IsDB البنك الإسلامي للتنمية Islamic Development Bank

ICIEC THE ISLAMIC CORPORATION FOR THE INSURANCE OF INVESTMENT AND EXPORT CREDIT

"A Cutting-Edge Platform to Drive Economic Transformation"

OIC BUSINESS INTELLIGENCE CENTRE (OBIC)

Workshop on
Fundamentals of Business Intelligence (BI)
Jeddah, Saudi Arabia (20-22 March 2023)

Fundamentals of Business Intelligence - Objectives

What is Business Intelligence?

- Answer what is BI and is it the same as Data Science?
- Learn the role that forms part of a BI Team.
- Examples of the most popular BI tools.
- Learn how BI serves the needs of a business.

Data Visualization Concepts

- Learn terms used in visuals and dashboards.
- Learn the purpose of telling a story.
- Creative visuals with a clear purpose and message.
- Recognize well and badly designed visuals.

Common Data Concepts

- Understand data types and data storage basics.
- Learn how BI joins data efficiently.
- Explore the basics of metrics and functions.
- Explain what exactly is a data model.

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Fundamentals of Business Intelligence

What is Business Intelligence?

What is Business Intelligence?

Business intelligence is the practice of turning **data** into **actionable insights.**

Processes

Tools

Skills

Roles

Actionable insights allow business leaders to change or maintain a course of action.

Is BI the same as Data Science?

Business Intelligence

What has happened and **what trends are developing?**

Typical Questions

How many loans did we issue compared to last year?

Which category delivered the highest margin in Q4?

Key Skills

Basic Stats
Data Transformation
Data Visualization
Business Knowledge

Data Analysis

Data Science

What will happen or **which outcome is most likely?**

Typical Questions

Can we predict which customers are likely to default on loans?

Can we suggest relevant movies that a user will like, based on their previous choices?

Key Skills

Coding
Data Mining
Advanced Stats
Domain Knowledge

Categories of Business Intelligence Analysis

There are three major types of BI analysis, which cover many different needs and uses. These are predictive analytics, descriptive analytics, and prescriptive analytics.

Predictive Analytics	Descriptive Analytics	Prescriptive Analytics
Takes historical and real-time data and models future outcomes for planning purposes	It is the process of identifying trends and relationships in data using historical and current data	It takes all relevant data to answer the question, “what should my business do?”

Advantages and Disadvantages of Business Intelligence

Advantages

- Data Visibility and Clarity
- Accurate Reports
- Streamlined Processes
- Increased Efficiency
- Better Customer Experience
- Improved Employee Satisfaction

Disadvantages

- Initial Cost
- User Resistance
- Data Skills Gap

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Fundamentals of Business Intelligence

Business Intelligence Platforms and Dashboards

Business Intelligence Platforms and Dashboards

Business Intelligence Platforms	Business Intelligence Dashboards
- Intuitive to use - Variety of dashboard and visualization options - Smart Insights - Alerts for good and bad metrics - Built-in artificial intelligence (AI) - Deployment flexibility - Integration with other platforms and applications - Data connectivity - Embedding in business application	- Interactivity - Real-time Data - Customizable interface - Standard templates - Sharing ability

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Fundamentals of Business Intelligence

Roles and Processes

BI - Roles and Processes

Roles

Data Engineer

Data Analyst

Data Visualization Specialist

Business Leader

Processes

Data Storage & ETL

Data Models & Analysis

Visuals, Dashboards & Reporting

Decision Making

Business Intelligence – Process and Roles

The Data Analyst

The Data Analyst

Data analysts are responsible for building data models and metrics, which facilitate analysis and visualization.

Extract, Transform & Load

- Import data from Excel files, CSV files and databases
- Transform data into desired format
- Load data into models

Create Models

- Combine tables to create **data models** that link related data
- Set up automated refreshes

Calculate Metrics

- Write formulas to calculate business performance
- Understand the data structure

Documentation

- Document data models for other analysts.
- Document metric definitions using a data dictionary.

The Data Analyst - Common Tools

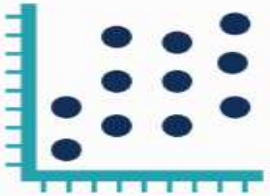
Traditional Tools		Excel	VBA
Data Transformation		Power Query	SQL
Analysis	Tableau	Power Pivot	Power BI
Other Popular Tools	Qlik	R	Python

Business Intelligence – Process and Roles

The Data Visualization Specialist

The Data Visualization Specialist

Data visualization specialists focus on turning clean data into visuals that help communicate a message or help answer a specific question.



Create Visuals

- Focus on one or a few metrics
- Highlight key data points or trends

Dashboarding

- Combine multiple visuals
- Tell a story using data & visuals
- See detail, identify root causes

Communicating Results

- Present to audiences
- Ensure consistency
- Manage audience permissions

Audience Feedback

- Improve definitions
- Avoid uncertainty
- Make reports clearer

Data Visualization - Common Tools

Industry Leaders

Tableau

Power BI

Excel

Other Tools

MicroStrategy

Qlik

Looker

SISENSE

Dundas BI

Adaptive Insights

Analytics

plotly

Python

Business Intelligence – Process and Roles

The Business Leader

The Business Leader

Business leaders are the main audience of business intelligence reports and dashboards. They are also key to guiding our data and analysis strategy.

Decision Making

- Maintain course of action
- Change course of action

Communicate

- Ask questions that highlight priorities
- Questions should engage thought
- Avoid transactional questions

Bad Example

"Could you run the sales and inventory report for me for September?"

Good Example

"Our warehousing costs are too high. I need to understand which products have the lowest turnover rate."

Business Intelligence – Process and Roles

The Data Engineer

The Data Engineer

Data engineers source, organize and move data between systems. They can also be involved in decisions about data storage and infrastructure.

Extract, Transform & Load

- Move data between systems
- Automate data feeds

Create Data Warehouses

- Store all business data
- Optimized for analysis
- Everything accessible in one place

Data Systems Knowledge

- Understand data structures
- Help analysts avoid issues

Data Governance

- Ensure the security of data
- Ensure data integrity

Types of Data Systems

Optimized for computers → **Optimized for human analysis**

OLTP

- Optimized to Enter, Modify, Delete and Read data.

Data Warehouse

- Combines data from multiple sources.
- Optimized for analysis and human interaction.

Data Mart

- Small data warehouses used for a specific project or team.

Data Lake

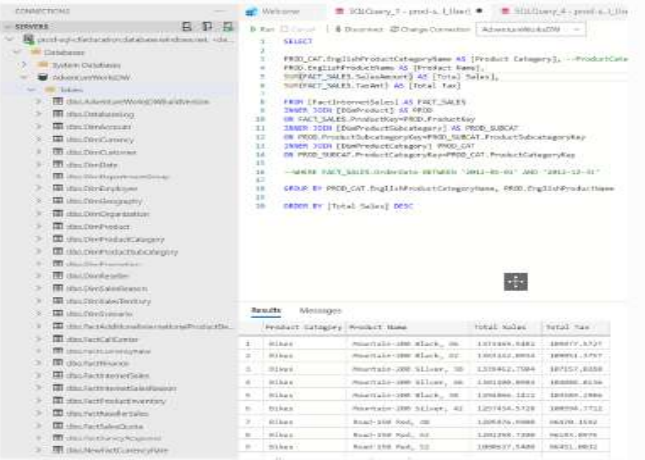
- Stores raw data in original format.
- Can store both **structured data** like tables and lists
- as well as **unstructured** data like emails and phone conversations.

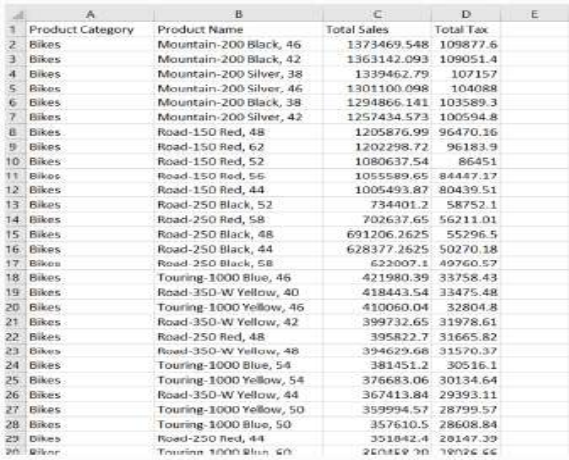
SQL in a Nutshell

- SQL is a query language used to fetch data from a database.

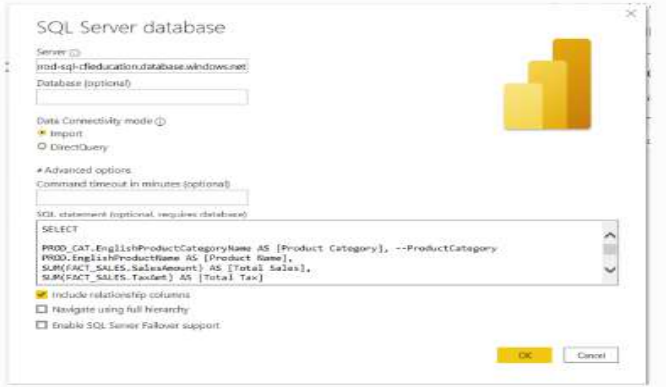
- SQL stands for Structured Query Language.
- SQL is designed to be easy to read and write.
- An understanding of SQL will set you apart from dashboard focused BI analysts.

- SQL can be used in many different environments





	A	B	C	D
1	Product Category	Product Name	Total Sales	Total Tax
2	Bikes	Mountain-200 Black, 46	1373469.548	109877.6
3	Bikes	Mountain-200 Black, 42	1363142.093	109051.4
4	Bikes	Mountain-200 Silver, 38	1339462.79	107157
5	Bikes	Mountain-200 Silver, 46	1301100.098	104088
6	Bikes	Mountain-200 Black, 38	1294866.141	103589.3
7	Bikes	Mountain-200 Silver, 42	1257434.573	100594.8
8	Bikes	Road-150 Red, 48	1205876.99	96470.16
9	Bikes	Road-150 Red, 62	1202298.72	96183.9
10	Bikes	Road-150 Red, 52	1080637.54	86451
11	Bikes	Road-150 Red, 56	1055589.65	84447.17
12	Bikes	Road-150 Red, 44	1005493.87	80439.51
13	Bikes	Road-250 Black, 52	734401.2	58752.1
14	Bikes	Road-250 Red, 58	702637.65	56211.01
15	Bikes	Road-250 Black, 48	691206.2625	55296.5
16	Bikes	Road-250 Black, 44	628377.2625	50270.18
17	Bikes	Road-250 Black, 58	622007.1	49760.57
18	Bikes	Touring-1000 Blue, 46	421980.39	33758.43
19	Bikes	Road-350-W Yellow, 40	418443.54	33475.48
20	Bikes	Touring-1000 Yellow, 46	410060.04	32804.8
21	Bikes	Road-350-W Yellow, 42	399732.65	31978.61
22	Bikes	Road-250 Red, 48	395822.7	31665.82
23	Bikes	Road-350-W Yellow, 48	394629.68	31570.37
24	Bikes	Touring-1000 Blue, 54	381451.2	30516.1
25	Bikes	Touring-1000 Yellow, 54	376683.06	30134.64
26	Bikes	Road-350-W Yellow, 44	367413.84	29393.11
27	Bikes	Touring-1000 Yellow, 50	359994.57	28799.57
28	Bikes	Touring-1000 Blue, 50	357610.5	28608.84
29	Bikes	Road-250 Red, 44	351842.4	28147.39



Data Warehouse

Transaction Table DB

Order ID	Product ID	Category ID	Revenue
7	1	A	25,995
8	2	B	42,495
9	3	A	26,500

Product Table DB2

Product ID	Product
1	Megane
2	F-150
3	Focus

Category Table XLS

Category ID	Category
A	Car
B	Truck

Transaction Table

Order ID	Product ID	Category ID	Revenue
7	1	A	25,995
8	2	B	42,495
9	3	A	26,500

Product Table

Product ID	Product	Category
1	Megane	Car
2	F-150	Truck
3	Focus	Car

Benefits

- Combines and links data from different sources in one accessible database.
- Organized by **semantic** groups, that bring together related data into simple tables.

Data Engineer – Common Tools

Data Storage

Data Storage

Cloud Services inc. Data Storage

Google GCS

Microsoft Azure

Amazon AWS

Coding Languages

SQL

Python

Scala

Big Data Manipulation

Hadoop

Spark

Databricks

Live Streaming Data

Kafka

Pubsub

Kinesis DS

Apache Beam

Business Intelligence Roles Recap

The Business Intelligence Team			The Business
 Data Engineer	 Data Analyst	 Data Visualization Specialist	 Business Leader
Data Storage & ETL	Data Models & Analysis	Visuals, Dashboards & Reporting	Decision Making

Business Intelligence & Data Analysis

Business Intelligence Team Skills

The Data Engineer

Data Storage & ETL

The Data Analyst

Data Models & Analysis

The Data Visualization Specialist

Visuals, Dashboards & Reporting

Business Intelligence Team Skills

The Data Engineer

The Data Analyst

The Data Visualization Specialist

Data Storage & ETL

Data Models & Analysis

Visuals, Dashboards & Reporting

- In the real world, these roles may not be so clearly defined.
- Responsibilities, skills and tools are likely to be shared across roles.

Data Architect **ETL Developer** **BI Developer** **BI Consultant**

DBA **SQL Developer** **Business Analyst** **BI Partner**

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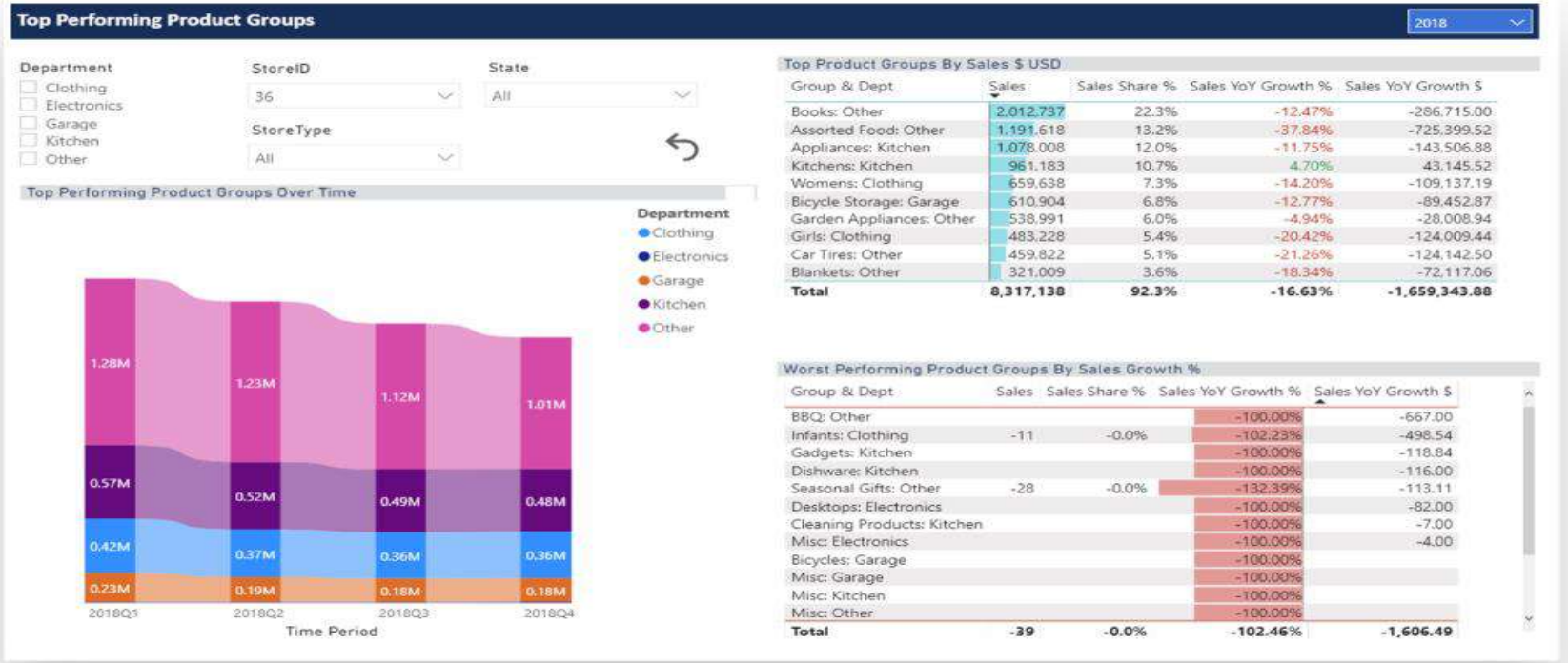
Fundamentals of Business Intelligence

Communicating with Data

Visuals vs. Dashboards

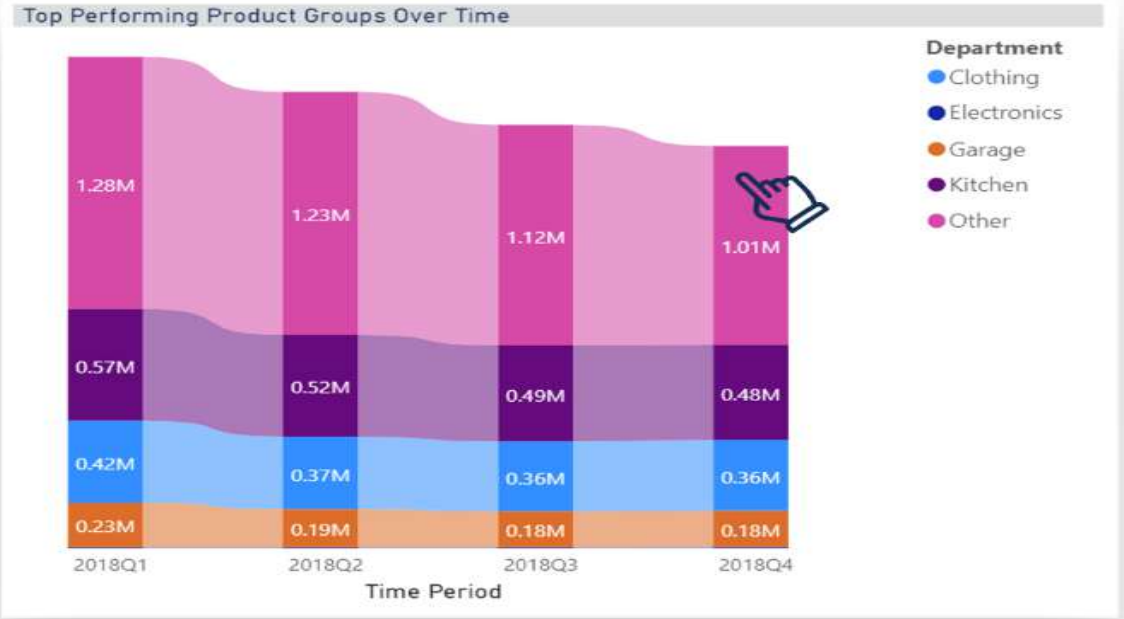
A visual represents a single table, chart or diagram.

A dashboard brings together several related charts to tell or story about the selected data.



What is a Data Story?

- Provides more detail on the current data, over time, across categories or locations.
- Helps identify the actual or forecasted consequences of the current data.
- Helps identify the root causes of an issue or success.



Worst Performing Product Groups By Sales Growth %

Group & Dept	Sales	Sales Share %	Sales YoY Growth %	Sales YoY Growth $
Assorted Food: Other	1,191,618	25.7%	-37.84%	-725,399.52
Books: Other	2,012,737	43.3%	-12.47%	-286,715.00
Car Tires: Other	459,822	9.9%	-21.26%	-124,142.50
Blankets: Other	321,009	6.9%	-18.34%	-72,117.06
Photo Services: Other	114,817	2.5%	-22.75%	-33,808.15
Garden Appliances: Other	538,991	11.6%	-4.94%	-28,008.94
BBQ: Other			-100.00%	-667.00
Seasonal Gifts: Other	-28	-0.0%	-132.39%	-113.11
Misc: Other			-100.00%	
Car Wash: Other			-100.00%	0.00
Total	**4,638,967**	**99.9%**	**-21.51%**	**-1,270,971.28**

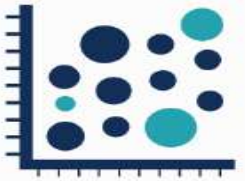
Chart Types

The **best chart is often the simple one** that communicates a message with absolute clarity.

Focusing Attention

Presenting and Comparing Values

Length



Size

Annotation

Order

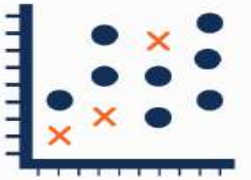
Averages

Dual Axis

Highlighting Values

Color

Enclosure



Shape

Position

Charts are used to answer questions, so **make sure the answers are clear.**

Good vs. Bad Visuals

You are the FP&A manager for a large department store.

Each week, you have a meeting to focus on the performance of one departments.

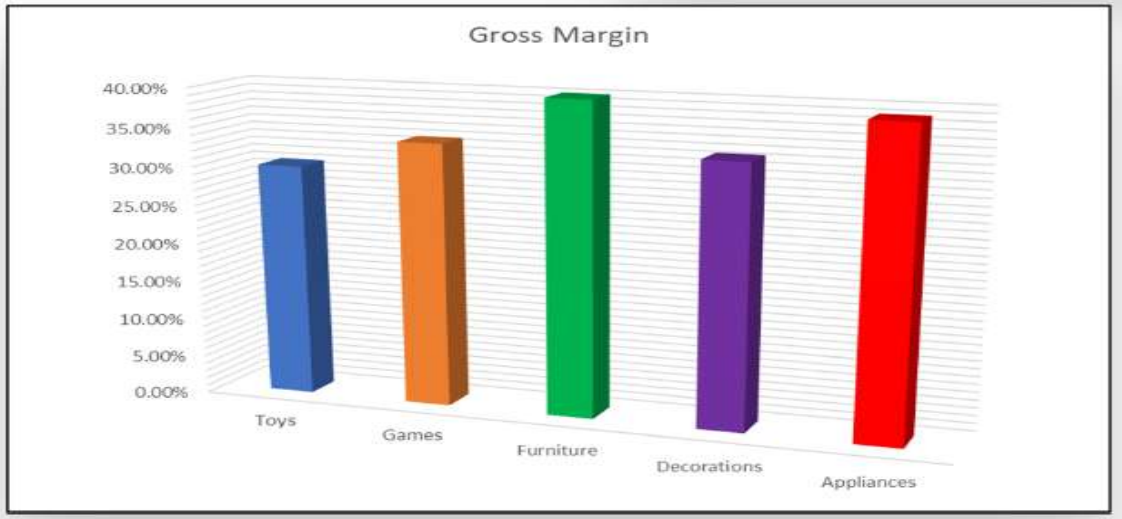
Key Questions

- What margin are we achieving in Decorations?
- How does that compare to other departments?
- What rank is this department in our business?

Good vs. Bad Visuals

Key Questions

- What margin are we achieving in Decorations?
- How does that compare to other departments?
- What rank is this department in our business?



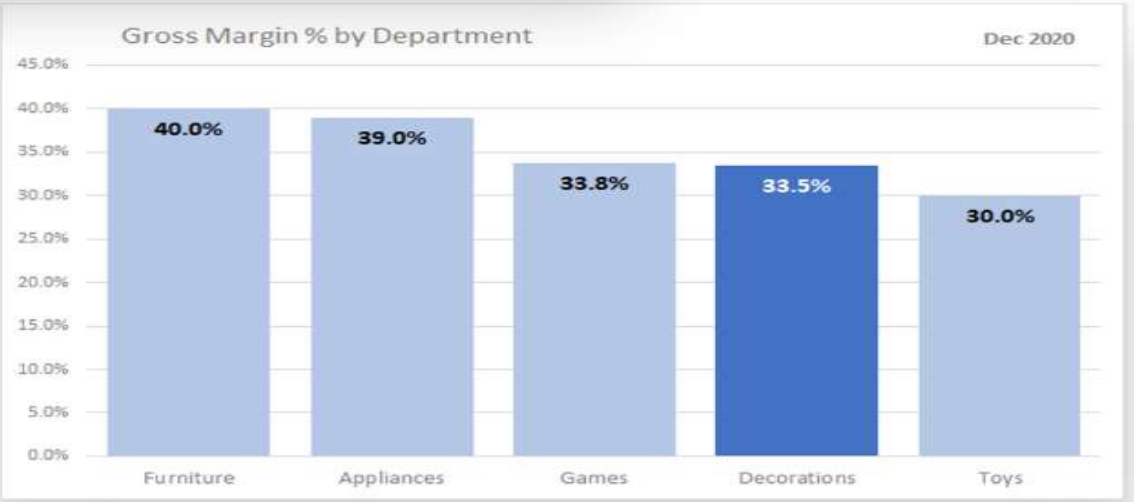
- ✗ 3D bars are distracting?
- ✗ Which bar should I be focusing on?
- ✗ What period is the data from?
- ✗ Difficult to compare Decorations to Games.

Good vs. Bad Visuals

Key Questions

- What margin are we achieving in Decorations?
- How does that compare to other departments?
- What rank is this department in our business?

- ✓ Title and period are clear
- ✓ Data point of interest is highlighted
- ✓ Bar ordering helps identify ranking

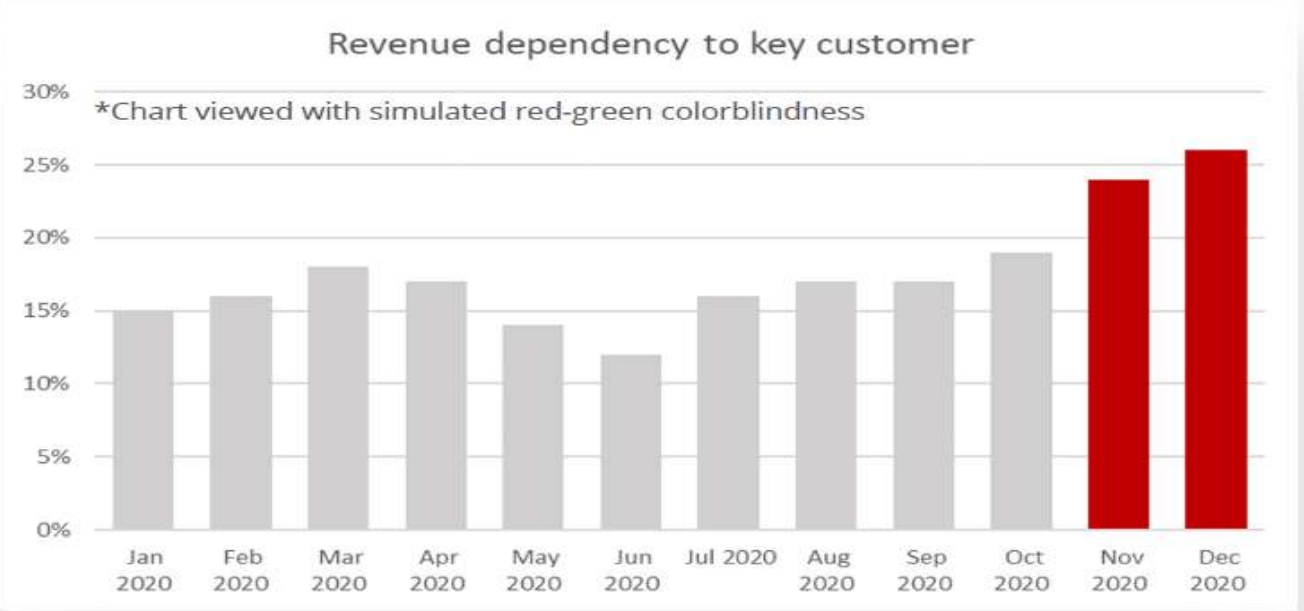


Design Principles

Industry Norms

Month	Amount
January 2020	10,300
February 2020	(20,200)
March 2020	13,250
April 2020	19,200
May 2020	(2,302)

Accessibility



Color blindness affects 8% of men and 0.5% of women.

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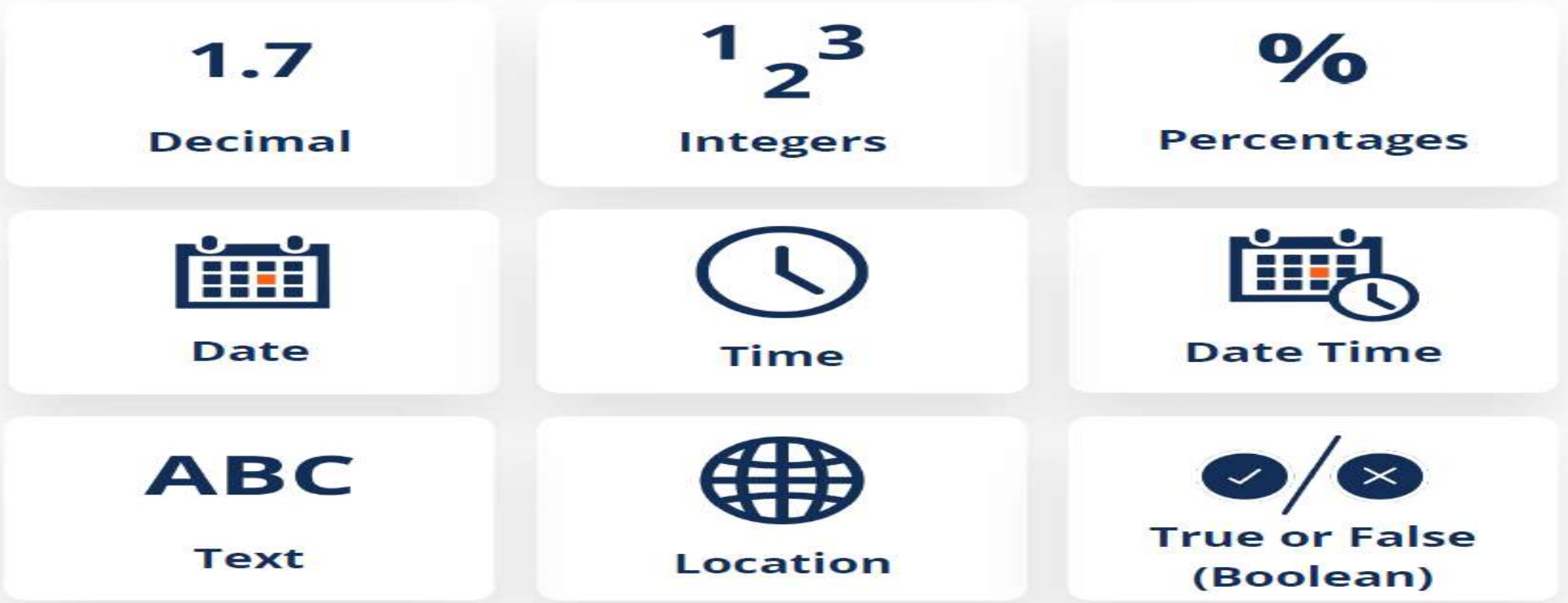
Fundamentals of Business Intelligence

Key Concepts of Data

Data Types



Defining data types help optimize the amount of memory used to store our data.

Data types also help software understand how it can manipulate values.

Functions

Functions are like formulas. They allow us to perform a calculation on or manipulate an input value.

ROUND(NUMBER , DECIMAL_PLACES) ROUND(25.3348 , 2) = 25.33

Each input is called an **argument.**

SUM(NUMBER[1] , NUMBER[2] , ...)

Number Functions	Text Functions	Date Functions	Boolean Functions
Sum()	Left()	DateAdd()	IF()
Average()	Right()	Today()	AND()
Abs()	Trim()	DateDiff()	OR()
Max()	Contains()	Month()	NOT()
Round()	Find()	IsDate()	
Floor()	Mid()		

Boolean Values

Boolean values describe whether a certain condition is **true** or **false**.

Comparison operators help us define boolean values.

=	>	<	≠
Equals	Greater Than	Less Than	Not Equal To

Examples:

Total Sales > 200,000 **True** or **False**

Credit Score < 600 **True** or **False**

☞ Remember, a true or false value is known as a **boolean**.

Boolean Values

Logical functions allow us to use **Boolean Variables (TRUE / FALSE)** in formulas.

Logical functions also known as **Boolean operators.**

IF (LOGICAL_TEST , OUTCOME_IF_TRUE , OUTCOME_IF_FALSE)

AND (LOGICAL_TEST1 , LOGICAL_TEST2)

OR (LOGICAL_TEST1 , LOGICAL_TEST2)

NOT (LOGICAL_TEST)

The application of Logical Functions is often referred to as **Boolean Logic.**

Data Structures

Variables

- Store a single value

Tables

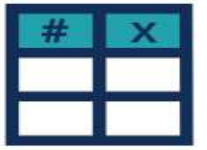
- Store multiple values
- Arranged in rows and columns

Lists

- No other columns needed

Arrays

Key Value Pairs



Hash Tables

Data structures help store one or more values in an appropriate way for our analysis.

Appending Tables

Appending tables allows us to combine multiple files or source tables into one.

Sales Table 1

OrderID	Revenue	CustomerID
152156	261.24	PM-12520
138688	14.62	DV-13045
108966	957.57	PM-12520
115812	1706.18	BH-11710

Sales Table 2

OrderID	Revenue	CustomerID
127372	222.01	DV-13045
129293	111.01	DV-13045
129443	293.12	BH-11710
122345	248.93	PM-12520

Appended Table

OrderID	Revenue	CustomerID
152156	261.24	PM-12520
138688	14.62	DV-13045
108966	957.57	PM-12520
115812	1706.18	BH-11710
127372	222.01	DV-13045
129293	111.01	DV-13045
129443	293.12	BH-11710
122345	248.93	PM-12520

☞ Appended tables are known as a **union.**

☞ Tables must have the **same columns.**

Joining Tables

Joins allow us to physically combine two different tables into one, by matching column values.

Foreign Key (FK)

OrderID	Revenue	CustomerID
152156	261.24	PM-12520
138688	14.62	DV-13045
108966	957.57	PM-12520
115812	1706.18	BH-11710

Primary Key (PK)

CustomerID	Customer Name
PM-12520	Prita Meier
DV-13045	Darrin Van Huff
BH-11710	Brosina Hoffman

OrderID	Revenue	CustomerID	Customer Name
152156	261.24	PM-12520	Prita Meier
138688	14.62	DV-13045	Darrin Van Huff
108966	957.57	PM-12520	Prita Meier
115812	1706.18	BH-11710	Brosina Hoffman

- Columns used to join tables are known as **keys.**
- A **Foreign Key (FK)** identifies a row in another table.
- A **Primary Key (PK)** identifies a row in the current table.

Relationships

Relationships create a connection between two tables, but keep them physically separate.

OrderID	Revenue	CustomerID (FK)
152156	261.24	PM-12520
138688	14.62	DV-13045
108966	957.57	PM-12520
115812	1706.18	BH-11710

CustomerID (PK)	Customer Name
PM-12520	Prita Meier
DV-13045	Darrin Van Huff
BH-11710	Brosina Hoffman

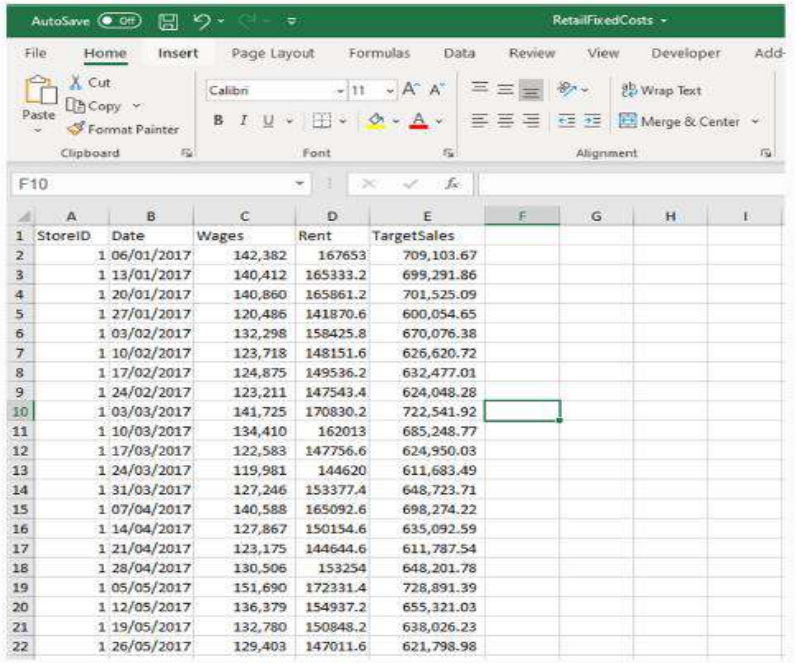
Example: What is the total revenue for Prita Meier?

Example formula: `CALCULATE( SUM( [Revenue] ) , [Customer Name] = 'Prita Meier' )`

- ✓ Columns are only used when they are needed.
- ✓ Helps reduce storage space.

File Types

Excel File



	A	B	C	D	E	F	G	H	I
1	StoreID	Date	Wages	Rent	TargetSales				
2	1	06/01/2017	142,382	167653	709,103.67				
3	1	13/01/2017	140,412	165333.2	699,291.86				
4	1	20/01/2017	140,860	165861.2	701,525.09				
5	1	27/01/2017	120,486	141870.6	600,054.65				
6	1	03/02/2017	132,298	158425.8	670,076.38				
7	1	10/02/2017	123,718	148151.6	626,620.72				
8	1	17/02/2017	124,875	149536.2	632,477.01				
9	1	24/02/2017	123,211	147543.4	624,048.28				
10	1	03/03/2017	141,725	170830.2	722,541.92				
11	1	10/03/2017	134,410	162013	685,248.77				
12	1	17/03/2017	122,583	147756.6	624,950.03				
13	1	24/03/2017	119,981	144620	611,683.49				
14	1	31/03/2017	127,246	153377.4	648,723.71				
15	1	07/04/2017	140,588	165092.6	698,274.22				
16	1	14/04/2017	127,867	150154.6	635,092.59				
17	1	21/04/2017	123,175	144644.6	611,787.54				
18	1	28/04/2017	130,506	153254	648,201.78				
19	1	05/05/2017	151,690	172331.4	728,891.39				
20	1	12/05/2017	136,379	154937.2	655,321.03				
21	1	19/05/2017	132,780	150848.2	638,026.23				
22	1	26/05/2017	129,403	147011.6	621,798.98				

- Store values, formulas & formatting
- Good for analysis, bad for storage

CSV (Comma Separated Values)

- Efficient storage in text format
- Values are separated by commas

JSON File

- Flexible and efficient file format
- Used to move data between systems

Databases

- Robust centralized data storage
- The one version of the truth

A Data Model

Two or more tables connected with relationships are referred to as a **Data Model.**

Date Table (Dimension Table)

Date (PK)	Day of Week
01/12/2020	Tuesday
02/12/2020	Wednesday
03/12/2020	Thursday

Customer Table (Dimension Table)

CustomerID (PK)	Customer Name
PM-12520	Prita Meier
DV-13045	Darrin Van Huff
BH-11710	Brosina Hoffman

Order ID	Date (FK)	Revenue	CustomerID (FK)
152156	01/12/2020	261.24	PM-12520
138688	02/12/2020	14.62	DV-13045
108966	02/12/2020	957.57	PM-12520
115812	03/12/2020	1706.18	BH-11710

Sales Transaction Table (Fact Table)

Fact Tables contain measurements about events or transactions.

Dimension Tables contain attributes that help describe the events in more detail.

Types of Relationships

Many to One

Each key can only appear once in one table, but may appear many times in the other.

One to Many

The same as the above, expressed the other way around.

One to One

A single occurrence of the key in each table.

Many to Many (Avoid where possible)

Potentially many occurrences of each key in each table.

Relationship types help us understand and manage duplicate values in our data.

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Fundamentals of Business Intelligence

Samples of Data, Process and Service Models

Samples - Data Models

Banking
(Data, Process and Services Models)

- Profitability, Relationship Marketing
- Risk Management
- Asset and Liability Mgmt
- Compliance
- Business Process re-engineering

Insurance
(Data, Process and Services Models)

- Customer centricity
- Claims, Policy, Underwriting
- Intermediary Performance
- Compliance
- Risk Management
- Business Process Re-engineering

Financial Markets
(Data, Process and Services Models)

- Risk Management
- Asset and Liability Mgmt
- Compliance
- KYC and Account Opening
- Middle/Back Office Transformation

Health Plan
(Health Plan Data Warehouse)

- Claims
- Medical Management
- Provider and Network
- Sales, Marketing and Membership
- Financials

Retail
(Retail Data Warehouse)

- Customer centricity
- Merchandising Management
- Store Operations & Product Mgmt
- Supply Chain Management
- Compliance

Telco
(Telecommunications Data Warehouse)

- Churn Management
- Relationship Mgmt and Segmentation
- Sales and Marketing
- Service Quality and Product Lifecycle
- Usage Profile

Samples - Process and Service Models

Banking
(IFW Process Models)

- KYC / Account Opening
- Lending, Syndicated Lending
- Mortgages
- Savings, Investments & Deposits
- Wealth Management
- Sales & Relationship Management
- Product & Marketing Management
- Payments
- Regulatory and Compliance
- Human Resource Administration

Financial Markets
(Financial Markets Process Models)

- KYC / Account Opening
- Lending, Syndicated Lending
- Mortgages
- Savings, Investments & Deposits
- Wealth Management
- Sales & Relationship Management
- Product & Marketing Management
- Payments
- Regulatory and Compliance
- Human Resource Administration
- Trade Processing
- Best Execution / MiFID

Insurance
(IAA Process Models)

- Enterprise Resource Management
- Channel Management and CRM
- Communications Management
- Marketing & Customer Acquisition
- Product Portfolio management
- Claim management
- Policy Administration
- Underwriting
- Financial transaction
- Reinsurance Management
- Investment Management
- Provider Management

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Fundamentals of Business Intelligence

Developing Business Intelligence Strategy

Developing Business Intelligence Strategy

Major success factors in building the Business Intelligence Strategy

- Know your business strategy and goals
- Identify key stakeholders
- Choose a sponsor from your key stakeholders
- Choose your BI platform and tools
- Create BI Team
- Define your scope
- Prepare your data infrastructure
- Define your goals and roadmap

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Fundamentals of Business Intelligence

OBIC will contain data, processes, and services models related to Driving the Economic Transformation

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OBIC PARTNERS

COMCEC Cooperation for Development

SESRIC

CIDC Islamic Centre for Development of Trade

Thank you