



Sri Lanka Institute of Information Technology

**BSc (Hons) in Information Technology Specializing in
Data Science**

Data Warehousing and Business Intelligence IT3021

Assignment 2

2025

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Step 1: Data Source

Data Warehouse Description

The data warehouse implemented in Assignment 1 serves as the foundation for this assignment. The warehouse follows a snowflake schema design focused on the Chinook music sales database with the following components:

Fact Table:

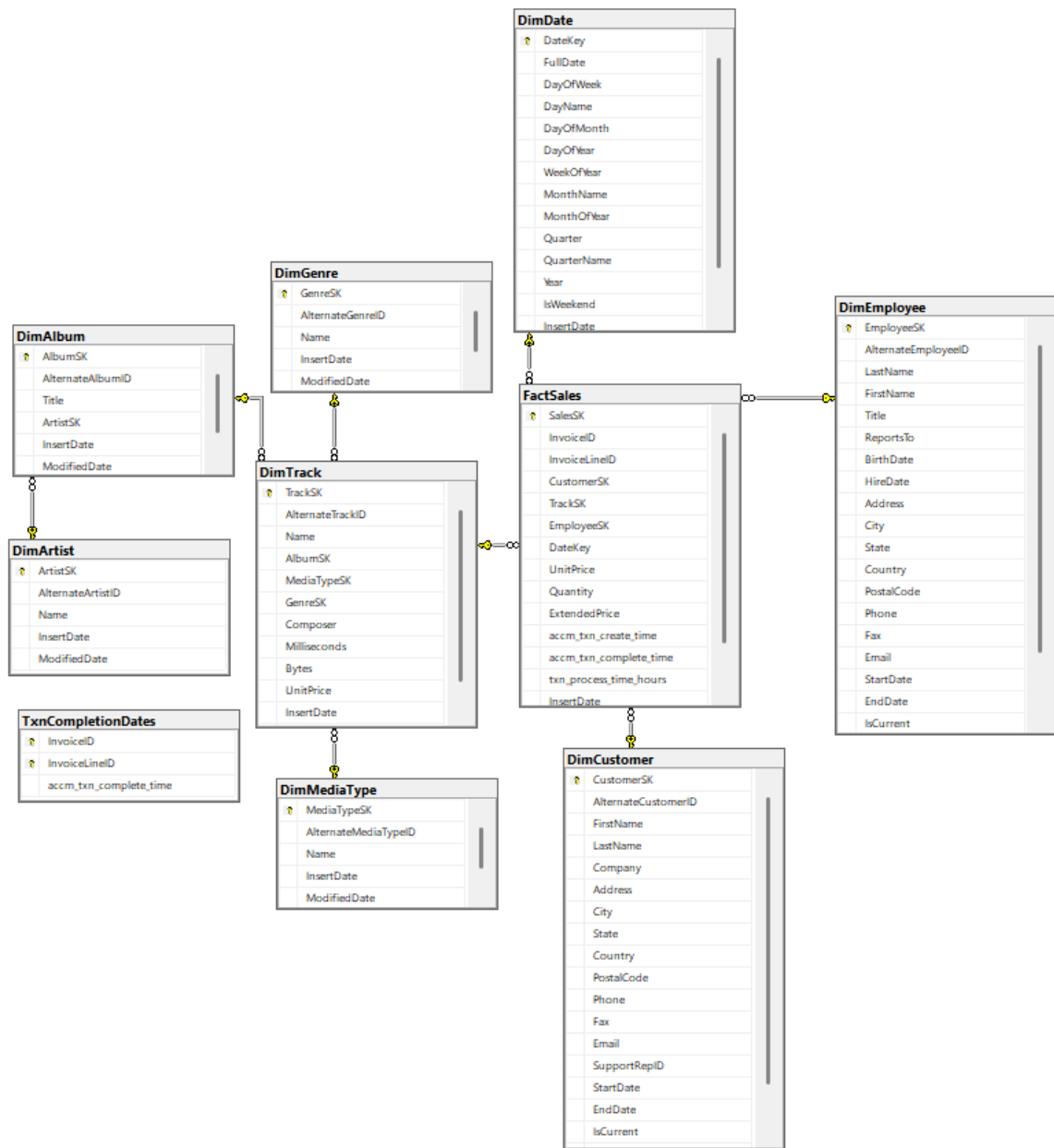
- **FactSales:** Contains sales transaction data with measures

Dimension Tables:

- **DimDate:** Time dimension with attributes for date hierarchy
- **DimCustomer:** Customer information implemented as Type-2 SCD
- **DimEmployee:** Employee data implemented as Type-2 SCD
- **DimTrack:** Music track information implemented as Type-1 SCD
- **DimAlbum:** Album details implemented as Type-1 SCD
- **DimArtist:** Artist information implemented as Type-1 SCD
- **DimGenre:** Genre categories implemented as Type-1 SCD
- **DimMediaType:** Media formats implemented as Type-1 SCD

Key Hierarchies:

- Time Hierarchy: Year → Quarter → Month → Day
- Geographic Hierarchy: Country → State → City
- Music Hierarchy: Artist → Album → Track



- Chinook_DW
 - Database Diagrams
 - Tables
 - System Tables
 - FileTables
 - External Tables
 - Graph Tables
 - dbo.DimAlbum
 - dbo.DimArtist
 - dbo.DimCustomer
 - dbo.DimDate
 - dbo.DimEmployee
 - dbo.DimGenre
 - dbo.DimMediaType
 - dbo.DimTrack
 - dbo.FactSales
 - dbo.TxnCompletionDates

Step 2: SSAS Cube Implementation

Implementation Process

1. Create Analysis Services Project:

- Created a new Analysis Services Multidimensional project in SQL Server Data Tools (SSDT) – “ChinookDW_SSAS”

2. Define Data Source:

- Connected to the Chinook data warehouse SQL Server database - “DSV_Chinook DW”

3. Create Data Source View (DSV):

- Added all dimension tables and the fact table to the DSV
- Ensured all relationships were properly defined between FactSales and dimension tables

4. Create Cube:

- Used the Cube Wizard to create the initial cube structure
- Selected FactSales as the main measure group
- Added key measures: UnitPrice, Quantity, ExtendedPrice
- Created calculated measures: Total Sales, Average Order Value, Order Count

5. Define Dimensions:

- Created and configured dimensions for:
 - Time (DimDate)
 - Customer (DimCustomer)
 - Employee (DimEmployee)
 - Track (DimTrack)
- Defined attributes for each dimension

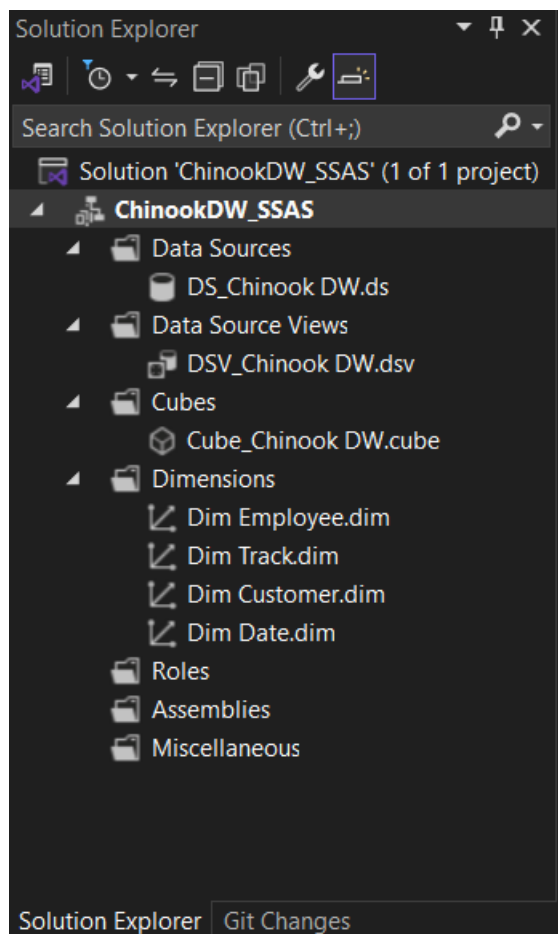
6. Implement Hierarchies:

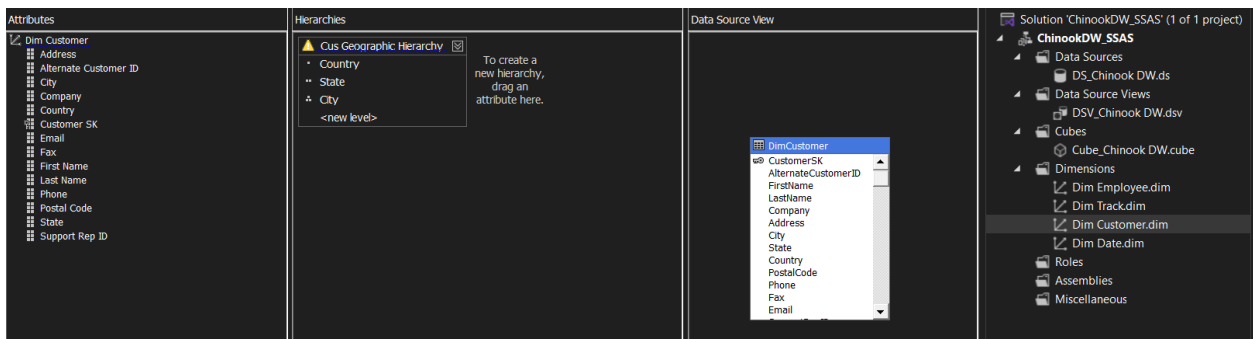
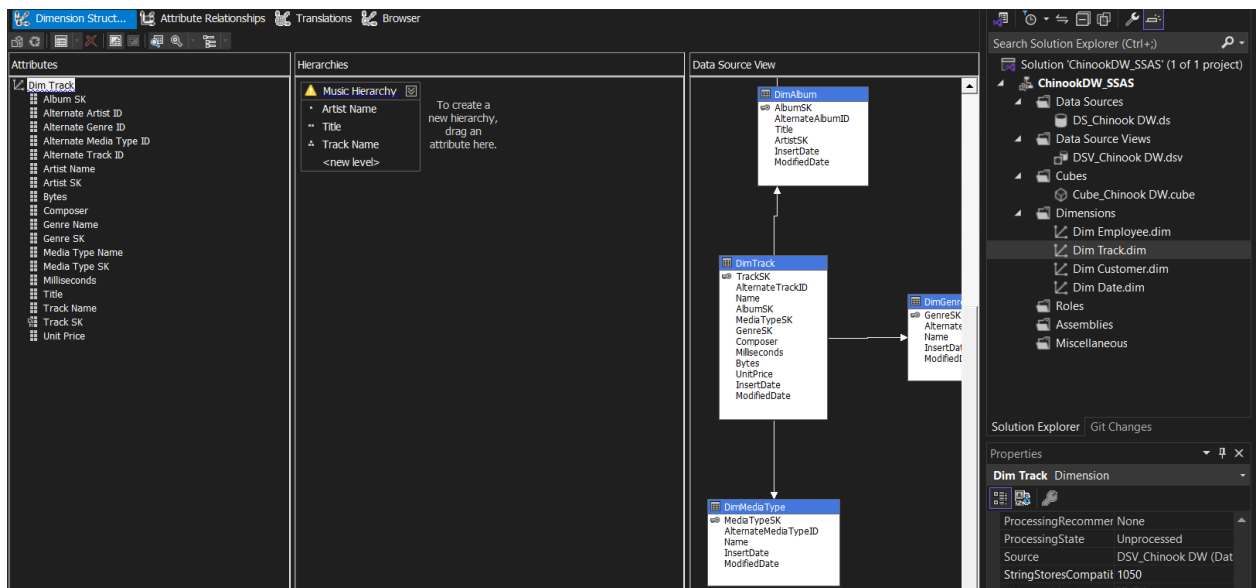
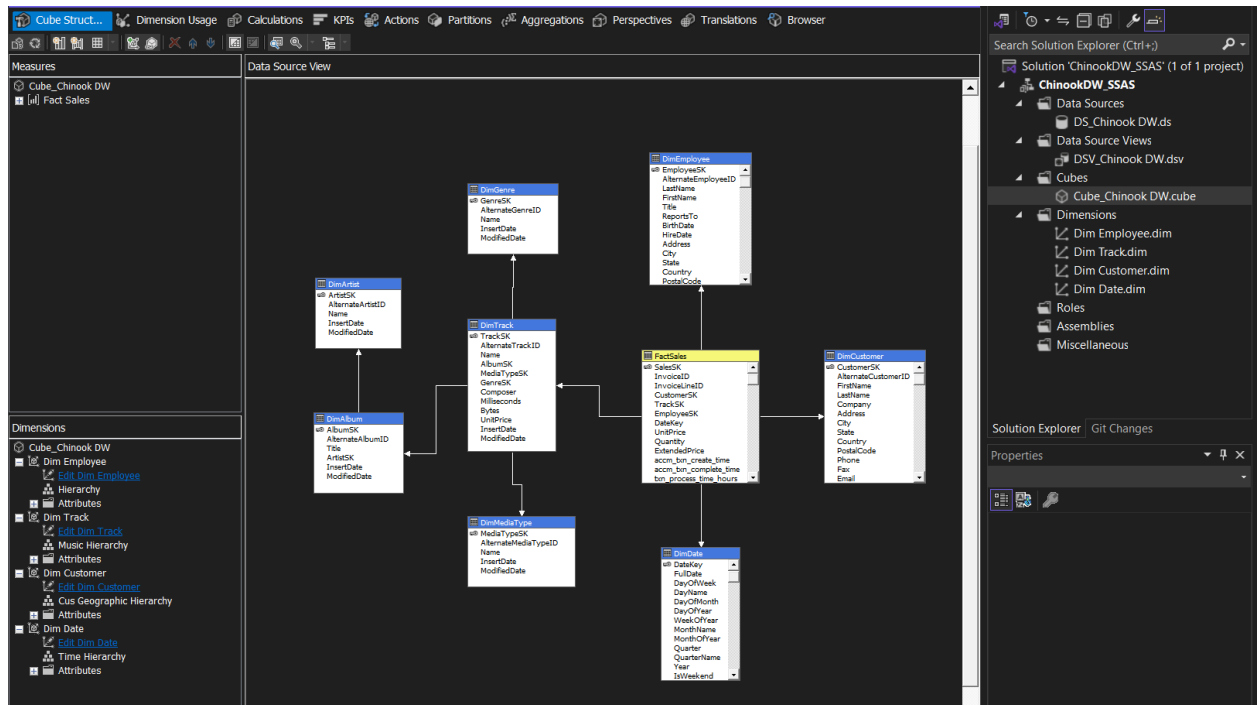
- Implemented Time Hierarchy: Year → Quarter → Month → Day
- Implemented Music Hierarchy: Artist → Album → Track

- Implemented Geographic Hierarchy: Country → State → City

7. Deploy and Process Cube:

- Deployed the cube to the Analysis Services server
- Processed the cube to load data





Step 3: Demonstration of OLAP Operations

Excel Connection and OLAP Operations

1. Connect Excel to SSAS Cube:

- Opened Excel and navigated to Data tab
- Selected "From Other Sources" → "From Analysis Services"
- Connected to the SSAS server and selected the Chinook cube
- Created a PivotTable to analyze the data

2. Demonstrate Roll-up Operation:

- Started with track-level sales data
- Rolled up to album level by removing Track from rows
- Further rolled up to artist level by removing Album from rows
- Observed how data aggregates at each level

	A	B
1	Row Labels	Fact Sales Count
2	AC/DC	16
3	Academy of St. Martin in the Fields & Sir Neville Marriner	1
4	Academy of St. Martin in the Fields, John Birch, Sir Neville Marriner & Sylvia McNair	1
5	Academy of St. Martin in the Fields, Sir Neville Marriner & Thurston Dart	2
6	Accept	5
7	Adrian Leaper & Doreen de Feis	1
8	Aerosmith	10
9	Alanis Morissette	8
10	Alice In Chains	7
11	Amy Winehouse	18
12	Antal Doráti & London Symphony Orchestra	1
13	Antônio Carlos Jobim	22
14	Apocalyptica	4
15	Aquaman	2
16	Audioslave	16
17	BackBeat	6
18	Battlestar Galactica	12
19	Battlestar Galactica (Classic)	18
20	Berliner Philharmoniker & Hans Rosbaud	1
21	Berliner Philharmoniker & Herbert Von Karajan	2
22	Billy Cobham	4
23	Black Label Society	8
24	Black Sabbath	9
25	Body Count	11
26	Bruce Dickinson	12
27	Buddy Guy	7
28	Caetano Veloso	21
29	Colexico	1
30	Cássia Eller	21
31	Chicago Symphony Orchestra & Fritz Reiner	2
32	Chico Buarque	27

	A	B
1	Row Labels	Fact Sales Count
2	Alternative	14
3	Alternative & Punk	244
4	Blues	61
5	Bossa Nova	15
6	Classical	41
7	Comedy	9
8	Drama	29
9	Easy Listening	10
10	Electronica/Dance	12
11	Heavy Metal	12
12	Hip Hop/Rap	17
13	Jazz	80
14	Latin	386
15	Metal	264
16	Pop	28
17	R&B/Soul	41
18	Reggae	30
19	Rock	835
20	Rock And Roll	6
21	Sci Fi & Fantasy	20
22	Science Fiction	6
23	Soundtrack	20
24	TV Shows	47
25	World	13
26	Grand Total	2240
27		
28		

	A	B
1	Row Labels	Fact Sales Count
2	AAC audio file	3
3	MPEG audio file	1976
4	Protected AAC audio file	146
5	Protected MPEG-4 video file	111
6	Purchased AAC audio file	4
7	Grand Total	2240
8		
9		

	A	B
1	Row Labels	Fact Sales Count
2	...And Justice For All	6
3	[1997] Black Light Syndrome	5
4	20th Century Masters - The Millennium Collection: The Best of Scorpions	5
5	A Matter of Life and Death	6
6	A Real Dead One	7
7	A Real Live One	5
8	A Tempestade Tempestade Ou O Livro Dos Dias	9
9	Ace Of Spades	6
10	Achtung Baby	6
11	Acústico	22
12	Acústico MTV	18
13	Acústico MTV [Live]	9
14	Adams, John: The Chairman Dances	1
15	Afrociberdelia	16
16	Album Of The Year	13
17	Alcohol Fueled Brevitality Live! [Disc 1]	5
18	Alcohol Fueled Brevitality Live! [Disc 2]	3
19	All That You Can't Leave Behind	6
20	American Idiot	15
21	Angel Dust	13
22	Ao Vivo [IMPORT]	9
23	Appetite for Destruction	9
24	Aquaman	2
25	Are You Experienced?	8
26	Arquivo II	12
27	Arquivo Os Paralamas Do Sucesso	15
28	As Canções de Eu Tu Eles	5
29	A-Sides	15
30	Audioslave	6
31	Axe Bahia 2001	6
32	Bach: Orchestral Suites Nos. 1 - 4	2
33	Back To Back - Backstreet	4

	A	B
1	Row Labels	Fact Sales Count
2	AC/DC	16
3	For Those About To Rock We Salute You	10
4	Breaking The Rules	1
5	Evil Walks	1
6	For Those About To Rock (We Salute You)	1
7	Inject The Venom	2
8	Night Of The Long Knives	1
9	Put The Finger On You	1
10	Snowballed	2
11	Spellbound	1
12	Let There Be Rock	6
13	Academy of St. Martin in the Fields & Sir Neville Marriner	1
14	Academy of St. Martin in the Fields, John Birch, Sir Neville Marriner & Sylvia McNair	1
15	Academy of St. Martin in the Fields, Sir Neville Marriner & Thurston Dart	2
16	Accept	5
17	Adrian Leaper & Doreen de Feis	1
18	Aerosmith	10
19	Alanis Morissette	8
20	Alice In Chains	7
21	Amy Winehouse	18
22	Antal Doráti & London Symphony Orchestra	1
23	Antônio Carlos Jobim	22
24	Apocalyptica	4
25	Aquaman	2
26	Audioslave	16
27	BackBeat	6
28	Battlestar Galactica	12
29	Battlestar Galactica (Classic)	18
30	Berliner Philharmoniker & Hans Rosbaud	1
31	Berliner Philharmoniker & Herbert Von Karajan	2
32	Billy Cobham	4
33	Black Label Society	6

3. Demonstrate Drill-Down Operation:

- Started with Year summary of sales
- Drilled down to Quarter level by expanding Years
- Further drilled down to Month level
- Drilled down to Day level for detailed view

	A	B
1	Row Labels	Fact Sales Count
2	2021	454
3	2022	455
4	2023	442
5	2024	447
6	2025	442
7	Grand Total	2240
8		
9		
10		
11		

	A	B
1	Row Labels	Fact Sales Count
2	1	558
3	2	566
4	3	560
5	4	556
6	Grand Total	2240
7		
8		

	A	B
1	Row Labels	Fact Sales Count
2	1	84
3	10	64
4	11	93
5	12	78
6	13	90
7	14	76
8	15	69
9	16	84
10	17	64
11	18	79
12	19	38
13	2	70
14	20	62
15	21	62
16	22	69
17	23	86
18	24	75
19	25	87
20	26	53
21	27	59
22	28	66
23	29	68
24	3	72
25	30	74
26	31	38
27	4	66
28	5	94
29	6	104
30	7	104
31	8	58
32	9	54
33	Grand Total	2240

	A	B
1	Row Labels	Fact Sales Count
2	2021	454
3	1	112
4	1	6
5	11	28
6	14	14
7	19	2
8	2	8
9	22	1
10	3	12
11	4	4
12	5	4
13	6	24
14	9	9
15	2	114
16	3	114
17	4	114
18	2022	455
19	2023	442
20	2024	447
21	2025	442
22	Grand Total	2240
23		
24		

4. Demonstrate Slice Operation:

- Applied filter to show only Rock genre sales
- Created a separate view showing only sales from USA
- Demonstrated how slice isolates a specific dimension value

	A	B	
1	Country	USA	
2			
3	Fact Sales Count		
4		494	
5			
6			
7			
8			
9			
10			

5. Demonstrate Dice Operation:

- Applied multiple filters simultaneously:
 - Genre: Rock
 - Country: USA
 - Year: 2022
- Showed how dice creates a subset of the cube across multiple dimensions

	A	B	
1	Genre Name	Rock	
2	Country	USA	
3	Year	2022	
4			
5	Fact Sales Count		
6		31	
7			
8			
9			

6. Demonstrate Pivot Operation:

- Started with Genres in rows and Time in columns
- Pivoted the view by moving Genres to columns and Time to rows
- Showed how perspective changes while data remains the same

	A	B	C	D	E	F	G	H
1	Fact Sales Count	Column Labels						
2	Row Labels	2021	2022	2023	2024	2025	Grand Total	
3	Argentina		12	1		25	38	
4	Australia		12	1	2	23	38	
5	Austria		2	23		12	38	
6	Belgium		7		25	6	38	
7	Brazil		38	40	20	54	38	190
8	Canada		58	74	56	43	73	304
9	Chile		16	9	6	7	38	
10	Czech Republic		11	10	13	17	25	76
11	Denmark		6	7		16	9	38
12	Finland		9		12	1	16	38
13	France		36	40	39	34	41	190
14	Germany		54	26	43	19	10	152
15	Hungary			25		12	1	38
16	India		10	17	25	11	11	74
17	Ireland		7		25		6	38
18	Italy		2	11		16	9	38
19	Netherlands		9	2	10	1	16	38
20	Norway		11		16	9	2	38
21	Poland		16	9		12	1	38
22	Portugal		12	7	9	23	25	76
23	Spain		1	2	23		12	38
24	Sweden		6	7		25		38
25	United Kingdom		26	31	18	10	29	114
26	USA		105	102	99	102	86	494
27	Grand Total		454	455	442	447	442	2240
28								

	A	B	C	D	E	F	G	H
1	Fact Sales Count	Column Labels						
2	Row Labels	2021	2022	2023	2024	2025	Grand Total	
3	Alternative		6	4	4		14	
4	Alternative & Punk		63	40	46	39	56	244
5	Blues		11	11	20	9	10	61
6	Bossa Nova		1	2	8		4	15
7	Classical			14	10	17		41
8	Comedy			2	1	6		9
9	Drama			9	6	9	5	29
10	Easy Listening		3	2	3		2	10
11	Electronica/Dance		2	4	2	3	1	12
12	Heavy Metal		4	3		3	2	12
13	Hip Hop/Rap		2	3	4	4	4	17
14	Jazz		20	16	16	6	22	80
15	Latin		83	78	81	64	80	386
16	Metal		62	54	26	66	56	264
17	Pop		1	9	10	8		28
18	R&B/Soul		8	9	7	10	7	41
19	Reggae		6	7	8	6	3	30
20	Rock		180	157	158	164	176	835
21	Rock And Roll		1	2	1	2		6
22	Sci Fi & Fantasy			5	9	6		20
23	Science Fiction			2	2	1	1	6
24	Soundtrack		4	4	5	4	3	20
25	TV Shows			13	14	13	7	47
26	World		3	3	1	3	3	13
27	Grand Total		454	455	442	447	442	2240
28								

Step 4: PowerBI Reports

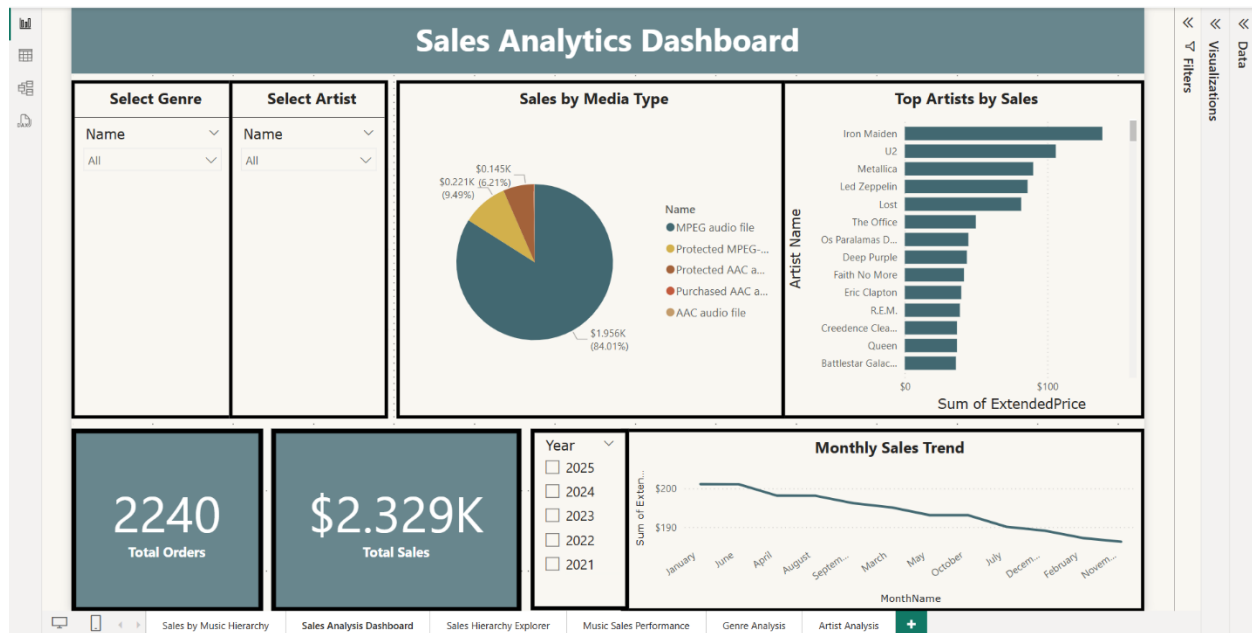
Report 1: Matrix Visual for Detailed Analysis

- Connected to Analysis Services and Load OLAP Cube
- Created matrix visual with hierarchical rows and columns
- Applied conditional formatting to sales metrics based on performance
- Implemented stepped layout for clearer hierarchy visualization

Music Sales Performance by Hierarchy									
Year	2021		2022		2023		2024		2025
Genre	Sum of ExtendedPrice	Sum of Quantity	Sum of ExtendedPrice	Sum of Quantity	Sum of ExtendedPrice	Sum of Quantity	Sum of ExtendedPrice	Sum of Quantity	Sum of Quantity
World	\$2.970	3	\$2.970	3	\$0.990	1	\$2.970	3	
TV Shows			\$25.870	13	\$27.860	14	\$25.870	13	
Soundtrack	\$3.960	4	\$3.960	4	\$4.950	5	\$3.960	4	
Science Fiction			\$3.980	2	\$3.980	2	\$1.990	1	
Sci Fi & Fantasy			\$9.950	5	\$17.910	9	\$11.940	6	
Rock And Roll	\$0.990	1	\$1.980	2	\$0.990	1	\$1.980	2	
Rock	\$178.200	180	\$155.430	157	\$156.420	158	\$162.360	164	
Reggae	\$5.940	6	\$6.930	7	\$7.920	8	\$5.940	6	
R&B/Soul	\$7.920	8	\$8.910	9	\$6.930	7	\$9.900	10	
Pop	\$0.990	1	\$8.910	9	\$9.900	10	\$7.920	8	
Metal	\$61.380	62	\$53.460	54	\$25.740	26	\$65.340	66	
Latin	\$82.170	83	\$77.220	78	\$80.190	81	\$63.360	64	
Jazz	\$19.800	20	\$15.840	16	\$15.840	16	\$5.940	6	
Hip Hop/Rap	\$1.980	2	\$2.970	3	\$3.960	4	\$3.960	4	
Heavy Metal	\$3.960	4	\$2.970	3			\$2.970	3	
Electronica/Dance	\$1.980	2	\$3.960	4	\$1.980	2	\$2.970	3	
Easy Listening	\$2.970	3	\$1.980	2	\$2.970	3			
Drama			\$17.910	9	\$11.940	6	\$17.910	9	
Total	\$449.460	454	\$481.450	455	\$469.580	442	\$477.530	447	

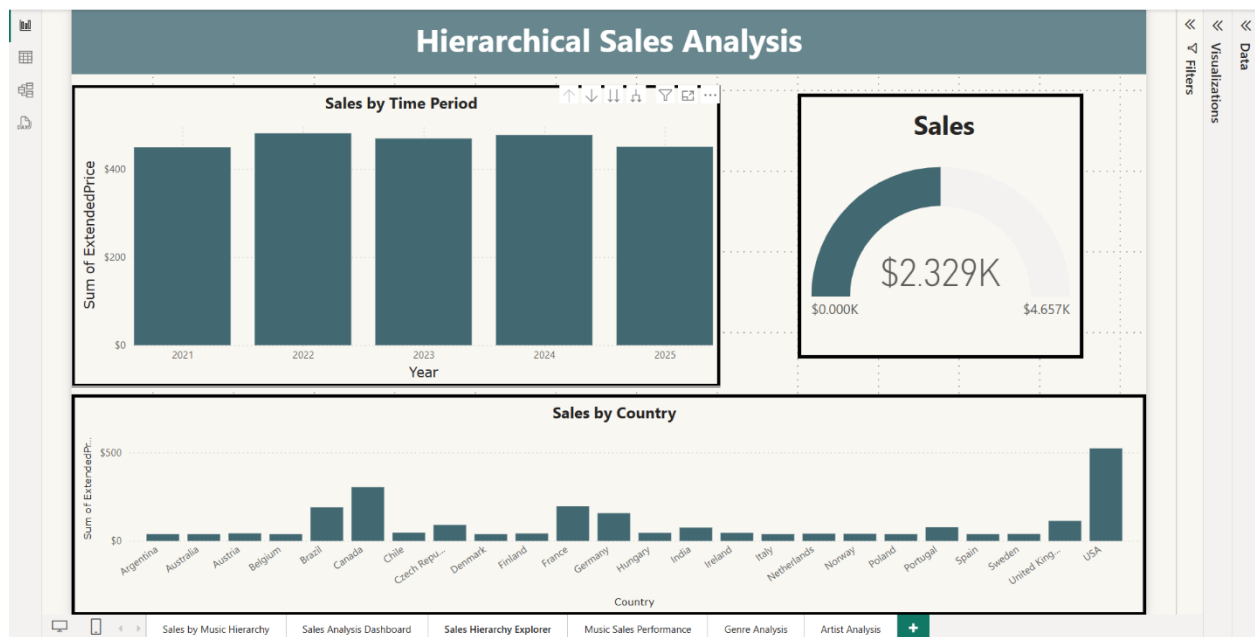
Report 2: Interactive Dashboard with Cascading Filters

- Created advanced slicers with search functionality
- Implemented slicer sync groups for coordinated filtering
- Set up cascading relationship between Genre and Artist slicers
- Added multiple visualization types: column charts, gauge visuals, decomposition tree



Report 3: Drill-Down Report with Multi-level Analysis

- Created hierarchies for time and country dimensions
- Implemented custom navigation buttons for drill operations
- Added breadcrumb navigation showing current path
- Created dynamic visuals that change based on hierarchy level



Report 4: Drill-Through Report with Multi-layered Details

- Created summary page with top artists, and genres
- Implemented first drill-through level showing genre details
- Added second drill-through level showing artists details
- Implemented parameter controls for time period filtering
- Created breadcrumb navigation between levels

