1. **Where does Panasonic stand with respect to other manufacturers.**

Aggregating data across different TV models for different manufacturers, we get the below rankings:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Row Labels** | **Average of Video Quality** | **Average of Sound quality** | **Average of Appearance** | **Average of Number of Features** | **Average of Ease of Set up** | **Average of Life Span** |
| LG | 5 | 1 | 3 | 2 | 4 | 8 |
| **Panasonic** | **1** | **6** | **5** | **3** | **1** | **1** |
| Philips | 6 | 4 | 2 | 8 | 7 | 4 |
| Samsung | 2 | 2 | 1 | 1 | 2 | 2 |
| Sharp | 4 | 5 | 7 | 5 | 8 | 7 |
| Sony | 3 | 3 | 4 | 6 | 3 | 3 |
| Toshiba | 8 | 7 | 6 | 4 | 5 | 6 |
| Vizio | 7 | 8 | 8 | 7 | 6 | 5 |
| **Grand Total** |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| **Row Labels** | **Average of Video Quality** | **Average of Sound quality** | **Average of Appearance** | **Average of Number of Features** | **Average of Ease of Set up** | **Average of Life Span** |
| LG | 3.415795455 | 4.209659091 | 3.971931818 | 4.225340909 | 3.601590909 | 3.100909091 |
| Panasonic | 4.378522727 | 3.503295455 | 3.586818182 | 3.814204545 | 4.211136364 | 4.637045455 |
| Philips | 3.391363636 | 3.889772727 | 4.025113636 | 2.903636364 | 3.209659091 | 3.595909091 |
| Samsung | 4.131590909 | 4.204204545 | 4.220113636 | 4.378636364 | 3.883636364 | 4.491136364 |
| Sharp | 3.572159091 | 3.63375 | 3.461022727 | 3.361136364 | 3.191704545 | 3.382954545 |
| Sony | 3.90625 | 4.081590909 | 3.964659091 | 3.236818182 | 3.728977273 | 4.102045455 |
| Toshiba | 3.056818182 | 3.110113636 | 3.482840909 | 3.433636364 | 3.403409091 | 3.509318182 |
| Vizio | 3.104204545 | 2.992386364 | 3.127045455 | 3.154204545 | 3.400795455 | 3.542272727 |

Panasonic ranks **#1** among competitors in the following areas:

1. Video Quality
2. Ease of set up
3. Life Span

However, there are other features that need improvements:

1. Sound Quality - #6
2. Number of features - #3
3. Appearance - #5
4. **Analyse data to determine which feature drives sales the most. Prioritize which features to invest in.**

To help Panasonic prioritize between which of the three features to improve first, it is important to check how significantly these features impact the sales/ units sold.

An Ordinary Least Square regression was performed on the features with the yearly units sold as the Goal Variable. At this stage, data from all manufacturers was taken to gauge the overall impact of these features on yearly units sold across manufacturers.

The regression summary looks like below:

**OLS Regression Results**

**===================================================================================**

**Dep. Variable: Yearly units sold in US R-squared: 1.000**

**Model: OLS Adj. R-squared: 1.000**

**Method: Least Squares F-statistic: 6.546e+04**

**Date: Thu, 01 Mar 2018 Prob (F-statistic): 0.00**

**Time: 12:26:36 Log-Likelihood: -4297.1**

**No. Observations: 704 AIC: 8640.**

**Df Residuals: 681 BIC: 8745.**

**Df Model: 22**

**Covariance Type: nonrobust**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Features** | **coef** | **std err** | **t** | **P>|t|** | **Significance** |
| Overall Rating | 38.4138 | 13.224 | 2.905 | 0.004 | \*\*\* |
| Video Quality | 557.8469 | 14.804 | 37.683 | 0 | \*\*\* |
| Sound quality | -33.8916 | 11.57 | -2.929 | 0.004 | \*\*\* |
| Appearance | 160.5381 | 12.472 | 12.872 | 0 | \*\*\* |
| Number of Features | 444.9331 | 8.149 | 54.6 | 0 | \*\*\* |
| Ease of Set up | 291.5331 | 12.33 | 23.644 | 0 | \*\*\* |
| Life Span | 62.3411 | 12.636 | 4.934 | 0 | \*\*\* |
| Expert Overall Rating | -162.16 | 11.654 | -13.914 | 0 | \*\*\* |
| size=26" | 868.5931 | 19.508 | 44.526 | 0 | \*\*\* |
| size=32" | 1653.458 | 19.534 | 84.647 | 0 | \*\*\* |
| size=36" | 5509.048 | 19.507 | 282.419 | 0 | \*\*\* |
| size=40" | 309.3236 | 19.541 | 15.829 | 0 | \*\*\* |
| size=42" | 7130.767 | 19.499 | 365.691 | 0 | \*\*\* |
| size=46" | 1.14E+04 | 19.514 | 585.63 | 0 | \*\*\* |
| size=49" | -1742.77 | 19.49 | -89.42 | 0 | \*\*\* |
| size=52" | -2493.6 | 19.511 | -127.805 | 0 | \*\*\* |
| size=55" | -3532.53 | 19.53 | -180.877 | 0 | \*\*\* |
| size=60" | -6814.96 | 19.559 | -348.426 | 0 | \*\*\* |
| motionrate=120 | -35.9291 | 11.809 | -3.042 | 0.002 | \*\*\* |
| motionrate=240 | -94.4455 | 11.82 | -7.991 | 0 | \*\*\* |
| motionrate=600 | -136.481 | 11.798 | -11.568 | 0 | \*\*\* |
| Pixel=1080 | 139.8997 | 8.315 | 16.825 | 0 | \*\*\* |
| Intercept | 1.11E+04 | 49.613 | 222.888 | 0 | \*\*\* |

**Conclusion:**

We see that the model has a very high value of adjusted R Squared. It converges to 1. So, with confidence, we can say that the model captures the learning and the contribution of the feature variables to the goal variable.

Coming to relative contribution of the features to the goal variable of units sold, we can compare the co-efficients to prioritize which feature holds most value to the units sold.

|  |  |  |  |
| --- | --- | --- | --- |
| Sl.No | Feature | Co-efficient | Prioritization Rank |
| 1 | Sound quality | -33.8916 | 3 |
| 2 | **Appearance** | **160.5381** | **2** |
| 3 | **Number of Features** | **444.9331** | **1** |

From the prioritization table above, we can see that ‘Number of features’ and ‘Appearance’ rank 1 and 2 respectively. This is where Panasonic needs to focus and improve first to increase units sold in US.

1. **How to price the Panasonic TVs to drive more sales?**

Let’s find the average price in each segment. Please refer to ‘Price\_Diff\_Calc’ of the excel sheet. There are 88 segments in total and below is a snapshot of the first five segments:

|  |  |  |  |
| --- | --- | --- | --- |
| **Screen Size** | **Pixel** | **Motion Rate** | **Average of Selling Price** |
| 19 | 720 | 60 | 438.75 |
| 19 | 720 | 120 | 490.625 |
| 19 | 720 | 240 | 553.75 |
| 19 | 720 | 600 | 601.875 |
| 19 | 1080 | 60 | 528.75 |

…

…

Using this look-up table, another column in ‘LCD Review-sales’ worksheet can be added. Please refer to the updated ‘LCD Review-sales’ in the attached excel sheet. Now, to find the relevance of (price diff from avg prices in a segment) to a focal product’s unit sold in US, let us build another regression model:

**OLS Regression Results**

**===================================================================================**

**Dep. Variable: Yearly units sold in US R-squared: 1.000**

**Model: OLS Adj. R-squared: 1.000**

**Method: Least Squares F-statistic: 2.012e+05**

**Date: Thu, 01 Mar 2018 Prob (F-statistic): 0.00**

**Time: 15:30:22 Log-Likelihood: -3885.7**

**No. Observations: 704 AIC: 7819.**

**Df Residuals: 680 BIC: 7929.**

**Df Model: 23**

**Covariance Type: nonrobust**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Features | coef | std err | t | p |
| Overall Rating | 126.6985 | 7.72 | 16.412 | 0 |
| Video Quality | 592.0965 | 8.306 | 71.289 | 0 |
| Sound quality | 55.115 | 6.85 | 8.046 | 0 |
| Appearance | 214.7484 | 7.096 | 30.261 | 0 |
| Number of Features | 435.4757 | 4.553 | 95.654 | 0 |
| Ease of Set up | 311.9369 | 6.899 | 45.218 | 0 |
| Life Span | 116.5499 | 7.186 | 16.219 | 0 |
| Expert Overall Rating | 20.4334 | 8.024 | 2.547 | 0.011 |
| size=26" | 835.0687 | 10.917 | 76.492 | 0 |
| size=32" | 1649.086 | 10.898 | 151.322 | 0 |
| size=36" | 5491.931 | 10.891 | 504.255 | 0 |
| size=40" | 296.6223 | 10.906 | 27.197 | 0 |
| size=42" | 7120.426 | 10.882 | 654.361 | 0 |
| size=46" | 1.14E+04 | 10.888 | 1048.905 | 0 |
| size=49" | -1757.76 | 10.88 | -161.564 | 0 |
| size=52" | -2498.32 | 10.885 | -229.512 | 0 |
| size=55" | -3534.39 | 10.895 | -324.392 | 0 |
| size=60" | -6815.78 | 10.912 | -624.634 | 0 |
| motionrate=120 | -42.8813 | 6.591 | -6.507 | 0 |
| motionrate=240 | -98.617 | 6.595 | -14.954 | 0 |
| motionrate=600 | -141.857 | 6.584 | -21.547 | 0 |
| Pixel=1080 | 136.545 | 4.639 | 29.432 | 0 |
| **Price Diff** | **-2.9745** | **0.077** | **-38.835** | **0** |
| Intercept | 9168.482 | 55.978 | 163.787 | 0 |

**Conclusion:**

From the regression summary, we can see that the Price Diff comes with a negative coefficient. This means, ‘Price Diff’ impacts units sold in US negatively. So, it is beneficial if Price Diff is < 0, so that the units sold in US is driven higher.  
For Ex:

In the segment,

|  |  |  |
| --- | --- | --- |
| Screen Size | Motion Rate | Pixel |
| 19 | 60 | 720 |

The average price is $438.75. Panasonic prices this segment at $475, which is higher than average. In this case, Panasonic sells lesser units because the overall contribution of Price Diff to the units sold is negative. In this case, it is (-2.9745 per $ \* ($475-$438.75)) = -108 units.

**So, Panasonic should have a strategy of selling focal products set below the average selling price of the relevant segment.**

**Note -** We need further analysis to say how much below the average selling price is an optimum.