Effects on visualisations and varying demographics on decoy effect.

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***Abstract*—Decoy effect is a type of decision making bias where the consumers are steered towards purchasing or selecting a specific product. It involves the addition of an obviously inferior choice into the choice set to alter the decision making of the consumers. In this paper, we intend to study the extent of decoy effect when used across various scenarios and when experimented across broad demographics. We also intend to study the qualitative reasons for decision making for various people to understand the method in which decoy effect alters the decision making process. Three types of scenarios were used. Three types of visualisations were utilised and the experiment was conducted with and without decoy for the experiment and control experiment respectively.**

***Index Terms*—decoy effect, decision making strategy, bias, visualisation, choice**

I. Introduction

The theory of choice invariance in decision making has become an ancient and outdated concept ever since researches have been done regarding different types of bias that arise with the type, quantity and order of choices available. Decoy effect is one of such cognitive bias which alters the decision making strategy of the consumer. For a decoy effect to be used, there are generally two original choices- the target and the competitor. The target is the choice that is supposed to be chosen more and the competitor is an equally attractive choice competing with the consumer in the market.

The decoy is a choice that is very similar to the target but clearly inferior when compared to it. There are multiple types of decoys. The one explained in this paper is the asymmetrically dominated decoy. The introduction of a decoy is theorised to change the preference of the consumer and chose the target option more than the competitor.

Many researchers have experimented and hypothesised on the idea of different kinds of visualisations helping to mitigate the decoy effect. The extent of decoy effect is also strongly related to the decision making strategy of the consumers which might or might not alter with the introduction of the decoy.

The experiment was done with a total of 55 participants using in person survey sheets.

II. Literature review

A. Changes in decision making strategy with different visualisations

The changing decision making strategies with visualisations has been researched by many researchers. It has been observed that any kind of bias fluctuates with visualisations. It has also been seen that graphs and bar graphs tend to make people chose biased options as compared to visualisations like table. On a general note, simple visualisations lead to less cognitive biases.

B. Decoy effect on decision making strategy

Asymmetrically dominated decoys has been extensively researched for their effect in dramatically increasing the likelihood of the decision maker in choosing the target over the competitor. This happens since the decoy is directly dominated by the decoy which serves an an anchor for the customers.

Fig. 1. Decoy effect

III. Experiment

The experiment was conducted in two groups- the control group and the experiment group. The control group consisted of 26 people and the experiment group consisted of 29 people. The experiment utilised three different real life scenarios. These were, choosing a plan for an OTT platform, choosing a package for a phone data plan and choosing a plan for Dish TV subscription. three different types of visualisations, namely, a table, a scatterplot and a one sided bar graph. These visualisation were chosen due to their familiarity with the general population and customers.

The unit price of the target and decoy were kept equal to assure the integrity of the results. The price and the attributes

Table for Dish TV

With three options		
	Price	Channels
Option A	250	17
Option B	675	42
Option C	700	47

Fig. 2. Table(3options)

With two options		
	Price	Channels
Option A	250	170
Option B	700	47

Fig. 3. Table(2options)

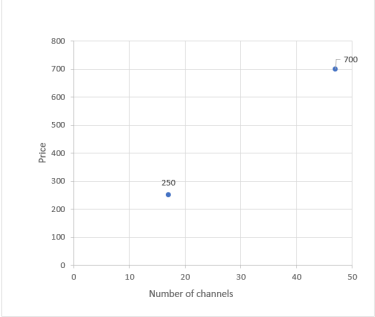

Fig. 4. plot(2options)

Scatter plot for Dish TV

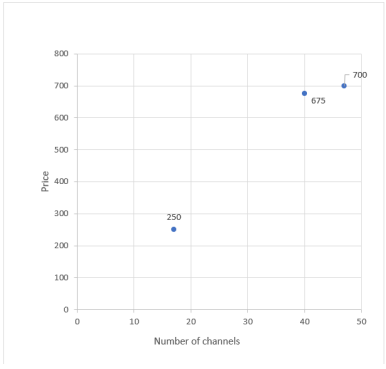

Fig. 5. plot(3options)

Fig. 6. graph(2options)

One sided bar graph for Dish TV

Fig. 7. graph(3options)

of the decoy were similar but obviously inferior when compared to the target(unit price was also kept considerably higher than the target and competitor) to observe the asymmetrically dominant decoy effect. For the OTT and phone data plan platform scenarios, the attributes were price and number of days for subscription. For the Dish TV scenario, the attributes were price and number of channels. The order of the options and the order of the scenarios were changed from participant to participant to ensure order invariance in the results.

A qualitative question regarding the decision making strategy and independence of scenarios was asked at the end to get a deeper insight into the effects of decoys on decision making.

A. Demographics

Three demographics questions regarding age, gender and educational qualification of the participants were asked. In the control group, there were 15 males and 14 females, whereas the experiment group contained 14 males and 12 females. The age of the participants was used to separate them into different age groups which resulted in 18 people of age 18-25, 4 people of age 25-30, 3 people of age 30-45 and 1 person above 45

in the control group. The experiment group had 18 people of age 18-25, 3 people of age 25-30, 4 people of age 30-45 and 4 people above 45.

As for educational qualifications, the control group consisted of 4 people with 10th grade education, 6 people with 12th grade education, 14 people with an undergraduate degree and 2 people with qualification of post graduate and above. The experiment group consisted of 3 people with 10th grade education, 5 people with 12th grade education, 14 people with an undergraduate degree and 7 people with qualification of post graduate and above.

All the questions to participants were asked in person to note the approximate reaction time and to get a detailed answer to the qualitative question.

In addition to these, the level of comprehension of each visualisation for every participant was asked on a 5 point Likert scale of: Very much, Somewhat, Neutral, Not much and Not at all.

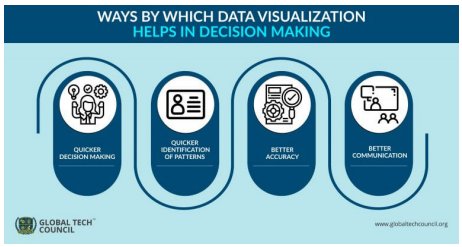

Fig. 8. Voisualisation

IV. Results and discussion

All the answers to the visualisation comprehension question on the five point Likert scale were either chosen to be 'Somewhat' or 'Very much' giving a score of 4.62 for the control group and 4.79 for experiment group from which it can be concluded that all the participants had a decent enough understanding of the visualisations to participate in the experiment

A. Control group results

When comparing the results obtained with various scenarios, we get the following. 50% of the participants chose the target option for the phone data plan scenario, 34 percent of the participants chose the target in the OTT plan scenario and 38 percent chose the target option in the Dish TV scenario.

The reason for these percentages can be understood from the qualitative questions asked. Most of the people who chose the competitor in the Dish TV or the phone data plan did so due to budget constraints or due to the lack of necessity of too many channels provided in the target option.

Also, the average reaction time of the choice making in the control group was above 7-8 seconds. This can be correlated with cognitive overload due to the equal attraction of both the target and competitor. The qualitative questions also revealed that the decision was thus made not on unit price basis but based on either gut instinct, budget constraints, necessity for a long or a short data plan. This fits with the usual trend regarding cognitive overload in consumers.

The demographics showed that most people(72%) who chose the competitor option which has an overall lower price were the people who had 10th or 12th class education and a few(26%) with UG education. It was also understood during the open ended discussion with the participants that the people with 12th class education of below from lower income families tend to chose the option with the lower overall price.

When different visualisations were compared, 34 percent participants chose the target with the table, 46 percent chose the target option with a bar graph and around 42 percent chose the target with a scatter-plot. The can again be correlated with the qualitative question asked and the level comprehension. Scatterplot and bar graph got a lower number(closer to 4 than 5) on the 5 point Likert scale as compared to a table. This could explain the increase in percentage choosing the target over competitor despite the qualitative arguments like budget constraints or a lack of preference.

B. Experiment group

For the experiment group, the analysis was similarly conducted for various scenarios and visualisations. The overall reaction time was around 5-6 seconds indicating an easier decision making as compared to the control group. With the scenarios, 57 percent chose the target in the phone data plan, 51 percent chose the target in the OTT scenario and 48 percent chose the target in the Dish Tv scenario. When compared with visualisations, 41 percent chose the target with a table, 51 percent chose the target with a bar graph and 68 percent chose the target with the scatterplot.

This confers with the comprehension levels obtained to be closer to 4 for scatterplot than bar graph and table, similar to the control group.

The demographics explains that more percentage(68% more) of people with 10th class or 12th class education chose the target when the decoy is present. The demographics shows that the effect of the decoy does not change for different genders. Also, the age demographics analysis shows that people of age 30 and higher did not chose the target when the decoy is present indicating an effect of life experience on the decoy effect.

Most people who chose the target when decoy is present mentioned that they did it so out of'gut feeling' or 'instinct' which explains the asymmetrically dominating effect of decoy.

We have also observed that the decoy effect is less for table and more more a scatterplot.

V. Conclusion

We have thus shown that decoy effect is different over different visualisations and it is more for a scatterplot and less for a table. We have also shown that the decoy effect is strongly dependent on the scenario and the financial restrictions of a person. We have also shown that the decoy effect is less on participants with higher levels of education. We have also seen that the reaction time is less when the decoy effect is present.

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