Effect of Information Presentation on Investment Decisions
Business Statistics

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Objective

The aim of this report is to analyze and compare how different ways of presenting financial information influence investment decisions. Using the framework of 6 steps, including lurking variables and experimental design.

I. DATA COLLECTION FRAMEWORK

This quantitative study employed a correlational research design identifying and analyzing significant influence of data visualization, time frame, and risk information on investor decision and confidence level.

Respondents of this study were students from Hult International Business School. Researchers utilized random sampling wherein they randomly select respondents from Hult. Researchers used survey questionnaires about age, sex, educational level, investors' profile, and risk tolerance. These questions were essential to get to know the respondents, which were helpful in the analysis of the results of the study. Besides, researchers created 8 fictional company profiles varying presentation styles in line with the research design, consisting of questions about the self-reported investment experience including the amount they would invest given a budget of £5000 and their confidence level, following the 8 unique combinations below. However, they is one respondent that answered beyond the budget. Meanwhile, they were also asked about the extent of presentation styles affecting their investment decision.

Independent Variables			Dependent Variables
Data Visualization	Time Frame	Risk Information	
tables	1 year	with explicit risk metrics	investor decision investor confidence
tables	1 year	without explicit risk metrics	investor decision investor confidence
tables	5 years	with explicit risk metrics	investor decision investor confidence
tables	5 years	without explicit risk metrics	investor decision investor confidence
graphs and charts	1 year	with explicit risk metrics	investor decision investor confidence
graphs and charts	1 year	without explicit risk metrics	investor decision investor confidence
graphs and charts	5 years	with explicit risk metrics	investor decision investor confidence
graphs and charts	5 years	without explicit risk metrics	investor decision investor confidence

They gathered data for 7 days from 29 Hult students using a survey through Microsoft Forms which was answered by the respondents for an average of 5 minutes and 45 seconds.

The researchers adhered to institutional guidelines to protect the respondents' privacy. Ensuring compliance, the policy was stated in the survey questionnaire. Furthermore, respondents were given the option to consent to the collection, use, and disclosure of their personal information for legitimate educational purposes.

II. DATA PREPARATION FRAMEWORK

For data preparation, the researchers compiled information collected from 29 respondents. The dataset includes details such as company names, presentation factors (like data visualization, time frame, and risk information), the amount they would invest, and their confidence level in the investment. 256 records were gathered from all respondents. The data was organized into an Excel table to ensure the correct data types and readiness for statistical analysis.

III. PRELIMINARY ANALYSIS FRAMEWORK

Initial Descriptive Statistics: Demographics

Age	Count
21	4
22	5
23	4
24	4
25	3
26	1
27	1
28	3
30	3
31	1

Table I. Hult Students' Age

The table indicates that the respondents from Hult were between the ages of 21-31. Most respondents were 22 years old, with five individuals in this age group, the least represented ages were 26, 27, and 31.

Sex	Count
Female	10
Male	19

Table II. Hult Students' Sex

Table II indicates that most respondents were male, with 19 participants, while only 10 female Hult students took part in the survey.

Education Level	Count
Graduate Certificate	1
Graduate Diploma	2
Master's	1
Bachelor's Degree	24
Graduate's Degree	1

Table III. Hult Students' Education Level

Table 3 shows that 24 respondents held a bachelor's degree, and 2 had a graduate diploma. Additionally, only 1 respondent each had attained a graduate certificate, a master's degree, and a graduate degree.

Investment Experience	Count
Beginner	12
Intermediate	15

Advanced	2

Table IV. Hult Students' Investor Expertise

Table 4 highlights investment experience of Hult students. The majority, comprising 15 respondents, had an intermediate level of experience. Followed by 12 respondents at beginner level, whilst 2 respondents had an advanced level.

Kind of Investor	Count
Moderate	14
Aggressive	5
Conservative	10

Table V. Hult Students' Risk Tolerance

The table shows most respondents, 14, have low risk tolerance regarding investing. Followed by 10 respondents taking minimal risks in the market. Only 5 respondents are highly experienced and take significant risks.

Investor Expertise	Risk Tolerance	Mean of Investment Decision (£)	Mean of Investor's Confidence
Beginner	Moderate	1,289.69	6.46
Beginner	Conservative	1,581.75	5.85
Beginner	Aggressive	4,125.00	7.50
Intermediate	Moderate	1,772.66	5.61
Intermediate	Conservative	2,948.23	7.20
Intermediate	Aggressive	2,395.75	5.88
Advanced	Aggressive	3,062.50	7.06

Table VI. Mean of the Hult Students' Responses in terms of Investor's Expertise and Risk Tolerance

Table 6 shows the analysis of Hult students' investment behaviors, based on expertise and risk tolerance, revealing distinct trends for all unique combinations. Beginner investors with aggressive risk tolerance are willing to invest the most among beginners, averaging £4,125, exhibiting relatively high confidence level of 7.50. Beginners with moderate and conservative risk tolerance invest less, at £1,289.69 and £1,581.75 respectively, with moderate confidence levels of 6.46 and 5.85. Intermediate investors display varied behaviors based on risk tolerance: those with a conservative approach invest more, at £2,948.23, and exhibit the highest confidence level among all groups at 7.20. Intermediate investors with moderate and aggressive risk tolerance invest lower amounts, £1,772.66 and £2,395.75, showing lower confidence levels, with aggressive investors having the lowest confidence at 5.88. Advanced investors with aggressive risk tolerance invest an average of £3,062.50 with a confidence level of 7.06, indicating a high-risk appetite but less confidence than intermediate conservative investors.

Overall, beginner and advanced aggressive investors take more risks, intermediate conservative investors exhibit most confidence, due to their experience and more cautious investment approach.

Company	Data Visualization	Time Frame (years)	Risk Information	Mean of Investor Decision (£)	Mean of Investor Confidence
Charing Cross	Tables	1	With explicit risk metrics	1,557.81	5.53
Charing Cross	Tables	1	Without explicit risk metrics	1,664.91	5.22
Baker Street	Tables	5	With explicit risk metrics	2,669.38	7.16
Baker Street	Tables	5	Without explicit risk metrics	2,276.56	6.75
St. Pancras	Graphs and Charts	1	With explicit risk metrics	1,408.13	4.94
St. Pancras	Graphs and Charts	1	Without explicit risk metrics	1,503.13	5.28
Farringdon	Graphs and Charts	5	With explicit risk metrics	2,694.69	7.38
Farringdon	Graphs and Charts	5	Without explicit risk metrics	2,603.09	7.31

Table VII. Mean of the Hult Students' Responses in terms of the Data Visualization, Time Frame, and Risk Information

The table provides insights into how different types of data visualization, time frames, and risk information influence investment decisions and confidence levels among respondents. For the Baker Street Company, respondents with a 5-year time frame and explicit risk metrics made an average investment decision of £2,669.38, accompanied by a confidence level of 7.16. When explicit risk metrics were not provided, the average investment decreased to £2,276.56, though the confidence level was slightly lower at 6.75. For Charing Cross Company, respondents with a 1-year time frame and explicit risk metrics invested an average of £1,557.81, with a confidence level of 5.53. Without explicit risk metrics, the investment rose slightly to £1,664.91, but confidence dropped to 5.22.
At Farringdon Company, respondents viewing data with graphs and charts over a 5-year time frame and explicit risk metrics invested an average of £2,694.69, displaying the highest confidence level at 7.38. Without explicit risk metrics, their investment decision was marginally lower at £2,603.09, with a close confidence level of 7.31. Finally, for St. Pancras Company, respondents with a 1-year time frame and explicit risk metrics made an average investment of £1,408.13, with a confidence level of 4.94. When risk metrics were excluded, their investment increased to £1,503.13, and confidence slightly improved to 5.28.

Overall, the data suggests that explicit risk metrics generally contribute to higher confidence levels but can sometimes lead to slightly lower investment amounts compared to cases without explicit risk information. Additionally, a longer time frame and graphical data representation (e.g., graphs and charts) are associated with higher confidence and investment levels, as observed with Farringdon Company.

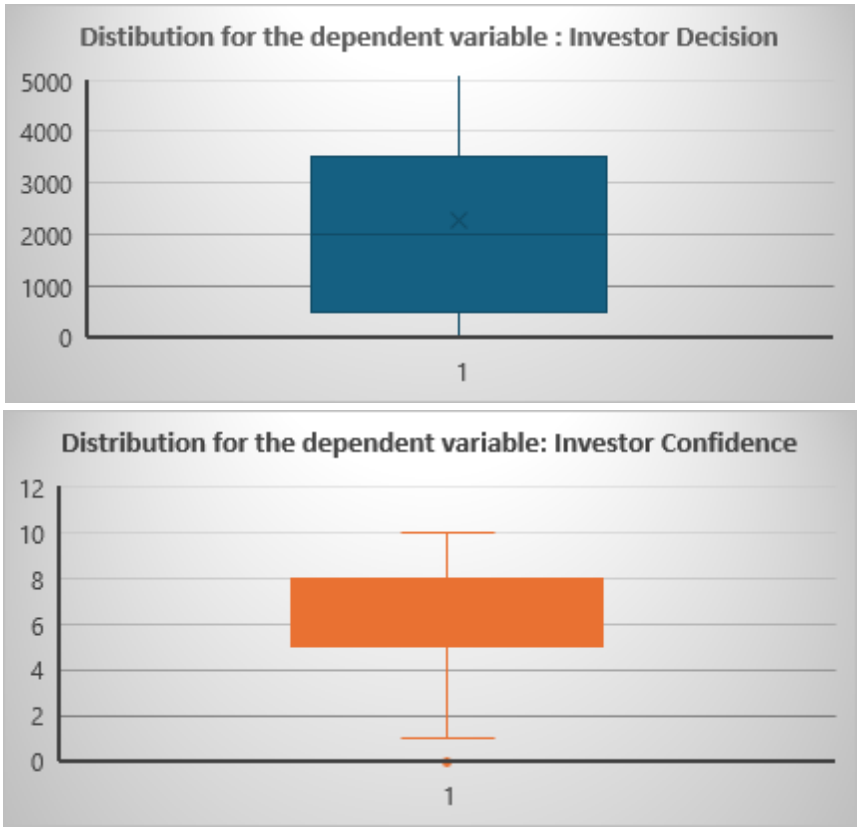
Investor's Profile	Risk Tolerance	To what extent did the presentation style influence your investment decision-making?
Beginner	Moderate	7.33

Beginner	Conservative	8.00
Beginner	Aggressive	8.00
Intermediate	Moderate	6.63
Intermediate	Conservative	8.00
Intermediate	Aggressive	6.50
Advanced	Aggressive	7.50

Table VIII. How presentation style impacted investment decision-making among investors with different profiles and risk tolerances

The table summarizes how presentation style impacted investment decision-making among investors with different profiles and risk tolerances. The influence of presentation style on investment decision-making was strongest for intermediate and beginner investors with conservative or aggressive risk tolerances, each reporting a score of 8.00. Following closely, beginner investors with a moderate risk tolerance had a score of 7.33, and advanced investors with an aggressive risk tolerance scored 7.50. Intermediate investors with a moderate risk tolerance scored slightly lower, at 6.63, while those with an aggressive risk tolerance reported the lowest influence, with a score of 6.50.

Overall, the impact of presentation style varied, with the highest influence on beginner and intermediate investors, especially those with conservative or aggressive risk preferences.



IV. MULTIPLE REGRESSION

For further analysis, it was decided to carry out a multiple regression to determine if data visualization, time frame, risk information, or the combination of each of these variables, affect or not the investor decision and the investor confidence. To make a match with the framework of business statistics, this section is related to the fourth step which is related to the analysis phase. Basically, by using the data analysis tool from Excel, the multiple regression for each dependent variable was computed to identify and analyze each result from the following tables.

a. Investor Decision

Regression Statistics	
Multiple R	0.304708
R Square	0.092847
Adjusted R Square	0.082047
Standard Error	1622.351000
Observations	256

Table IX. Regression statistics for Dependent Variable: Investor Decision

In the first row we can see that **the multiple R has a value of 0.3047** which means that the correlation between the independent and the dependent variables is not a linear relationship. The second row has the **R square** with a value of **0.09,** which means that this model can barely be used to predict changes in the investor decision.

The third row, the **adjusted R Square is 0.08**, meaning that the variables do not adjust to the model, or that this model cannot predict the dependent variable.

For the **standard error**, we have a value of **1622.35**, which is very high and indicates a big dispersion between the results.

ANOVA					
	df	*SS*	*MS*	*F*	*Significance F*
Regression	3.000000	67885502.000000	22628501.000000	8.597377	0.000019
Residual	252.000000	663000000.000000	2632024.000000		
Total	255.000000	731000000.000000			

Table X. ANOVA for Dependent Variable: Investor Decision

From the result of ANOVA we can conclude that **F is 8.597**, higher than 1 meaning that some factors of the model can predict the dependent variable. Moreover, we can say that the model can predict some behaviors of the investor decision.

For the value of **significance F which is 0.000019.** It shows that is lower than **0.05** (the level of confidence) and we can conclude that, we cannot reject that the model can have a certain impact on the dependent variable. However, as it was stated previously, the model can have a certain impact but not all of the independent variables.

Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*

Intercept	1367.359000	467.416900	2.925353	0.003754	446.818100	2287.901000	446.818100	2287.901000
Data Visualization	10.093750	202.793900	0.049773	0.960342	-389.293000	409.480600	-389.293000	409.480600
Time Frame	**256.859400**	**50.698480**	**5.066412**	**0.000001**	**157.012700**	**356.706100**	**157.012700**	**356.706100**
Risk Information	-70.578100	202.793900	-0.348030	0.728109	-469.965000	328.808700	-469.965000	328.808700

Table XI. Dependent Variable: Investor Decision.

In the previous table, the **p-value of time frame is 0.000001 which is lower than 0.05 (level of confidence**), compared to the other variables we can conclude that this is the only independent variable that influences investor decision.

b. Investor Confidence

Regression Statistics	
Multiple R	0.407266
R Square	0.165866
Adjusted R Square	0.155936
Standard Error	2.159012
Observations	256.000000

Table XII. Regression statistics for Dependent Variable: Investor Confidence

The **multiple R has a value of 0.4072** meaning the correlation between the independent variables and dependent variables has a low relationship. The R^2 **has a value of 0.1658,** meaning that this model can barely be used to predict changes in the investor decision.

The **adjusted** R^2 **has a value of 0.155**, meaning that some variables do not adjust to the model, or the model cannot predict the dependent variable.

The **standard error is 2.159**, which is not that high compared to the investor decision; However, is still high and confirms that the whole model cannot predict the dependent variable.

ANOVA					
	df	*SS*	*MS*	*F*	*Significance F*
Regression	3.000000	233.578100	77.859370	16.703240	0.000000
Residual	252.000000	1174.656000	4.661334		
Total	255.000000	1408.234000			

Table XIII. ANOVA for Dependent Variable: Investor Confidence

From **ANOVA table**, the **F value is 16.70324,** higher than **1** meaning that some factors of the model can predict the dependent variable. We can say that the model can predict some behaviors of the investor decision.

For **significance F which is 0.000000**. This value < **0.05 (the level of confidence**) and meaning that we cannot reject the model can have a certain impact on the dependent

variable. However, as was stated previously, the model can have a certain impact but not the whole independent variables.

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	4.835938	0.622035	7.774385	0.000000	3.610888	6.060987	3.610888	6.060987
Data Visualization	0.062500	0.269877	0.231587	0.817046	-0.469000	0.594001	-0.469000	0.594001
Time Frame	**0.476562**	**0.067469**	**7.063415**	**0.000000**	**0.343687**	**0.609438**	**0.343687**	**0.609438**
Risk Information	-0.109380	0.269877	-0.405280	0.685617	-0.640880	0.422126	-0.640880	0.422126

Table XIV. Dependent Variable: Investor Confidence

In the previous table, the **p-value of time frame is 0.00000 which is < 0.05 (level of confidence**) wherein compared to the other variables, we can conclude that this is the only independent variable that influences investor confidence.

V. INTEPRET AND DISCUSS FRAMEWORK COULD BE: SHARE POINTS TO COVER:

Results and Interpretation

Research Question: How do data visualization, time frame, and risk information presentation affect investment decisions and investor confidence?

Investment Decision
Ho: Data visualization, time frame, and risk information **do not affect** investment decisions of students from Hult International Business School.
Ha: Data visualization, time frame, and risk information **affect** investment decisions of students from Hult International Business School.

Investor Confidence
Ho: Data visualization, time frame, and risk information **do not affect** the confidence of the students from Hult International Business School as investors.
Ha: Data visualization, time frame, and risk information **affect** the confidence of the students from Hult International Business School as investors.

a. Investment Decision Model
The R^2 **of 0.092847** indicates a weak relationship between the independent variables and investment decisions. This low result implies that there are other factors that are more likely to play an influential role in investment decisions.

b. Investor Confidence Model
The R^2 **of 0.165866** indicates a moderate relationship between independent variables and investor confidence. The R^2 is higher than in investment decisions, signifying the independent variables have more relevance to investor confidence.

Assessing the Strength of Each Variable

a. Data Visualization
There is not much impact generated from data visualization in either model. Regarding the investment decision model, the p-value (0.960342) > 0.05; therefore, there is no statistical significance. Similarly, in the investor confidence model, the high p-value (0.817406) suggests that the data visualization provided does not influence investor confidence.

b. Time Frame
Highlighting the time frame significantly impacted respondents' investment decisions, as indicated by the high coefficient (335.97) and low p-value (0.000014). This suggests increased respondent confidence in the time frame, establishing it as a strong variable. Regarding investor confidence, time frame also has a strong influence. A p-value < 0.05 and a positive coefficient (0.476562) demonstrate the significance of this variable for investor confidence and understanding.

c. Risk Information
Risk Information does not show the strong significance of time frame, demonstrated by the positive coefficient (245.82) and the large p-value (0.728109) in the investment decision model. In the investor confidence model, the low coefficient (-0.109380) and the p-value > 0.05 (0.685617) show the minimal impact risk information had on respondents.

Limitations of the Analysis

a. Limited Significance of Variables

Respondents lack a comprehensive view of investment scenarios, leading them to make decisions based only on simplified information. This is evidenced by the non-significant p-values for both data visualization and risk information. Without fully grasping the potential investment outcomes, their decision-making may be affected.

b. Limited Sample Size

Larger sample size generates less biased conclusions. Respondents' ages range between 21 - 31 years, therefore the sample does not cover more experienced ages, which may have different experience levels. Based on the data collected, 41% demonstrated beginner experience levels. Considering almost half of the respondents had low experience, they may interpret risk information or data visualization less effectively than experienced investors.

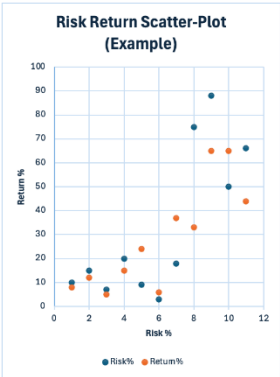
Discuss how lurking variables were handled and their potential impacts

To interpret investment confidence accurately, it is essential to consider biases like age, education, and gender, as the sample (mostly middle-aged men with bachelor's degrees) may skew findings. This demographic often shows higher confidence and risk tolerance, while younger, less experienced investors opt for conservative strategies. Having a more balanced sample would generalize these results, as limited diversity may not fully represent broader investment behaviors.

Propose implications for financial information presentation in real world contexts

Based on statistical significance of the time frame variable for both investment decisions and investor confidence, the researchers suggest that it is important to have a clear time frame for investors as it can positively influence their decision-making and further increase their level of confidence in the investment. An example of how the time frame could be better defined is by creating a goal-based timeline. If the investor has an approximation of when they can expect returns, they feel more confident in their decision, thereby reducing the rate of doubt ability and diminishing second-guesses when investing.

Another implication based on the results provided in our survey is the importance of optimizing data visualization. Based on the lack of statistical significance in the p-value for both investment decisions and investor confidence, tailoring visualization based on the level of investor experience and financial knowledge could be beneficial in supporting the investors decision-making process. An example of an effective visualization could be generating a risk-return matrix, where you input the risk on the x-axis and the return on the y-axis using a scatterplot table, showing various investment options.



VI. CRITICAL ANALYSIS FRAMEWORK

Propose how to make the experiment more comprehensive by adding more factors

Aside from the independent variables of the study, the researchers presented the company size, employee count, and financial performance metrics as additional factors in the survey. Meanwhile, to make the study on the effect of information presentation on investment decisions more comprehensive, the following are the factors which can be added:

a. Market Conditions

Assess how information presentation impacts decisions under different market scenarios (e.g., bull vs. bear markets). This addition can highlight whether economic conditions alter investor responsiveness to information.

b. Trustworthiness of Source

Present the information as coming from different sources (e.g., reputable financial institutions vs. lesser-known firms) to see if source credibility influences decision-making.

c. Historical Volatility

Show past volatility of the company's stock or sector, which can affect investor risk perception and potentially alter the impact of the presented information.

Discuss how to address the added complexity in experimental design and analysis

Making use of the 6-step Framework (Ask, Prepare, Process, Analyze, Share and Act) can help to add complexity in the experimental design and analysis.

a. ***Ask***

Define specific questions related to the research objective to identify variables and data requirements, setting a clear foundation for the study.

b. ***Prepare***

Plan data collection carefully by choosing appropriate tools and ensuring data quality, which reduces bias and potential issues in later stages.

c. ***Process***

Clean and standardize data for consistency, which simplifies the analysis and reduces errors from inconsistent or low-quality data.

d. ***Analyze***

Use statistical methods and visualization tools to uncover patterns and relationships, breaking down complexity to derive meaningful insights.

e. ***Share***

Communicate findings with clear visualizations and accessible language, ensuring stakeholders can easily understand complex results.

f. ***Act***

Translate insights into actionable steps, allowing organizations to make informed decisions and improve future experimental designs.

The 6-step Framework, therefore, provides a structured method for navigating and managing complexity throughout experimental design and analysis, enabling a clear and effective pathway from research questions to actionable insights.

Practical limitations and trade-offs in expanding the experiment

Efficient data collection and analysis is beneficial in identifying high impact variables, reducing time and simplifying data collection. While larger samples improve reliability, they are not always feasible, factorial designs can identify main effects with smaller samples. Focusing on broad performance metrics enhances external validity by aligning outcomes with diverse investor behaviors. However, adding complex factors increases the risk of errors-type I (false positives) from multiple comparisons and type II (false negatives) from small samples. Prioritizing relevant interactions helps clarify significant results, minimizing statistical issues in complex experiments.