**Project Name:** CCenter

**Sample Only**

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**Document Title:** Final Report

**Revision Number:** 1.0

**Name and E-mail Address:** -

1. **Problem statement and approach**

The developed model was thought out for the CallMe Center, a call center dedicated to fulfill sales of nationwide telemarketing networks. As other call centers in the industry, the CallMe Center needs a tool to support decisions around human capital requirements and recognize the impact of those requirements on costs, revenue, and profits. To support making informed decisions at the CallMe Center, the developed model has the following objectives:

First, the model aims to provide top executive managers with a tool to optimize their hiring stream for 12 periods based on the growing customer base that needs to be served, the seasonality of the forecasted volume of incoming customer phone calls, and the productivity and performance targets of the call center.

Second, using scenarios identify and understand the effects of the resulting hiring stream on revenues, expenses and profits depending on the market in which the call center operates. Revenues are based on the call volume, agents’ success rate of selling a product upgrade, and the sales commission charged by the CallMe Center. Expenses are based on the impact of the hiring stream on the resulting human capital costs, and the expenses incurred under the categories of equipment, overhead and depreciation.

To meet the objectives of the model, this project followed a four-step approach:

First, understand the operating mechanics of a call center and create a model that captures them. Once the call center’s operating mechanics have been modeled, define a productivity metric that conceives a hiring decision rule to then use this rule to generate a hiring stream.

Second, define the mechanisms by which the call center generates its revenue. With the defined mechanisms in place, calculate the revenue stream.

Third, recognize that a call center is a business in which human capital expenses are the main cost driver. With this recognition, calculate the human capital expenses and other related costs.

Fourth, identify the calculated streams that impact the call center’s financial statements. Once these streams are identified, construct the financial statements.

The described first step is captured in the ‘Hiring worksheet’. This worksheet first calculates the sales force’s available time to answer the phone by taking into consideration the length of a working shift, the number of working days in a month, the percentage of the sales agent’s time that is spent in meetings and trainings, and the number of days in a month that a sales agent is out of the office. Then, the worksheet calculates the required sales agents’ ‘on the phone’ time by taking into consideration the customer base, the monthly call volume and the average length of a phone call (this is equivalent to the total time customers are talking to an agent on the phone). After this calculation, the worksheet compares the available time to answer the phone with the required ‘on the phone’ time and calculates the occupancy ratio (selected productivity metric). Finally, the worksheet constructs a hiring stream of temporal and stock sales agents such that on any given month the occupancy ratio does not fall below a specified occupancy target. Notice that in the presented model, stock agents are higher forever, while temporal agents are only hired for the required month.

NOTE: An occupancy ratio of 100% is neither possible nor desirable. A 100% occupancy ratio means that all the sales agents are talking to customers 100% of the time. Therefore, if a high percentage of the incoming calls happen at the same time, the sales agents won’t be able to cope and calls would be dropped. In call centers, the occupancy ratio is usually in the order of 80%.

The second step is captured in the ‘Revenues’ worksheet. The worksheet calculates the call center’s revenues by calculating the call center’s sales volume in dollars and then applying a commission percentage. The model assumes that all the revenues are generated by sales commissions. The worksheet calculates the sales volume by taking into consideration two kinds of sales: product sales and product upgrade sales. Since the modeled call center is a telemarketing call center, it is assumed that all the incoming calls result in a product sale. On the other hand, a product upgrade sale is not guaranteed. Product upgrade sales are modeled using an average success rate. This success rate is captured by a parameter for temporal agents, another parameter for the initial stock agents, and by a learning curve for new stock agent hires.

The third step is captured in the ‘Expenses’ worksheet. The worksheet first calculates the total compensation expense by computing the sales agent’s total worked time and multiplying this time by the hourly wage. Then, based on the current inventory and the hiring stream, the worksheet calculates the number of equipment sets needed to be purchased and the purchasing costs. After this calculation, the worksheet calculates the total overhead cost by applying a multiplier to the total compensation expense. In other words, the model assumes that overhead costs are directly proportional to the total compensation expense. Finally, the worksheet computes the depreciation expense of the newly bought equipment assuming linear depreciation and that the initial equipment has been fully depreciated.

The fourth step is captured by the ‘Financial Statement’ worksheet. This worksheet first calculates the call center’s cash flow by finding the difference of incoming and outgoing cash flows. The model assumes that all revenues are generated in cash and that all expenditures are cash payments. Then the worksheet calculates the call center’s net income following standard financial accounting procedures and a parameterized corporate tax rate. Finally, the worksheet computes the call center’s net change in assets based on equipment purchases and their associated depreciation.

1. **Descriptions of scenarios**

As mentioned in the previous section, the goal of the model and the scenario based case study is to optimize the hiring decisions in a call center and show the impact of the decisions on revenues, expenses and profits depending on the market in which the call center operates. The premise of the study is that the hiring decisions should be influenced by external conditions and internal initiatives. External conditions include the customer base growth and the seasonality of incoming calls. Internal initiatives affect the learning curve of sales agents (e.g. modified through training), the occupancy ratio (e.g. modified through policy) and the average call length (e.g. modified through phone handling protocols). Additionally, the hiring decisions should also be affected by the initial number of stock sales agents.

In order to expose and understand these dependencies the following two scenarios have been modeled:

*Scenario 1*: This scenario considers a call center operating in an environment characterized by a slow customer growth and low business seasonality. Internally, in this call center the target occupancy ratio is moderate, the average length of phone calls is fairly long, and the learning curve of newly hired sales agents in fairly shallow.

*Scenario 2*: This scenario considers a call center operating in an environment characterized by a fast customer growth and high business seasonality. Internally, in this call center the target occupancy ratio is aggressive, the average length of phone calls is fairly short, and the learning curve of newly hired sales agents in fairly steep.

As it can be observed, the two scenarios are vastly different. The call center of the first scenario could be called a ‘conservative’ call center. It tries to shy away from markets that are very volatile and growing rapidly. Additionally, this call center does not push its staff very hard since (occupancy ratio is low and phone call lengths are long). The call center of the second scenario is the total opposite of the call center in the first scenario. This call center does business in a highly volatile and fast growing market. Additionally, this call center pushes its staff fairly hard (occupancy ratio is high and phone call lengths are short).

1. **Conclusions of the study**

Comparing the two scenarios led to some interesting conclusions. The model exposed that there is a substantial relationship between the required hiring needs of a call center and the environment in which it operates.

In the first scenario, the conservative call center is operating in a fairly stable environment (little monthly seasonality and small customer growth). As a result, its required work force does not vary much over the course of the year. Looking at the hiring output stream, the call center only hired one stock agent in the entire year and only used nine temporal agents to cope with the small peaks in customer call volume. If this call center were to push its staff a bit harder by either raising the target occupancy to 10%, or reducing the average call length by one minute, then the need to recruit temporal agents vanishes. Additionally, in this scenario the occupancy ratio is fairly stable over the course of the year, never dropping below 46%.

In the second scenario, the aggressive call center is operating in a fairly volatile environment (high monthly seasonality and high customer growth). As a result the monthly required workforce required varies wildly over the course of the year. The output hiring streams indicates that most of the volatility in the customer call volume is handled by the temporal sales agents. Over the year, the call center employed 311 temporal agents and hired 22 stock agents. Unlike the first scenario, in the second scenario, the occupancy ratio varies wildly over the year, even dropping to 0% in the month of March.

Regarding profits and revenues, for both scenarios the main levers are the initial number of stock sales agents, the target occupancy and the average call length in minutes. In a call center, there is always the tradeoff between hiring more stock agents at a higher compensation rate and hiring temporal agents at a lower compensation rate. Stock Agents, who are kept forever, create larger expenses than temporal agents, who are kept for one month, due to the stock agent’s higher compensation rate. This is especially true in the months that the occupancy ratio falls below the target and no temporal agents are needed. On the other hand, stock sales agents are also more successful at selling product upgrades than temporal agents; therefore, they create more revenue. As a result, it can be expected that there is a local maxima in the total profit generated, since keeping too many stock agents incurs excessive human capital costs and too little incurs excessive opportunity costs (the loss selling product upgrades). For the call center in the first scenario the profit maximum occurs when the number of initial sales agents is 21. Therefore, at 55 initial stock agents, the call center is overstaffed. For the call center in the second scenario, the profit maximum occurs when the number of initial sales agents is 14. Therefore, at 30 initial stock agents, the call center is also overstaffed.

Increasing the target occupancy and reducing the average phone call length is analogous to increasing the productivity of sales agent workforce. In other words, less sales agents can answer the same call volume in a given month. Therefore, increasing the target occupancy and reducing the average phone call length, reduces the required sales workforce and reduces the human capital expense. This fact is true in both scenarios and holds under any external conditions.

After analyzing both scenarios, we can draw the following conclusions:

1. In stable environments, a call center’s hiring needs are fairly small. Most of the phone call volume is handled by stock agents.
2. In volatile environments, a call center’s hiring needs are fairly high. Most of the phone call volume is handled by temporal agents.
3. There is an optimum mix of stock agents and temporal agents that maximizes profits. This mix is dictated by external factors like sales volume and customer growth, and internal factors like the learning curve of newly hired stock agents.
4. Regardless of the external conditions and workforce composition, a higher occupancy rate and lower phone call lengths increase productivity and lower expenses.
5. **Budget and schedule performance**

Completing the project required more effort than initially anticipated. This was due to my personal choice of working in a team of one and my belief that all the tasks associated with the project would go fairly smoothly. The latter turned out to be quite untrue and several difficulties arose at various stages of the development. These difficulties are described in section 5 along with the valuable lessons I learned from them.

The tables below compare the proposed budget and proposed schedule to the actual ones:

*Budget:*

|  |  |  |
| --- | --- | --- |
| Phase | Planned Cost (in hours) | Actual Cost (in hours) |
| PlanningProblem definitionProject schedule  |  41 |  41 |
| Modeling Model Implementation | 20 |  24 |
| DocumentsCourse Project ProposalMid-point Status ReportFinal ReportUser GuideReference Guide | 63855 |  631046  |
| ExecutionScenario SelectionScenario Analysis | 14 |  13 |
| Total | 57 | 62 |

*Schedule:*

|  |  |  |
| --- | --- | --- |
| Milestone | Proposed Completion Date | Actual Completion Date |
| Submit Course Project Proposal | 10/05/2011 | 10/5/2011 |
| Submit Mid-point Status Report | 10/26/2011 | 10/26/2011 |
| Start Model planning | 10/29/2011 | 11/12/2010 |
| Begin Excel Work | 11/5/2011 | 11/19/2010 |
| Model Completion | 11/19/2011 | 12/4/2011 |
| Model Verification | 11/23/2011 | 12/7/2011 |
| Scenario Generation | 11/26/2011 | 12/9/2011 |
| User Guide, and Reference Guide | 12/03/2011 | 12/11/2012 |
| Final Report | 12/11/2011 | 12/13/2011 |
| Submit User Guide, Reference Guide, and Final Report | 12/14/2011 | 12/14/2011 |

As the tables above show, the project exceeded the planned budget and deviated from the proposed schedule. Regarding the budgeted time, I underestimated how long it was going to take to implement the model and write the associated documentation. When I wrote the proposal, I had a lot of ideas that I thought were good and valuable to the model. During the implementation of these ideas though, I found out that several of them were difficult to implement and were not compatible with each other (i.e. either one or the other could be implemented but not both). As a result, in several occasions during the Excel writing phase, I had to stop to re-think where the model was going and make hard decisions on what should and should not be implemented. These stops were not budgeted and increased the model implementation time. Documentation time (guides and final report) was extended mainly due to the complexity of the designed model and the desire to make the documentation exhaustive.

The project deviated from the proposed schedule mainly due a late start. Even though the project planning was supposed to start on October 29th, it actually started on November 12th, two weeks late. This two-week delay was carried forward through the rest of the project, reducing the time allotted to writing the documentation.

1. **Lessons learned**

In the course of developing the CCenter model, I encountered several problems and learned the following lessons while facing them:

1. *Choose an appropriate problem to be modeled:*

When selecting the business to be modeled, select one that is appropriate to you considering factors such as your interests, business contexts that you happen to know a lot about or that you might want to learn more about.

For this project, I decided to model a call center given that I thought the business components could exploit the functions and structures learned in class. The problem is that I have no actual knowledge about call centers nor I see myself managing one. As a result, in many instances, I had to invest time researching the business components of a call center rather than applying my knowledge, which resulted in a less enjoyable experience.

If I were to do the project again, I would do a model on a business that I am either starting or would like to start. For example, I am currently considering starting a small online business that sells do-it-yourself (DIY) electronic kits for audio projects. Doing a feasibility model for this business would have been rewarding at a personal level.

1. *Plan your model ahead of time:*

When writing your proposal, make sure you understand the problem 100% and think very carefully what exactly you want to model and how you are planning to model it. This is especially true if you are working on your own.

After having a rough idea of how a call center works, I got plenty of ideas on how to do the call center model. Some of these ideas were pretty good and others not so much. Since I was doing the project on my own, I did not have a reality check from teammates, so I wrote my proposal with all the ideas I had in mind at that point in time.

The problem became apparent when I started working on the Excel portion of the model. Some of the core ideas that I had early on proved to be very difficult to implement, or simply could not be implemented. For example, the idea of using a learning curve in the model seemed to be an excellent one at the beginning, but turned out to be much more difficult than expected. Some of the questions that came up while implementing a learning curve were: How do you apply the learning curve to sales agents? What exactly does the learning curve apply to: reduction in call lengths, success in pushing a product, higher productivity? I did not think of any of these questions while writing the project proposal and had to resolve them as I was crafting the model.

While in the end I managed to sort out all the complications caused by lack of planning during the proposal phase, having more foresight would have saved me a lot of headaches in the middle and final stages of the development.

1. *Begin early, plan your time, and stick to your schedule:*

After writing the proposal and the mid-point status report, make sure to stick to the proposed schedule. If you deviate from the original plan, re-craft the schedule into one that you think you can meet.

During the proposal phase, I crafted a schedule to do the project that seemed very reasonable. At the midpoint status, this schedule was adjusted a little bit to accommodate some new ideas. The problem was that after the midpoint status report was handed in, the schedule was not checked ever again.

Around the time of the project mid-point status report, my available time during the week was limited given additional responsibilities at work. As a result, I could only spend time on the weekends working on the course’s assignments. Since the homework assignments were due before the project, they were given higher priority and any project work was casted aside.

If I were to do the project again, I would insert ‘project time’ to my daily schedule and devote that time to working on the project. Additionally, in the weekends in which the homework assignments were particularly easy, I would devote substantial time to project work after finishing the homework assignment.

1. *The final reports are as time consuming as the project*

After finishing your model, consider starting the final report, user guide and reference guide right away. These documents take a substantial amount of time to write.

I worked on the excel portion of the project until the week before the project was due and only had one week to finish the project’s final report and guides. As a result, I had to cram the writing of all three documents into one week, where most of the writing happened over the weekend. This left very little time to thoroughly proofread the reports and review again the model itself.

Besides not leaving the final reports to the very end, if I were to do the project again, I would create a project checklist. Using a checklist would minimize the time needed to proofread the model since it exactly tells you what to look for.

1. *If you think your time commitment is going to be affected for external reasons, consider having teammates*

The course project is a lot of work, so if you think that you will not be able to do a good job working on your own given your time constraints, consider having teammates. Spreading the work load among teammates should ease up completing the project in a timely fashion. However, note that having teammates implies having meetings.

In my previous class, I did my final project in a team of five. Working on a large team proved to be a challenging ordeal, so for this class, I decided to work on my own. While this should not have been a problem under ideal conditions (i.e. choosing the right problem to be modeled, working normal hours at my job, and testing core ideas before committing to their implementation during the planning phase), having a project schedule considering ideal conditions is not realistic.

If I were to work alone in the project again, I would account for non-ideal conditions. If I were to work with teammates, I would take the necessary actions at the beginning of the project to prevent complications caused by working with other people.