ Better regression model → More accurate forecasts → Smarter decisions → Higher KPI performance.

5. How KPIs Link Back to BI Success (ISS Model)

BI Component	Technique Result	KPI Impact
System Quality	Reliable, fast model	High adoption rate
Information Quality	Accurate predictions	Decision accuracy ↑
Service Quality	Good support/training	User engagement ↑
User Satisfaction	Users trust predictions	Trust in BI ↑
Net Benefits	Profit, efficiency gains	ROI ↑, churn ↓

Data Science techniques (like classification or regression) help make predictions and insights.
Those insights are measured by KPIs (like accuracy, retention rate, profit).
If KPIs improve → your BI system is successful.

IKDDM PROCESS

= *Interactive Knowledge Discovery and Data Mining*

It's a step-by-step process of turning raw data into useful business knowledge — things that help make better decisions and improve KPIs.

It's an evolution of CRISP-DM, meaning it's more interactive (users and analysts work together, testing and improving models repeatedly).

The IKDDM Process Steps (Simplified)

Step	Name	What Happens	Example
1	**Data Selection**	Choose what data to use	Pick customer purchase data from CRM
2	**Data Preprocessing**	Clean the data	Remove duplicates, fix missing values
3	**Data Transformation**	Prepare data for analysis	Convert text to numbers, normalize values
4	**Data Mining**	Use algorithms to find patterns	Run classification or regression models
5	**Pattern Evaluation**	Check if the patterns make sense	See if predictions are accurate and useful
6	**Knowledge Representation**	Show results visually	Build dashboards, charts, or reports
7	**Knowledge Utilization**	Use insights for business actions	Launch a marketing campaign, change pricing
8	**Feedback**	Review and improve	Check results, adjust models, repeat process

Where Predictive Techniques Fit in IKDDM

The Predictive Techniques (like Classification, Regression, etc.) are used in Step 4: Data Mining of the IKDDM process.

Predictive Technique	Example Application	Target Variable	Key KPIs Improved
Classification (Decision Tree, Logistic Regression)	Customer Churn Prediction	Churn (Yes/No)	Churn Rate, CLV
Regression	Sales Forecasting	Sales Amount	Forecast Accuracy, Revenue
Classification	Credit Risk Scoring	Risk (High/Low)	Default Rate, Profit per Loan
Predictive Modeling	Product Recommendation	Product Purchased	AOV, Retention Rate
Time Series Regression	Demand Forecasting	Quantity Sold	Stockouts, Waste
Classification	Employee Turnover	Leave (Yes/No)	Turnover Rate, HR Costs
Regression	Pricing Optimization	Ticket Sales	Profit Margin, Revenue

Classification techniques

Used when the **output** is a **category** (Yes/No, High/Low, etc.)

Predictive Technique	Example Application	Target Variable (What You Predict)	KPIs Improved (What You Measure)
Decision Tree / Logistic Regression	Customer Churn Prediction	Churn (Yes/No)	🔹 Churn Rate ↓ 🔹 Customer Lifetime Value (CLV) ↑
Classification	Credit Risk Scoring	Risk (High/Low)	🔹 Default Rate ↓ 🔹 Profit per Loan ↑
Classification / Association Rules	Product Recommendation	Product Purchased	🔹 Average Order Value (AOV) ↑ 🔹 Retention Rate ↑
Classification	Employee Turnover Prediction	Leave (Yes/No)	🔹 Turnover Rate ↓ 🔹 HR Costs ↓

➡️ **Summary:**

Classification models *sort* things into groups (yes/no, high/low, etc.)

They help reduce risk, retain customers, and improve loyalty KPIs.

Regression Techniques

Used when the **output** is a **number or continuous value** (e.g. sales, price, revenue).

Predictive Technique	Example Application	Target Variable (What You Predict)	KPIs Improved (What You Measure)
Regression / Predictive Modeling	Sales Forecasting	Sales Amount	🔹 Forecast Accuracy ↑ 🔹 Revenue ↑
Time Series Regression	Demand Forecasting	Quantity Sold	🔹 Stockouts ↓ 🔹 Waste ↓
Regression	Pricing Optimization	Price / Profit Margin	🔹 Profit Margin ↑ 🔹 Revenue ↑
Regression / Predictive Modeling	Ticket Sales Forecasting	Ticket Sales	🔹 Forecast Accuracy ↑ 🔹 Revenue ↑

➡️ **Summary:**

Regression models *predict numbers*.

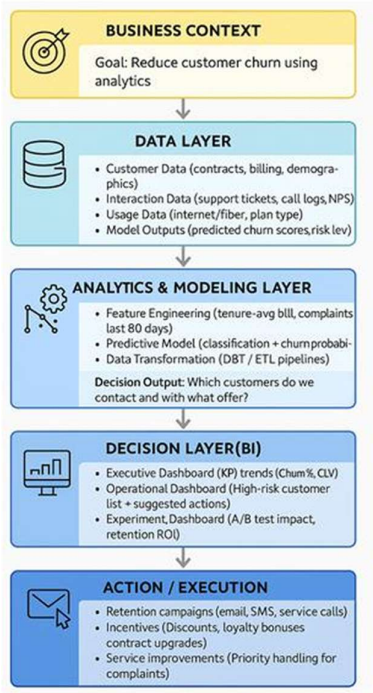
They help forecast sales, optimize pricing, and reduce waste.

HOW PROTOTYPING SUPPORTS BI SUCCES

BI Prototyping means building and testing a small version of a Business Intelligence solution before fully developing it.

It's like making a draft dashboard or model to check if the system gives useful insights for decisions and KPI improvements.

The BI Prototype Flow



Business Context (Why we do BI)

- This is the starting point.
- You identify goals, problems, and KPIs you want to improve.

Example:

- Problem: Too many customers are leaving.
- Goal: Improve customer retention.
- KPI: Reduce churn rate by 10%.

Data Layer (Collect & Prepare Data)

- Collect all relevant data from different sources (CRM, sales, HR, finance, etc.).
- Clean, combine, and organize it so it's ready for analysis.

Example:

- Customer purchase history
- Support tickets
- Website visits
- Demographics

This connects with IKDDM steps like data selection, preprocessing, and transformation.

Analytics & Modeling Layer (Find Patterns / Make Predictions)

- Apply analytics techniques (classification, regression, etc.) to discover insights or make predictions.
- Use BI or data mining tools (Power BI, Python, R, Tableau).

Example:

- Use a classification model to predict which customers will leave (churn = Yes/No).
- Or use regression to forecast next month's sales.

Output: insights, predictions, or metrics that affect KPIs.

Decision Layer (Interpret & Visualize Results)

- Build BI dashboards or reports showing key insights, KPIs, and trends.
- Managers or decision-makers use these visuals to understand what's happening.

Example:

- Dashboard shows "20% of customers are at high churn risk."
- KPIs displayed: Churn Rate, CLV, Customer Satisfaction.

This is where data → becomes information for decision-making.

Action / Execution (Do Something With It)

- Turn the insights into real business actions.
- Monitor the effects using the same BI dashboard (feedback loop).

Example:

- Send discounts to high-risk customers → churn decreases.
- Adjust inventory based on sales forecast → waste decreases.

Then check if your KPIs improved → if not, go back and adjust the model (interactive feedback).

1) Start with the decision not data

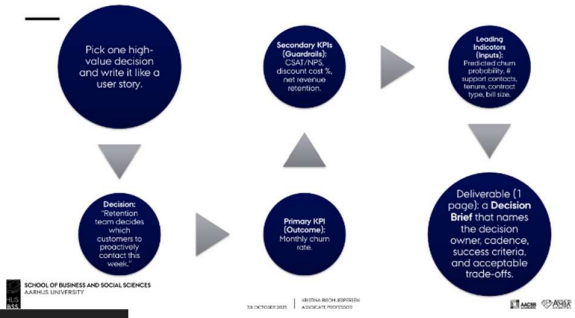
- Many organizations make the mistake of saying:
  - "Let's collect data and see what we can find."

  That's backward.
- Instead, you should start by asking:
  - "What decision do we need to make?"

  Then, you figure out what data and KPIs are needed to support that decision.
- In short: Don't collect random data — collect data that helps you decide something important.

Step 1: Pick one high-value decision
You start with a specific business decision that really matters.
Example:
"Retention team decides which customers to proactively contact this week."
Why this is good:

- It's specific (retention team, this week).
- It's actionable (contact customers).
- It's valuable (reduces churn, increases revenue).



Step 2: Define KPIs to measure success
These are the metrics that tell you if the decision worked.

KPI Type	Purpose	Example
Primary KPI (Outcome)	The main goal you want to improve	**Monthly churn rate ↓**
Secondary KPIs (Guardrails)	Check for side effects or trade-offs	**CSAT/NPS** (customer satisfaction), **discount cost %, net revenue retention**

Example: You reduce churn, but if discount costs go up too much or satisfaction drops — that's a warning sign.

Step 3: Identify Leading Indicators (Inputs)
These are data signals that help you make the decision.
They're like early warning signs before the KPI changes.

Leading Indicator	What It Shows
Predicted churn probability	Which customers are at risk
# of support contacts	Customer frustration or dissatisfaction
Tenure	How long they've been with you
Contract type	If customers are locked in or flexible
Bill size	Customer value or potential loss

These inputs come from your data models (classification, regression) — part of your BI analytics layer.

Step 4: Deliverable → Create a "Decision Brief" (1-page summary)
The Decision Brief is a short document that explains everything clearly for the team.
This "Decision Brief" keeps everyone focused on making one *high-value* decision — and measuring it properly.

Section	What It Includes
Decision	"Which customers should we contact this week to prevent churn?"
Decision Owner	Retention Manager
Cadence	Weekly (every Monday)
Primary KPI	Monthly churn rate ↓
Secondary KPIs	NPS, discount cost %, net revenue retention
Leading Indicators	Predicted churn score, # contacts, tenure, etc.
Success Criteria	10% churn reduction in 3 months
Acceptable Trade-offs	Up to 2% increase in discount cost
Tools Used	BI dashboard, churn prediction model

2) Translating a decision into a metrics & events contract.

- Once you've defined your decision (e.g. "Which customers should we contact to reduce churn?"), you now need to make that decision measurable and data-driven.
- To do that, you must create a clear data agreement — called a metrics & events contract.

Why This Is Important

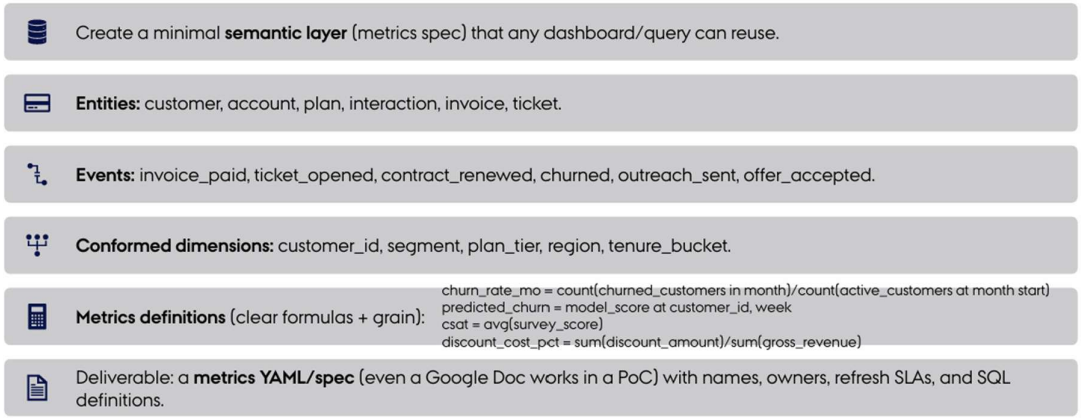
In many organizations, different teams define the same metric differently.

- Marketing says churn is 5%.
- Finance says it's 8%.
- BI says it's 6.2%.

→ This causes chaos and bad decisions.

So, the metrics contract ensures everyone uses the *same logic* to calculate KPIs.

Step-by-Step Breakdown



Entities (the "nouns")

These are the core objects in your business data — the *things* you track.

Entity	Example Meaning
`customer`	Each person or company using your product
`account`	Their billing or subscription account
`plan`	The product or pricing tier they are on
`interaction`	Any contact between customer and business
`invoice`	Billing event or payment
`ticket`	Customer support request

These form the **foundation of your data model.**

Events (the "verbs")

Events describe what happens with those entities — the *actions or changes* in time.

Event	Meaning
`invoice_paid`	A payment was made
`ticket_opened`	A support issue was created
`contract_renewed`	A customer renewed their subscription
`churned`	A customer left
`outreach_sent`	Your team reached out to the customer
`offer_accepted`	Customer accepted a retention offer

These events help track *behavior and lifecycle.*

For example: if `outreach_sent` → `offer_accepted` → `contract_renewed`, your retention campaign worked.

Conformed Dimensions

These are shared filters or grouping variables used across all dashboards.

They make sure data is consistent everywhere.

Dimension	Meaning
`customer_id`	Unique ID for each customer
`segment`	Type of customer (e.g. SME, Enterprise)
`plan_tier`	Subscription level (Basic, Pro, Premium)
`region`	Geography (e.g. EU, APAC, NA)
`tenure_bucket`	How long they've been a customer (e.g. 0–6 months, 6–12 months)

> These are called **"conformed dimensions"** because they are *standardized across systems* (CRM, billing, support, etc.).

Metrics Definitions

Now you define exact formulas for your KPIs — with clear names and levels ("grain").

Metric	Formula	Grain / Level	Meaning
`churn_rate_mo`	`count(churned_customers in month) / count(active_customers at month start)`	Monthly	% of customers lost per month
`predicted_churn`	`model_score at customer_id, week`	Weekly, per customer	Predicted churn probability from model
`csat`	`avg(survey_score)`	Per survey / aggregated	Customer satisfaction score
`discount_cost_pct`	`sum(discount_amount) / sum(gross_revenue)`	Monthly / campaign	% of revenue lost to discounts

> These definitions remove ambiguity — everyone calculates metrics the same way.

Deliverable: The "Metrics Contract" Document

This is a simple but powerful document — or even a YAML / Google Doc / Excel file — listing all metrics, their owners, and refresh rules.

3) Model the Data to Match the Decision Flow

- You already know your decision ("Which customers should we contact to reduce churn?"). You've also defined your metrics and events.
- Now it's time to organize the data in a structure that makes those decisions easy to analyze and visualize.
- This is called data modeling — the process of designing tables and relationships between them in your BI system or data warehouse.

Keep It Ultra-Small for a Prototype

- When you're just testing or proving a concept (PoC), you don't need a huge data warehouse. You only need a minimal model that supports your specific decision — in this case, *customer retention*.
- So you build:
  - 1 star schema (the classic BI structure)
  - 1 feature view (for predictive modeling)

What's a Star Schema?

- A star schema is a simple way to organize data for analytics.
- It has:
  - One Fact Table in the center (where the actions/numbers live)
  - Multiple Dimension Tables around it (the "who, what, where, when" details)

Example of Tables

Fact Table

Table Name	Meaning	Example Columns
`f_customer_status_daily`	Daily snapshot of each customer's status	customer_id, status (active/churned), plan_id, region_id, active_flag, date_key
`f_interactions`	Records of customer interactions (calls, emails, etc.)	interaction_id, customer_id, interaction_type, date_key, resolved_flag
`f_billing`	Billing and payment transactions	invoice_id, customer_id, amount, payment_status, date_key
`f_retention_actions`	What actions your team took to retain customers	action_id, customer_id, action_type (email/offer), result, date_key

💬 These are the **facts** — they describe what happened and when.

Dimension Tables (describe facts with context)

Table Name	Meaning	Example Columns
`d_customer`	Customer profile info	customer_id, name, segment, signup_date
`d_plan`	Product or subscription plan	plan_id, plan_name, price, plan_tier
`d_region`	Geographic info	region_id, region_name
`d_time`	Calendar table	date_key, day, month, year, week

💬 These are the **lookup tables** — they help group, filter, and label your facts.

Feature View (for predictive modeling)

Table Name	Purpose	Example Columns
`vw_churn_features`	A single wide view combining customer info + recent activity metrics for prediction	customer_id, tenure_days, last_90d_tickets, avg_bill_3m, contract_type, region, predicted_churn_score

💬 This is the data your **machine learning model** (classification) uses to predict churn.

Prediction Table

Table Name	Purpose	Example Columns
`f_churn_scores_weekly`	Stores the weekly churn predictions per customer	customer_id, predicted_score, snapshot_week

💬 Example:

customer_id	predicted_score	snapshot_week
00123	0.87	2025-10-27
00124	0.12	2025-10-27

> So, if predicted_score > 0.8 → the retention team contacts that customer.

The Goal

“Every metric and every dashboard screen should be derivable from these few tables.”

That means:

You should be able to calculate your KPIs (churn rate, CSAT, revenue, etc.) directly from this small, clean data model — no messy joins across 20 different systems.

Example:

- Churn Rate: from f_customer_status_daily
- Predicted Churn: from f_churn_scores_weekly
- Discount Cost %: from f_billing
- Retention Actions Success Rate: from f_retention_actions
- Breakdown by Region / Plan: join to d_region and d_plan

4) Ship Decision-First BI Screens — i.e., design dashboards that help people make better decisions, not just show pretty charts.

- Most BI dashboards fail because they just display data — they don't drive action.
- A decision-first BI screen is built around *who makes the decision, what decision they make, and when they make it*.
- So instead of asking:
  "What charts can I show?"
  You ask:
  "What does the user need to decide — and what data helps them decide fast and confidently?"

Design the prototype around who decides what and when

A) Executive Outcome View	Leadership / Strategy	Monthly	Monitor business performance and trends
B) Operator Playbook View	Retention / CX Team	Weekly	Act on specific customer-level decisions
C) Experiment & Impact View	BI / Data Science / Ops	Continuous	Measure what's working and optimize actions

A) Executive Outcome View (Monthly)
Audience: Executives, Directors, Senior Managers
Goal:
Show top-level KPIs and whether the company is on track.
Dashboard Contents:
Tiles (Key Metrics):

- 🔸 Churn % — percentage of customers lost this month
- 🔸 Customer Lifetime Value (CLV) — average revenue per customer over time
- 🔸 Net Revenue Retention (NRR) — how much recurring revenue was retained or expanded
- 🔸 CSAT — average customer satisfaction

Visuals:

- Trend Charts: Show KPI over last 12 months, with variance to goal

e.g. "Churn target = 10%, actual = 12.1% (+2.1% over goal)"

- Cohort Chart: Show how customers who joined in different months behave over time (to see retention decay patterns)

Why it matters:
Executives don't care about individual customers — they care about outcomes, trends, and progress toward goals.

B) Operator Playbook View (Weekly)
Audience: Retention / Customer Support / Marketing Team
Goal:
Help frontline teams decide which customers to contact and what to do.
Dashboard Contents:
Main Table:

Operator Dashboard (Tactical Level)
Users:
Marketing / Retention Managers
Sales / Service Supervisors
Product Managers
Purpose:
Manage daily/weekly actions based on predictive insights
Prioritize high-risk customers
Trigger retention or cross-sell campaigns
Decision Focus: → *"What actions should we take this week?"*

- Ranked list of High-Risk Customers
  - Customer ID

- Plan tier
- Predicted Churn Score (from your model)
- Reason codes (why they might churn: e.g. high ticket volume, low usage, price increase)

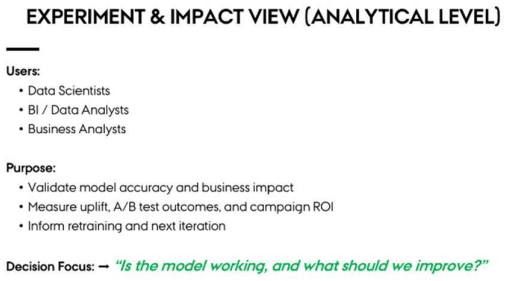
Action Recommendations:

- Offer A or B (e.g. 10% discount vs. 1-month extension)
- Service callback (high ticket customers)
- Contract incentive (renewal bonus)

Impact Sidebar:
"If we contact top 2,000 at-risk customers, expected churn ↓ from 12.1% → 10.8%."
Why it matters:
Operators use this view to *act immediately* based on BI insights.
It's where data becomes action.

C) Experiment & Impact View (Continuous)
Audience: BI / Data Science / Strategy / Finance
Goal:
Measure if actions and offers are actually working and worth the cost.
Dashboard Contents:
Uplift Charts:

- Compare customers who received an offer (treatment) vs. those who didn't (control)
  → e.g. churn rate reduced by 1.5% in treatment group



ROI Table:

Action	Discount Cost	Churn Avoided	ROI
Offer A (10% off)	$10k	200 customers retained	4.2x
Offer B (Free Month)	$25k	500 customers retained	3.5x

Summary Metric:
"Cost of discounts vs. churn avoided → Retention ROI = 3.9x"
💬 Why it matters:
This is how you prove BI has a real financial impact — you're not just visualizing, you're optimizing

Example:
Scenario: Telecom Churn Case
The goal:
Reduce customer churn (customers leaving the telecom company).
1️⃣ The Business Problem / Decision

- Decision: "Which customers should we contact and what offer should we make to retain them?"
- Primary KPI (goal): Monthly churn rate ↓
- Secondary KPIs: Customer Lifetime Value (CLV) ↑, ROI of offers ↑, CSAT stable

This connects to Step 1 of the BI prototype — *Start with the decision, not the data.*
2️⃣ Roles and What They Do

Role	What They Use / Check	What Decision They Make
🧠 Data Scientist	Looks at the predictive churn model	"Is the model accurately predicting who will churn?"
📊 BI Analyst	Monitors dashboards & KPIs	"Which offers are actually reducing churn?"

Role	What They Use / Check	What Decision They Make
🎯 Marketing Manager	Tests retention campaigns (Offer A vs B)	"Which offer gives better ROI?"
💼 Executive	Watches summary KPIs	"Are our retention efforts improving business value overall?"

Each of these users corresponds to a different BI screen/view:

- Executive → Outcome View
- Marketing / Operator → Playbook View
- Data Scientist / BI → Experiment & Impact View

3️⃣ What Happens Step by Step

🧩 Step A — Predictive Model Runs

- Data scientist uses a classification model (e.g., logistic regression or decision tree).
- It predicts:

"Customer X has 85% probability of churning next month."

- These scores are stored in the prediction table (f_churn_scores_weekly).

🗂️ Step B — BI Playbook View

- Marketing team opens the Operator Playbook dashboard.
- They see a ranked list of high-risk customers with suggested actions:
  - Offer A (10% discount)
  - Offer B (free data for 1 month)
- They choose Offer B for the top 2,000 customers.

🧪 Step C — Experiment & Impact View

- BI analyst tracks the experiment results:
  - Control group (no offer): churn = 12.1%
  - Offer A: churn = 11.5%
  - Offer B: churn = 10.8%
- Offer B reduces churn by 1.3 percentage points (pp).
- Cost of Offer B is acceptable, so ROI is positive.

📈 Step D — Executive Dashboard

- Executive sees a monthly summary:
  - Churn ↓ from 12.1% → 10.8%
  - CLV ↑ by $25 per customer
  - Retention campaign ROI = 3.2x
- Decision: "We'll scale Offer B next quarter."

4️⃣ What BI Success Looks Like Here

BI Layer	What It Does	Example in Telecom Case
Data Layer	Collects customer, billing, and churn data	Customer accounts, plan types, payments, churn flag
Analytics Layer	Runs predictive models	Logistic regression predicts churn probability
Decision Layer	Visualizes insights in BI dashboards	Operator, Experiment, Executive views
Action Layer	Drives business actions	Offer B is deployed to at-risk customers
Outcome / KPI Layer	Measures impact	Churn ↓, CLV ↑, ROI positive

5️⃣ In Short

🔁 Data → Model → Dashboard → Action → KPI Improvement

Or in this Telecom case:

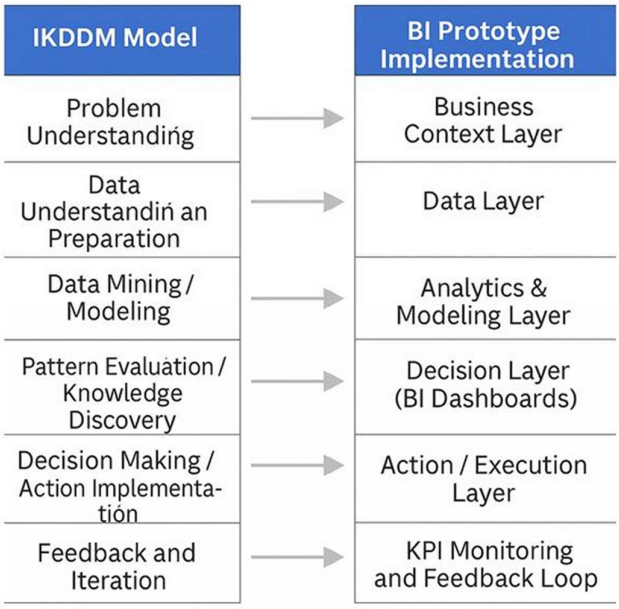
- Data: Customer + billing + complaints data
- Decision: Who to contact with retention offer
- BI Screen: Operator Playbook + ROI Dashboard
- Action: Offer B to high-risk customers
- KPI Impact: Churn ↓ by 1.3pp, CLV ↑, ROI positive

The Key Takeaway:

Every BI stakeholder uses the same system but at a different level of detail:

- Data Scientist ensures model accuracy
- BI Analyst measures outcomes
- Marketing acts on insights
- Executives see the results and business value

Together, they close the loop — from data to decision to KPI impact — which is the ultimate goal of Business Intelligence.



IKDDM Phase	Corresponding Layer in BI Prototype	What Happens	Example from Churn Case
1. Business Understanding	*Business Context Layer*	Define business goal, KPIs, decision scope	"Reduce churn from 15% to 10% by predicting at-risk customers."
2. Data Understanding & Preparation	*Data Layer*	Gather, clean, and integrate data from CRM, billing, service logs	Collect customer data, call history, and tenure info
3. Data Mining / Modeling	*Analytics & Modeling Layer*	Apply predictive techniques (classification, regression)	Build churn prediction model using logistic regression or decision trees
4. Pattern Evaluation / Knowledge Discovery	*Decision Layer (BI)*	Visualize results, evaluate model insights, identify key drivers	Dashboards showing churn probability, high-risk segments
5. Decision Making / Action Implementation	*Action / Execution Layer*	Translate insights into business action	Launch retention offers, improve customer service response
6. Feedback / Iteration	*KPI Monitoring and Feedback Loop*	Evaluate results, measure impact, retrain model	Track churn rate ↓, CLV ↑ → refine model with new data

PROTOTYPING AND BI SYSTEM SUCCESS

ISS Dimension	How Prototyping Contributes	Example (Predictive BI PoC)
System Quality	Prototyping tests functionality, usability, response time, and integration before full deployment.	Rapid iteration ensures the BI dashboard is intuitive and responsive.
Information Quality	Early prototypes expose data quality issues, missing variables, and poor visualizations.	The PoC reveals that churn data is inconsistent across systems — enabling fixes before scaling.
Service Quality	Collaborative prototyping improves communication between IT, analysts, and business stakeholders.	Data scientists and business users co-develop retention dashboards, improving support expectations.
Use / Intention to Use	When users participate in design and see early value, adoption intentions rise.	Managers use the prototype weekly to test customer retention strategies — leading to high acceptance.
User Satisfaction	Iterative feedback loops ensure the system meets real user needs, not just technical specs.	Executives find dashboards more insightful after their feedback shapes KPIs and visual design.
Net Benefits	Faster time-to-value and better alignment with business goals improve ROI and decision-making.	The final BI system reduces churn by 5%, improving CLV and marketing efficiency.

Example:

ShopSmart BI Prototype Worksheet

After completing this exercise, you should be able to explain how data supports decisions, identify useful KPIs, and understand how prototyping improves BI design.

Part 1 – Case Background

ShopSmart is a national retail chain with stores across several regions.
Management wants to understand which stores are performing well and which need extra support — but their current reports are slow and hard to interpret.
They've decided to build a Business Intelligence (BI) prototype — a small, test version of a dashboard — to see how data can help managers make better decisions.
Your task: Design a simple BI prototype concept that links
👉 Data → Decisions → KPIs → Business Value

Part 2 – The Data Available

Variable	Description	Example Value
Store ID	Unique store number	101
Region	North / South / East / West	North
Monthly Sales (€)	Total monthly sales	58,000
Customer Visits	Number of visitors	3,200
Staff Count	Number of employees	12
Satisfaction Score	Customer survey rating (1–10)	7.8

Part 1 & 2 are given now its our turn

Part 3 – Connecting Data → Decisions → KPIs

Data Insight (what we see)	Possible Decision or Action	KPI to Track Success
Stores with low sales per employee	Provide staff training or adjust staff schedules	↑ Sales per employee
Stores with low satisfaction scores	Investigate service quality, add customer service training	↑ Customer satisfaction score
Regions with high visits but low sales	Review product mix or pricing	↑ Conversion rate (sales ÷ visits)
Stores with low promotion spend and low sales	Test a small marketing campaign	↑ Monthly sales
Stores with high satisfaction and sales	Share best practices with other stores	↑ Average regional sales

Part 4 – Design Your BI Prototype

Dashboard Overview The ShopSmart BI prototype is designed for regional managers to identify which stores need help and why.

Dashboard Features:

1. Top KPIs (Tiles at top of screen):
    - Total Monthly Sales (€)
    - Average Customer Visits
    - Sales per Employee
    - Average Satisfaction Score

2. Chart 1 – Store Comparison Bar Chart:
    - X-axis: Store ID
    - Y-axis: Sales per Employee
    - Color code: Green = High performers, Red = Low performers.

3. Chart 2 – Scatter Plot:
    - X-axis: Customer Visits
    - Y-axis: Monthly Sales
    - Each dot = a store → helps spot stores with many visitors but low sales.

4. Optional Table – Satisfaction vs. Sales by Region:
    - A simple table ranking regions by average satisfaction and total sales.

5. Dashboard Description

    "The dashboard helps managers quickly see which stores perform best and which need attention. The scatter plot shows if high visits lead to high sales. The bar chart shows which stores have low sales per employee. KPIs give a fast overview of total performance."

Part 5 – Design Questions

1. Data
    - The most useful data are sales, visits, satisfaction, and staff count, because they show both performance and customer experience.
    - We might add promotion data or store size to better understand differences.
2. Decision
    - Managers can decide:
        - Which stores need sales or service training.
        - Where to test new promotions.
        - Which regions are improving or declining.
3. KPIs
    - Sales per employee → shows store efficiency.
    - Customer satisfaction score → shows service quality.
    - Total monthly sales → shows business impact.
4. Prototyping
    - A prototype helps test if the dashboard is easy to read and if the right data are included.
    - Managers can give feedback on what's useful or confusing before full rollout.
    - It saves money and ensures the final BI system supports real decisions.

Part 6 – Reflection

“The BI prototype connects data to real business actions. By seeing data about sales and satisfaction together, managers can decide where to focus support and measure improvement using KPIs. Prototyping helps the company test ideas, fix data issues, and make sure the system meets manag ers’ needs before building the full version.”

General answers:

Part 3 – Connecting Data → Decisions → KPIs

This part shows how raw data leads to insights, which lead to actions, and how success is measured.

This part shows how raw data leads to insights, which lead to actions, and how success is measured.

Data Insight (what we see)	Possible Decision or Action	KPI to Track Success
Low performance / low output in certain units, teams, or products	Provide extra training, adjust staffing, review process efficiency	↑ Productivity per employee / ↑ Output per unit
High volume but low outcome (e.g., many visits but few conversions)	Review pricing, product mix, or customer journey	↑ Conversion Rate / ↑ Efficiency
Low satisfaction or quality scores	Improve service quality, implement feedback programs	↑ Customer Satisfaction (CSAT, NPS) / ↓ Complaints
High costs with low results	Optimize spending, negotiate supplier terms	↓ Cost per unit / ↑ Profit Margin
High performance areas	Capture and share best practices	↑ Overall Performance Index / ↑ Consistency
Low engagement / retention	Design loyalty or incentive programs	↑ Retention Rate / ↑ Lifetime Value
Delayed operations or processes	Improve workflow or automate steps	↓ Cycle Time / ↑ On-Time Delivery
Uneven regional / departmental results	Reallocate resources or marketing budget	↑ Balanced Performance Across Regions

💡 **Tip:** Always express KPIs with ↑ (improvement) or ↓ (reduction) so they're action-oriented.

Part 4 – Design Your BI Prototype

Dashboard Overview

The BI prototype helps decision-makers quickly see **what's going well**, **what needs attention**, and **why**. It focuses on clarity, comparability, and decision relevance.

Dashboard Features

1. **Top KPI Tiles (executive summary)**
   - 💰 Total Revenue / Output
   - ⚙️ Efficiency Metric (e.g., Output per Employee or Cost per Unit)
   - 😊 Satisfaction / Quality Score
   - 📈 Trend vs. Target (variance from goal)
2. **Visual 1 – Comparison Bar Chart**
   - X-axis = Entity (e.g., Department / Product / Region)
   - Y-axis = Performance metric (e.g., Sales per Employee or Error Rate)
   - Colors = High (green) vs. Low (red) performance
3. **Visual 2 – Relationship Chart (Scatter / Line)**
   - X-axis = Input variable (e.g., Spend, Visits, Leads)
   - Y-axis = Outcome (e.g., Revenue, Profit, Retention)
   - Each dot = unit, product, or team → reveals efficiency patterns
4. **Optional Visual 3 – Table or Map**
   - Summary by category (e.g., region, product line, segment)
   - Columns: Average Satisfaction | Total Revenue | Conversion Rate

Dashboard Description (Expanded Version)

"The dashboard is designed to provide both a high-level overview and detailed insight into the performance of the organization.

At the top, KPI tiles summarize key performance indicators, giving a quick snapshot of critical metrics such as total revenue, efficiency, customer satisfaction, or output per unit.

These KPI tiles allow managers and decision-makers to immediately identify whether overall targets are being met."

Part 5 – Design Questions (Expanded Version)

Data

"The most useful data for the dashboard are those that capture performance, efficiency, and customer or user experience. This typically includes metrics such as revenue, sales, output, visits, satisfaction, retention, and resources used.

Additional contextual data such as marketing spend, employee hours, product types, regional information, or external market data can further enhance insight and help explain patterns.

Comprehensive, clean, and well-structured data ensures that all KPIs are reliable, comparable, and actionable."

Decision

"The dashboard supports a range of managerial and operational decisions, including:

- Identifying underperforming units, products, or regions to target for improvement.
- Allocating resources, staff, or marketing budget where it can have the most impact.
- Adjusting processes, pricing, or strategies based on trends and patterns.
- Scaling successful initiatives and replicating best practices across the organization.
- Monitoring ongoing campaigns, interventions, or operational changes to assess effectiveness."

KPIs

"KPIs provide measurable indicators of business performance and success. A well-rounded BI dashboard typically includes:

- **Performance KPIs** (e.g., total revenue, profit margin, output per unit) to track overall results.
- **Efficiency KPIs** (e.g., sales per employee, cost per unit, conversion rates) to monitor resource utilization.
- **Experience or satisfaction KPIs** (e.g., CSAT, NPS, retention rates, error rates) to measure customer or employee outcomes.

  Tracking a combination of these KPIs ensures that the dashboard supports balanced decision-making, showing both outcomes and processes."

Prototyping

"Developing a BI prototype before full implementation allows the organization to test assumptions, visualize key metrics, and gather user feedback.

Prototyping ensures the dashboard meets user needs, presents data clearly, and supports the intended decisions. It allows teams to identify gaps in data, refine metrics definitions, and adjust visualizations for clarity.

Feedback from users — such as managers, analysts, or executives — informs improvements and increases adoption.

By iteratively refining the prototype, organizations can build a final BI system that is cost-effective, practical, and aligned with business goals."

Part 6 – Reflection (Expanded Version)

"The BI prototype demonstrates how structured data and well-defined KPIs can be translated into actionable insights that support informed decision-making.

By linking data to decisions and KPIs, managers can quickly identify areas needing intervention, evaluate the effectiveness of actions, and monitor improvements over time.

The prototype approach allows the organization to validate assumptions, test visualizations, and adjust metrics before committing to a full BI implementation, reducing risk and ensuring relevance.
Moreover, the dashboard fosters a **data-driven culture** by providing transparency, consistency, and actionable insights to all levels of management.
It allows the organization to move beyond intuition-based decision-making toward evidence-based strategies, improving efficiency, customer satisfaction, operational performance, and ultimately business value.
Continuous iteration and feedback ensure that the BI system evolves with organizational needs, making it a sustainable tool for long-term performance improvement and competitive advantage."