

# Application of Decision Theory on Strategy of Supermarket in Promoting Health Safety and Developing Sustainability amidst Pandemic

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## Abstract

Many of the supermarket was forced to close their services because of the damages that COVID-19 brought hence some of the supermarket continue to operate by extending their market reach through providing online services. However, since restrictions and health protocols must be achieved, effectiveness of each strategy in promoting health safety during the pandemic is still in question. Hence, the study aims to determine the optimal strategy suited for supermarkets based on the criterion that customers prioritize during the Pandemic. The study used decision analysis to help the researchers to give innovative ideas and plans of action. The result of the study shows that the overall performance of actual shopping is better compared to online services and third-party strategies based on the provided criterion.

## Keywords

Supermarket, Decision Analysis, Actual Shopping, Online Services, Third-Party

## 1. Introduction

In 2019 the coronavirus first appeared in Wuhan City, Hubei Province of China (Altman & Levkovich, 2020). This virus was produced by the new strain of novel coronavirus (SARS-CoV-2). The outbreak of coronavirus rapidly spread around the world, resulting in a global health crisis of epic proportions. With this, the World Health Organization (WHO) declared COVID-19 as a worldwide pandemic. Governments from different countries implemented protocols such as lockdown, social isolation, wearing of face masks and face shields, and getting vaccinated to prevent the spread of the coronavirus. Due to the official's safety standards, the business industry was severely impacted. The global economy slowed because of the delayed production, sales, and interchange of products around the world.

Furthermore, many supermarkets, small firms, and enterprises were forced to close their services. Hence, grocery stores and some supermarkets continued to operate to meet people's necessities, resulting in consistent daily earnings. Due to COVID-19 regulations, only a certain number of individuals are permitted to enter grocery stores at any given time. As a result, people are queuing, which leads them to be in the same place for an extended amount of time, which is deemed unsafe. Therefore, even if the enterprises are open for business, it is impossible to deny that sales and service have been affected because there is a sudden demand for a certain type of products together with the reduction of customers due to the implemented quarantine, resulting in unstable revenue.

Most of the conducted studies are evaluating each alternative individually and stating its pros and cons. For instance, a study by Bentsen and Pauli (2017), was comparing a self-service service and human interaction based on service encounters. The study helps distinguish the difference between the two alternatives. However, it does not state whether

which alternative will be better off for the company. In addition, the period of the study was far from the events that are currently happening. This research will focus on synthesizing and testing whether which alternative will be better off an optimal solution and sustainable for a supermarket with respect to its size capacity. Furthermore, since most of the studies were conducted before the pandemic situation, the trend of the data of previous studies will be untimely for this study since it does not cover the aspect of the whole setting of the community.

According to Lichtenthaler (2021), the pandemic made businesses vulnerable to all aspects of the business, which numerous attentions to keep the business running. Now companies find resilient and sustainable plans that could help the business be profitable amidst pandemics. This research aims to provide and determine the best strategies for the supermarket to manage service quality without neglecting health safety in the pandemic situation. Therefore, increasing their reach of service to people is necessary. Since it will not just promote safety to people but also be a profitable decision for their company. In addition, the strategies to be proposed will be analyzed for sustainability to guarantee that the decision made will be effective not just in the events of the pandemic but also after the pandemic.

This study will be valuable not just to supermarkets of all sizes but also to other businesses that have a similar business model to supermarkets. The scope of this research study will focus on the criteria that customers focused during the pandemic and decision alternatives that will be used to determine the optimal strategy for supermarkets amidst this pandemic. This study will not include the application of investment analysis and the costs and revenue of the supermarket in the future as it will focus on the effectiveness of the decision alternatives to be used as new optimal strategy. The level of effectiveness to be determined in this study is to ensure the safety and satisfaction of their customers and to help the supermarkets be sustainable. This research study will not use monetary values as their payoff, instead the researchers will use the effectiveness of the different decision alternative. The researchers will translate the effectiveness into direct relationship with the income whereas as the effectiveness increases, the income also increases. A study conducted by Ogbadu (2009) discussed how effective management of materials can help increase the profitability of a business firm. The objective of his study is to find out the occurring problems in the material management of the firm as well as analyzing its benefits. The findings of his study have showed that financial gain can be achieved through increasing the effectiveness of their materials management particularly with the materials that causes problems in the business firm.

### **1.1. Objectives**

The objective of this study is to determine the optimal strategy suited for supermarkets based on the criteria that customer prioritizes during the pandemic. This study will use decision analysis that can help the researchers to provide innovative ideas and plans of action to the owner of the supermarkets to promote the health and safety of the customers of every supermarket and to further improve the business to provide more decent quality services.

## **2. Literature Review**

Many businesses lost their revenue due to the negative change of product and service sales, which led them to bankruptcy. Some businesses have produced a strategy to combat the pandemic, for example, online implementation of services that will be a pathway to their consumers for the service that they are providing. Consumers prefer availing of products and services since they are afraid to have human interactions that may lead them to acquire the COVID-19 virus (Donthu, & Gustafsson, 2020). A study conducted in Germany found out that most of the businesses have converted into the use of artificial intelligence as their way of communicating or transacting with customers. They use this strategy to lessen physical contact. The use of AIs was proven effective since it is a fast transaction and does not require human interactions. In addition, the researchers determined that businesses must renew their protocols regarding the new normal in the post-pandemic. Since the COVID-19 pandemic has changed how customers interact with businesses, the owners must think of ways to provide their services effectively with the so-called new normal of the post-pandemic (Lichtenthaler, 2021).

A Research was conducted to determine what are the beliefs and knowledge about e-groceries and internet shopping in general. The results from the respondents from both experienced and less experienced e-grocery shoppers and internet shoppers both positive and negative beliefs are correlated to each other. The advantages that were stated by the respondents were online grocery shopping are much more convenient, the price and product range are better compared to traditional grocery. The disadvantages stated by the respondents were mostly affected by the mental barrier of the respondents because delivered products may lose quality and freshness due to the delivery process. Ramus, K., Nielsen, N., 2005). The behaviors of grocers in the Philippines focus on the convenience, freshness, and price of products (Pascual, et al., 2019). The pandemic has affected supermarkets of all sizes, but these establishments have also been an essential demand during the pandemic (Martins, Riordan & Dolnicar, 2020). Due to the needs and necessities of the customers, the demands for a workforce in supermarkets have been increasing. However, since the pandemic prohibits achieving the demand for workers, the possibility of creating a quality service to Filipino consumers was being constrained, especially when most of the supermarket industries in the Philippines follow the traditional service system. Due to the event, supermarkets tried to introduce technology and automation to the Filipino community. Moreover, a study by (Ramus, K., Nielsen, N., 2005) shows that respondents from both experienced and less experienced e-grocery shoppers and internet shoppers both positive and negative beliefs are correlated to each other. The advantages that were stated by the respondents were online grocery shopping are much more convenient, the price and product range are better compared to traditional grocery. The disadvantages stated by the respondents were mostly affected by the mental barrier of the respondents because delivered products may lose quality and freshness due to the delivery process.

Product placement in stores or supermarkets can influence how consumers buy their items even if they already have a list on which items to buy. Promotions can also affect how consumers act in buying in stores or supermarkets. A group of researchers conducted a study in which it aims to determine the effects of different marketing strategies that promotes healthy items in the supermarket, specifically, cereal, milk, in-aisle beverages, frozen meals, and cooler beverages. Based on the results of the study, different product placement and promotions significantly change how each of the said items is being sold. If healthier items are being sold more often, it will have a positive impact on the health of the community that are customers in that grocery (Brensinger, et al., 2014). This study gave this decision alternative that it is possible that placing essential products on strategically may help supermarket decrease shopping times of grocer which increase safety, at the same time increase profitability. However, according to the study of Maric (2020), the reduction of workers on supermarkets hinders achieving the goal of strategically placing every essential product in optimum placements because putting essential products upfront sure enough will be reducing rapidly due to its demand.

Online groceries or what is known as E-grocery are also becoming a trend since it can be useful and convenient for consumers that do not prefer physical interaction in the supermarket. It was discovered that online shoppers tend to have more positive experiences compared to physical groceries consumers who experience more negative experiences (Hansen, 2005). This study used an EGS model in which it presented how supplies and materials should be managed and how should it be safely stored and delivered to the customers without the risk of losing the quality of a certain product (Kallio, et.al. 2000). Furthermore, in the online-delivery sector, groceries lack this feature compared to other businesses such as food businesses or online shopping businesses that focus on gadgets or tools. A study by Punakivi and Saranen (2001) determined that there are some factors that contributes to the success of e-grocery home delivery service. This factor is what they called Streamline wherein the courier will drop the ordered goods in a reception box at the customer's yard resulting in a faster delivery process. They had studied this discovered factor for other e-grocery companies to improve their future services. Moreover, a study by (Ramus, K., Nielsen, N., 2005) determined what are the beliefs and knowledge about e-groceries and internet shopping in general. The results from the respondents from both experienced and less experienced e-grocery shoppers and internet shoppers both positive and negative beliefs are correlated to each other. The advantages that were stated by the respondents were online grocery shopping are much more convenient, the price and product range are better compared to traditional grocery. The disadvantages

stated by the respondents were mostly affected by the mental barrier of the respondents because delivered products may lose quality and freshness due to the delivery process. Ramus, K., Nielsen, N., 2005)

A study conducted by (Brown, J., 2001) which aims to determine what are the segments or factors that affect in which how a supermarket is attracting their customers. The segments that that are being used to determine which is the most effective are, Customer service seeker, Specials Seeker, Take-home foods, modern store seeker, Low price seeker, and small store seeker. The results shows that large grocery chain patrons focus more on the low prices of their products compared to small supermarket chains in which small supermarket chain patrons focuses more on their service quality and other criteria that does not involve prices in which it may results to more expensive prices in small grocery chains. Moreover, a study conducted by (Desai, S., Kesharwani A., Sreeram, A., 2017) that focuses factors that affects loyalty in satisfaction shows product assortment to have a significant impact on the loyalty and satisfaction of customers in online groceries. Economic value and entertainment value also significantly impact the satisfaction and loyalty of consumers. A study by (Brown, J., 2004) aims to determine which factors or determinants that affects the loyalty of customers the most in several types of Grocery stores. The determinants that the researchers used are Product areas, clean store, Prices, variety of products, quick checkout, Service quality, and the convenience of the location of the store. The results shows that Satisfaction with decent prices, quick checkout, and variety of products that are being offered positively affects the loyalty of customers in supercenter shoppers. Second, it shows that service quality and the convenience of the location is positively affective the loyalty of customers in a traditional grocery chain.

Ever since smartphones became our daily drivers for our communications, online shopping has become one of the addictive activities for multiple people. Online customers are quite unsatisfied with their own experience in online shopping. Therefore, a group of researchers conducted a study that identifies which factors can significantly contribute to the satisfaction of customers in their online shopping experience. The factors that were considered in the study are user interface design, the uncertainty of the products, service quality, visibility of the seller, and the overall customer satisfaction of customers on the website. Service quality, the design of the website, and the pricing of products have the most significant negative impact on the low visibility of the retailer and the high uncertainty of the products. Service quality lessens the negative impact of high uncertainty of products and the low visibility of the retailer (Ba, et.al. 2012). Moreover, a study conducted by Hays and others (2005) discussed the factors that will contribute to the success of e-grocery business. They figured out that having a massive resource, vast customer base, and coordination infrastructures will help the e-grocery company to success. Also, they stated that e-grocery companies usually succeed in a city with dense population like New York, since it is difficult to drive to a physical grocery location due to traffic congestion.

The O2O (Online-to-Offline) channel has big advantages, and it helps in the part of retailing and traditional e-commerce of the local market as the grocery retailers now can offer their products to online retailing and offline home delivery. The studies have shown that O2O can captivate grocery retailers through their pricing, market expansion, and providing a better experience in shopping convenience and home delivery. To strengthen the O2O platform delivery services and their online grocery retailing services, they have looked for different delivery couriers to help and facilitate the higher demand of their deliveries (He, et.al. 2020). The boom of third-party delivery couriers also sparked during the pandemic; it caters to the demands of the community with regards to the grocery. According to (Etumnu and Widmar, 2020), 21% percent of the grocers in the US use third-party couriers for the grocery deliveries because it accommodates customers directly since it is a one-to-one ratio of deliverer and customer. Unlike in-house online grocery that is done in batches before delivery. This O2O platform is now being used in the Philippines mostly in the supermarket such as Grab, Food Panda, Lalamove, Toktok, and other online services in this time of the pandemic.

The provided review of related literatures are separate studies on the effectiveness of the different alternative solutions that the researchers find useful based on the pandemic situation. Supermarkets used a product placement strategy to promote assorted products that are essential to their customers. This implemented strategy decreases the time spent by the customers in shopping and increases their safety and profitability. In addition, online services also helped in

increasing the safety of their customers because human interactions are limited and avoided since their product is delivered to them. These presented decision alternatives will serve as a solution and strategy to promote health safety and develop sustainability. However, there are no studies that compare these alternatives to which solution fits the situation. Therefore, the researchers of this study will conduct decision theory to know what best decision alternatives that the supermarket should they use to improve their services to their customers.

### 3. Methods

#### 3.1. Conceptual Framework

Grocery becomes an essential market in the in the community, especially in the Philippines. Now that the pandemonium affected the stability of the grocery supermarkets. Due to community restrictions, supermarkets were obliged to extend their reach to the masses at the same time achieve stability and profitability amidst pandemics. Main strategies that groceries seek are the use of face-to-face with social restrictions and the use of online platforms with association to home delivery. These alternatives have its pros and cons, and the research would want to provide recommendations for supermarkets on which strategies they can put focus on and will be optimal for their respective size of market. The research provided criterions that will rate the effectiveness of the strategies in the current setting. The criterions used are convenience, accuracy, service quality, satisfaction, loyalty, safety, and availability. The criterions that were used for this analysis was ranked based on their priority given the current situation of the pandemic. Ranking first will be the safety criterion since this is the key factor to determine effectiveness. Safety on public places have been a priority of the community to minimize spread of the virus. Followed by availability, quality, accuracy satisfaction and convenience, these attributes have been ranked based on the acquired information on the literature review.



Figure 1: Conceptual Framework of the Determining the Best Alternative

#### 4. Data Collection

The researchers created an online survey for data collection of the study. They developed the questionnaires using Google Forms that will be then distributed to at most 100 respondents. The target respondents of the study are the people who have experienced actual shopping, online grocery service, and third-party couriers of different supermarket. The type of sample that was used in this study is snowball sampling to quickly achieve the number of respondents needed for the study. The data gathered will help the researchers determine the optimal strategy suited for supermarkets based on the criterions that customer prioritizes during the pandemic.

The analysis tool that is used in this study is the decision analysis. Decision analysis is simple an analysis tool that helps individuals make their decisions. It is a process of assessing which of the following strategies or alternatives are the best to choose from. The research used a decision analysis with probabilities in order to obtain the expected value of each presented strategies and enable to construct a payoff table and decision tree diagram. Performing a decision analysis in this research will allow formulate the best decision whether which strategy will be considered optimal during the pandemic. Moreover, expert choice software is a mathematical tool that helps the users to identify the best solution in fulfilling their goals. This software is used to determine the weight of each alternative and their criterions. It serves as an assistance for creating the payoff table and decision tree of the decision analysis of this study.

## 5. Results and Discussion

### 5.1. Numerical Results

Table 4.1.1. Demographic Profile of the respondents

Respondents' Profile	Category	N	%
Gender	Male	54	40%
	Female	20	15%
Age	Less than 25	54	40%
	25-35	20	15%
	36-45	27	20%
	46-55	29	21%
	56-65	6	4%
	Over 65	0	0%
Employment Status	Employed	61	45%
	Unemployed	19	14%
	Self-Employed	6	4%
	Retired	2	1%
	Student	48	35%
Decision Maker	Myself	72	53%
	Parents	54	40%
	Partner	9	7%
	Guardian	1	1%
Monthly Income	Less than 20,000	16	12%
	20,000 - 40,000	27	20%
	40,000 - 60,000	33	24%
	60,000 - 80,000	20	15%
	80,000 - 100,000	12	9%
	More than 100,000	28	21%
Average Cost per Grocery	Less than 5,000	46	34%
	5,000 - 10,000	69	51%
	10,000 - 20,000	15	11%
	20,000 - 30,000	4	3%
	More than 30,000	2	1%
Size of Supermarket	Small	9	7%
	Medium	48	35%
	Large	79	58%

Based on Table 4.1.1, the researchers have surveyed 136 respondents, 40% of the respondents who answered the survey is aged less than 25 years old. Most of the respondent employment status are employed having a percentage of 45%. Based on the table that shows above that mostly of the respondents is deciding on their own in terms of grocery shopping having a percentage of 53% Furthermore, 21% of the respondents is having a monthly income more than one hundred-thousand and 34% of the respondents answered that their average cost per grocery is less than five thousand. Moreover, the researchers were also able to determine that 58% of the respondents goes to large supermarket, 35% of the respondents goes to medium supermarket and lastly 7% of the respondents goes to small supermarket to buy their grocery.

Table 4.1.2. Weights of the Criterion on Expert Choice Using Pairwise comparisons

Criterion	Rank	Weight
Convenience	5	11.1%
Accuracy	3	15.2%
Availability	2	24.1%
Service Quality	4	8.4%
Safety	1	30.1%
Satisfaction	5	11.1%

Table 4.1.2 shows the weights of each criterion in the analysis of each criterion used in the analysis of the strategies used by the supermarket. The weights were obtained based on the rankings and priorities of consumer when it comes to grocery shopping during the pandemic. This data will be useful in formulating the sensitivity graph for this analysis. Moreover, Table 4.1.2 shows the weight of the criteria, it shows that Safety with a weight of 30.1% is the top ranked among the criteria, followed by the availability, Accuracy, Service Quality, and lastly, the convenience and satisfaction got an equal weight of 11.1%. The results shows that the respondents prioritize the safety of themselves when it comes to purchasing their groceries on any platform. This is mainly because due to the COVID-19 pandemic, people are more cautious about their social interactions.

Table 4.1.3. Payoff Table of the Strategies of Supermarkets

Alternatives/Criterion	Convenience	Accuracy	Availability	Service Quality	Safety	Satisfaction
Actual Shopping	4.2316	4.1029	3.9338	3.9412	4.4118	4.0956
Online Grocery Shopping	4.0167	4.1667	4.0000	3.9667	4.1667	4.0333
Third Party Couriers	4.0125	4.0500	4.0500	3.7000	4.0000	3.9500
Probability	0.111	0.152	0.241	0.084	0.301	0.111

In Table 4.1.3, the payoff consists of 6 states of nature which is the criteria presented which is convenience, accuracy, availability, service quality, safety, and satisfaction. Then the set alternatives were the factors affecting the effectiveness of each strategy presented. The probability was equally distributed since all the respondents were able to experience all the strategies offered by the supermarket. Based on the computed expected value, safety will be the contributing factor that would affect the effectiveness of the strategies.

Based on the Table 3, it shows the payoff of each strategy of supermarkets. It shows that the respondents are still more convenient in purchasing their online groceries in Actual groceries. Mainly because products are properly categorized and much easier to find the product. In Accuracy, the respondents finds that the delivered products from online-services are more accurate when in comparison to third-party services. Reasons why this is the cause because Online services has their own system that can accurately store the order data from their customer which will be forwarded to their own delivery couriers. Unlike in third-party services, order is just listed through the chat or through call between the customer and courier. In the Availability criterion, the average score from the respondents shows that Third-party couriers ranked top mainly because workers from third-party couriers provides instant updates regarding whether a product is available or not compared to online services. In service quality criterion, the score shows that Actual shopping and online services have an equal score which means they are equally performing in terms of the service they provide. In safety criterion, the score from the respondents shows that Actual shopping is still the safest method in purchasing grocery items, one probable reason is that groceries have implemented proper social-distancing protocols and restrictions to provide a safe environment. Overall, the scores shows that majority of the respondents

are still more satisfied with actual grocery shopping. One probable reason is that online shopping and the use of third-party services for purchasing groceries are not yet fully effective in the Philippines even during the pandemic. In comparison for all the criteria in all the strategies, the scores are different but not in a large margin.

Moreover, another probable reason is that in the Philippines, stable internet connection is hard to achieve stable internet connection. According to AGB Nielsen Philippines, only 1/3 of the Filipinos has access to a stable internet. Since online services requires stable internet, many Filipinos will have issues in using such features. Resulting into response time of websites and application to delay impacting the convenience of the users negatively. With the unstable internet connection, Filipinos and even Grocery companies will have a tough time in fully utilizing the technology because the interaction between the online grocery and the consumer will be disrupted by the slow internet. Moreover, an article online has a list of online delivery supermarkets and which majority of the stated supermarkets in the list are only being offered in metro manila. Another reason actual shopping is still the best strategy in the Philippines, is because features such as online services and third-party services are currently being offered only in Metro Manila and neighboring cities. In far provinces, only a small number of supermarkets currently offers such features. In addition, an article by Prachi Darji stated that online shopping will always have payment issues. Technical issues will always be present. There are instances that consumers experience inconvenience using online grocery features, for example, transaction of the payment will tend to fail due to an error of the website or application. There are also instances where payment has been detected by your credit card but no received by the Supermarket.

## 5.2. Graphical Results

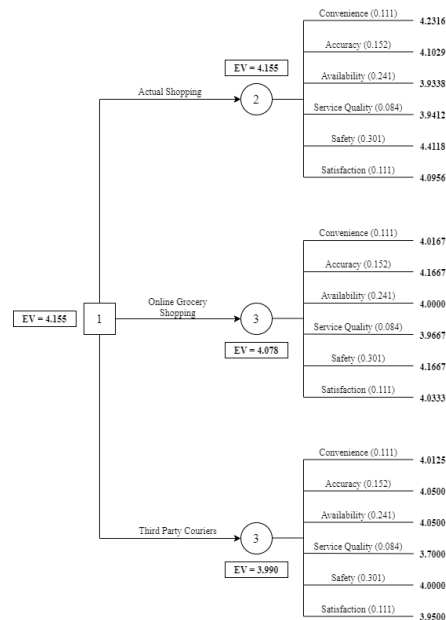


Figure 2. Decision Tree for the Comparison of Strategies

Figure 2 presents the construct of the decision tree in present the payoff of every strategy. This shows the complete breakdown of how the different criteria perform in each strategies presented. Same with the table 3, safety will be the most contributing factors in comparison with other criteria.



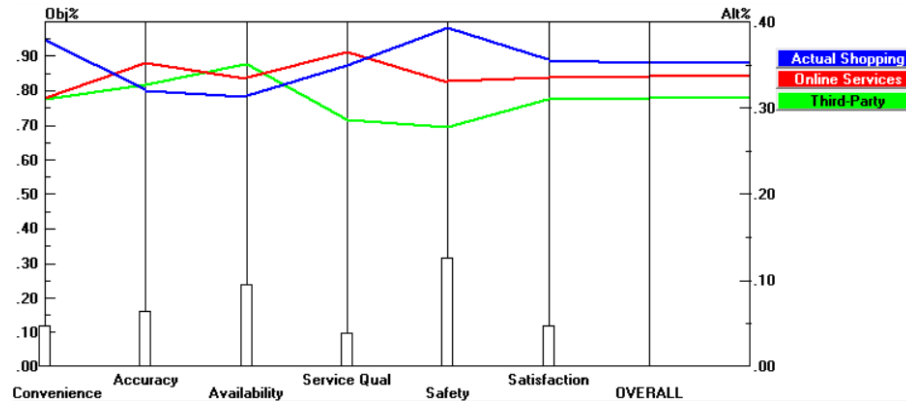


Figure 3. Sensitivity Graph Analysis Generated from Expert Choice

Based on Figure 3, the three strategies namely actual shopping, online grocery services and third party has slightly different performance in some of the criterions that was provided. For the convenience, the actual shopping has the higher percentage than online grocery services and third party because the respondents are more convenient to buy their grocery in actual shopping because they see the product physically. The online services have the higher percentage when it comes to accuracy compared to online services and actual shopping it is because the online services are more accurate when it comes to the delivery of ordered products since the products listed are already in the system which decreases error in packaging of orders. For the availability, the third party is much higher than actual shopping and online services percentage because there is assistance that can help the consumers to know the different information of the products and help them in buying the products that they need when it's not available to a single store. For the service quality criterion online services has the highest percentage among the actual shopping and third party because they give more information and update about the products.

Actual shopping has the higher percentage for safety even though there is a significant risk that you can be infected by the virus when you go out, still they want to buy their grocery items in actual because they feel that the supermarket precautionary measures help to delay the spread of the virus. In addition, contact is less direct since the customers comply social distancing unlike in deliveries. For the satisfaction still the actual shopping has the higher percentage because the consumers are used to do their grocery in the actual shopping, and they are satisfied with that. For the overall rating, actual shopping is still the best for the consumer in terms of buying their grocery items even though there is still pandemic the consumer will still choose the actual shopping based on the results that we have.

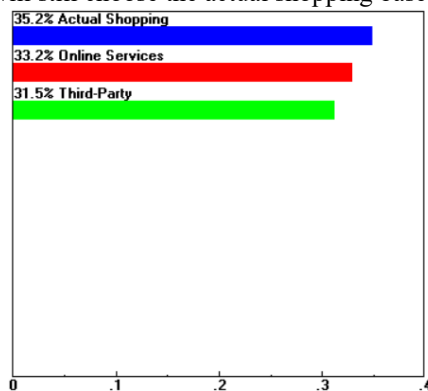


Figure 4. The Overall Performance of the Strategies Presented

In Figure 4, the actual shopping has a percentage of 35.2% it means that among the three strategies, actual shopping is the best for the consumers. For the online services and third party they have close percentage 33.2% and 31.5% it means that the services that they offer is mostly likely the same for the consumers and it will vary from the criterion that was provided. The researchers also put criterion to measure the effectiveness of actual shopping, online grocery

services and third-party overall satisfaction was also asked. In terms of the criterion the actual shopping has high percentage it is because all its criterion has high rating score compared to online services and third-party. For the overall performance, the actual shopping performed the best among the three strategies presented.

## 6. Proposed Improvements

As recommendation, the researchers suggest that supermarkets shall continue to improve their online platforms that will enhance customer experience and expand the reach of this service nationwide. In addition, for the future researchers of this study, increase the sample size and make sure to have an equal number of respondents to perform decision analysis with posterior probabilities. As well as improve the developed survey questionnaires in detailed like add a question where the respondents can provide additional comments.

## 7. Conclusion

The use of traditional grocery shopping which in the Philippines were still the viable option to be based on the optimal policy generated by the decision analysis performed together with the support of the Expert Choice tool. Based on the data that we have gathered most of the respondents still choose the actual shopping strategy when it comes in buying their grocery items in the supermarket based on the different criterion that was provided. For the overall performance, the actual shopping still performed the best among the three strategies that was provided. The performance of online and third party was still comparable to the actual shopping, however due to majority of the respondents was not able to experience the use of this new strategies of the supermarket. The probable reason for not experiencing these strategies is due to the constraints of the strategy since these services were only being offered within location of Metro Manila and near neighboring cities. In addition, traditional shopping has solidified its service in the country long before the two new strategies were being offered, hence the respondents would still prefer face-to-face shopping than the two strategies because this gives faster access to all products being offered by the store.

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