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1. Composing T-SQL Queries

1.1 Top Stadium by Total Spectator Attendance

1.1.1 SQL Query

```
SELECT
    Rank() Over(Order by Sum(SpectatorsNumber + VIPSpectatorsNumber) Desc) As Ranking,
    StadiumName as [Name of Stadium], Country, EventName as [Event Type],
    Sum(SpectatorsNumber) as [Number of Spectators],
    Sum(VIPSpectatorsNumber) as [Number of VIP Spectators],
    Sum(SpectatorsNumber + VIPSpectatorsNumber) as [Total Number of Spectators]
FROM GameFact gf
Inner JOIN EventFact ef ON ef.EventID = gf.EventID
INNER JOIN EventDim ed ON ed.EventID = gf.EventID
INNER JOIN StadiumDim sd ON sd.StadiumID = gf.StadiumId
INNER JOIN LocationDim ld on ld.LocationID = sd.StadiumLocationID
GROUP BY StadiumName, EventName, Country;
```

	Ranking	Name of Stadium	Country	Event Type	Number of Spectators	Number of VIP Spectators	Total Number of Spectators
1	1	Copper Box Arena	United Kingdom	msi	2676564	154440	2831004
2	2	KeyArena	United States	msi	2416040	147345	2563385
3	3	Commerzbank Arena	Germany	msi	2219360	136770	2356130
4	4	San Jose SAP Centre	United States	Worlds	2120712	125367	2246079
5	5	Wembley Arena	United Kingdom	msi	2028180	133056	2161236
6	6	Spodek Arena	Poland	Worlds	1875200	108000	1983200
7	7	Staples Centre	United States	msi	1812800	114400	1927200
8	8	Sang-am World Cup Stadium	Korea, South	Worlds	1622313	99792	1722105
9	9	CSKA Arena	Russia	Worlds	1456154	88830	1544984
10	10	Royal Arena	Denmark	Worlds	1044555	58100	1102655

Figure 1: Query results

1.1.2 Query Description

The query ranks the stadiums where Tior Games events were previously held based on their total number of spectators. The number of spectators and VIP spectators were calculated by using the sum of spectator that attended the event. Total number of spectators were calculated by adding both sum of spectator and VIP spectator, giving the overall attendance in the stadium.

1.1.3 Business Rationale

From a business aspect, this query provides insights on planning for future events. With the identification of stadium with the highest spectator attendance, it can help to show the more successful venues. It also identifies which event type (MSI or Worlds) is more popular among the community. In the query, it can be seen that the MSI event is more popular than the Worlds with 4 of the Top 5 popular stadiums are held for the MSI events.

The total number of spectators also gives a strong indication for revenue forecasting, helping Tior Games in predicting the potential ticket sales and merchandise opportunities. Larger audiences means there is more brand exposure as well, this can guide in the marketing and sponsorship strategies. The high attendance rate can attract major sponsors to have exposure.

From past events, there are at least more than 1 million spectators that attended the event, therefore understanding of crowd size can help in logistical planning. An event with larger turnout require more staff and enhanced security to manage the crowd and providing a smooth experience. Tior Games can prepare for the high turnout by increasing the number of staff and also the merchandise stock to cater to the fans. Further in depth analysis can be concluded to break down the number of attendance to the different Game Stages. As generally, the number of attendance are higher in the final few game stages (Finals and Semi-Finals). Therefore more logistical preparation can be done on the game stages events with higher attendance as compared to the early game stages with lesser spectator.

1.2 Highest Sold Merchandise Type

1.2.1 SQL Query

```
SELECT
    MerchandiseType AS [Merchandise Type],
    Sum(MerchandiseStocked) As [Total Stocked],
    Sum(MerchandiseSold) As [Total Sold],
    Concat(ROUND(CAST(Sum(MerchandiseSold) AS FLOAT) / Sum(MerchandiseStocked) *
100, 2), ' %')  AS [Percentage Sold]
From EventFact ef
Inner Join MerchandiseDim md on md.MerchandiseID = ef.MerchandiseID
GROUP By MerchandiseType
Order By [Percentage Sold] DESC
```

	Merchandise Type	Total Stocked	Total Sold	Percentage Sold
1	figures	325975	322399	98.9 %
2	art and book	286747	273386	95.34 %
3	accessories	379966	341998	90.01 %
4	plush	244565	209469	85.65 %
5	clothing	448696	383316	85.43 %
6	statues	436092	357701	82.02 %
7	pins	593752	479014	80.68 %
8	board games	321199	242152	75.39 %

Figure 2: Query results

1.2.2 Query Description

The query compares the different merchandise type by looking at the percentage of merchandise being sold. It is rank by the most sold merchandise type at the top. It took the sum of merchandise being sold among all the events and comparing to the total merchandise being stocked for the event to give a percentage. The most popular merchandise being sold are the figures.

1.2.3 Business Rationale

This query is able to show which merchandise type is popular among the fans by looking at the percentage sold per merchandise type. The calculation of the percentage sold is a critical metrics in evaluating the product success. By knowing these numbers, it can help in demand forecasting and inventory optimisation. As seen in the results, the top 3 highly sold products are figures, art and book and accessories with more than 90% of the stocked being sold. Tior Games can anticipate the high demand for these highly sold merchandise and prepare more stock for it. This can also help in the inventory by bringing lesser stock on the lesser popular merchandise type to the events such as pins and board games, with less than 80% of the stocked being sold.

Maximising revenue can be the result from the optimisation of inventory. With the reduce number of stock on lesser popular merchandise type, it will reduce the holding cost of the items and increasing overall revenue.

Tior Games are also able to use this values to plan for event exclusive merchandise type. By looking at the more popular merchandise type, they are able to plan for the type of merchandise to use to event exclusive merchandise. With the highly sold figures merchandise type of 98% stock sold, an exclusive event figures merchandise can be produced to generate more sales and as a result, revenue to increase.

1.3 Total Sales Earnings Over The Years

1.3.1 SQL Query

```
SELECT
    EventYear As Year,
    Concat('£ ', (Sum(MerchandiseSoldPND) - Sum(MerchandiseStockedPND) -
Sum(MerchandiseRefundedPND))) AS [Earnings From Merchandise Sale],
    Concat('£ ', (Sum(TicketsSoldPND) - Sum(TicketsRefundedPND))) As [Earnings From
Tickets Sale],
    Concat('£ ', (Sum(MerchandiseSoldPND) - Sum(MerchandiseStockedPND) -
Sum(MerchandiseRefundedPND)) + (Sum(TicketsSoldPND) - Sum(TicketsRefundedPND))) As
[Sub Total Earnings]
From EventFact ef
Inner Join RefundFact rf on ef.TicketID = rf.TicketID
Inner join EventDim td on ef.EventID = td.EventID
GROUP By EventYear
Order BY EventYear DESC;
```

	Year	Earnings From Merchandise Sale	Earnings From Tickets Sale	Sub Total Earnings
1	2021	£ -61016970	£ 46492999	£ -14523971
2	2020	£ -58660782	£ 39025533	£ -19635249
3	2019	£ -122592552	£ 79449463	£ -43143089
4	2018	£ -122817410	£ 95174578	£ -27642832
5	2017	£ -132778462	£ 87824513	£ -44953949
6	2016	£ -124522801	£ 85746916	£ -38775885

Figure 3: Query results

1.3.2 SQL Description

The query calculate the total earnings from merchandise sale and tickets sale for the both event in a year. The subtotal column shows the overall earnings in the year combining the merchandise and tickets sale. The merchandise sale is calculated by taking the total sum of merchandise sold minus away the cost price and refunded amount giving the overall earnings. The overall earnings from tickets sale is calculated from the sum of tickets sold minus the amount of refunded tickets.

1.3.3 Business Rationale

Having a query that is able to show the overall earnings over the years is useful in giving updates on the business whether it is making a profit. The annual earnings from the events can help Tior Games to assess their financial health and growth in organising these events. It can also provide yearly comparison and trend analysis. With the earnings broken down by year, a trend analysis can be done to identify best and worst earnings so a further research can be done on the marketing strategy and to make a decision to replicate it for future events.

From the query results, it can be seen that Tior Games are on a net loss over the years. 2017 and 2019 was the worst losses for Tior Games having a net loss of more than 40 million pounds. Given the numbers, Tior Games can look into the reason for the huge loss amount and relook into the strategies taken for the events in the 2 years and to improve on them. The trend and number can also show if the strategies is working. Bouncing back from a more than 40 million pounds net loss in 2019, 2020 and 2021 have a lesser net loss earning with less than 20 million pounds. With the numbers decreasing over the two years, it could mean that the strategies that Tior Games have implemented are working and it could be replicated for future events.

As the query has a separation on the earnings from merchandise and tickets, it can aid in pointing out the revenue stream that are either profitable or loss. The results show the net loss from merchandise are the results of the net loss revenue for Tior Games. It can be seen that total earnings from merchandise sale over the years are at a loss after taking into account of the cost price and refunded items. The profitable earnings for Tior Games only comes from ticket sales with having a positive earning over the years. Thus, Tior Games can look into their merchandise sale strategy to identify the causes for the net loss.

Ultimately, this enables Tior Games to better plan and make decisions for future events. It can also be a tool in planning of budget for future events.

1.4 Top 10 Promotion Strategies

1.4.1 SQL Query

```
WITH RankedPromotions AS (
    SELECT
        PromotionType AS [Type of Promotion],
        ed.EventName AS [Event Name],
        pd.PromotionDuration AS [Promotion Duration],
        md.MarketeerName AS [Marketeer],
        PromotionCost AS [Promotion Cost Price],
        PromotionRevenue - PromotionCost AS [Promotion Profit],
        ROW_NUMBER() OVER (
            PARTITION BY ed.EventName
            ORDER BY (PromotionRevenue - PromotionCost) DESC, pd.PromotionDuration
ASC
        ) AS ranking
    FROM EventFact ef
    INNER JOIN PromotionDim pd ON pd.PromotionID = ef.PromotionID
    INNER JOIN EventDim ed ON ed.EventID = ef.EventID
    INNER JOIN MarketeerDim md ON pd.MarketeerID = md.MarketeerID
)
SELECT *
```

```
FROM RankedPromotions
WHERE ranking <= 10
ORDER BY [Event Name], [Promotion Profit] DESC, [Promotion Duration] ASC;
```

	Type of Promotion	Event Name	Promotion Duration	Marketeer	Promotion Cost Price	Promotion Profit	ranking
1	General Advertising	msi	45	Mynte	2601.00	41313.00	1
2	Digital Promotions	msi	28	Flashset	2545.00	40732.00	2
3	General Advertising	msi	70	Gigashots	2849.00	40034.00	3
4	Digital Promotions	msi	3	Zooxo	3386.00	39856.00	4
5	Public Relations	msi	85	Rhyzio	4278.00	39340.00	5
6	General Advertising	msi	83	Avaveo	3953.00	39108.00	6
7	Sponsorships	msi	7	Tagcat	3000.00	39006.00	7
8	Sponsorships	msi	18	Avaveo	2736.00	39000.00	8
9	Sales Promotion	msi	85	Shufflebeat	4876.00	38791.00	9
10	Public Relations	msi	25	Linkbridge	3506.00	38672.00	10
11	Sponsorships	Worlds	42	Feedbug	2772.00	41023.00	1
12	Direct Marketing	Worlds	11	Avamba	2574.00	40843.00	2
13	Public Relations	Worlds	34	Leexo	3101.00	40669.00	3
14	Public Relations	Worlds	31	Divavu	2597.00	40094.00	4
15	General Advertising	Worlds	39	Shufflebeat	2624.00	39233.00	5
16	Sponsorships	Worlds	15	Tagcat	2937.00	39155.00	6
17	Sales Promotion	Worlds	81	Rhyzio	2813.00	38755.00	7
18	Sponsorships	Worlds	47	Dabfeed	3148.00	38733.00	8
19	Public Relations	Worlds	71	Divape	3964.00	38485.00	9
20	Direct Marketing	Worlds	46	Divape	4594.00	38424.00	10

Figure 4: Query results

1.4.2 SQL Description

This SQL query is used to identify the top performing promotions across the different events. It is compared based on the profits by calculating the difference between the revenue and cost price of the promotion. The ranking prioritises the highest profit made and the shortest duration in the case where profits are tied. It was able to show the top 10 performing promotion strategy and the marketing company with its duration and profits.

1.4.3 Business Rationale

Marketing strategies is important in helping a business boost sale and gain attraction. In this aspect, different kind of promotion can be done by Tior Games to promote the 2 events to generate ticket and merchandise sales and overall audience engagement. However not all promotion will have the same returns, therefore this analysis is able to provide improvement in future promotional campaign and by optimising promotional spending by picking the promotion type with the highest profit to cost ratio.

The query returns that the best promotion type for the MSI event are general advertising and digital promotions as it brings a profit of more than 40,000 pounds. The marketing company that brought the profits are Mynte, Flashset and Gigashots. However, the top promotion type for the Worlds event are sponsorship, direct marketing and public relations which are different from the MSI event. These promotion type have also brought in a profit of more than 40,000 pounds.

Therefore, Tior Games is able to use this query to identify best promotion type to use for their marketing strategy based on the different event. They are also able to reengage the previous marketing company in to help in the promotion to have similar return of investment as based from previous data would have gain trust. Tior Games can also use the results to plan strategically on the promotions. As the query not only highlights the profits but also the promotion duration, a promotion type that brings in high profit with shorter duration can be used and fine-tune for future campaigns. The team can also compare the different marketeer used and based on their results from profits, to evaluate whether the marketeer can be hired again for future events. Ultimately, the query is important in providing budgeting for the company and shows the efficiency of the marketing funds being utilised.

1.5 Top Highlight Type

1.5.1 SQL Query

```
SELECT
    HighlightType as [Highlight Type],
    Count(gf.HighlightID) as [Number of Occurrence]
FROM GameFact gf
INNER JOIN HighlightDim hd on hd.HighlightID = gf.HighlightID
GROUP BY HighlightType
ORDER BY [Number of Occurrence] DESC;
```

	Highlight Type	Number of Occurrence
1	Legendary!	12
2	pentakill	8
3	Godlike!	8
4	Dominating!	7
5	quadrakill	7
6	doublekill	6
7	Killing spree!	6
8	triplekill	5
9	Unstoppable!	3
10	Rampage!	3

Figure 5: Query results

1.5.2 SQL Description

This query analyse the frequency of different types of highlights recorded by counting the number of occurrence for each highlight. The results shows the count from all the games at the events. The query is also group by its highlight type as it is counting the frequency for each highlight. It is then order by most frequently occurring highlight type at the top.

1.5.3 Business Rationale

Highlights are quite common in sports and are also common in competitive gaming or esports. It allows fans to rewatch, remember and reexperience these matches. The highlights are also able to help in content creation, post-event marketing on the game played and even use it for future event promotion.

From the query results, Tior Games can use the most frequent highlight types to be publicise as content. It can be in a form of highlight reel or shorts on social media. As the “Legendary!” highlight type has highest number of occurrence, Tior Games are able to use the 12 highlight videos to be shared for content creation. Events are usually sponsored and these brands would want to show their brand or product to gain exposure, Tior Games are able to use the highlight opportunity to have sponsorship segments overlay them, giving consistent exposure.

These highlights can also be used after the event, such as post-event analysis or future event marketing strategy. Tior Games can provide analysis using these highlights to show the player performance and game excitement level. Tior Games will also continue to organise more events and the highlights can be used in creating advertisement to promote the event. Ultimately, having this query can provide different highlight for Tior Games for marketing and sponsorship opportunities.

1.6 Top 10 Coaches

1.6.1 SQL Query

```
SELECT TOP 10
    Max(CoachName) AS [Coach Name],
    Max(ClubName) As [Club],
    MAX(CoachYearsOfExperience) AS [Total Years of Experience],
    STRING_AGG(CoachPosition, ', ') AS [Positions],
    Sum(Distinct(AwardValueInPND)) AS [Total Winnings]
FROM CoachDim cd
INNER JOIN ClubCoachDim ccd ON ccd.CoachID = cd.CoachID
INNER JOIN AwardDim ad ON ad.AwardID = cd.CoachHigherAwardID
INNER JOIN ClubDim cbd ON cbd.ClubID = ccd.ClubID
GROUP BY ccd.CoachID
ORDER BY [Total Winnings] DESC, [Total Years of Experience] DESC;
```

	Coach Name	Club	Total Years of Experience	Positions	Total Winnings
1	Hanson Coxwell	Cardify	8	draft coach	2418750
2	Maura Giorgetti	Daltfresh	7	draft coach	2418750
3	Aldus Keysel	Rank	4	sports psychologist, draft coach	870750
4	Celinda Anten	Gembucket	10	sports psychologist, strategic coach	667841
5	April Davidovic	Trippledex	8	draft coach	667841
6	Minnie Tydeman	Treeflex	6	head coach	667841
7	Nert Duignan	Fix San	9	draft coach	451500
8	Wenona Krink	Alpha	8	sports psychologist, head coach	400000
9	Jeannie Del Dello	Lotstring	9	head coach	380250
10	Raeann Cuss	Wrapsafe	3	head coach, sports psychologist, draft coach	380250

Figure 6: Query results

1.6.2 SQL Description

This query shows the top 10 coaches and their club based on their total winnings from all the events. It also presented the number of years of experience and the positions the coach held. As some coaches holds multiple positions and it gives duplicates on the winnings which will affect the sum of total winnings. Therefore a sum with distinct function was used to calculate the total winnings.

1.6.3 Business Rationale

It is important to be able to identify and understand top coaching talent as it is essential for strategic planning and have a competitive advantage in professional gaming. From the query, the top performing coach are Hanson Coxwell and Maura Giorgetti with the highest total winnings of £2.4M each. Based on their winnings, it could suggest that they are highly valuable in their club. Some coaches like Aldus Keysel and Celinda Anten, holds multiple positions in their clubs which shows there is some adaptability and broader influence. Although the results show that years of experience is proportional to total winnings, there are some coaches like Aldus Keysel and Raeann Cuss having less than 5 years of experience in the top 10 list. This could also signal potential rising stars.

Based on the results, Tior Games can use them to identify top coaches or potential rising star coaches for their marketing promotion to gain attraction for the events. The results can also help the clubs in searching for talents or upcoming talents. Clubs are able to decide whether to hire multi-skilled coaches which can help reduce staffing and increase operational efficiency or coaches that are skilled to their own domain. The clubs can also use these results for their planning of resources which include trainings and coaches bonuses. Therefore, it is useful for Tior Games to have these results which can sold to clubs to share the information and to have another stream of revenue.

2. Schema Revision

2.1 Social Media Engagement Dimension

2.1.1 Dimension Table

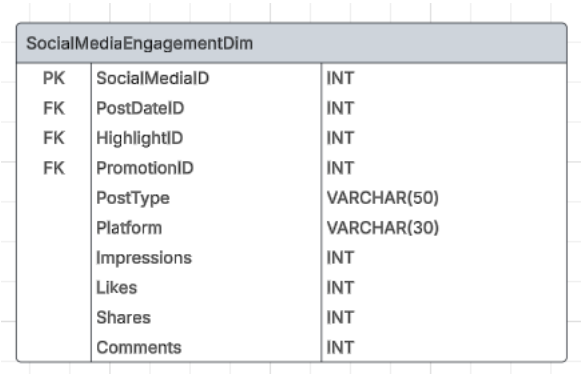

Figure 7: SocialMediaEngagementDim Dimension

SocialMediaEngagementDim					
	SocialMediaID	INT	PK		
	PostDateID	INT	FK	references DateDim	
	HighlightID	INT	FK	references HighlightDim	
	PromotionID	INT	FK	references PromotionDim	
	PostType	VARCHAR(50)		Type of Post (e.g. Highlight or Promotions)	
	Platform	VARCHAR(30)		Social Media Platform Name	
	Impressions	INT		Totla number of views	
	Likes	INT		Total number of likes	
	Shares	INT		Total number of shares	
	Comments	INT		Total number of comments	

Figure 8: Data Dictionary for SocialMediaEngagementDim

2.1.2 Business Rationale

The addition of SocialMediaEngagementDim dimension brings about metrics that can be related to fans, viewership and interaction. Social Media platform such as Instagram, TikTok, Youtube, X are quite common in today's day and age. At every corner, it can be seen at least one person are on their mobile device scrolling through a social media platform. Tior Games can tap on this widely use platform to gain attraction through marketing efforts and gather feedback among the fans. This would allow Tior Games to measure their digital footprint and effectiveness of social media strategy over time.

The SocialMediaEngagementDim dimension consist of attributes that are able to track engagement levels through the number of views, likes, shares and comments collected. Other attributes like the type of post (e.g. Promotions or Highlights) and the platform the content was posted on, can help contribute in the tracking as well. From the results, Tior Games can understand what contents are able attract and resonates with their fans. Additionally, with the date attribute in the dimension, Tior Games are able to analyse what is the optimal times or days to post their content for maximum engagement. This can help in optimising their content creation and strengthen audience connection and community development.

Tior Games are also able to use this avenue for their sponsors and promotion sharing as well. Having a strong presence and wide fan base, they are able to attract well-known and large brands sponsors. Using social media, Tior Games are able to include their sponsors in their content (e.g. posts or videos) so as to meet the sponsors agreements but also to help increase the sponsor brand visibility. Through this opportunity, Tior Games are able to expand its audience through cross-promotion, as the sponsors re-share Tior Games' content which taps into the sponsor's existing follower base. Resulting in increasing Tior Games' visibility and attracting new fans, which can drive merchandise or ticket sales as well.

Ultimately, having a social media presence, it is able to boost revenue, promotes fan engagement and strengthens strategic partnership which Tior Games should adopt for its' growth in the highly competitive esports world.

2.2 Sponsor Dimensions

2.2.1 Dimension Table

SponsorDIM		
PK	SponsorID	INT
FK	EventID	INT
FK	PromotionID	INT
FK	MarketeerID	INT
	SponsorName	VARCHAR(100)
	SponsorType	VARCHAR(50)
	SponsorDetails	VARCHAR(255)
	Industry	VARCHAR(50)
FK	StartDate	INT
FK	EndDate	INT
	TotalSponsorshipPND	Decimal
	ContactName	VARCHAR(50)
	ContactEmail	VARCHAR(100)

Figure 9: SponsorDim Dimension

Dimension	Attributes	Data type	Identifier	notes
SponsorDim				
	SponsorID	INT	PK	
	EventID	INT	FK	references EventDim
	PromotionID	INT	FK	references PromotionDim
	MarketeerID	INT	FK	references MarketeerDim
	SponsorName	VARCHAR(100)		name of sponsor company/individual
	SponsorType	VARCHAR(50)		type of sponsor (e.g. apparel, tech, media)
	SponsorDetails	VARCHAR(255)		details of the sponsor (e.g. Terms and Conditions)
	Industry	VARCHAR(50)		sponsor's industry (e.g. retail, gaming)
	StartDate	INT	FK	referencese DateDim
	EndDate	INT	FK	referencese DateDim
	TotalSponsorshipPND	Decimal		total sponsorship value
	ContactName	VARCHAR(50)		contact name of sponsor
	ContactEmail	VARCHAR(100)		contact email of sponsor

Figure 10: Data Dictionary for SponsorDim

2.2.2 Business Rationale

The SponsorDim dimension allows Tior Games to capture detailed information about each sponsor that sponsor Tior Games' events, contents and marketing efforts. The dimension consists of attributes such as the sponsor name, type, details, industry, business contact, sponsor period and financial contributions that can help with Tior Games sponsor tracking. This dimension also references to other dimensions of the data warehouse like event, promotion and marketeer to give additional breakdown of the sponsorship details.

Sponsorship is considered to be a major revenue stream for esports organisation like Tior Games. With the increase competition for top sponsors, it is crucial to be able to quantify sponsor value based on the profit, audience exposure and engagement. Tior Games will be able to use the data from this dimension to create performance dashboard. With the dashboard, it will be able to track and report on each sponsor performance to further evaluate on future partnership or to seek strategy improvements.

The SponsorDim dimension also allows the retention and expansion of sponsorship for Tior Games. Through analysing of performance trends, sponsors can be identified and with negations to secure the sponsors for a longer term. This can target the high-performing sponsors to provide quality and premium products for merchandise or as gift to fans, staff or participants. Additionally this dimension can be referenced to the newly created SocialMediaEngagementDim dimension as well. As Tior Games is able to use the engagement levels on social media to evaluate the popularity on the sponsors.

Therefore, with the SponsorDim, Tior Games is able to maximise revenue potential through the data, strengthening sponsor relationships and attract popular or high quality sponsors.

3. Unexpected Sale Query

3.1 SQL Query

```
WITH UnexpectedSales AS (
    SELECT
        md.MerchandiseType AS [Merchandise Type],
        dd.DateYear AS [Year],
        Concat((Round((Cast(Sum(osf.MerchandiseSoldPND) As float) /
Sum(osf.MerchandiseStockedPND) * 100), 2)), '%') As [Percentage Sold],
        ld.Country AS [Country]
    FROM OnlineSalesFact osf
    INNER JOIN MerchandiseDim md ON md.MerchandiseID = osf.MerchandiseID
    INNER JOIN DateDim dd ON dd.DateID = osf.DateID
    INNER JOIN ProviderDim pd ON md.MerchandiseProviderID = pd.ProviderID
    INNER JOIN LocationDim ld ON ld.LocationID = pd.ProviderLocation
    GROUP BY
        md.MerchandiseType,
        dd.DateYear,
        ld.Country
)

SELECT * FROM (
    SELECT TOP 1
        [Merchandise Type],
        [Year],
        [Country],
        [Percentage Sold]
    FROM UnexpectedSales
    WHERE [Country] = 'Japan'
    ORDER BY [Percentage Sold] ASC
) AS MostUnexpectedSale

UNION

SELECT * FROM (
    SELECT TOP 1
        [Merchandise Type],
        [Year],
        [Country],
        [Percentage Sold]
    FROM UnexpectedSales
    ORDER BY [Percentage Sold] DESC
) AS LeastUnexpectedSale;
```

	Merchandise Type	Year	Country	Percentage Sold
1	pins	2017	Japan	35.94%
2	clothing	2020	Germany	91.75%

Figure 11: Query results

3.2 Results Inference

There are multiple ways to define unexpected sale. One scenario is if the sales amount exceeds the forecast amount, it is considered as a positive unexpected sale. However, another is if the sales amount is lesser than the forecast amount, it is considered as a negative unexpected sale. Another looks into the trend, where the sudden change in sales volume is consider as unexpected.

The given query was based on the second scenario. As the data shows that sales amount represented by MerchandiseSoldPND attribute is lesser than the forecasted or expected amount represented by the MerchandiseStockedPND. The assumption made was the total cost price is the expected amount that Tior Games would like to earn from the sales of each merchandise type which can be calculated with the sales attribute. Therefore to find which merchandise type brings an unexpected sale, a percentage ratio can be used to show the percentage of sales made compared to the forecasted amount. The higher the percentage value, means the merchandise type was close to meeting the expected sale amount. The merchandise type with the lower percentage also shows that it is far from hitting the sales target which is considered as an unexpected sale.

From running the query, the results shows the most unexpected sale of merchandise type in Japan is pins in the year 2017. It shows that the sales of pins in that year was only at 36% from hitting the sales target. Whereas, the least unexpected sale was the sale of clothing in Germany in 2020, having earn 92% from hitting the sales expectation.

One reason that might result the unexpected sale of merchandises type was the sales strategy implemented for the online merchandise sale. With the data given, the sold price and cost price per item can be calculated by using the cost or sales amount divide by the total stocked or sold amount, as seen in figure 12. The calculations shows that Tior Games have been selling their merchandise lesser than the cost price amount. This resulted in a loss instead of profits for their online merchandise sale and could not meet the forecasted sales target. Therefore, Tior Games should re-evaluate their sales strategy. One such recommendation could be setting the sales price of the merchandise to either be equal or more than the cost price. Alternatively, searching for a supplier that supplies the merchandise at a lower cost price could be done as well.

	Merchandise Type	Year	Country	Percentage Sold	Sale Price Per Unit	Cost Price Per Unit
1	pins	2017	Japan	35.94%	£5	£9
2	clothing	2020	Germany	91.75%	£5	£6

Figure 12: Query results including cost price and sale price per unit

4. External Dataset Integration

The combining and using of an external dataset for analysis, also known as external dataset integration, is beneficial in helping understand competitor's performance and observe trends such as consumer behaviour or market dynamics (Marr, 2022). Through the observation of the trends, companies can improve their strategies such as forecasting on market demand or improving marketing campaign to reach to a wider audience. It can also help uncover new markets, sponsorship opportunities or new product invention by showing any emerging trends or any unmet needs that the company can tap on to. Competition is also common in every industry, having an external dataset integrated can help to track the company's competitor performance and have a benchmark for the company to identify gaps and growth opportunities.

For Tior Games, one external dataset that can be integrated into its data warehouse is the "Top Games on Twitch 2016 – 2023" dataset. This external dataset is taken from a public dataset platform called Kaggle, https://www.kaggle.com/datasets/rankirsh/evolution-of-top-games-on-twitch/data, that contains a csv file for the Twitch games data. Twitch is a live-streaming platform that is often associated with video games streaming. It is the leading company for gaming live-streaming where it is rank 19th in the US and 34th globally in internet engagement (Pahalyants, 2021). This live-streaming platform allows streamers to stream their gameplay and interact with their fans at the same time on a single platform. The viewers are able to interact by chatting in the chatbot and the streamers can reply on their live stream, this gives a feeling of interaction to the fans. As Twitch is a leading company, it is highly likely that they hold huge amount of data that will be useful for company analysis. The data can be useful to gain audience insights, event performance, marketing or sponsorship strategies. As Tior Games is in the gaming industry, it would be beneficial for them to use a dataset that consists of data from their competitors in the industry for their analysis or planning.

The Twitch dataset consists of the monthly data of the top 200 games streamed on Twitch. It contains data for the attributes like the number of hours watched or streamed on the platform, the amount of streamers who streamed the game and the average number of viewers for each game which can be used for analysis. These data can be used to create different trends over each months for the top 200 games which can be used with Tior Games's data for analysis and decision making. The external dataset have data that shows the popularity of the games based on the streamers and viewers numbers. This is useful for Tior Games as it is able to use these numbers to be benchmark on their game's popularity so as to be able to review the company's strategy. There is also a correlation with popularity and business revenue, games with a higher popularity tend to have a higher business revenue which is generated from the different streams. Tior Games are also able to use this as a benchmark to forecast company revenue and merchandise sales. The external dataset can also considered as a compliment to Tior Game's data warehouse as the data provided starts from the year 2016 which is aligned to Tior's data, making it relevant.

Although the external data and the data warehouse from Tior Games compliments each other, there could be some potential challenges face. One such potential issues that Tior Games might face is referencing the data with dates. In the Tior Games data warehouse, there is an additional dimension for dates which can be used for references with other tables. However, on the external dataset, the month and year data are integers, this makes referencing the external dataset to Tior Games' data an issue. To combat this issue, there is a need to transform the data for month and year from the external dataset into integer that references the date dimension on Tior Game data warehouse. The transformation also allows the external dataset to have a primary key/foreign key as the current external dataset does not have a primary key. One other possible challenge that could be face is the update frequency for the external dataset and Tior Games' data warehouse. The dataset taken from

Kaggle is a static dataset which data stops until the year 2023 and the Tior Games data warehouse last data was in 2021. As trends are always changing quickly, it could be every year or even months, it is important to have update real-time data to show the popularity comparison and the trend. This is to allow Tior Games to be informed constantly on the trend and to make decisions on their strategies. Tior Games can negotiate an agreement with Twitch to be able to receive updated data or as an application programming interface (API) to allow the exchange of updated data. Tior Games should also update the data in their data warehouse so that it is up to date and can provide the information needed. Lastly, in Tior Games data warehouse, there are no data such as number of viewers for the streaming platform. Although Tior Games can use the social media engagement dimension suggested in part 2, there can be an additional dimension added specifically for streaming or streaming engagement. Using the social media dimension is also able to show the popularity of the game, however the social media platform such as Youtube, Tik Tok, or Instagram have different usage levels. Therefore, Tior Games should create an additional dimension which specifically shows streaming on Twitch, to have a much reliable comparison with their competitors. This dimension can have similar attributes to the external dataset and can be collected as months, weeks or days.

In summary, there will always be issues or challenges faced when integrating an external dataset as their format could be different. Therefore early identification and understanding can help in tackling the issues during the integration of dataset before moving to conduct analysis. For this integration, Tior Games can look into adding additional dimensions, having updated real-time data and either transforming or cleaning the external dataset to fit the data warehouse are essential in achieving the desired analysis which can result in making sound and accurate decisions.

References

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