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question   **80** views

Incentive system as optimization

I have a idea for routing drivers that does not fit well into any of the optimization models we discussed. I would like to hear thoughts about if this seems feasible, optimal, terrible, etc. Here's the idea:

Assuming we have a system that identifies customers whose power could justifiably be shut off (intentionally delinquent), and the expected value/cost of that customer's power staying on, could the power company set up a commission-like incentive system for their employees to turn off as much power as they feel is worth their time?

For example, imagine there is an intentionally delinquent household who is using $200 worth of power each month. The power company could set an commission rate of 50% (this example is arbitrary) and any of the power company's employees could choose to shut off the power at that house for $100 commission, while the power company keeps the other $100 in savings.

Here are the pros and cons of such a system as I see it:

Pros:

1. There is a shared incentive between the employees & the company to save as much money as possible.
2. Assuming employees live throughout the city, the cost (time, gas, etc) of turning off power at a particular location would vary depending on where individual employees live. This would make it very cheap for employees to turn of power of delinquent customers who live near them. This could increase the number of cost-saving homes that the power company could reach.
3. Employees could choose their hours. This would give employees the option to choose to work at low-traffic hours that may or may not have been accurately predicted in advance, increasing hourly wages for the employee and increasing savings for the power company.
4. The power company could toggle the incentive rate to balance between employee pay and and need for drivers. If there aren't enough houses being attended to, pay could go up. If all houses are being attended to very quickly, pay could go down.

Cons:

1. Drivers may not be evenly distributed throughout the city, potentially leaving some neighborhoods not tended to. This could potentially be handled by having different incentive rates per neighborhood.
2. It may be hard to keep workers if some fixed income is not guaranteed. This is especially a problem if employees require some training that the company pays for. This could potentially be handled with some guaranteed base hourly rate or by keeping the number of employees artificially low so there is enough work for everyone.
3. I am having trouble thinking of a way to construct a model that could accurately predict savings from this approach. If my struggle is because this is hard to model and not lack of effort/creativity on my end, we could take a multi-armed bandit approach where one option is the model I proposed and the other options are more like the optimization models we have learned about in this course.

Because this is different than what we have discussed in class, I would love any form of input/critique. Also, if this could be a good idea, but it goes against the spirit of the assignment and I should stick to the approached we learned in this course, I would appreciate a TA/instructor making that clear.

hw8

Updated 8 hours ago by Brandon Barber

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the students' answer, where students collectively construct a single answer

I'm interested to hear other's thoughts as well. I've thought about this and am struggling with how complex to "solve" this case. I've begun working on my optimization program and constraints and came to this part as well. Some of the constraints I have that are related are:

Constraints on drive time per day
Constraints on work hours per day (8) and also times that work may be done (making your own schedule is great, but generally work like this, from my experience with utility companies, would not be done outside of 7am to 5 or 6pm)
Since I have the employee starting from the hub of the utility company, I have constraints that the employee must start and end there.
Constraint that a solid 1 hour block for a lunch break must be given between the hours of 11am and 2pm or so

And so on

That's intriguing! Kinda like how they were trying to incentivize walmart employees to do home deliveries. In our make-believe world, I think it's a great answer... In the real world, I think it could still work, as long as you worked closely with legal to make sure everything is kosher - they'd surely give you many more constraints. Definitely makes for an interesting answer to this problem!

Updated 5 hours ago by Kimberly Kisner and Matthew Nguyen

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the instructors' answer, where instructors collectively construct a single answer

For this assignment, we want you to try to identify appropriate analytics techniques to solve different kinds of problems. Therefore, I would expect in your submission that you have determined some way to create a model of what you are proposing.

Updated 4 hours ago by Margaret Bolton

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followup discussions for lingering questions and comments

◉ Resolved   ○ Unresolved

Prasanta Kumar Lenka 7 hours ago
When you mentioned to incentivize the power shutoff for the employees, did you mean any employee? If yes, then I would say that it may not work because it is a specialized job. having the freedom of any employee carrying this job would be unsafe and it will expose the company to leagal and liability problem.

If your suggestion was just to incentivize only employee who are trained and whose role is to shut off , then it may work . But it might bring other operational complexities like prioritizing the job and schedule, Overall cost impact (What happens if the customer pays back after the shutoff) etc. I think you may consider to add some constraint here to make sure the operation streamlined and there are are overall benefits to the company

⦿ Resolved   ◯ Unresolved

Hunter 2 hours ago
I definitely respect the creativity but my guess is employees wouldn't want the burden of deciding who to shut off, especially if they are their neighbors. I also suspect you would have some pretty significant legal challenges.