

Avesco Marketing Order Transaction And Delivery Simulation

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I. INTRODUCTION

People encounter technical problems at home, work, and in industries. With the said reason, people tend to know where they can find some excellent quality products that a market can offer to them. In the Philippines, AVESCO MARKETING CORPORATION is the top and most comprehensive marketing organization for products related to industry, electricity, electronics, and communications. Today, AVESCO has more than 500 dealers around the country and several affiliate businesses. Having the benefit of more than 60 years of marketing milestones, it continues to grow in stature both locally and globally. This study aims to determine the efficiency of the company in how they process the deliveries and to determine if they deliver them on time.

II. EXPERIMENT

A. Data Gathering

To determine how efficient the said company in processing the products, and if the company does deliver the products on time the researchers requested the data from the customer representatives of the AVESCO MARKETING COMPANY who are assigned to assess the customer's data. The data granted will also help the researcher to create the model. The below figure shows some data that the researchers were granted:

B. Data Cleansing

Since the data gathered are raw, the researchers cleanse the data by sorting out all the transactions per hour from the 3rd to 31st of the month of January and producing the total transactions every hour and on daily basis. As shown in the Figure below:

| CUSTOMER | ITEM | QTY | TRANSACTION | | SCHED OF DELIVERY | |
|--------------------------------------|----------------|------|-------------|-------------|-------------------|------------|
| | | | DATE | TIME | TYPE | DATE |
| DMCI PROJECT DEVELOPERS INCORPORATED | WIRING DEVICES | 8494 | 03/01/2022 | 8:00:00 AM | DELIVERY BY TRUCK | 04/01/2022 |
| CW MARKETING & DEVT. CORP. | WIRING DEVICES | 10 | 10/01/2022 | 8:00:00 AM | DELIVERY BY TRUCK | 04/01/2022 |
| CW MARKETING & DEVT. CORP. | WIRING DEVICES | 210 | 03/01/2022 | 8:00:00 AM | DELIVERY BY TRUCK | 04/01/2022 |
| DMCI PROJECT DEVELOPERS INCORPORATED | WIRING DEVICES | 6356 | 03/01/2022 | 8:00:00 AM | DELIVERY BY TRUCK | 04/01/2022 |
| CW MARKETING & DEVT. CORP. | WIRING DEVICES | 30 | 30/01/2022 | 8:00:00 AM | DELIVERY BY TRUCK | 04/01/2022 |
| DMCI PROJECT DEVELOPERS INCORPORATED | WIRING DEVICES | 4377 | 03/01/2022 | 8:00:00 AM | DELIVERY BY TRUCK | 04/01/2022 |
| CW MARKETING & DEVT. CORP. | WIRING DEVICES | 332 | 03/01/2022 | 8:00:00 AM | DELIVERY BY TRUCK | 04/01/2022 |
| DMCI PROJECT DEVELOPERS INCORPORATED | WIRING DEVICES | 1548 | 03/01/2022 | 9:00:00 AM | DELIVERY BY TRUCK | 04/01/2022 |
| CW MARKETING & DEVT. CORP. | WIRING DEVICES | 780 | 03/01/2022 | 9:00:00 AM | DELIVERY BY TRUCK | 04/01/2022 |
| CW MARKETING & DEVT. CORP. | WIRING DEVICES | 247 | 03/01/2022 | 9:00:00 AM | DELIVERY BY TRUCK | 04/01/2022 |
| KIPCO INTERNATIONAL CORPORATION | AMPLIFIERS | 1 | 03/01/2022 | 9:00:00 AM | DELIVERY BY TRUCK | 04/01/2022 |
| CW MARKETING & DEVT. CORP. | WIRING DEVICES | 87 | 03/01/2022 | 9:00:00 AM | DELIVERY BY TRUCK | 04/01/2022 |
| CW MARKETING & DEVT. CORP. | WIRING DEVICES | 12 | 03/01/2022 | 10:00:00 AM | DELIVERY BY TRUCK | 04/01/2022 |
| CW MARKETING & DEVT. CORP. | WIRING DEVICES | 190 | 03/01/2022 | 10:00:00 AM | DELIVERY BY TRUCK | 04/01/2022 |
| CW MARKETING & DEVT. CORP. | WIRING DEVICES | 330 | 03/01/2022 | 10:00:00 AM | DELIVERY BY TRUCK | 04/01/2022 |
| CW MARKETING & DEVT. CORP. | WIRING DEVICES | 130 | 03/01/2022 | 10:00:00 AM | DELIVERY BY TRUCK | 04/01/2022 |
| CW MARKETING & DEVT. CORP. | WIRING DEVICES | 20 | 03/01/2022 | 10:00:00 AM | DELIVERY BY TRUCK | 04/01/2022 |
| CW MARKETING & DEVT. CORP. | WIRING DEVICES | 400 | 03/01/2022 | 10:00:00 AM | DELIVERY BY TRUCK | 04/01/2022 |
| CW MARKETING & DEVT. CORP. | WIRING DEVICES | 180 | 03/01/2022 | 11:15:00 PM | DELIVERY BY TRUCK | 04/01/2022 |
| CW MARKETING & DEVT. CORP. | WIRING DEVICES | 20 | 03/01/2022 | 11:35:00 PM | DELIVERY BY TRUCK | 04/01/2022 |
| CW MARKETING & DEVT. CORP. | WIRING DEVICES | 10 | 03/01/2022 | 11:49:00 AM | DELIVERY BY TRUCK | 04/01/2022 |
| CW MARKETING & DEVT. CORP. | WIRING DEVICES | 350 | 03/01/2022 | 12:00:00 PM | DELIVERY BY TRUCK | 04/01/2022 |
| MAXTEC SOLUTIONS PHILIPPINES INC. | AMPLIFIER | 1 | 03/01/2022 | 12:28:00 PM | DELIVERY BY TRUCK | 04/01/2022 |
| CW MARKETING & DEVT. CORP. | WIRING DEVICES | 150 | 03/01/2022 | 12:30:00 PM | DELIVERY BY TRUCK | 04/01/2022 |
| CW MARKETING & DEVT. CORP. | WIRING DEVICES | 60 | 03/01/2022 | 12:45:00 PM | DELIVERY BY TRUCK | 04/01/2022 |
| CW MARKETING & DEVT. CORP. | WIRING DEVICES | 490 | 03/01/2022 | 1:15:00 PM | DELIVERY BY TRUCK | 04/01/2022 |
| CW MARKETING & DEVT. CORP. | WIRING DEVICES | 60 | 03/01/2022 | 1:45:00 PM | DELIVERY BY TRUCK | 04/01/2022 |
| CW MARKETING & DEVT. CORP. | WIRING DEVICES | 73 | 03/01/2022 | 2:00:00 PM | DELIVERY BY TRUCK | 04/01/2022 |
| CW MARKETING & DEVT. CORP. | WIRING DEVICES | 250 | 03/01/2022 | 2:00:00 PM | DELIVERY BY TRUCK | 04/01/2022 |
| CW MARKETING & DEVT. CORP. | WIRING DEVICES | 125 | 03/01/2022 | 2:00:00 PM | DELIVERY BY TRUCK | 04/01/2022 |

Fig. 1. Some of the raw data of AVESCO MARKETING COMPANY

[illegible]

Fig. 2. Transaction per hour from January 3 to 17

C. Probability and Distribution

The following step is to get the probability distribution of the data in the month January. The purpose of getting the probability distribution is because it provides the probability of different potential outcomes for an experiment.

| January Probability Distribution | | | |
|----------------------------------|------------------------|-------------|---|
| | Frequency Distribution | Probability | Expected Outcome ($\sum x \cdot p(x)$) |
| 7 | 4 | 0.20 | 2.80 |
| 8 | 73 | 0.11 | 0.881 |
| 9 | 51 | 0.08 | 0.677 |
| 10 | 68 | 0.10 | 1.00 |
| 11 | 38 | 0.06 | 0.677 |
| 12 | 43 | 0.07 | 0.881 |
| 13 | 30 | 0.04 | 0.575 |
| 14 | 194 | 0.17 | 2.354 |
| 15 | 51 | 0.08 | 0.881 |
| 16 | 50 | 0.13 | 2.124 |
| 17 | 86 | 0.15 | 2.55 |
| 18 | 22 | 0.03 | 0.584 |
| Total | 678.00 | 1.00 | 13.08 |
| Mean Hourly Monthly | 678 | | 3.63 |
| Mean Hourly Daily | 67 | | 3.10 |

Fig. 3. Probability Distribution for the Month January

Figure 3 shows the probability distribution in the month of January that will be useful for creating the model.

D. Arena Modelling

To create the model, Arena Simulator is used. For this, the model have three sections, the order processing station, the order packaging station and delivery station. The transaction of the customer and the operator happens at the order processing station. Telling what to order, how many quantity and knowing if it will be delivered or picked up happens in this station. For the order packaging station, the packaging of orders are happened. And for the delivery station, the items will be delivered into the customer's area.

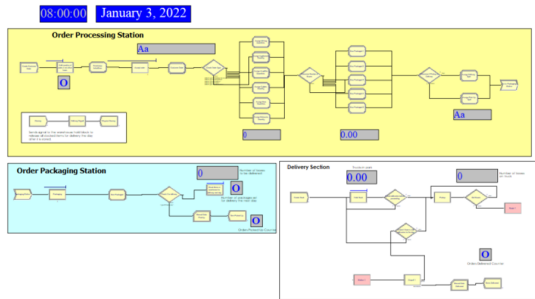


Fig. 4. Arena Model

1) *Creation of entity*: Using create module, an order entity will be created. Exponential distribution with the mean of 21 is used to know when the entity will be created. It means that an order will be created between 1 and 21 minutes randomly.

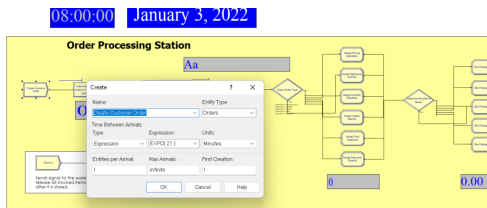


Fig. 5. Order Entity Creation

2) *Setting orders and number of boxes*: Using the assigned module, an attribute is added into the order entity. The value will be assigned into the entity will be the order type. Wiring Devices, appliances, amplifier, cables, fans and intercoms are the product that is ordered in the dataset. Using discrete probability distribution, the order type is assigned into each entity passed through the module.

To know the number of boxes, determining if the item is small or big is needed first. 100 pcs Small items such as wiring devices, intercoms and cables are needed to fill a box. While 50 pcs of big items are needed to fill a box.

| Types of Orders | Quantity | Percentage | Max Value |
|-----------------|------------|------------|-----------|
| Wiring Devices | 530 | 0.987 | 22050 |
| Appliances | 1 | 0.002 | 1 |
| Amplifier | 1 | 0.002 | 1 |
| Cables | 3 | 0.006 | 155 |
| Fans | 1 | 0.002 | 12 |
| Intercoms | 1 | 0.002 | 3 |
| Total | 537 | | |

Fig. 6. Type of orders and their quantity

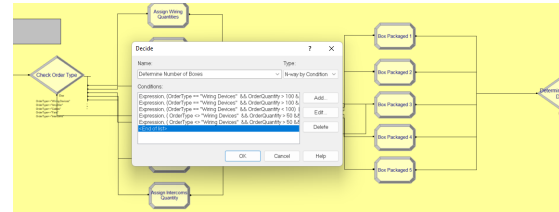


Fig. 7. Determining number of boxes

3) *Determining if by Delivery or Pick Up*: Using the 2-way by chance decide module will determine if the order will be delivered or picked up. Based on the dataset, 95% of the items are delivered.

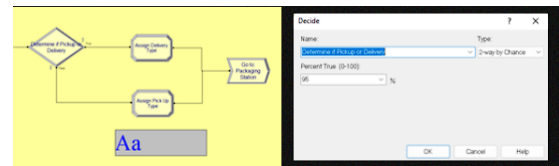


Fig. 8. Decide module to know if by delivery or pick up

4) *Packaging*: For the packaging station, the time will it take for the item to be packaged is determined. Based on the dataset, a box is packaged within 5 minutes. Process module is used to delay the entity. A total of 30 persons are assigned into the packaging station in real life so the formula $(\text{NumberOfBoxes} * 5) / 30$ is used to know the time of the orders to be packaged. The item packaged will go to the hold module and wait for the truck to pick it up.

| Frequency Distribution | Probability | Expected Outcome | Variance |
|----------------------------------|--------------|------------------|--------------|
| 1 | 0.002 | 0.002 | 0.002 |
| 2 | 0.004 | 0.008 | 0.008 |
| 3 | 0.006 | 0.018 | 0.018 |
| 4 | 0.008 | 0.032 | 0.032 |
| 5 | 0.010 | 0.050 | 0.050 |
| 6 | 0.012 | 0.072 | 0.072 |
| 7 | 0.014 | 0.098 | 0.098 |
| 8 | 0.016 | 0.128 | 0.128 |
| 9 | 0.018 | 0.162 | 0.162 |
| 10 | 0.020 | 0.200 | 0.200 |
| 11 | 0.022 | 0.242 | 0.242 |
| 12 | 0.024 | 0.288 | 0.288 |
| 13 | 0.026 | 0.338 | 0.338 |
| 14 | 0.028 | 0.392 | 0.392 |
| 15 | 0.030 | 0.450 | 0.450 |
| 16 | 0.032 | 0.512 | 0.512 |
| 17 | 0.034 | 0.578 | 0.578 |
| 18 | 0.036 | 0.648 | 0.648 |
| 19 | 0.038 | 0.722 | 0.722 |
| 20 | 0.040 | 0.800 | 0.800 |
| 21 | 0.042 | 0.882 | 0.882 |
| 22 | 0.044 | 0.968 | 0.968 |
| 23 | 0.046 | 1.058 | 1.058 |
| 24 | 0.048 | 1.152 | 1.152 |
| 25 | 0.050 | 1.250 | 1.250 |
| 26 | 0.052 | 1.352 | 1.352 |
| 27 | 0.054 | 1.458 | 1.458 |
| 28 | 0.056 | 1.568 | 1.568 |
| 29 | 0.058 | 1.682 | 1.682 |
| 30 | 0.060 | 1.800 | 1.800 |
| Total | 1.000 | 11.40 | 11.40 |
| Mean Monthly Monthly | 11.40 | | |
| Mean Monthly Daily | 0.38 | | |
| Boxes Packaged per minute | 0.38 | | |

Fig. 9. Determining the amount of time to package a box

5) *Delivery*: Using create module, 15 trucks for delivery is created. Since based on the dataset, all deliveries are

scheduled on the next day the transaction order happened. So, the truck entity is needed to be held for 1 day after it created and it is possible with the hold module. With this, the entity will be hold until it receives a signal, the signal is sent using this block. A dummy entity is created each day constantly to send signal into the hold module to release the truck entities. The truck will pick up the orders in the holding area for delivery. Using route module, the truck is delayed using the triangular probability distribution to know the time it will take for the orders to be delivered. The minimum time it will take to deliver the item is 1 hour and the maximum is 5 hours. Usually, the time it will take for the items to be delivered is 2 hours.



Fig. 10. Using Route Module

E. Validation of Model

Using R programming and T Test, the model created is validated. For the t test, there are 2 data compared, the data that consists of 20 model replications and the data that consists of 100 model replications. Using the t.test function, the data is fed and tested. The null hypothesis will be there is no significant different between the two means and for the alternative hypothesis, there is a significant different between the two means. 2 types of t.test is used for the validation, assuming their variance is equal and assuming their variances is unequal.

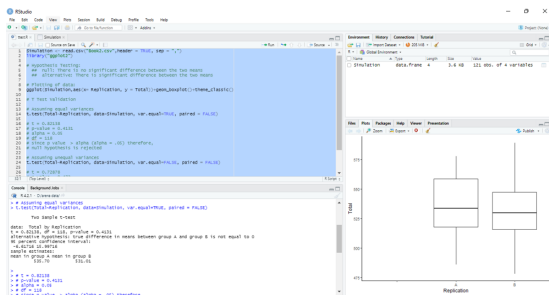


Fig. 11. R programming for T Test validation

For equal variances, here is the result. Since the p-value of the test is greater than the alpha which is 0.05, the null hypothesis is rejected and alternative hypothesis is accepted. The test result shows the t value is 0.82138, df or degrees of freedom 118, p-value of .4131 and confidence level of 95%.

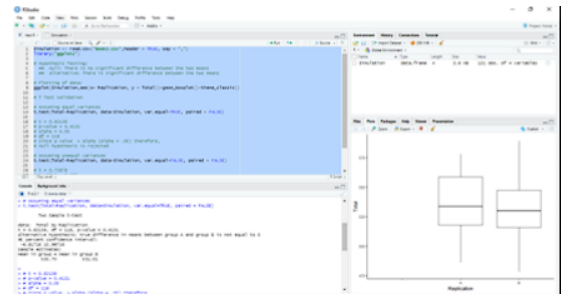


Fig. 12. Result of Equal variances

For unequal variances, here is the result. Since the p-value of the test is greater than the alpha which is 0.05, we reject the null hypothesis and we accept the alternative hypothesis. The test result shows the t value is 0.72878, df or degrees of freedom 24.595, p-value of .473 and confidence level of 95%.

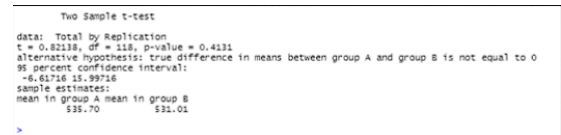


Fig. 13. Result of Unequal variances

III. CONCLUSION

The simulated results are close compared to the raw data, the mean transaction of the simulation results is close the actual mean on the raw data and all items are delivered the next day in the simulation results just like in the raw data. The model created is proven valid with the use of T-Test for both equal variance and unequal variance instance. Manipulation of data used on some modules will be helpful in the industry to know the what-if situations and to know what are the possible risks if that instance happened so that they can adjust and avoid it immediately.