Faculty of Computing and Information Technology

Department of Mathematical and Data Science

Bachelor of Science (Honours) in Management Mathematics with Computing

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BAMS3043 Mathematical and Statistical Software
Assignment 3

Programme of Study: RMM3S1G2

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Part 1: Numerical Descriptive Measures

Measures of Central Tendency: Mean

In this dataset, 5 major measure values need to be focused, which are the 4 country sales and total (global) sales.

Average Europe Sales	Average Japan Sales	Average North America Sales	Average Other Country Sales	Average Total Sales
$0.1450 million	$0.0776 million	$0.2633 million	$0.0473 million	$0.5333 million

Figure 1.1 Average Mean for the Measure Values

The average mean for **sales** in **Europe** is **$0.145 million**, while the average mean of **North America sales** is higher, which yields **$0.2633 million**. Then, the mean for **sales** in **Japan** is **$0.0776 million**. The lowest average **sales** is the **other countries** with the value **$0.0473 million**. **Total (global) sales**, the sum of all the 4 countries' sales, produce a mean of **$0.5333 million**.

Measures of Central Tendency: Mode

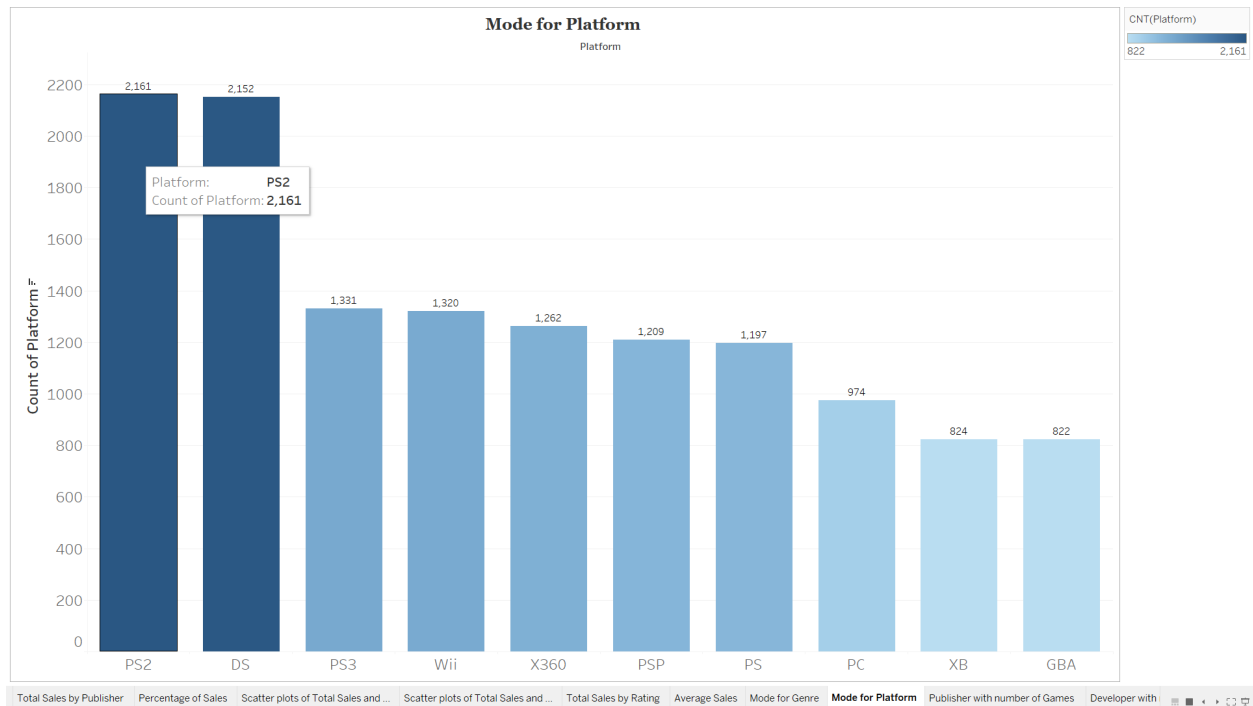Mode can be calculated for the quantitative data in this dataset.
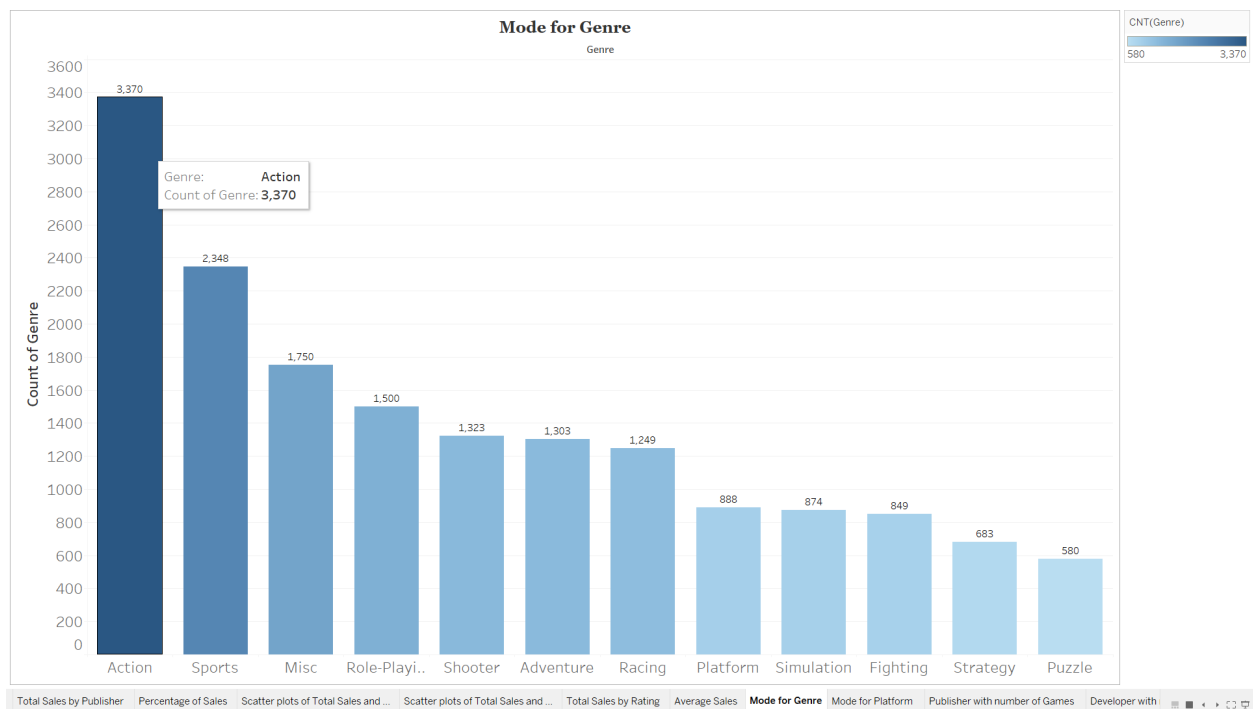

Figure 1.2 Mode for Platform
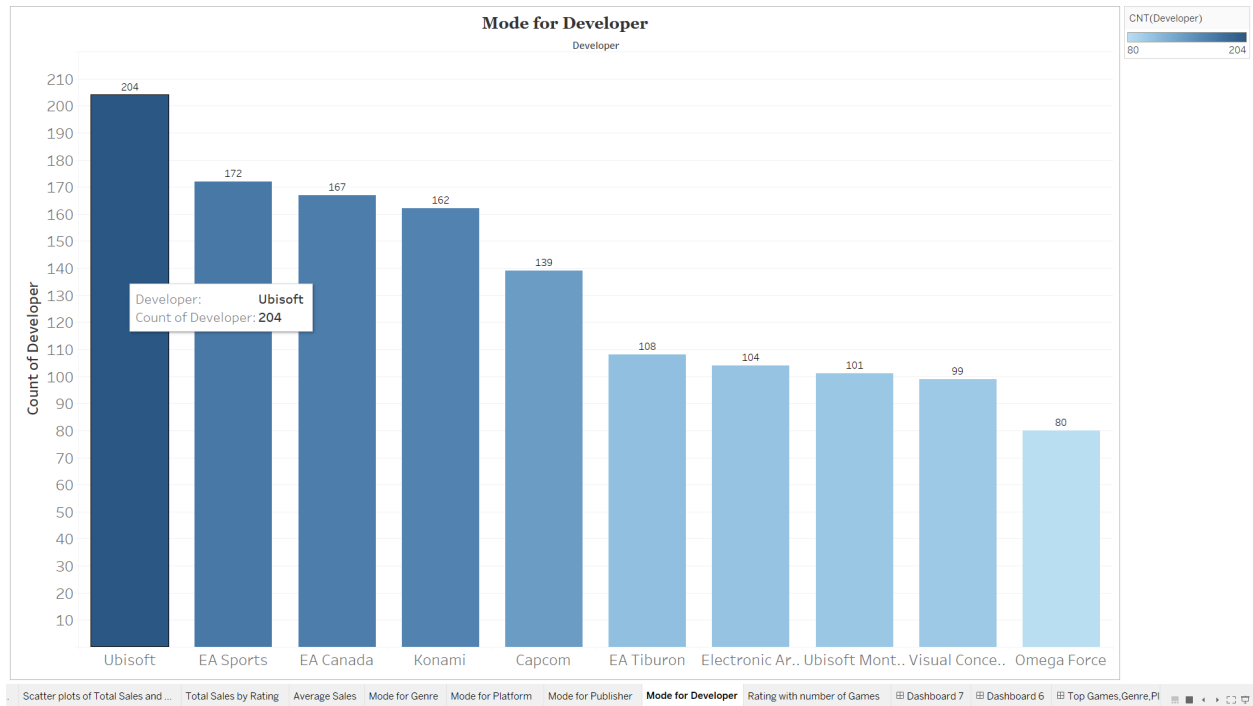

Figure 1.3 Mode for Genre
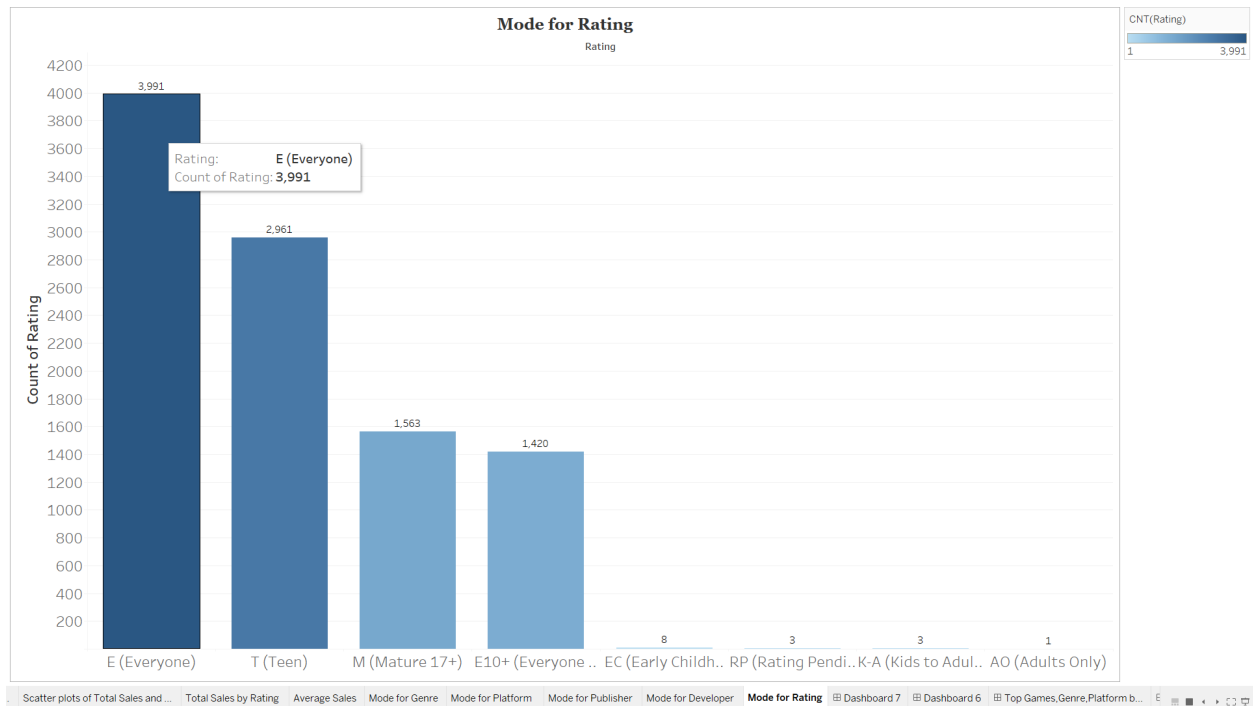
Figure 1.4 Mode for Developer

Figure 1.5 Mode for Rating

The **platform** that appears with the highest frequency in this dataset is **PS2**, with a count of 2161. Among the **genres** of the games, **action** has the highest frequency, with a 3370 count. **Ubisoft** is the mode for the **developer** with the count of 204. The game **rating** of **E (everyone)** appears the most in this dataset, with a count of 3991.

Part 2: Chart

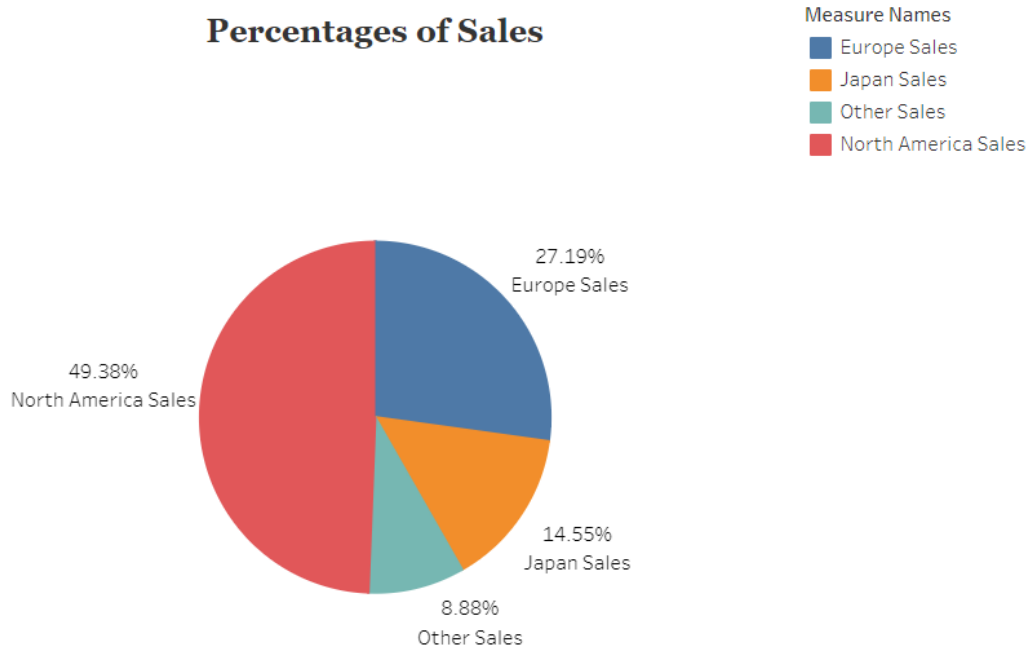*Sales Overview at 22 Dec 2016*

Figure 2.1 Pie Chart - Percentages of Sales

The pie chart above shows the percentage of 4 countries' sales from the total sales. **North America** has the largest proportion of the pie chart, with **49.38%** of the total sales. Next, **Europe** sales occupy **27.19%** of the pie, taking second place in the global sales. The sales in **Japan** yielded third place with **14.55%** of the total sales. The sales in **other countries** have the lowest sales among the total, with the proportion of **8.88%** of the pie.
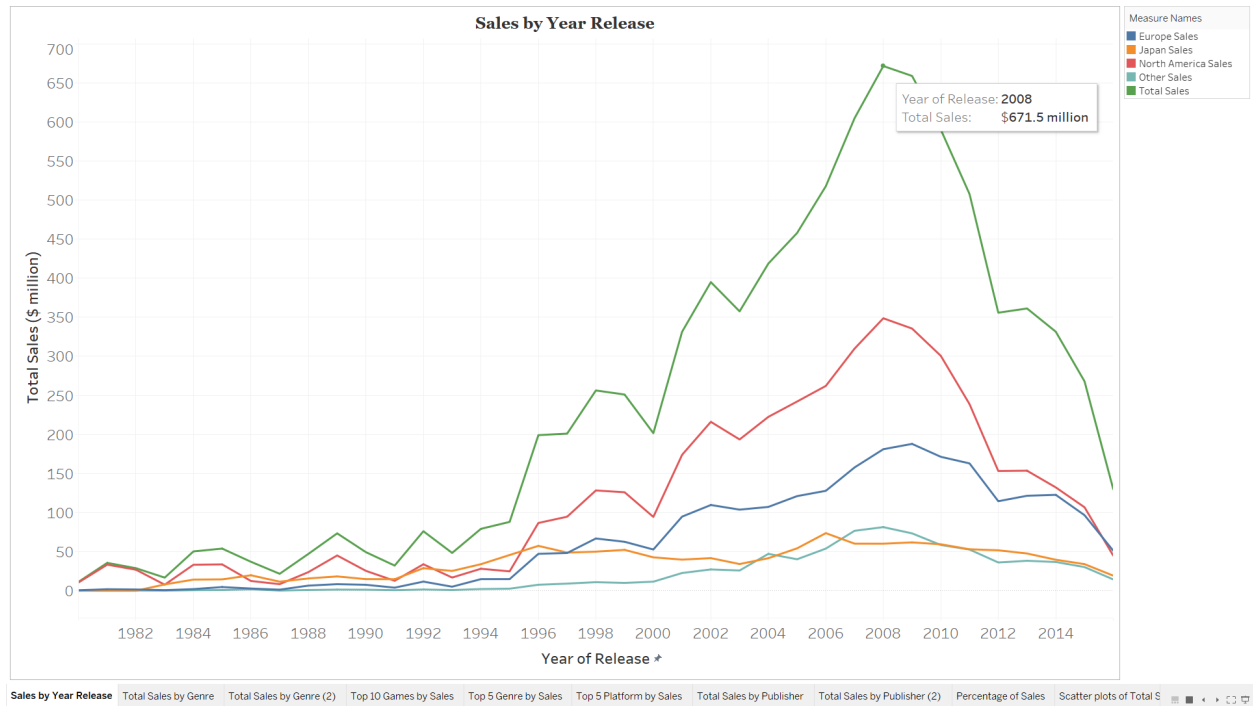
Figure 2.2 Line Chart - Sales by Year Release

The line chart above shows four countries' sales and total sales of the video games released in different years. The games that were released from **1982 until 1994** have **lower sales** in all countries. This is probably due to the games being out of trend or not favoured by people. Overall, the sales of the games that were released **starting from 1996** are **higher** than the sales of the games released in the previous year. The trend continued until the year 2008. It can seem that the games released in **2008** have the **highest** total sales which is **$671.5 million**. After that, the sales had a significant **decrease** starting from the year released in 2009.
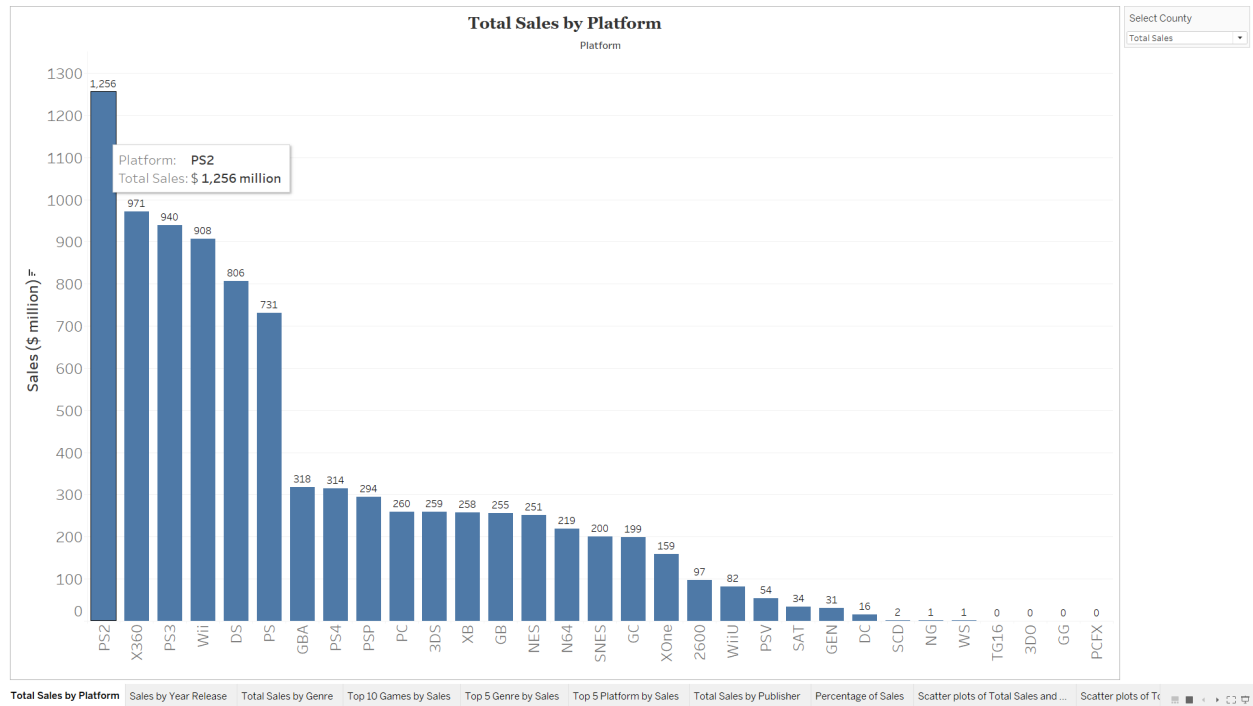
Figure 2.3 Bar Chart - Total Sales by Platform

Overall, the **PS2** platform has the highest total sales with **$1,256 million**. The platform in second to fourth place has similar sales as shown in the chart above, which is **X360** with **$971 million**, **PS3** with **$940 million**, and **Wii** with **$908 million**. **DS** has total sales of **$806 million**, placing in the top 5. Meanwhile, **PS** platform has the sixth highest sales with **$731 million**. Besides that, the other platforms have sales of less than $320 million, yielding a big difference from the top 6 platforms.
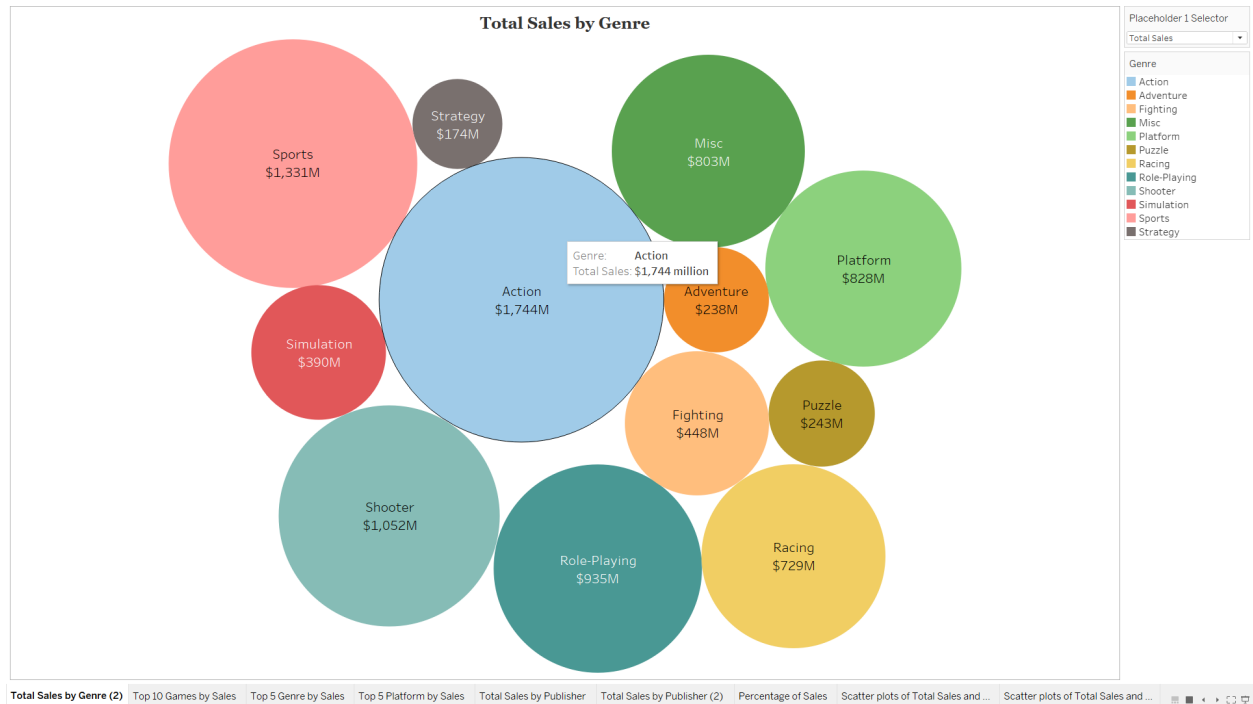
Figure 2.4 Packed Bubble Chart - Total Sales by Genre

By looking at the total sales, the genre with the largest bubble is the **action** with **$1,745 million**. It may indicate that action is the most preferable type of game from the users' perspective. The second-highest sales is the **sports** genre which has **$1,332 million** in total. The **shooter** genre has the third sales of **$1,053 million**, and the **role-playing** genre has fourth sales of **$934 million**. The **platform** and **misc** have a similar amount of sales, which is **$828 million** and **$803 million** respectively. The **racing** genre has quite a high sales among the rest, which is **$729 million**.
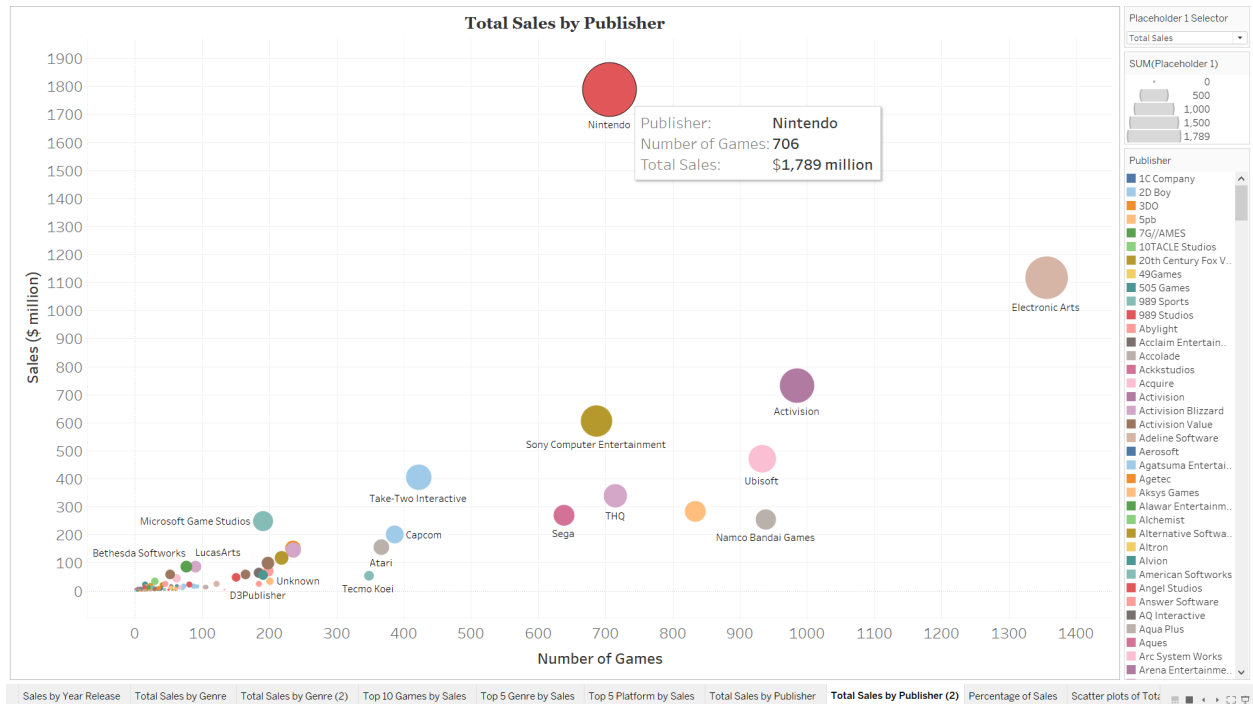
Figure 2.5 Scatter Plot - Total Sales by Publisher

Nintendo has the highest sales among all the other publishers with sales of **$1,789 million**. Even though Electronic Arts has the highest number of games (mode), its sales do not exceed Nintendo. **Electronic Arts** ranked second for the total sales by publisher with the value of **$1,117 million**. The next 4 publishers have a similar amount of sales compared to the top 2. The third publisher with the highest sales is **Activision** and the fourth is **Sony Computer Entertainment**, with the value of **$731 million** and **$607 million**, respectively. **Ubisoft** and **Take-Two Interactive** have total sales of **$471 million** and **$404 million**, respectively, even though their number of games published differs greatly. Meanwhile, The rest of the publishers gain their sales less than $400 million in total.

The scatter plot shows a positive relationship with moderate strength between the number of games by publishers and the total sales. However, the Nintendo publisher seems to be an outlier of this relationship since it earns the highest sales, but the number of games ranked seventh.
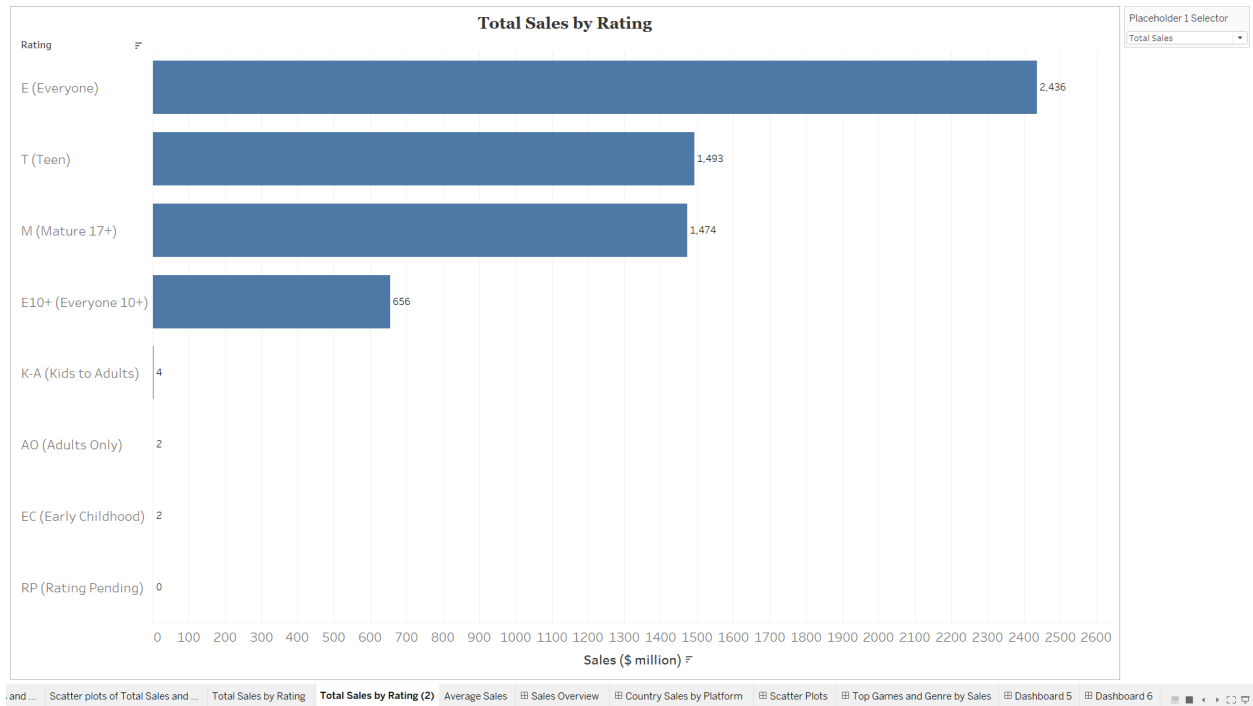
Figure 2.6 Horizontal Bar Chart - Total Sales by Rating

The games with a rating of **E (Everyone)** have the highest sales among all the ratings, earning a value of **$2,436 million**. Then, the ratings **T (Teen)** and **M (Mature 17+)** have similar sales with **$1,493 million** and **$1,474 million**, respectively. The total sales of **$656 million** are earned by the games rated **E10+ (Everyone 10+)**. Besides, the other ratings have significantly lower sales compared to the top 4. It may be due to the number of games with those ratings being much lesser than the top 4 ratings. Thus, when adding up all the sales for a particular rating, the ratings with a lower number of games do not take advantage. It also shows that the number of games by rating is critically unbalanced.
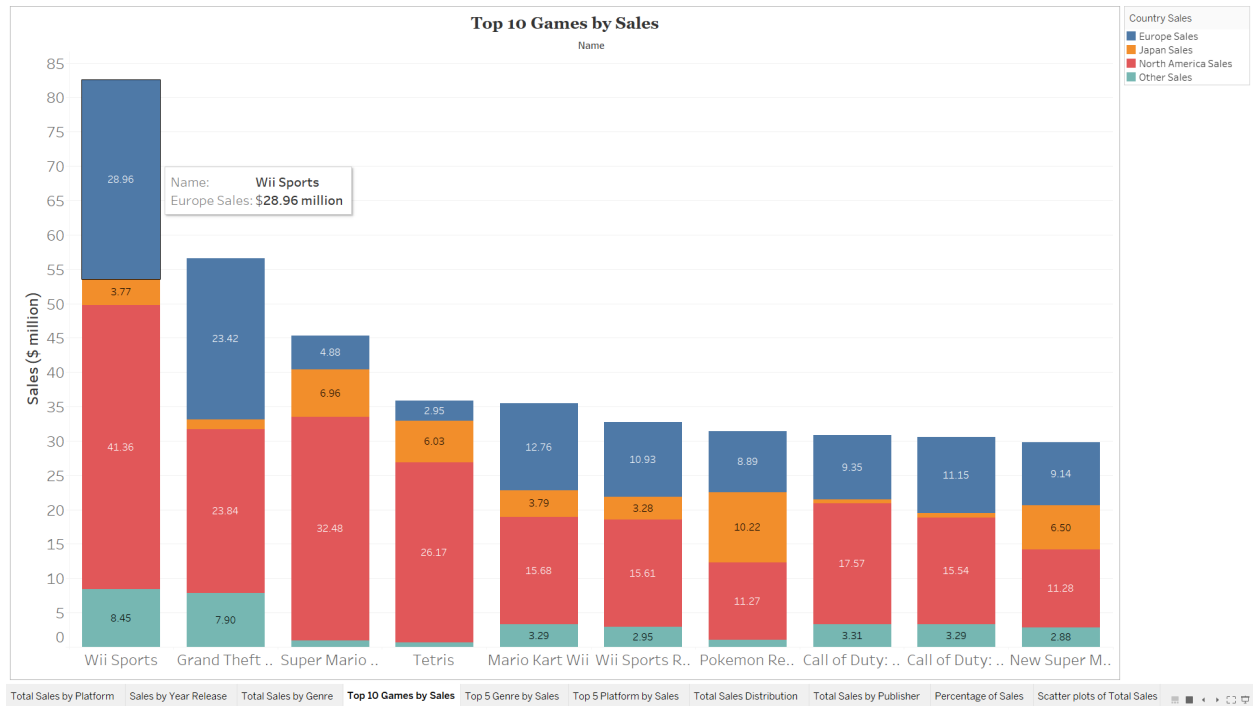
Figure 2.7 Stacked Bar Chart - Top 10 Games by Sales

The stacked bar chart above shows the top 10 games with the highest sales. Each bar contains sales in four countries which are Europe, Japan, North America, and other countries. The top 1 game is **Wii Sports** which has around **$83 million** in sales. **$41.36 million** of the sales came from **North America,** while **$28.96 million** came from **Europe**. The sales performance of Wii Sports in **Japan** and **other countries** is relatively poor, with only **$3.77 million** and **$8.45 million**. Next, **Grand Theft Auto V** and **Super Mario Bros.** are the top 2 and top 3 games which have total sales of around **$58 million** and **$45 million**. For these two games, it seems that the sales amount is also the highest in **North America**. The sales of the games that ranked fourth until rank tenth are all under $40 million. These games are Tetris, Mario Kart Wii, Wii Sports Resort, Pokemon Red/Pokemon Blue, Call of Duty: Black Ops, Call of Duty: Modern Warfare 3, and New Super Mario Bros. The last four games have almost similar sales.
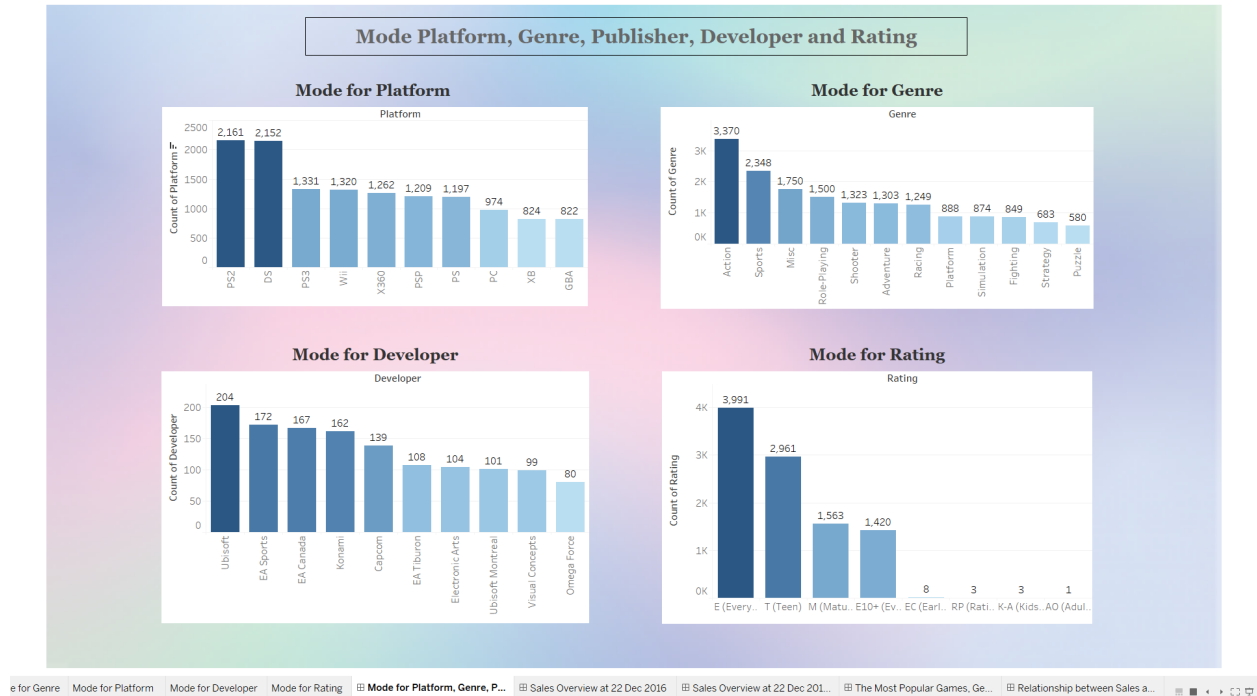
Part 3: Dashboard and Decision Making

Figure 3.1 - Dashboard - Mode Platform, Genre, Publisher, Developer and Rating

The dashboard above contains four bar charts that show the mode for the platform, genre, developer, and rating. From this dashboard, the most preferred platform, genre, and game rating can be known. This will help in making the game's development decision. For example, the developer can focus more on the development of the video games with action type and E(Everyone) rating categories in the PS2 platform if they continue to appear as top in the future sales. At the same time, the platform such as GBA, genre such as puzzle and game rating such as AO(Adults only) that are not favoured by the people can be reduced in the future development. Besides, the developer who can get the customer preferences can also be seen. This can help the management team to make better decisions in selecting the developer to collaborate with.
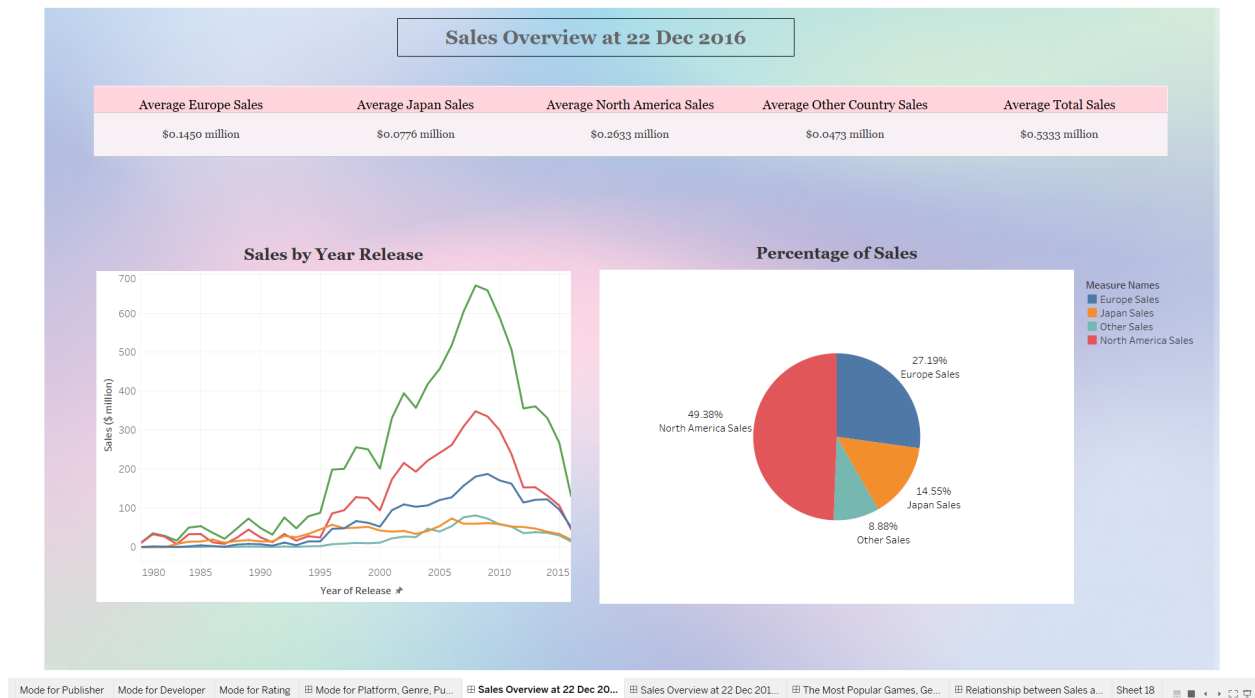
Figure 3.2 - Dashboard - Sales Overview at 22 Dec 2016

The dashboard above shows the average sales and percentage of sales in each country. The sales of the games released in different years in each country can also be seen. This information will help the management to know their sales performance in each country and make a better decision in marketing the video games. For example, it can be seen that the average sales and percentage of sales in Japan and other countries are relatively poor. Therefore, surveys can be done in those countries to know more about the customers' preferences. Some marketing strategies such as promotions and advertising can also be done to boost up the sales. Besides, The games that were released from 1982 until 1994 have lower sales in all countries. This is probably due to the games being out of trend or not favoured by people. The management can make decisions to remove those games and focus more in promoting the new games. This is because the sales of the new games are also quite low.
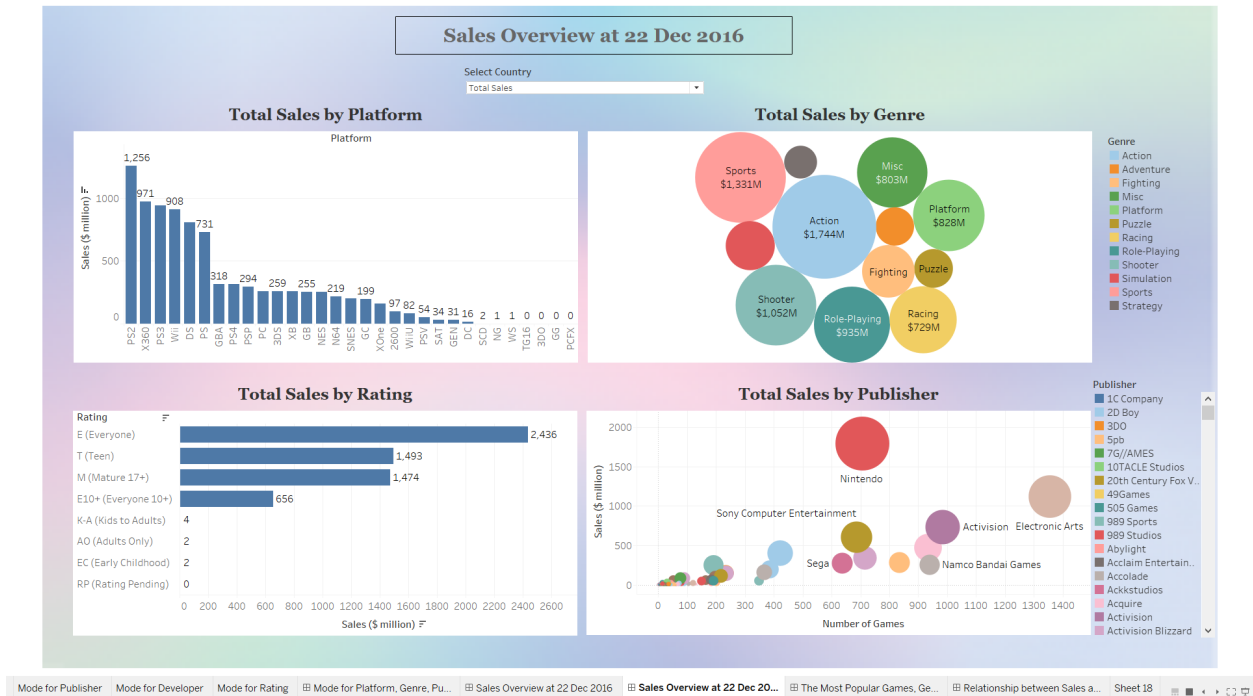
Figure 3.3 - Dashboard - Sales Overview at 22 Dec 2016

The dashboard above shows the sales overview in each country. This is useful while the management wants to know the sales performance and make business decisions in one particular country. The sales of each platform, genre, rating and publisher in each country are able to provide essential information to help the management in making better development and marketing decisions.
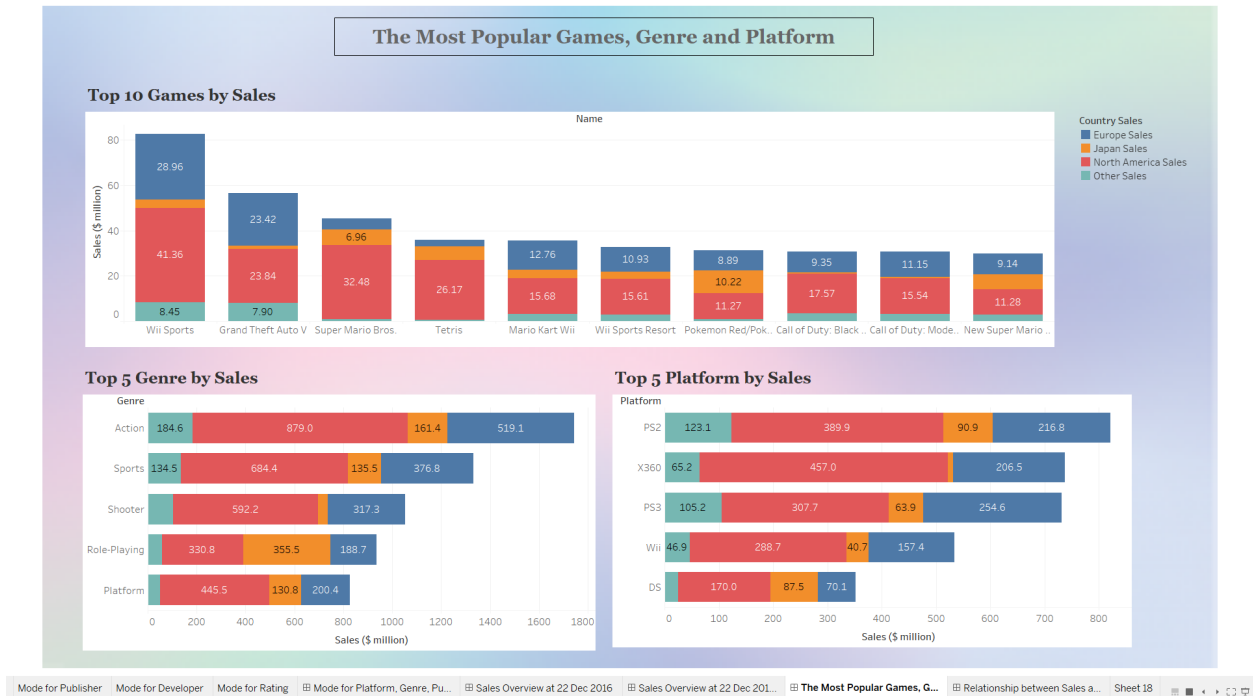
Figure 3.4 - Dashboard - The Most Popular Games, Genre and Platform

This dashboard will provide the management team with information of the proportion of each country's sales for the most popular games, genre, and platform. For the action genre, the sales in North America reach the highest. Meanwhile, the sales of the role-playing genre in Japan is relatively higher than other countries. Therefore, if a company had decided to publish a game of a certain genre, they may consider releasing to the appropriate countries that may give them the highest sales.
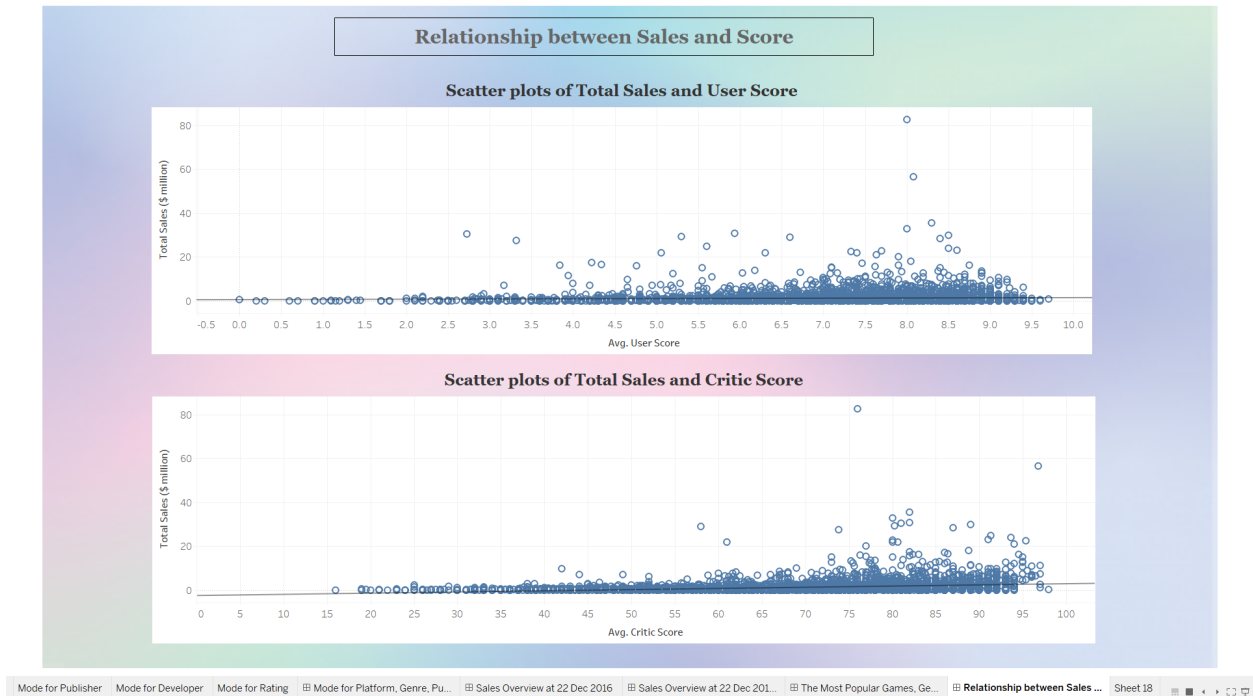
Figure 3.5 - Dashboard - Relationship between Sales and Score

The dashboard contains two scatter plots that show the relationship between sales and scores. This will let the management team know that the critic score and user score given by Metacritic staff and subscribers will not significantly affect the sales performance of the video games. Therefore, they may consider whether it is required to take the score into consideration while publishing the video games. Moreover, the management would think to increase the sales by increasing the average score, meanwhile they can explore other marketing strategies.