

Final

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Submission date: 08-Jan-2026 07:08PM (UTC+0000)

Submission ID: 272590213

File name: 66125_Ryan_Easton_Final_692035_854654031.docx (20.57K)

Word count: 1466

Character count: 7155

Applied Computing (Foundation)

Analysing and solving problems ACCA4019

Problem Analysis and Solution Development

In this report, the student has been tasked with analyzing a real-world problem and develop a solution using problem-solving and abstract thinking to find a solution. The problem is as follows:

“Problem Scenario:

An online grocery delivery service, GrocerQuick, is experiencing difficulties in managing its delivery routes efficiently. The company aims to optimize delivery routes to reduce fuel consumption and improve delivery times. You have been asked to develop a solution that achieves the following:

1. Efficient allocation of orders to delivery routes
2. Minimised fuel consumption by reducing total travel distance
3. Timely delivery of all orders, ensuring no delivery is more than 30 minutes late.”

Deconstruction

In order to find a solution, the student will need to deconstruct the issue at hand. The first issue is the delivery routes and their disorganization. In order to deal with this problem, the student will have to look deeper into the Delivery routes and determine if there are any routes that can be used to make deliveries faster and more efficient.

The second issue is reducing fuel consumption. in order to deal with this problem, the student will have to look into possible alternatives, possibly a reduction in delivery vehicles or a better routing system to ensure that the company is not paying as much as they currently are for fuel. The Company is also an online Based service, so the student will need to look into how this can impact their delivery times and how their vehicles are delivering their deliveries and what route they take, from the warehouse to the delivery location.

The final issue that needs to be addressed is that the deliveries cannot be more than 30 minutes late. It is to be expected that not every delivery will be on time. No plan is ever perfect. The student will need to take this into account when finding the solution.

Solution

The solution can be found by addressing the deconstructed issues. The first issue that needs to be addressed is the delivery routes and how disorganized the routes are. The student will find other routes and ensure that the routes are serviceable enough to make a meaningful impact on the efficiency of the delivery. For example, if there is a route that will allow 3 delivery vehicles to make their deliveries in 20 minutes each, then that would be better than 2 delivery vehicles making their deliveries in 45 minutes each. This means that having more vehicles would make delivery times better and faster. However, the second issue presented to the student is to reduce fuel consumption. In order to resolve this, the student will need to look at routes and vehicles used more efficiently. This conflicts with the first solution simply because more vehicles would reduce the delivery times over an area but would raise the amount of fuel used. To resolve this, a better optimization of the routes used will need to be found. To find this, the delivery routes will need to be further optimized, looking at which road, which delivery vehicle will be sent to what area and what is being delivered and how many at any given time. For instance, if there are 3 vehicles available to the company, and 10 deliveries all in an area, then 2 delivery vehicles delivering 5 deliveries each should make the deliveries smoother and faster while reducing fuel costs.

Alternatively, if there are a lot of deliveries, then all of the delivery vehicles will be needed to ensure that deliveries are delivered on time with minimal problems. Another way to optimize the delivery routes is to determine which order the deliveries are delivered. For instance, if there is a delivery one block away from the warehouse, another 3 blocks away and one more being a town away. In order to make a timely delivery, the delivery vehicle can aim for the target that is a town away, then make their way back to the target that is 3 blocks out, then finally to the one a block away. This allows the delivery vehicle to make one round to deliver all of the products in a timely fashion without having to make another trip back and forth, wasting fuel in the process.

The company is also an online-based service, making finding a solution harder to find. The company being an online service would mean that the company would branch out to a lot of people in the country at least. This shows a new limitation, which is the number of delivery vehicles in comparison to the number of deliveries needed in a day and how many times a delivery vehicle can deliver their deliveries per day. If the vehicles can make a lot of deliveries in one day, then that would allow the fuel consumption to be lowered.

In order to address the issue that is related to the deliveries being late by over 30 minutes, the student will look into how the deliveries are being made and how the routing looks currently. By looking at the current routes, the student will then be able to find routes that will make deliveries more efficient. By ensuring that the deliveries are streamlined in this fashion, the deliveries should almost never be late, and if they are it would be within the 10 to 15 minute range instead of going beyond 30 minutes.

Justification

To find these solutions, the student will use sub-division of the problems and abstract thinking in order to find the solution necessary to answer the task given to them. The problem can be split into different sub-problems in order to make the task easier to find a solution without making the solution incredibly hard to find. To split the problem into sub-problems, the student will need to find and break down the sub-problems. These problems include; Finding efficient routes to make deliveries smoother, determining travel distance, minimizing fuel use, a delivery is not 30 mins late. The first problem can be split into a few different problems. One of these problems is to look into finding different routes, and another being that routes can be merged together if the route is more efficient. Determining travel distance can be split into; determining travel time for a single vehicle and determine if 2 or more vehicles are necessary for deliveries. This is because using only 1 vehicle can cut down on fuel costs significantly, whereas using 2 or more vehicles will make busier days go by smoother and more efficiently.

There are, however, limitations on what can be done to make this more efficient. For instance, the fuel consumption problem cannot be simply removed entirely due to the fact that the deliveries have to be made one way or another. If the deliveries were local, then the company could potentially use smaller vehicles or walk the product down to the delivery location. This is simply not feasible due to the fact that the deliveries are likely more than one person could deliver in a single delivery.

Another limitation is the number of routes available to the company in a given area. If all of the routes are optimized already, then it would depend on what vehicles the company would have available on that day and the amount of product the company needs to deliver on that day. If the delivery vehicle can deliver all of the products needed for delivery can deliver on it's own, that would help with fuel consumption, but if there is too much to deliver in 1 delivery, then the company will need to use more vehicles, at which point the company will need to balance out the fuel consumption and their deliveries delivered in a timely fashion. Too many vehicles would mean that fuel is wasted, and the consumption will rise, but not enough vehicles would make deliveries go slowly and make the deliveries late, potentially making the deliveries longer than 30 minutes or longer.

Conclusion

In conclusion, the student has found several problems and divided these into sub-problems. These sub-problems were then solved, one by one, until the problem itself has a solution. the solutions were found through abstract thinking. The student has addressed various solutions to the problems. One of which is to streamline the delivery process and make the deliveries more efficient. Another problem is how many vehicles the company has available in comparison to

their product that needs to be delivered. The student addressed a limitation that is because the company is an online company, it is impossible to deliver their product without using a vehicle simply because the company covers too much of an area to feasibly deliver on time using something like a bicycle or even walking.