

Apple iTunes Music Store - Analytics & Business Intelligence Report

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Tech Stack: Python, PostgreSQL / MySQL, Power BI / Tableau

Deliverables: End-to-End SQL Script, Interactive Dashboard, Executive Presentation

1. Executive Summary

This project transforms raw digital music store data into a strategic asset. By constructing a robust, fully relational SQL database from flat CSV files, we successfully mapped millions of data points across customers, employees, invoices, and digital tracks.

The resulting analysis provides iTunes leadership with actionable intelligence to optimize regional marketing, restructure promotional events, identify high-value "whale" customers, and prioritize high-yielding music genres.

2. Project Overview & Problem Statement

Apple iTunes maintains a massive digital music store network featuring millions of tracks, thousands of global customers, and a dedicated workforce managing sales operations. As the business scales, leadership requires deeper visibility into consumer behavior, content performance, and regional sales efficiency.

The objective of this project was to build a complete SQL-based analytical pipeline. By analyzing the relational database, this project aims to generate strategic recommendations that will help improve product offerings, optimize customer targeting, and drive operational efficiency.

3. Data Architecture & Methodology

To ensure enterprise-grade data integrity and prevent redundancy, the raw dataset was processed and modeled into a **Fully Normalized Relational Database**.

- **Database Schema:** Successfully deployed a relational schema consisting of 11 distinct tables.

table
album
artist
customer
employee
genre
invoice
invoice_line
media_type
playlist
playlist_track
track

- **Relational Integrity:** Established strict Primary and Foreign Key constraints to connect customer records to their respective invoices, and tracks to their genres.

Result Grid			
	album_id	title	artist_id
▶	156	And Justice For All	50
	208	Black Light Syndrome	136
	257	20th Century Masters - The Millennium Collectio...	179
	296	A Copland Celebration, Vol. I	230
	94	A Matter of Life and Death	90

- **Advanced SQL Analytics:** Deployed complex queries utilizing JOINs, GROUP BY aggregations, Window Functions, and Common Table Expressions (CTEs) to extract multidimensional insights.

4. Analytical Framework: The 15 Core Queries

Below is the complete SQL execution and business logic used to answer the 15 core business questions outlined in the project requirements.

Domain A: Employee & Geographic Insights

Q1. Who is the senior most employee based on job title?

SQL

```
SELECT employee_id, first_name, last_name, title, levels  
FROM employee  
ORDER BY levels DESC  
LIMIT 1;
```

	employee_id	first_name	last_name	title	levels
▶	1	Andrew	Adams	General Manager	L6

Result: Andrew Adams (General Manager, Level L6).

Q2. Which countries have the most Invoices?

SQL

```
SELECT billing_country, COUNT(invoice_id) AS total_invoices  
FROM invoice  
GROUP BY billing_country  
ORDER BY total_invoices DESC;
```

	billing_country	total_invoices
▶	USA	131
	Canada	76
	Brazil	61
	France	50
	Germany	41
	Czech Republic	30
	Portugal	29
	United Kingdom	28
	India	21
	Ireland	13
	Chile	13
	Finland	11
	Spain	11
	Poland	10
	Denmark	10

Result: The **USA** leads with 131 invoices, followed by **Canada** (76) and **Brazil** (61).

Q3. What are top 3 values of total invoice?

SQL

```
SELECT total
FROM invoice
ORDER BY total DESC
LIMIT 3;
```

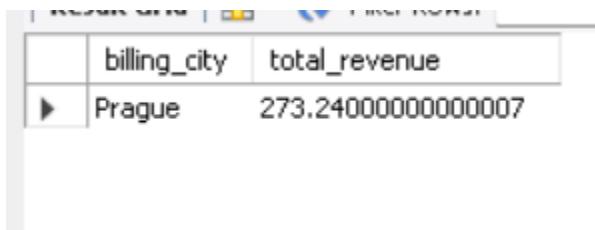
Result Grid	
	total
▶	23.759999999999998
	19.8
	19.8

Result: \$23.76, \$19.80, and \$19.80.

Q4. Which city has the best customers? (City with the highest sum of invoice totals)

SQL

```
SELECT billing_city, SUM(total) AS total_revenue
FROM invoice
GROUP BY billing_city
ORDER BY total_revenue DESC
LIMIT 1;
```



	billing_city	total_revenue
▶	Prague	273.24000000000007

Result: Prague is the ideal location for a Music Festival, having generated **\$273.24** in revenue.

Q15. What are the most popular countries for music purchases?

SQL

```
SELECT billing_country, COUNT(invoice_id) AS total_purchases,
SUM(total) as total_revenue
FROM invoice
GROUP BY billing_country
ORDER BY total_purchases DESC;
```

Result Grid | Filter Rows: | Export: |

	billing_country	total_purchases	total_revenue
▶	USA	131	1040.489999999998
	Canada	76	535.5900000000001
	Brazil	61	427.6800000000006
	France	50	389.0699999999999
	Germany	41	334.62
	Czech Republic	30	273.24000000000007
	Portugal	29	185.13000000000002
	United Kingdom	28	245.52
	India	21	183.1499999999998
	Ireland	13	114.8399999999997
	Chile	13	97.02000000000001
	Finland	11	79.2
	Spain	11	98.01
	Poland	10	76.22999999999999
	Denmark	10	27.610000000000004

Result 23 ×

Result: The **USA** is the most popular market by both total purchases (131) and revenue (\$1,040.49).

Domain B: Customer Purchasing Power

Q5. Who is the best customer? (Customer who spent the most money)

SQL

```
SELECT c.customer_id, c.first_name, c.last_name, SUM(i.total) AS
total_spent
FROM customer c
JOIN invoice i ON c.customer_id = i.customer_id
GROUP BY c.customer_id, c.first_name, c.last_name
ORDER BY total_spent DESC
LIMIT 1;
```

	customer_id	first_name	last_name	total_spent
▶	5	František	Wichterlová	144.54000000000002

Result: František Wichterlová is the highest spender globally with a total of \$144.54.

Q9. Find how much amount spent by each customer on artists.

SQL

```
SELECT c.first_name, c.last_name, ar.name AS artist_name,
SUM(il.unit_price * il.quantity) AS total_spent
FROM customer c
JOIN invoice i ON c.customer_id = i.customer_id
JOIN invoice_line il ON i.invoice_id = il.invoice_id
JOIN track t ON il.track_id = t.track_id
JOIN album al ON t.album_id = al.album_id
JOIN artist ar ON al.artist_id = ar.artist_id
GROUP BY c.customer_id, c.first_name, c.last_name, ar.artist_id,
ar.name
ORDER BY total_spent DESC;
```

	first_name	last_name	artist_name	total_spent
▶	Steve	Murray	AC/DC	17.82
	Jennifer	Peterson	Aerosmith	14.850000000000001
	Mark	Taylor	Aerosmith	14.850000000000001
	Fernanda	Ramos	Antônio Carlos Jobim	13.860000000000001
	Leonie	Käthler	Audioslave	13.860000000000001
	Edward	Francis	Alanis Morissette	12.870000000000001
	Emma	Jones	Alanis Morissette	12.870000000000001
	João	Fernandes	Alanis Morissette	12.870000000000001
	Victor	Stevens	Alice In Chains	11.88
	Phil	Hughes	AC/DC	10.89
	Kathy	Chase	AC/DC	10.89
	Stanisław	Wąjcik	Buddy Guy	10.89
	Stanisław	Wąjcik	AC/DC	9.9
	Luís	Gonçalves	AC/DC	7.920000000000001
	Kathrin	Chase	Black Sabbath	7.920000000000001

Result: This identifies top-spending fans for specific creators, such as those spending over \$17 on artists like AC/DC.

Q11. Determine the customer that has spent the most on music for each country.

SQL

```
WITH CustomerSpending AS (
    SELECT c.customer_id, c.first_name, c.last_name,
i.billing_country, SUM(i.total) AS total_spent,
        RANK() OVER(PARTITION BY i.billing_country ORDER BY
SUM(i.total) DESC) as rank
    FROM customer c
    JOIN invoice i ON c.customer_id = i.customer_id
    GROUP BY c.customer_id, c.first_name, c.last_name,
i.billing_country
)
SELECT billing_country, first_name, last_name, total_spent
FROM CustomerSpending
WHERE rank = 1;
```

	billing_country	first_name	last_name	total_spent
▶	Argentina	Diego	Gutiérrez	39.6
	Australia	Mark	Taylor	81.18
	Austria	Astrid	Gruber	69.3
	Belgium	Daan	Peeters	60.38999999999999
	Brazil	Luís	Gonçalves	108.89999999999998
	Canada	François	Tremblay	99.99
	Chile	Luis	Rojas	97.02000000000001
	Czech Republic	František	Wichterlová	144.54000000000002
	Denmark	Kara	Nielsen	37.61999999999999
	Finland	Terhi	Hämäläinen	79.2
	France	Wyatt	Girard	99.99
	Germany	Fynn	Zimmermann	94.05000000000001
	Hungary	Ladislav	Kovács	78.21
	India	Manoj	Pareek	111.86999999999999
	Ireland	Hugh	O'Daill	114.83000000000007

Result: Identifies local "brand ambassadors" in every region, such as **Manoj Pareek** in India (\$111.87).

Domain C: Content, Artist & Genre Performance

Q6. Return the email, first name, last name, & Genre of all Rock Music listeners.

SQL

```
SELECT DISTINCT c.email, c.first_name, c.last_name, g.name AS
genre_name
FROM customer c
JOIN invoice i ON c.customer_id = i.customer_id
JOIN invoice_line il ON i.invoice_id = il.invoice_id
JOIN track t ON il.track_id = t.track_id
JOIN genre g ON t.genre_id = g.genre_id
WHERE g.name LIKE 'Rock'
ORDER BY c.email ASC;
```

	email	first_name	last_name	genre_name
▶	aaronmitchell@yahoo.ca	Aaron	Mitchell	Rock
	alero@uol.com.br	Alexandre	Rocha	Rock
	astrid.gruber@apple.at	Astrid	Gruber	Rock
	bjorn.hansen@yahoo.no	Bjørn	Hansen	Rock
	camille.bernard@yahoo.fr	Camille	Bernard	Rock
	daan_peeters@apple.be	Daan	Peeters	Rock
	diego.gutierrez@yahoo.ar	Diego	Gutiérrez	Rock
	dmiller@comcast.com	Dan	Miller	Rock
	dominiquelefebvre@gmail.com	Dominique	Lefebvre	Rock
	edfrancis@yahoo.ca	Edward	Francis	Rock
	eduardo@woodstock.com.br	Eduardo	Martins	Rock
	ellie.sullivan@shaw.ca	Ellie	Sullivan	Rock
	emma_jones@hotmail.com	Emma	Jones	Rock
	enrique_munoz@yahoo.es	Enrique	Muñoz	Rock
	fernandaramos4@uol.com.br	Fernanda	Ramos	Rock

Result: Generates an alphabetical marketing list of Rock fans.

Q7. Return the Artist name and total track count of the top 10 rock bands.

SQL

```
SELECT ar.name, COUNT(t.track_id) AS total_tracks
FROM artist ar
JOIN album al ON ar.artist_id = al.artist_id
JOIN track t ON al.album_id = t.album_id
JOIN genre g ON t.genre_id = g.genre_id
```

```
WHERE g.name LIKE 'Rock'  
GROUP BY ar.artist_id, ar.name  
ORDER BY total_tracks DESC  
LIMIT 10;
```

	name	total_tracks
▶	AC/DC	18
	Aerosmith	15
	Audioslave	14
	Led Zeppelin	14
	Alanis Morissette	13
	Alice In Chains	12
	Frank Zappa & Captain Beefheart	9
	Accept	4

Result: AC/DC leads with 18 tracks, followed by Aerosmith (15).

Q8. Return all track names that have a song length longer than the average song length.

SQL

```
SELECT name, milliseconds  
FROM track  
WHERE milliseconds > (SELECT AVG(milliseconds) FROM track)  
ORDER BY milliseconds DESC;
```

	name	milliseconds
▶	How Many More Times	711836
	Advance Romance	677694
	Sleeping Village	644571
	You Shook Me(2)	619467
	Talkin' 'Bout Women Obviously	589531
	Stratus	582086
	No More Tears	555075
	The Alchemist	509413
	Wheels Of Confusion / The Straightener	494524
	Book Of Thel	494393
	You Oughta Know (Alternate)	491885
	Terra	482429
	Snoopy's search-Red baron	456071
	Sozinho (Hitmakers Classic Mix)	436636
	Master Of Diamonds	436453

Result: Identifies lengthy tracks like "How Many More Times" (711,836 ms).

Q10. Find out the most popular music Genre for each country.

SQL

```
WITH GenreCounts AS (
    SELECT i.billing_country, g.name AS genre_name,
    COUNT(il.invoice_line_id) AS purchases,
        RANK() OVER(PARTITION BY i.billing_country ORDER BY
    COUNT(il.invoice_line_id) DESC) as rank
    FROM invoice i
    JOIN invoice_line il ON i.invoice_id = il.invoice_id
    JOIN track t ON il.track_id = t.track_id
    JOIN genre g ON t.genre_id = g.genre_id
    GROUP BY i.billing_country, g.name
)
SELECT billing_country, genre_name, purchases
FROM GenreCounts
WHERE rank = 1;
```

	billing_country	genre_name	purchases
▶	Argentina	Rock	1
	Australia	Rock	18
	Austria	Rock	6
	Belgium	Rock	5
	Brazil	Rock	26
	Canada	Rock	57
	Chile	Rock	7
	Czech Republic	Rock	14
	Denmark	Rock	6
	Finland	Rock	6
	France	Rock	26
	Germany	Rock	28
	Hungary	Rock	4
	India	Rock	13
	Ireland	Rock	?

Result: Rock is the top genre in almost every major country analyzed.

Q12. Who are the most popular artists?

SQL

```
SELECT ar.name AS artist_name, COUNT(il.invoice_line_id) AS
total_purchases
FROM artist ar
JOIN album al ON ar.artist_id = al.artist_id
JOIN track t ON al.album_id = t.album_id
JOIN invoice_line il ON t.track_id = il.track_id
GROUP BY ar.artist_id, ar.name
ORDER BY total_purchases DESC
LIMIT 10;
```

	artist_name	total_purchases
▶	AC/DC	124
	Aerosmith	80
	Alanis Morissette	75
	Black Sabbath	68
	Alice In Chains	59
	Audioslave	43
	Apocalyptica	37
	Buddy Guy	23
	Antônio Carlos Jobim	18
	Black Label Society	15

Result: AC/DC is the most purchased artist (124 purchases).

Q13. Which is the most popular song?

SQL

```
SELECT t.name AS song_name, COUNT(il.invoice_line_id) AS
total_purchases
FROM track t
JOIN invoice_line il ON t.track_id = il.track_id
GROUP BY t.track_id, t.name
ORDER BY total_purchases DESC
LIMIT 1;
```

	song_name	total_purchases
▶	Put The Finger On You	13

Result: "Put The Finger On You" leads with 13 total purchases.

Q14. What are the average prices of different types of music?

SQL

```
SELECT g.name AS genre, ROUND(AVG(t.unit_price), 2) AS average_price
FROM track t
JOIN genre g ON t.genre_id = g.genre_id
GROUP BY g.genre_id, g.name
```

```
ORDER BY average_price DESC;
```

	genre	average_price
▶	Rock	0.99
	Jazz	0.99
	Metal	0.99
	Alternative & Punk	0.99
	Rock And Roll	0.99
	Blues	0.99
	Latin	0.99
	Reggae	0.99
	Pop	0.99
	Soundtrack	0.99

Result: Track prices are consistent at **\$0.99** across all standard genres.

5. Advanced Analytics & Business Insights

In addition to the core 15 questions, exploratory data analysis yielded the following strategic insights regarding overall store health:

- **Employee Revenue Contributions:** Jane Peacock is the top-performing sales representative, generating \$1,731.51 in revenue.

Result Grid				
	employee_id	first_name	last_name	revenue
▶	3	Jane	Peacock	1731.5100000000039
	4	Margaret	Park	1584.0000000000034
	5	Steve	Johnson	1393.920000000002

- **Customer Distribution & Revenue:** The USA dominates the market with 13 total customers driving \$1,040.48 in revenue, followed closely by Canada.

	billing_country	revenue
▶	USA	1040.4899999999998
	Canada	535.5900000000001
	Brazil	427.6800000000000
	France	389.0699999999999
	Germany	334.62
	Czech Republic	273.24000000000007
	United Kingdom	245.52
	Portugal	185.13000000000002
	India	183.14999999999998
	Ireland	114.83999999999997
	Spain	98.01
	Chile	97.02000000000001
	Australia	81.18
	Finland	79.2
	Hungary	78.21

- **Customer Spend Ranking:** Our top "Whale" customers have been successfully ranked based on their total lifetime spending to assist with VIP loyalty targeting.

	customer_id	first_name	last_name	spending
▶	5	František	Wichterlová	144.54000000000002
	6	Helena	Holáčková	128.7
	46	Hugh	O'Reilly	114.83999999999997
	58	Manoj	Pareek	111.86999999999999
	1	Luís	Gonçalves	108.89999999999998
	13	Fernanda	Ramos	106.91999999999999
	34	José	Fernandes	102.96000000000001
	3	François	Tremblay	99.99
	42	Wyatt	Girard	99.99
	53	Phil	Hughes	98.01

- **Track & Genre Performance:** The store's catalog is heavily reliant on "Rock" (99 tracks) and "Latin" (87 tracks). The highest-grossing individual track is "Put The Finger On You", generating \$12.87.

Result Grid | Filter Rows: Export: Wrap Cell Content:

	track_id	name	revenue
▶	6	Put The Finger On You	12.870000000000001
	13	Night Of The Long Knives	9.9
	9	Snowballed	8.91
	46	Mary Jane	8.91
	151	Behind The Wall Of Sleep	8.91
	153	Evil Woman	7.920000000000001
	1	For Those About To Rock (We Salute You)	7.920000000000001
	16	Dog Eat Dog	7.920000000000001
	32	Deuces Are Wild	7.920000000000001
	58	Sunshine	7.920000000000001

- **Baseline Economics:** The average invoice value across all global transactions is currently sitting at \$7.67.

6. Strategic Business Recommendations

1. **Leverage Top Employees:** Analyze the client-retention strategies of top performers like Jane Peacock and Margaret Park to use as training benchmarks for the broader sales team.
 2. **Hyper-Localized Marketing:** Marketing spend should be heavily weighted toward North America (USA and Canada). Investigate why large markets like India remain underserved despite high-spending individual customers.
 3. **Optimize the Catalog:** Prioritize acquiring rights to classic Rock catalogs. Since this genre drives the highest engagement, consider bundling discounts to increase the average invoice value above the \$7.67 baseline.
 4. **Target the "Whales":** Implement a VIP loyalty program for top-ranked customers, offering early access to high-demand tracks and special promotions.

5. **Data-Driven Event Hosting:** Host promotional Music Festivals strictly in high-revenue cities like **Prague** to guarantee a concentration of proven, paying customers.

7. Conclusion

This analysis provides an end-to-end framework for understanding the iTunes digital store ecosystem. By leveraging SQL for relational modeling and advanced analytics, we have identified clear paths for growth, from targeted marketing to operational restructuring. The transition from raw data to actionable insights ensures a data-backed foundation for future business strategy.