MKTG749

Quantitative Research Report

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1. EXECUTIVE SUMMARY

This project explores consumer behaviour in the laptop market, focusing on the interplay between price and quality preferences. The document provides insights into how consumers prioritize between cost and product excellence when making purchasing decisions. It delves into the factors influencing consumer preferences, including budgetary constraints, brand perceptions, and individual preferences.

The project utilizes a multifaceted approach to research, integrating both qualitative and quantitative methodologies such as focus groups and projective techniques to investigate consumers' decision-making processes. By examining the interplay between price and quality, organizations can optimize their product positioning and pricing strategies. Furthermore, survey data was gathered, rigorously analysed through statistical tests, and augmented with data mining techniques to offer a comprehensive quantitative overview complementing the qualitative insights.

2. BACKGROUND

Envision, a company that studies what people like to buy, is studying how Millennials and Gen Z (young people) shop. These two groups are really important because they have a big impact on what sells.

Our client, the company that hired us, wants to know more about these young shoppers. They want to understand what makes them want to buy things so they can sell to them better.

To do this, we're going to look at lots of different things, like what they say in surveys, what they talk about on social media, and what's popular right now. We're going to use this information to figure out why they buy certain things.

We're going to do all of this using facts and data, not just guessing. This way, we can help our client make smart choices about how to sell things to Millennials and Gen Z. Our goal is to help them connect with these young shoppers and sell more stuff they like.

3. RESEARCH METHODOLOGY

- The study was descriptive, aiming to understand the preferences of college students regarding variables in a laptop.
- The data primarily came from a primary source, directly from the responses of college students participating in the survey.
- Results were collected through a survey method, where participants were asked to provide their preferences regarding various variables in a laptop.

This methodology helps in comprehensively understanding the preferences and buying behaviour of college students when it comes to choosing a laptop based on different variables.

- The target population for this survey was Centennial College students.
- Ideally, the survey aimed to generalize the findings to all Centennial College students who were within the age range of 18 to 45 years and owned a laptop.
- The actual sample included Centennial College students across all Business programs within the specified age range and laptop ownership criteria.
- The sample was obtained through non-probability sampling, likely convenience sampling, where participants were easily accessible and willing to participate.
- The sample size for this survey was 63 responses, with 59 of them deemed usable for analysis after any necessary data cleaning or screening processes.
- 2 responses were deleted as they were preview responses, and 2 responses were incomplete, resulting in 59 usable responses for analysis.

4. RESEARCH OBJECTIVES

- To understand the effects of demographic variables on BRAND, PERFORMANCE, DISPLAY, ECOSYSTEM, FEATURES, FINANCE, and PRICE and QUALITY of the laptop
- To validate the relationship between BRAND, PERFORMANCE, DISPLAY, ECOSYSTEM, FEATURES, FINANCE and PRICE and QUALITY of the laptop
- To validate the impact of BRAND, PERFORMANCE, DISPLAY, ECOSYSTEM, FEATURES, FINANCE on PRICE and QUALITY of the laptop.

5. QUESTIONNAIRE USED

Q1 Please select the range that best represents your age

Q2 Do you currently own a laptop ?

Q3 Are you planning to buy laptop in near future ?

Q4 How frequently do you think of upgrading your laptop?

Q5 How likely are you to purchase a newly released product in the market?

Q6 How often do you use laptop in a day ?

Q7 What activities do you primarily use your laptop for ?

Q8 About the **Brand** How important are these to you?

Q9 About the **Performance** How important are these to you?

Q10 About the **Features** How important are these to you?

Q11 About the **Display** How important are these to you?

Q12 About the **Ecosystem** How important are these to you?

Q13 About the **Finance** How important are these to you?

Q14 How important was **price** when you purchased a technical device ?

Q15 How important was **quality** when you purchased a technical device ?

Q16 When choosing a laptop, what matters more to you?

Q17 On a scale from $500 to $7,000, please slide the marker to indicate what you consider to be a 'Decent price' for a laptop.

Q18 What aspects do you associate with the brands below?

Apple (1)

Dell (2)

HP (3)

Lenovo (4)

Asus (5)

Acer (6)

Microsoft Surface (7)

Chrome book (8)

Alienware (9)

Q19 What is your current employment status?

Q20 What is your gender?

Q21 What is the highest level of education you have completed?

Q22 What is your approximate annual income?

- There were a total of 9 questions used to measure each variable.
- A composite measure was utilized, and the mean was calculated for each variable based on the responses to these 9 questions. This approach allowed for a more comprehensive understanding of each variable by aggregating responses across multiple items.
- Binary variables were created for price and quality, with a threshold of 3; ratings above 3 were coded as 1 to denote importance, while ratings of 3 or below were coded as 0 to denote lack of importance.

6. PROPOSED ANALYSIS

Software and Analysis

- Qualtrics was used for survey administration and data collection.
- SAS Enterprise Guide and SAS Miner were employed for data analysis, including statistical analyses and data mining techniques.
- Excel was utilized for data cleaning, manipulation, and basic descriptive statistics.
- Descriptive statistics: Utilized to summarize and describe the characteristics of the data collected, such as frequencies, means, and standard deviations.
- Inferential statistics: Employed to make inferences or predictions about the population based on the sample data collected. This may include techniques such as hypothesis testing and regression analysis.
- Data mining techniques: Applied to identify patterns or relationships within the dataset that may not be immediately apparent. Techniques such as regression decision trees employed using SAS Miner.
- Advanced statistical analysis: Utilized to explore relationships between variables and test hypotheses. Used SAS Enterprise Guide for this purpose.

7. NOTE OF CAUTION

- The sample size is small, typically less than 100 completed responses. In small samples, the findings may not be statistically robust or representative of the population, leading to potential limitations in generalizability.
- The response rate is low, indicating a potential lack of engagement or interest from the target population. A low response rate can introduce bias and affect the reliability of the results.
- There is bias in the sample, meaning that the characteristics of the respondents do not adequately represent the broader population under study. This could occur if certain demographic groups are overrepresented or underrepresented in the sample, leading to skewed findings.

8. RESULTS

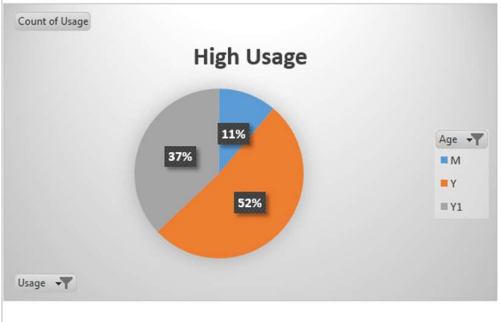
8.1. Data cleaning

- Data Importation
- Data Segmentation
- Column Optimization
- Variable Averaging
- New Variable Column Creation
- Binary Target Variable Conversion
- Missing Values(Numeric)= Mean
- Missing Values(Categorical)=Mode

8.2. Exploratory Analysis

8.2.1. Created pivot table for Usage

Count of Usage	Column Labels	
Row Labels	High Usage	Grand Total
M	3	3
Y	14	14
Y1	10	10
Grand Total	27	27



RESULT = Young people with age of 25-34 uses laptop are high users.

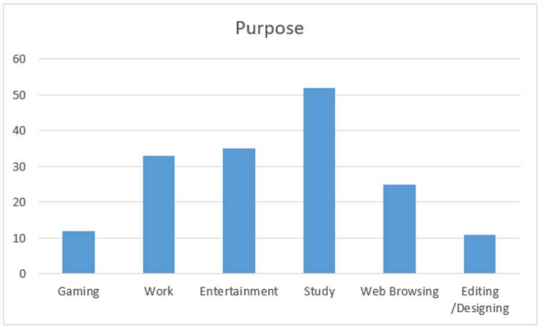
8.2.2. Created pivot table for purchasing intention

Row Labels	Count of Planning to buy
0	33
1	26
Grand Total	**59**

RESULT= 44% of students who attended the survey are planning to buy a laptop.

8.2.3. Created frequency table and bar chart for purpose of laptop

1	4	7	0	0	0	0	0 Gaming	12
33	0	0	0	0	0	0	0 Work	33
1	16	11	2	5	0	0	0 Entertainn	35
24	28	0	0	0	0	0	0 Study	52
0	3	7	9	1	5	0	0 Web Brow	25
0	2	4	5	0	0	0	0 Editing /De	11



RESULT = Laptop are mainly used for study and secondly used for entertainment and work

8.2.4. For Average estimate price of a laptop, took mean of the values provided by the respondents

R	S	T	U	V
RICE_E	QUALIT	PRICE	Apple	Dell
1	1	1650	Brand Rep	Price
1	1	1503	Features	Feature
1	1	1064	Price	Price
1	1	1315	Features	Feature
1	1	1705.507		
1	1	1131	Brand Rep	Feature
1	1	1877	Brand Rep	Feature
1	1	519	Performan	Price
1	1	1506	Brand Rep	Feature
1	1	2147	Performan	Perforn
0	1	2343	Brand Rep	Price
1	1	1002	Brand Rep	Feature
1	1	1425	Performan	Feature
1	1	1705.507	Brand Rep	Feature
1	1	1705.507	Brand Rep	Display
1	1	1996	Ecosystem	Perforn
1	1	1705.507	Brand Rep	Display
1	1	1009	Features	Perforn
1	1	1930.644	Features	
1	1	2172	Brand Rep	Perforn
1	1	1098	Price	Brand F
1	1	1027	Brand Rep	Feature
1	1	1152	Brand Rep	Perforn
1	1	1232	Brand Rep	Perforn
1	1	1618	Ecosystem	Price
1	1	1566	Ecosystem	Feature
		1492.559		

RESULT=People estimated Average $1492.55 as a decent price of a laptop according to their preference of variables.

8.2.5. For brand known for analysis created a cross tab

Apple	Dell	HP	Lenovo	Asus	Acer	Microsoft	Chrome b	Alienware	
24	4	6	5	6	1	1	0	3	Brand Reputation
8	14	18	7	10	9	10	10	16	Performance
7	8	11	16	9	16	3	3	6	Price
9	19	11	12	7	5	10	6	5	Features
7	1	3	5	7	6	7	8	2	Ecosystem
0	5	3	2	4	5	6	5	7	Display

Apple	brand
Dell	Features
HP	Performance
Lenovo/ Acer	Price

8.2.6. Created pivot table for demographic insights

Row Labels	Count of Upgrading frequency
Frequent Upgraders	**6**
Freelancer	1
Full-time worker	1
Jobseeker	4
Minimal Upgraders	**18**
Freelancer	1
Full-time worker	7
Jobseeker	5
Part-time worker	5
Occasional Upgraders	**34**
Freelancer	2
Full-time worker	12
Jobseeker	8
Part-time worker	12
Grand Total	**58**

RESULT = Frequent Upgraders are jobseekers, People who are full time employed are minimal upgraders.

9. ANALYSIS

9.1. CHI_sq

Objective 1 = To understand the effects of demographic variables

Table Analysis Results

The FREQ Procedure

Frequency / Col Pct — Table of Upgrading frequency by Age

Upgrading frequency	M	Y	Y1	Total
Frequent Upgraders	0 0.00	5 13.89	1 6.25	6
Minimal Upgraders	2 33.33	10 27.78	6 37.50	18
Occasional Upgraders	4 66.67	21 58.33	9 56.25	34
Total	6	36	16	58

Frequency Missing = 1

Statistics for Table of Upgrading frequency by Age

Statistic	DF	Value	Prob
Chi-Square	4	1.7480	0.7820
Likelihood Ratio Chi-Square	4	2.3572	0.6704
Mantel-Haenszel Chi-Square	1	0.0727	0.7874
Phi Coefficient		0.1736	
Contingency Coefficient		0.1710	
Cramer's V		0.1228	

WARNING: 67% of the cells have expected counts less than 5. (Asymptotic) Chi-Square may not be a valid test.

Table Analysis Results

The FREQ Procedure

Frequency / Col Pct — Table of Usage by Upgrading frequency

Usage	Frequent Upgraders	Minimal Upgraders	Occasional Upgraders	Total
High Usage	2 33.33	10 55.56	16 45.71	28
Low Usage	1 16.67	1 5.56	3 8.57	5
Moderate Usage	3 50.00	7 38.89	16 45.71	26
Total	6	18	35	59

Statistics for Table of Usage by Upgrading frequency

Statistic	DF	Value	Prob
Chi-Square	4	1.3589	0.8513
Likelihood Ratio Chi-Square	4	1.2978	0.8618
Mantel-Haenszel Chi-Square	1	0.0000	0.9973
Phi Coefficient		0.1518	
Contingency Coefficient		0.1500	
Cramer's V		0.1073	

WARNING: 56% of the cells have expected counts less than 5. Chi-Square may not be a valid test.

Sample Size = 59

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Table Analysis Results

The FREQ Procedure

Frequency / Col Pct — Table of Education by Upgrading frequency

Education	Frequent Upgraders	Minimal Upgraders	Occasional Upgraders	Total
Bachelor's degree	3 50.00	9 50.00	19 55.88	31
Graduate or professional degree	2 33.33	8 44.44	6 17.65	16
High school diploma or equivalent	1 16.67	1 5.56	8 23.53	10
Some college or associate degree	0 0.00	0 0.00	1 2.94	1
Total	6	18	34	58

Frequency Missing = 1

Statistics for Table of Education by Upgrading frequency

Statistic	DF	Value	Prob
Chi-Square	6	6.1473	0.4069
Likelihood Ratio Chi-Square	6	6.8289	0.3370
Mantel-Haenszel Chi-Square	1	0.2620	0.6088
Phi Coefficient		0.3256	
Contingency Coefficient		0.3096	
Cramer's V		0.2302	

WARNING: 67% of the cells have expected counts less than 5. Chi-Square may not be a valid test.

Sample Size = 58
Frequency Missing = 1

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Table Analysis Results

The FREQ Procedure

Frequency / Col Pct — Table of Gender by Upgrading frequency

Gender	Frequent Upgraders	Minimal Upgraders	Occasional Upgraders	Total
Female	2 33.33	9 50.00	10 29.41	21
Male	4 66.67	9 50.00	23 67.65	36
Prefer not to say	0 0.00	0 0.00	1 2.94	1
Total	6	18	34	58

Frequency Missing = 1

Statistics for Table of Gender by Upgrading frequency

Statistic	DF	Value	Prob
Chi-Square	4	2.7123	0.6071
Likelihood Ratio Chi-Square	4	3.0285	0.5531
Mantel-Haenszel Chi-Square	1	1.0047	0.3162
Phi Coefficient		0.2162	
Contingency Coefficient		0.2114	
Cramer's V		0.1529	

WARNING: 56% of the cells have expected counts less than 5. Chi-Square may not be a valid test.

Sample Size = 58
Frequency Missing = 1

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Table Analysis Results

The FREQ Procedure

Frequency
Col Pct

Table of Income by Upgrading frequency				
	Upgrading frequency			
Income	Frequent Upgraders	Minimal Upgraders	Occasional Upgraders	Total
$100,000 - $149,999	0 0.00	1 5.56	1 2.94	2
$150,000 or more	1 16.67	1 5.56	0 0.00	2
$25,000 - $49,999	0 0.00	2 11.11	8 23.53	10
$50,000 - $74,999	0 0.00	1 5.56	1 2.94	2
$75,000 - $99,999	0 0.00	2 11.11	0 0.00	2
Less than $25,000	4 66.67	8 44.44	14 41.18	26
Prefer not to say	1 16.67	3 16.67	10 29.41	14
Total	6	18	34	58
Frequency Missing = 1				

Statistics for Table of Income by Upgrading frequency

Statistic	DF	Value	Prob
Chi-Square	12	13.7104	0.3196
Likelihood Ratio Chi-Square	12	14.9223	0.2457
Mantel-Haenszel Chi-Square	1	0.0219	0.8822
Phi Coefficient		0.4862	
Contingency Coefficient		0.4373	
Cramer's V		0.3438	
WARNING: 81% of the cells have expected counts less than 5. Chi-Square may not be a valid test.			

Sample Size = 58
Frequency Missing = 1

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Statically significant chi _sq

Ho: there is NO significant association between Upgrading frequency and Buy new launch.

Table Analysis Results

The FREQ Procedure

Frequency
Col Pct

Table of Upgrading frequency by Buy new launch				
	Buy new launch			
Upgrading frequency	May be	No	yes	Total
Frequent Upgraders	4 11.11	0 0.00	2 28.57	6
Minimal Upgraders	6 16.67	11 78.57	1 14.29	18
Occasional Upgraders	26 72.22	3 21.43	4 57.14	33
Total	36	14	7	57
Frequency Missing = 2				

Statistics for Table of Upgrading frequency by Buy new launch

Statistic	DF	Value	Prob
Chi-Square	4	21.1317	0.0003
Likelihood Ratio Chi-Square	4	20.6549	0.0004
Mantel-Haenszel Chi-Square	1	2.9672	0.0850
Phi Coefficient		0.6089	
Contingency Coefficient		0.5201	
Cramer's V		0.4305	
WARNING: 67% of the cells have expected counts less than 5. (Asymptotic) Chi-Square may not be a valid test.			

Pearson Chi-Square Test	
Chi-Square	21.1317
DF	4
Asymptotic Pr > ChiSq	0.0003
Exact Pr >= ChiSq	0.0005

Null Hypothesis got REJECTED.

- Frequent upgraders are tend to buy a newly launch product
- Minimal upgraders are less likely to buy a newly launch product

9.2. ANOVA

Objective 1 = To understand the effects of demographic variables

One-Way Analysis of Variance Results

The ANOVA Procedure

Class Level Information		
Class	Levels	Values
Upgrading frequency	3	Frequent Upgraders Minimal Upgraders Occasional Upgraders

Number of Observations Read	59
Number of Observations Used	59

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One-Way Analysis of Variance Results

The ANOVA Procedure

Dependent Variable: Importance- price

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	0.88426150	0.44213075	0.53	0.5917
Error	56	46.74285714	0.83469388		
Corrected Total	58	47.62711864			

R-Square	Coeff Var	Root MSE	Importance- price Mean
0.018566	23.74596	0.913616	3.847458

Source	DF	Anova SS	Mean Square	F Value	Pr > F
Upgrading frequency	2	0.88426150	0.44213075	0.53	0.5917

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One-Way Analysis of Variance Results

The ANOVA Procedure

Class Level Information		
Class	Levels	Values
Buy new launch	3	May be No yes

Number of Observations Read	59
Number of Observations Used	57

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One-Way Analysis of Variance Results

The ANOVA Procedure

Dependent Variable: Importance- price

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	2.49143693	1.24571846	1.65	0.2024
Error	54	40.87698413	0.75698119		
Corrected Total	56	43.36842105			

R-Square	Coeff Var	Root MSE	Importance- price Mean
0.057448	22.33904	0.870047	3.894737

Source	DF	Anova SS	Mean Square	F Value	Pr > F
Buy new launch	2	2.49143693	1.24571846	1.65	0.2024

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One-Way Analysis of Variance Results

The ANOVA Procedure

Class Level Information		
Class	Levels	Values
Usage	3	High Usage Low Usage Moderate Usage

Number of Observations Read	59
Number of Observations Used	59

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One-Way Analysis of Variance Results

The ANOVA Procedure

Dependent Variable: Importance- price

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	1.81173403	0.90586701	1.11	0.3376
Error	56	45.81538462	0.81813187		
Corrected Total	58	47.62711864			

R-Square	Coeff Var	Root MSE	Importance- price Mean
0.038040	23.50920	0.904506	3.847458

Source	DF	Anova SS	Mean Square	F Value	Pr > F
Usage	2	1.81173403	0.90586701	1.11	0.3376

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One-Way Analysis of Variance Results

The ANOVA Procedure

Class Level Information		
Class	Levels	Values
Employment status?	4	Freelancer Full-time worker Jobseeker Part-time worker

Number of Observations Read	59
Number of Observations Used	58

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One-Way Analysis of Variance Results

The ANOVA Procedure

Dependent Variable: Importance- price

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	3.97890467	1.32630156	1.67	0.1846
Error	54	42.91764706	0.79477124		
Corrected Total	57	46.89655172			

R-Square	Coeff Var	Root MSE	Importance- price Mean
0.084844	23.08347	0.891499	3.862069

Source	DF	Anova SS	Mean Square	F Value	Pr > F
Employment status?	3	3.97890467	1.32630156	1.67	0.1846

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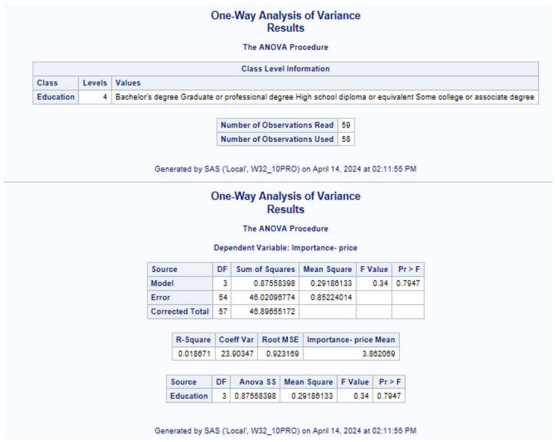

One-Way Analysis of Variance Results

The ANOVA Procedure

Class Level Information		
Class	Levels	Values
Education	4	Bachelor's degree Graduate or professional degree High school diploma or equivalent Some college or associate degree

Number of Observations Read	59
Number of Observations Used	58

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One-Way Analysis of Variance Results

The ANOVA Procedure

Dependent Variable: Importance- price

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	0.87558398	0.29186133	0.34	0.7947
Error	54	46.02096774	0.85224014		
Corrected Total	57	46.89655172			

R-Square	Coeff Var	Root MSE	Importance- price Mean
0.018671	23.90347	0.923169	3.862069

Source	DF	Anova SS	Mean Square	F Value	Pr > F
Education	3	0.87558398	0.29186133	0.34	0.7947

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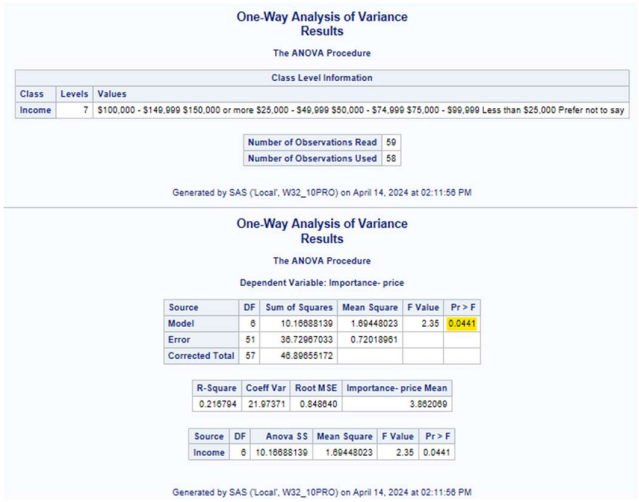
Statically significant Anova

Ho: There is NO difference b/w means of price and Income.



One-Way Analysis of Variance Results

The ANOVA Procedure

Class Level Information		
Class	Levels	Values
Income	7	$100,000 - $149,999 $150,000 or more $25,000 - $49,999 $50,000 - $74,999 $75,000 - $99,999 Less than $25,000 Prefer not to say

Number of Observations Read	59
Number of Observations Used	58

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One-Way Analysis of Variance Results

The ANOVA Procedure

Dependent Variable: Importance- price

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	6	10.16888139	1.69448023	2.35	0.0441
Error	51	36.72967033	0.72018961		
Corrected Total	57	46.89655172			

R-Square	Coeff Var	Root MSE	Importance- price Mean
0.216794	21.97371	0.848640	3.862069

Source	DF	Anova SS	Mean Square	F Value	Pr > F
Income	6	10.16888139	1.69448023	2.35	0.0441

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Null Hypothesis got **REJECTED.**

- People earning less than $25000 are more concerned about the price.
- While people earning $50,000-$74,999 are least concern about the price.

One-Way Analysis of Variance Results

The ANOVA Procedure

Class Level Information		
Class	Levels	Values
Upgrading frequency	3	Frequent Upgraders Minimal Upgraders Occasional Upgraders

Number of Observations Read	59
Number of Observations Used	59

Generated by SAS ('Local', W32_10PRO) on April 14, 2024 at 02:11:57 PM

One-Way Analysis of Variance Results

The ANOVA Procedure

Dependent Variable: Importance-quality

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	0.37589454	0.18794727	0.30	0.7405
Error	56	34.84444444	0.62222222		
Corrected Total	58	35.22033898			

R-Square	Coeff Var	Root MSE	Importance-quality Mean
0.010673	18.17962	0.788811	4.338983

Source	DF	Anova SS	Mean Square	F Value	Pr > F
Upgrading frequency	2	0.37589454	0.18794727	0.30	0.7405

Generated by SAS ('Local', W32_10PRO) on April 14, 2024 at 02:11:57 PM

One-Way Analysis of Variance Results

The ANOVA Procedure

Class Level Information		
Class	Levels	Values
Buy new launch	3	May be No yes

Number of Observations Read	59
Number of Observations Used	57

Generated by SAS ('Local', W32_10PRO) on April 14, 2024 at 02:11:58 PM

One-Way Analysis of Variance Results

The ANOVA Procedure

Dependent Variable: Importance-quality

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	0.77088555	0.38544277	0.77	0.4670
Error	54	26.94841270	0.49904468		
Corrected Total	56	27.71929825			

R-Square	Coeff Var	Root MSE	Importance-quality Mean
0.027810	16.04246	0.706431	4.403509

Source	DF	Anova SS	Mean Square	F Value	Pr > F
Buy new launch	2	0.77088555	0.38544277	0.77	0.4670

Generated by SAS ('Local', W32_10PRO) on April 14, 2024 at 02:11:58 PM

One-Way Analysis of Variance Results

The ANOVA Procedure

Class Level Information		
Class	Levels	Values
Usage	3	High Usage Low Usage Moderate Usage

Number of Observations Read	59
Number of Observations Used	59

Generated by SAS ('Local', W32_10PRO) on April 14, 2024 at 02:11:59 PM

One-Way Analysis of Variance Results

The ANOVA Procedure

Dependent Variable: Importance-quality

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	1.67143788	0.83571894	1.39	0.2563
Error	56	33.54890110	0.59908752		
Corrected Total	58	35.22033898			

R-Square	Coeff Var	Root MSE	Importance-quality Mean
0.047457	17.83845	0.774007	4.338983

Source	DF	Anova SS	Mean Square	F Value	Pr > F
Usage	2	1.67143788	0.83571894	1.39	0.2563

Generated by SAS ('Local', W32_10PRO) on April 14, 2024 at 02:11:59 PM

One-Way Analysis of Variance Results

The ANOVA Procedure

Class Level Information		
Class	Levels	Values
Education	4	Bachelor's degree Graduate or professional degree High school diploma or equivalent Some college or associate degree

Number of Observations Read	59
Number of Observations Used	58

Generated by SAS ('Local', W32_10PRO) on April 14, 2024 at 02:12:01 PM

One-Way Analysis of Variance Results

The ANOVA Procedure

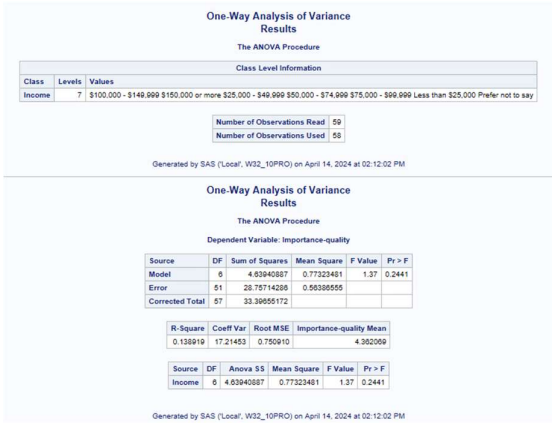
Dependent Variable: Importance-quality

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	1.20421301	0.40140434	0.67	0.5721
Error	54	32.19233871	0.59615442		
Corrected Total	57	33.39655172			

R-Square	Coeff Var	Root MSE	Importance-quality Mean
0.036058	17.70055	0.772110	4.362069

Source	DF	Anova SS	Mean Square	F Value	Pr > F
Education	3	1.20421301	0.40140434	0.67	0.5721

Generated by SAS ('Local', W32_10PRO) on April 14, 2024 at 02:12:01 PM



One-Way Analysis of Variance Results

The ANOVA Procedure

Class Level Information		
Class	Levels	Values
Income	7	$100,000 - $149,999 $150,000 or more $25,000 - $49,999 $50,000 - $74,999 $75,000 - $99,999 Less than $25,000 Prefer not to say

Number of Observations Read	59
Number of Observations Used	58

Generated by SAS ('Local', W32_10PRO) on April 14, 2024 at 02:12:02 PM

One-Way Analysis of Variance Results

The ANOVA Procedure

Dependent Variable: Importance-quality

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	6	4.63940887	0.77323481	1.37	0.2441
Error	51	28.75714286	0.56386555		
Corrected Total	57	33.39655172			

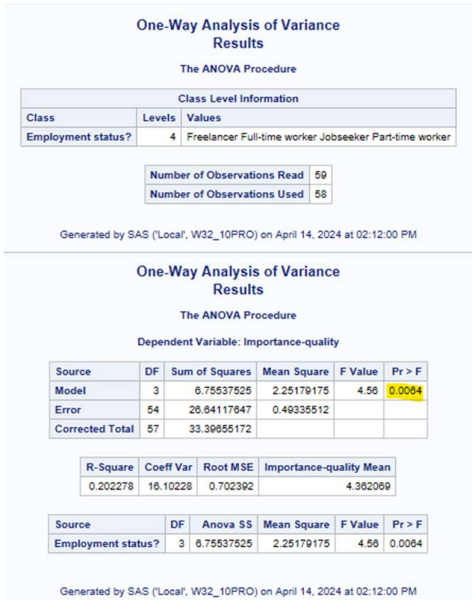
R-Square	Coeff Var	Root MSE	Importance-quality Mean
0.138919	17.21453	0.750910	4.362069

Source	DF	Anova SS	Mean Square	F Value	Pr > F
Income	6	4.63940887	0.77323481	1.37	0.2441

Generated by SAS ('Local', W32_10PRO) on April 14, 2024 at 02:12:02 PM

Statically significant Anova

Ho: There is NO difference b/w means of Quality and Employment status.



One-Way Analysis of Variance Results

The ANOVA Procedure

Class Level Information		
Class	Levels	Values
Employment status?	4	Freelancer Full-time worker Jobseeker Part-time worker

Number of Observations Read	59
Number of Observations Used	58

Generated by SAS ('Local', W32_10PRO) on April 14, 2024 at 02:12:00 PM

One-Way Analysis of Variance Results

The ANOVA Procedure

Dependent Variable: Importance-quality

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	6.75537525	2.25179175	4.56	0.0064
Error	54	26.64117647	0.49335512		
Corrected Total	57	33.39655172			

R-Square	Coeff Var	Root MSE	Importance-quality Mean
0.202278	16.10228	0.702392	4.362069

Source	DF	Anova SS	Mean Square	F Value	Pr > F
Employment status?	3	6.75537525	2.25179175	4.56	0.0064

Generated by SAS ('Local', W32_10PRO) on April 14, 2024 at 02:12:00 PM

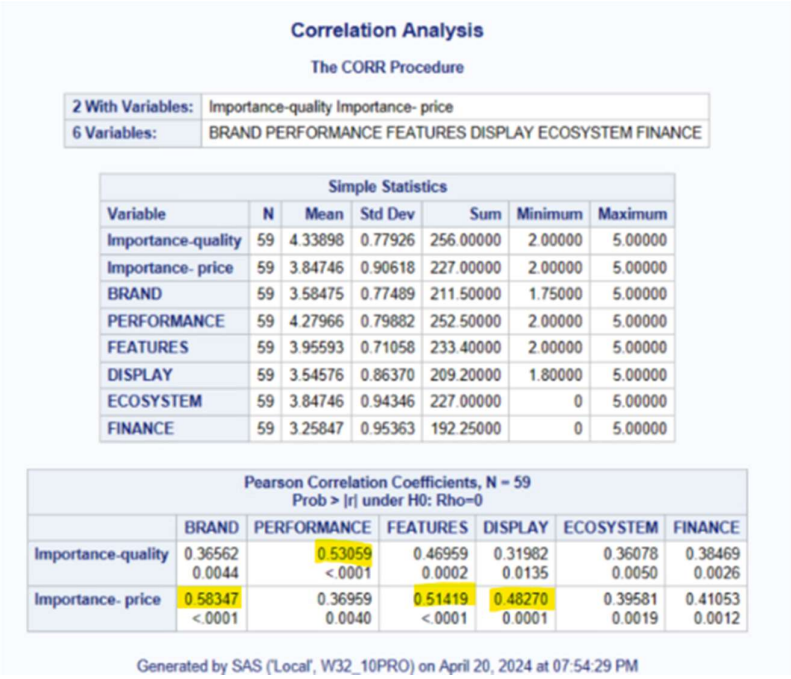
Null Hypothesis got **REJECTED.**

- Part time workers are more concerned about Quality of the laptop
- Full time workers are less concerned about Quality of the laptop.

9.3. CORRELATION

Objective 2 = To validate the relationship between Independent and dependent variables.

Ho: No significant relationship between Price, Quality, Brand, Performance, Display, Finance, Feature, and Ecosystem.



Correlation Analysis

The CORR Procedure

2 With Variables:	Importance-quality Importance- price
6 Variables:	BRAND PERFORMANCE FEATURES DISPLAY ECOSYSTEM FINANCE

Simple Statistics

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum
Importance-quality	59	4.33898	0.77926	256.00000	2.00000	5.00000
Importance- price	59	3.84746	0.90618	227.00000	2.00000	5.00000
BRAND	59	3.58475	0.77489	211.50000	1.75000	5.00000
PERFORMANCE	59	4.27966	0.79882	252.50000	2.00000	5.00000
FEATURES	59	3.95593	0.71058	233.40000	2.00000	5.00000
DISPLAY	59	3.54576	0.86370	209.20000	1.80000	5.00000
ECOSYSTEM	59	3.84746	0.94346	227.00000	0	5.00000
FINANCE	59	3.25847	0.95363	192.25000	0	5.00000

Pearson Correlation Coefficients, N = 59
Prob > |r| under H0: Rho=0

	BRAND	PERFORMANCE	FEATURES	DISPLAY	ECOSYSTEM	FINANCE
Importance-quality	0.36562 0.0044	0.53059 <.0001	0.46959 0.0002	0.31982 0.0135	0.36078 0.0050	0.38469 0.0026
Importance- price	0.58347 <.0001	0.36959 0.0040	0.51419 <.0001	0.48270 0.0001	0.39581 0.0019	0.41053 0.0012

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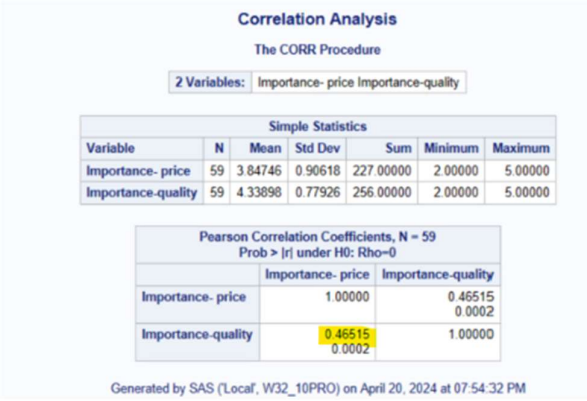
Null Hypothesis got **REJECTED.**

- Correlation shows the strength of the relationship.
- Found that price has moderate positive linear relationship with Brand (58% related), Features (51% related) and Display (48% related).
- Higher the Price higher better the Brand Reputation, More Features in the laptop and Good Display in a laptop.
- Found that Quality has moderate positive linear relationship with Performance (53% related).
- Higher the Quality better the performance of the laptop.
- All the correlations are statically significant

Objective 2 = To validate the relationship between Independent and dependent variables.

Ho: No significant relationship between Price, Quality, Brand, Performance, Display, Finance, Feature, and Ecosystem.



Correlation Analysis

The CORR Procedure

2 Variables:	Importance- price Importance-quality

Simple Statistics

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum
Importance- price	59	3.84746	0.90618	227.00000	2.00000	5.00000
Importance-quality	59	4.33898	0.77926	256.00000	2.00000	5.00000

Pearson Correlation Coefficients, N = 59
Prob > |r| under H0: Rho=0

	Importance- price	Importance-quality
Importance- price	1.00000	0.46515 0.0002
Importance-quality	0.46515 0.0002	1.00000

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Null Hypothesis got REJECTED.

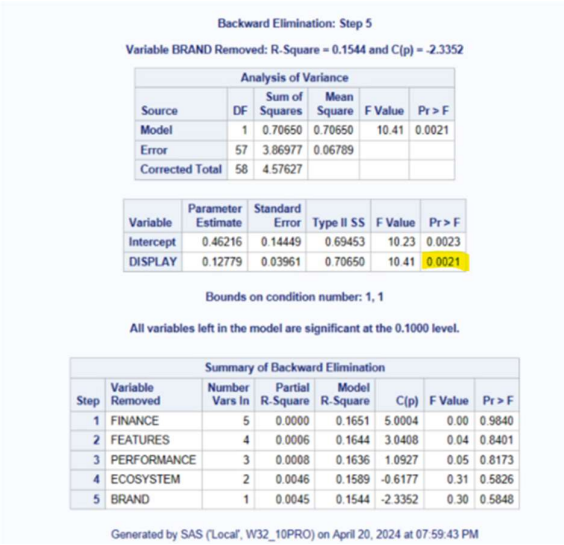
- Found that importance of price has moderate positive linear relationship with importance of quality.
- Unit change in importance of price will increase the importance of quality by 46%

9.4. REGRESSION

WE used backward regression as it will eliminate the Independent variables that are not impacting the dependent variables

Objective 3 = To validate the impact of Independent and dependent variables.

Ho: No significant effect of Brand, Performance, Display, Finance, Feature, and Ecosystem on Price.



Backward Elimination: Step 5

Variable BRAND Removed: R-Square = 0.1544 and C(p) = -2.3352

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	0.70650	0.70650	10.41	0.0021
Error	57	3.86977	0.06789		
Corrected Total	58	4.57627			

Variable	Parameter Estimate	Standard Error	Type II SS	F Value	Pr > F
Intercept	0.46216	0.14449	0.69453	10.23	0.0023
DISPLAY	0.12779	0.03961	0.70650	10.41	0.0021

Bounds on condition number: 1, 1

All variables left in the model are significant at the 0.1000 level.

Summary of Backward Elimination

Step	Variable Removed	Number Vars In	Partial R-Square	Model R-Square	C(p)	F Value	Pr > F
1	FINANCE	5	0.0000	0.1651	5.0004	0.00	0.9840
2	FEATURES	4	0.0006	0.1644	3.0408	0.04	0.8401
3	PERFORMANCE	3	0.0008	0.1636	1.0927	0.05	0.8173
4	ECOSYSTEM	2	0.0046	0.1589	-0.6177	0.31	0.5826
5	BRAND	1	0.0045	0.1544	-2.3352	0.30	0.5848

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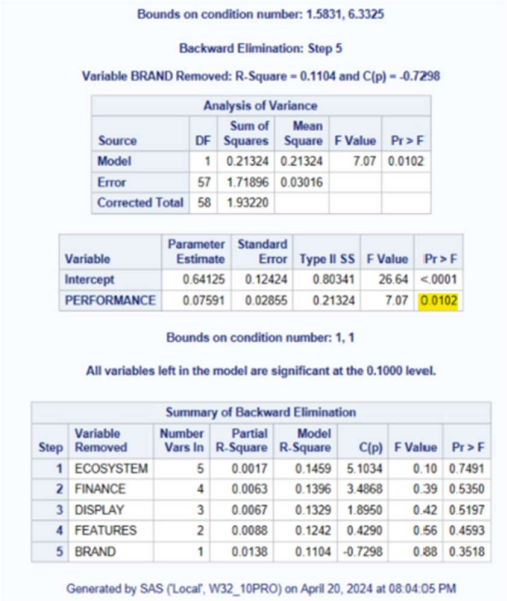
Null Hypothesis got **REJECTED.**

- Display significance to Price, P-value is less than 0.05.
- This paves the way for further exploration and investigation.

Objective 3 = To validate the impact of Independent and dependent variables.

Ho: No significant effect of Brand, Performance, Display, Finance, Feature, and Ecosystem on Quality.



Bounds on condition number: 1.5831, 6.3325

Backward Elimination: Step 5

Variable BRAND Removed: R-Square = 0.1104 and C(p) = -0.7298

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	0.21324	0.21324	7.07	0.0102
Error	57	1.71896	0.03016		
Corrected Total	58	1.93220			

Variable	Parameter Estimate	Standard Error	Type II SS	F Value	Pr > F
Intercept	0.64125	0.12424	0.80341	26.64	<.0001
PERFORMANCE	0.07591	0.02855	0.21324	7.07	0.0102

Bounds on condition number: 1, 1

All variables left in the model are significant at the 0.1000 level.

Summary of Backward Elimination

Step	Variable Removed	Number Vars In	Partial R-Square	Model R-Square	C(p)	F Value	Pr > F
1	ECOSYSTEM	5	0.0017	0.1459	5.1034	0.10	0.7491
2	FINANCE	4	0.0063	0.1396	3.4868	0.39	0.5350
3	DISPLAY	3	0.0067	0.1329	1.8950	0.42	0.5197
4	FEATURES	2	0.0088	0.1242	0.4290	0.56	0.4593
5	BRAND	1	0.0138	0.1104	-0.7298	0.88	0.3518

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Null Hypothesis got REJECTED.

- Performance significance to Quality, P-value is less than 0.05.
- This paves the way for further exploration and investigation.

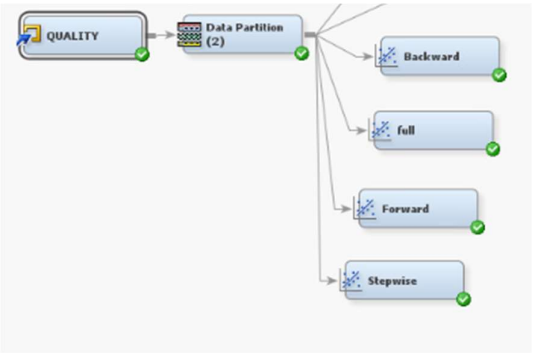
10. DATA MINING

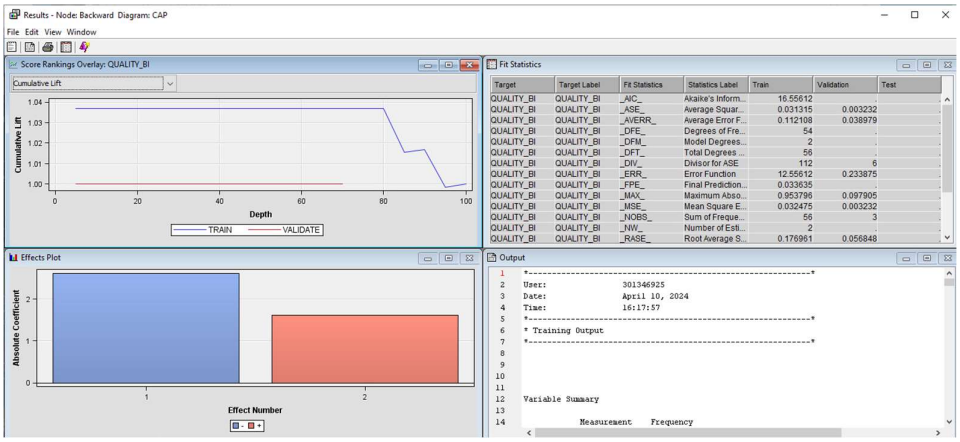
In SAS Miner, we utilize regression analysis to ascertain the extent to which our independent variables influence the dependent variables. Additionally, we assess the significance of our model for validation purposes. Given the limited dataset available, we allocate 95% of the data for training and reserve 5% for validation, recognizing that our current data volume may not adequately support further validation efforts.

10.1. REGRESSION

Objective 3 = To validate the impact of Independent and dependent variables.

Ho: No significant effect of Brand, Performance, Display, Finance, Feature, and Ecosystem on Quality.





Type 3 Analysis of Effects

Effect	DF	Wald Chi-Square	Pr > ChiSq
PERFORMANCE	1	3.8784	0.0489

Analysis of Maximum Likelihood Estimates

Parameter	DF	Estimate	Standard Error	Wald Chi-Square	Pr > ChiSq	Standardized Estimate	Exp(Est)
Intercept	1	-2.6193	2.6018	1.01	0.3141		0.073
PERFORMANCE	1	1.6133	0.8192	3.88	0.0489	0.7076	5.019

Odds Ratio Estimates

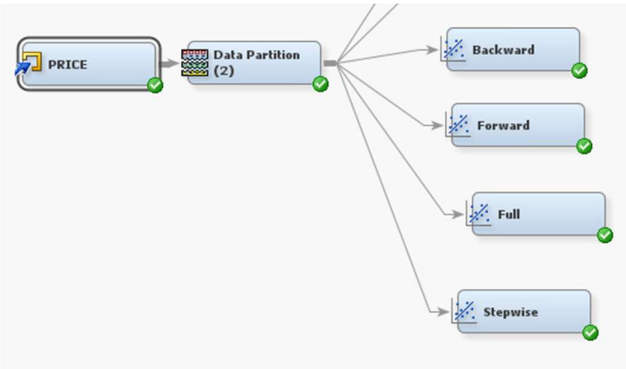
Effect	Point Estimate
PERFORMANCE	5.019

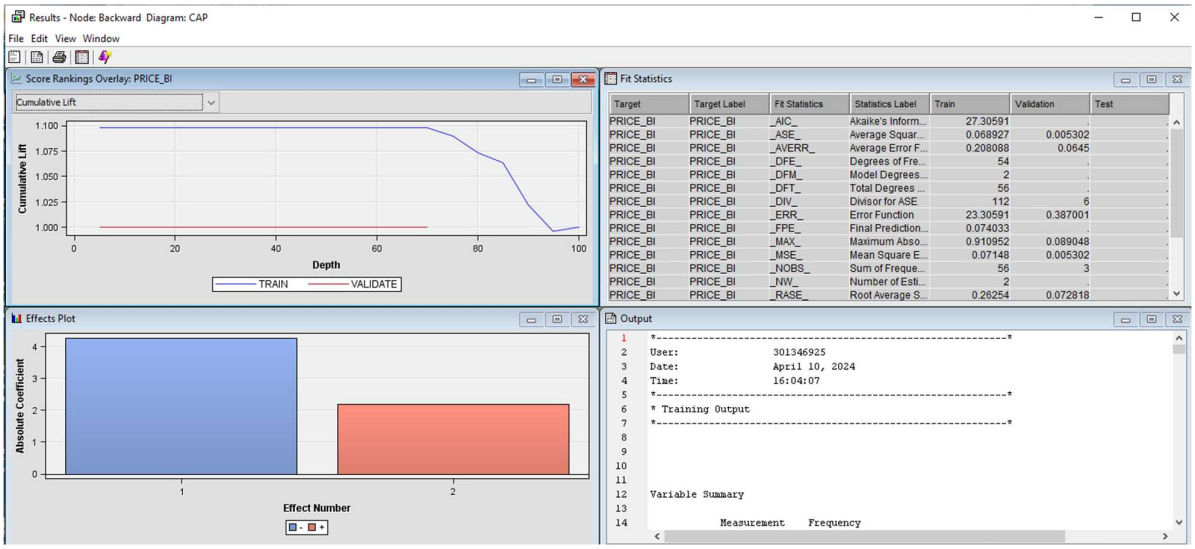
Null Hypothesis got REJECTED.

It has been discovered that the performance of the laptop significantly influences its quality. With an odds ratio estimate of 5.019, a one-unit increase in performance is projected to amplify the quality by fivefold.

Objective 3 = To validate the impact of Independent and dependent variables.

Ho: No significant effect of Brand, Performance, Display, Finance, Feature, and Ecosystem on Price.





Likelihood Ratio Test for Global Null Hypothesis: BETA=0

-2 Log Likelihood Intercept Only	Intercept & Covariates	Likelihood Ratio Chi-Square	DF	Pr > ChiSq
33.699	23.306	10.3929	1	0.0013

Analysis of Maximum Likelihood Estimates

Parameter	DF	Estimate	Standard Error	Wald Chi-Square	Pr > ChiSq	Standardized Estimate	Exp(Est)
Intercept	1	-4.2679	2.2844	3.49	0.0617		0.014
DISPLAY	1	2.1977	0.8507	6.67	0.0098	1.0619	9.005

Odds Ratio Estimates

Effect	Point Estimate
DISPLAY	9.005

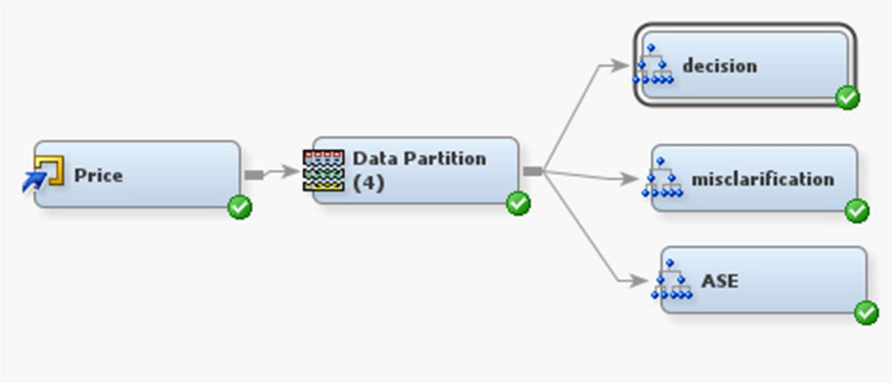
Null Hypothesis got **REJECTED.**

The analysis reveals that the display of the laptop has a substantial impact on its price. With an odds ratio estimate of 9.005, a one-unit increase in display quality is anticipated to boost the laptop's price by a factor of nine.

10.2. DECISION TREE

We are Using decision tree analysis, performed Misclassification, ASE, Decision Tree Got same ASE and result from all the decision tree performed.

Price as a target.

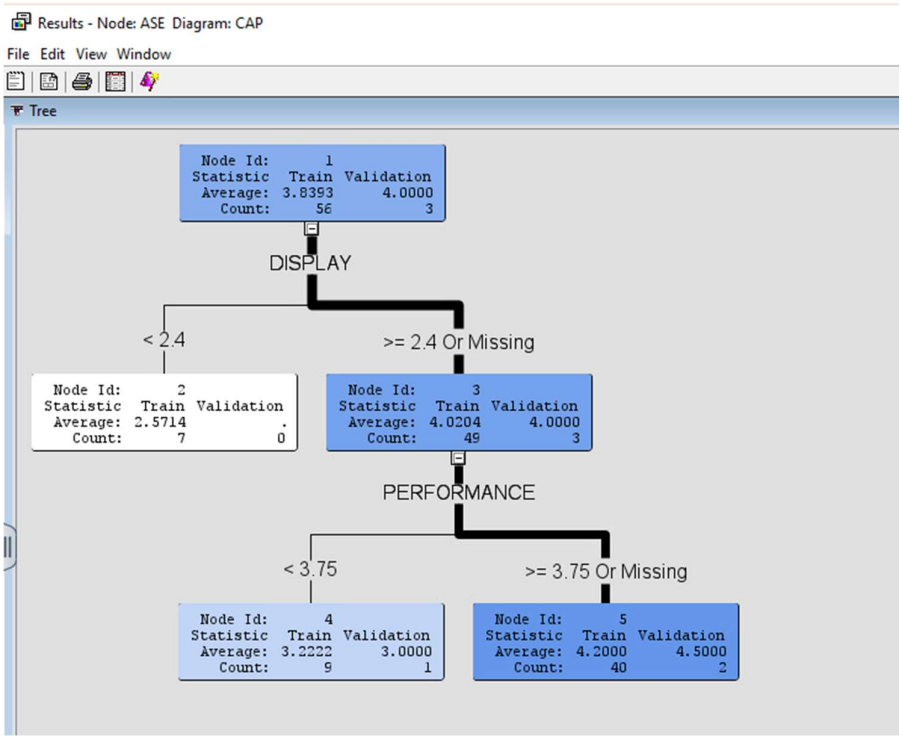


Results - Node: ASE Diagram: CAP

File Edit View Window

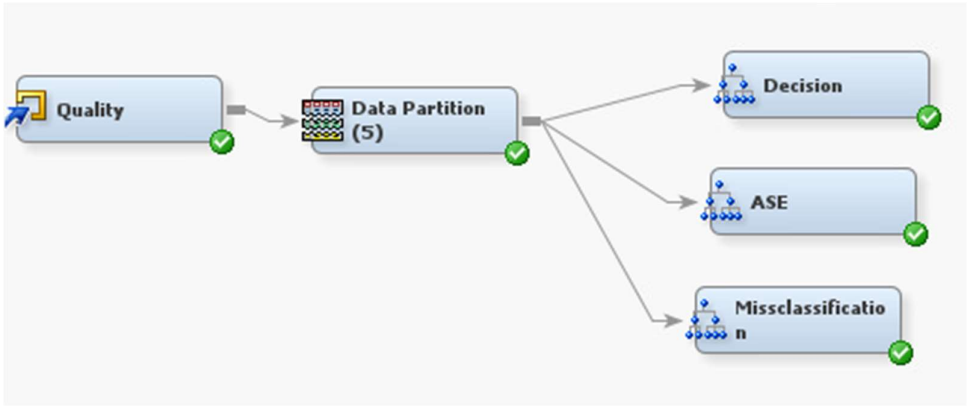
Fit Statistics

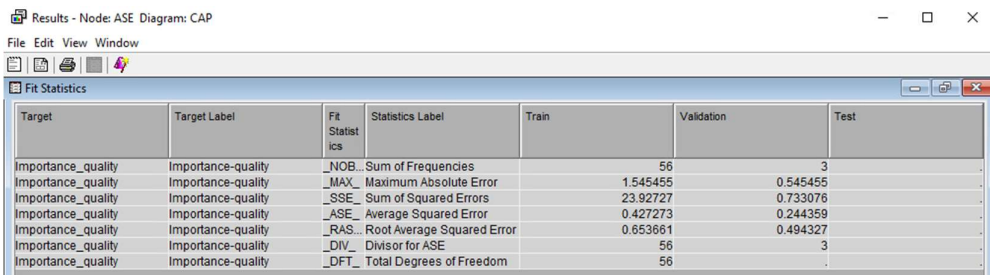
Target	Target Label	Fit Statistics	Statistics Label	Train	Validation	Test
Importance__price	Importance- price	_NOBS_	Sum of Frequencies	56	3	.
Importance__price	Importance- price	_MAX_	Maximum Absolute Error	2.2	0.8	.
Importance__price	Importance- price	_SSE_	Sum of Squared Errors	25.66984	0.729383	.
Importance__price	Importance- price	_ASE_	Average Squared Error	0.45839	0.243128	.
Importance__price	Importance- price	_RASE_	Root Average Squared ...	0.677045	0.49308	.
Importance__price	Importance- price	_DIV_	Divisor for ASE	56	3	.
Importance__price	Importance- price	_DFT_	Total Degrees of Freed...	56	.	.



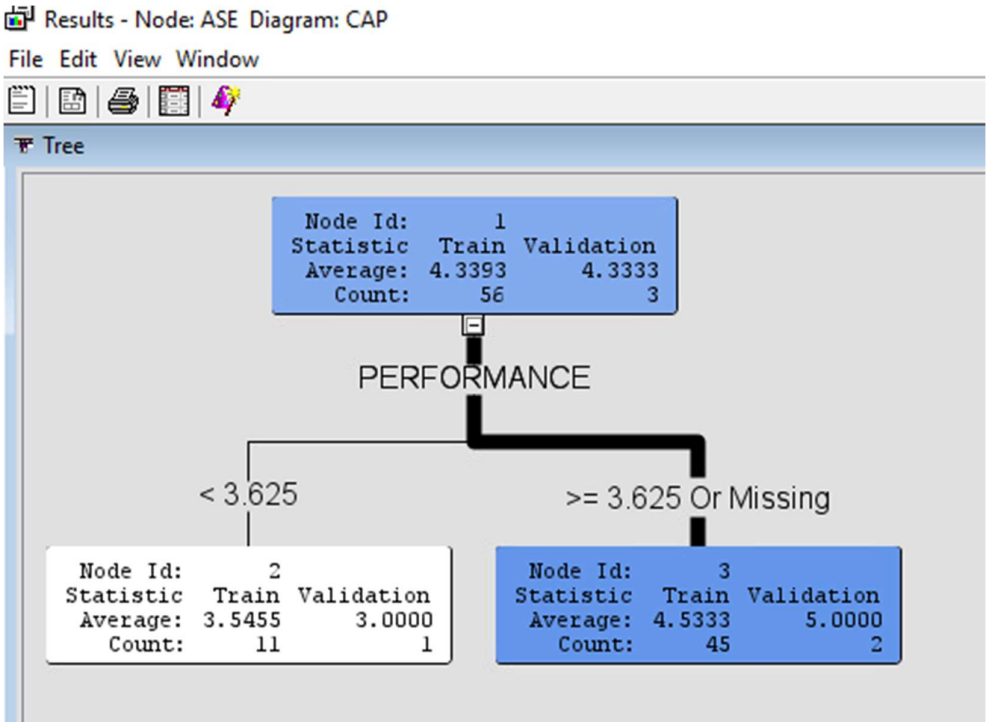
For price, Display is most important just like we got the result in regression.

Quality as a target.





Target	Target Label	Fit Statistics	Statistics Label	Train	Validation	Test
Importance_quality	Importance-quality	_NOB_	Sum of Frequencies	56	3	.
Importance_quality	Importance-quality	_MAX_	Maximum Absolute Error	1.545455	0.545455	.
Importance_quality	Importance-quality	_SSE_	Sum of Squared Errors	23.92727	0.733076	.
Importance_quality	Importance-quality	_ASE_	Average Squared Error	0.427273	0.244359	.
Importance_quality	Importance-quality	_RAS_	Root Average Squared Error	0.653661	0.494327	.
Importance_quality	Importance-quality	_DIV_	Divisor for ASE	56	3	.
Importance_quality	Importance-quality	_DFT_	Total Degrees of Freedom	56	.	.



For quality, Performance is most important just like we got the result in regression.

11. RECOMMENDATIONS

- Prioritize performance improvements to cater to the multitasking needs of student users who heavily rely on their systems.
- Enhance the quality of the laptop by focusing on improving the cooling system and speed. This will ensure a smoother and more efficient performance, addressing the needs of users who prioritize quality and reliability.
- Improve screen resolution and refresh rate to add value without significantly increasing the laptop's price, meeting the needs of budget-conscious users.
- Prioritize display quality by enhancing screen resolution and refresh rate to provide a more comfortable and visually pleasing experience for users who spend extended hours on their laptops.

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