**Project Name:** CCenter

**Sample Only**

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

1. **How the calculation works**

The CCenter model organizes its information in six worksheets (there is one additional worksheet called ‘Info’ that stores the name and version of the project and the Excel version in which the model was build). The ‘Inputs’ worksheet allows the user to assign values to the input parameters and streams used through the intermediate calculation worksheets (The ‘Inputs’ worksheet does not have any calculation). The ‘Hiring’, ‘Revenues’, ‘Expenses’ and ‘Financial Statements’ worksheets are called intermediate calculation worksheets because they calculate the values needed to obtain the outputs of the model. The ‘Outputs’ worksheet references the results already provided by the model in the intermediate calculation worksheets. The following describes how all the calculations work:

*Hiring Worksheet: Calculates the output streams Temporal Agents Hires, Stock Agent Hires, Total Temporal Agents Used, and Occupancy. Also, it provides as input streams to other worksheets the streams named Total Calls per Month, Stock Agent Workforce, Initial Stock Agent Workforce, New Hire Stock Agent Workforce, Temporal Agent Workforce, and Total Workforce.*

To calculate the stream Stock Agent Total Effective Hours Worked ({=AgentEffective HoursWorked\*StockAgents}), the model considers that the number of stock agents increases at the same rate as the customer base (StockAgents) and that stock agents’ effective time answering phone calls is impacted by their shift hours, out-of-office time and shrinkage (AgentEffectiveHoursWorked).

To calculate the stream Total Call Time per Month in Hours ({=TotalCallsperMonth \*Inputs!AverageCallLengthInMinutes/60}), the model uses the input Average Call Length In Minutes to obtain the equivalent in hours, and the inputs Customer Base, Customer Base Percentage Increase, and Average Number of Calls Per Customer to calculate the number of phone calls per month (TotalCallsperMonth).

The stream Occupancy Gap ({=Inputs!TargetOccupancy-OccupancyWithStockAgents}) is calculated as the difference between the defined input Target Occupancy and the current occupancy of stock agents (OccupancyWithStockAgents). The occupancy of stock agents is calculated by dividing total call time per month in hours by the effective hours stock agents work ({=TotalCallTimeperMonthinHours/StockAgentTotalEffective HoursWorked}).

The output stream Temporal Agent Hires is calculated considering the effective hours required to cover the identified occupancy gap in hours (ExtraEffectiveHoursRequired), shrinkage, and the shift hour per month.

The output stream Stock Agent Hires is calculated as the running difference of the actual number of stock agents that result from the need to increase this group at the same rate as the customer base.

The output parameter Total Temporal Agents Used is calculated by adding each value of the output stream Temporal Agent Hires.

The output parameter Total Stock Agents Hired is calculated by adding each value of the output stream Stock Agent Hires.

The output stream Occupancy is calculated as the rate between the total call time per month in hours and the total workforce effective hours worked ({=TotalCallTimeper MonthinHours/(StockAgentTotalEffectiveHoursWorked+ExtraEffectiveHoursRequired)}). This output represents the actual occupancy of the workforce; by design, the values per month will always be lower than or equal to the target occupancy.

*Revenues Worksheet: Does not calculate a direct output, but provides as input stream to the Financial Statements Worksheet the stream named Generated Sales Commissions.*

First, the model calculates the number of phone calls answered by each agent group: Calls Answered by Initial Stock Agents ({=TotalIncomingCalls/Hiring!TotalWorkforce \*Hiring!InitialStockAgentWorkforce}), Calls Answered by New Hire Stock Agents ({=TotalIncomingCalls/Hiring!TotalWorkforce\*Hiring!NewHireStockAgentWorkforce}), and Calls Answered by Temporal Agents ({=TotalIncomingCalls/Hiring!TotalWorkforce \*Hiring!TemporalAgentWorkforce}).

Second, the model calculates the stream Average New Stock Agent Success Rate of selling a product upgrade per month. This is done by adding the success rate of all the new stock agent hires ({=CONVOLVE(Hiring!StockAgentHires,Inputs!LearningCurve)}) and then dividing this calculation by the number of new stock agent hires.

Third, the model calculates the number of phone calls with and without upgrades considering the corresponding average success rate by each agent group. Total Calls with Product Upgrades adds the results of Initial Stock Agents Upgrades ({=Calls AnsweredbyInitialStockAgents\*Inputs!SteadyStateProductUpgradeSuccessRate}), New Hire Stock Agent Upgrades ({=CallsAnsweredbyNewHireStockAgents\*AverageNewStock Agent SuccessRate }), and Temporal Agents Upgrades ({=CallsAnsweredbyTemporal Agents\*Inputs!TemporalProductUpgradeSuccessRate }). The stream Total Calls without Product Upgrades is calculated as the difference between Total Incoming Calls and Total Calls with Product Upgrades ({=TotalIncomingCalls-TotalCallsWithProductUpgrades}).

Finally, the model calculates the stream Generated Sales Commissions by applying the percentage sales commission to the Total Sales Base ({=TotalSalesBase\*Inputs! SalesCommision}). To calculate the Total Sales Base, the model adds the sales generated by calls with and without product upgrades ({=TotalCallsWithoutProduct Upgrades\*Inputs!AverageProductPrice+TotalCallsWithProductUpgrades\*Inputs!Average ProductPrice\*(1+Inputs!UpgradePriceIncrease)}).

*Expenses Worksheet: Calculates the output stream Equipment Sets to be Purchased. Also, it provides as input streams to the Financial Statements Worksheet the streams named Depreciation Expense, Operating Expense, Capital Expenditure, and Total Expenditure.*

The output stream Equipment Sets to be Purchased is calculated as the difference between the total equipment needed (this stream equals the total workforce of the call center each month) and the equipment sets in inventory (the first month equals the defined input Initial Sales Agent Equipment Sets and each subsequent month equals new number of equipment sets in inventory considering the purchases of the previous month). Once the number of equipment sets to be purchased is calculated, the total equipment cost (in the case of this model, also equivalent to the Capital Expenditure) is obtained by tallying the individual costs of each component in an equipment set and then adding all the individual costs. The monthly individual costs of the elements in an equipment set are calculated by matrix multiplying equipment sets to be purchased with the equipment costs input rage ({=MMULT(Inputs!EquipmentCost, EquipmentSetstobePurchased)}).

The stream Depreciation Expense is calculated by convolving the monthly depreciation base, which is the reciprocal of the depreciation term in months, with the total equipment cost per month ({=CONVOLVE(TotalEquipmentCost,DepreciationBase)}). By using convolve, the calculation takes into account when the equipment was purchased. The model assumes that all pieces of equipment are depreciated over the same term.

The stream Operating Expense is the sum of the compensation expense stream and the overhead expense stream. The compensation expense is calculated by adding the monthly wages of the stock sales agents and the temporal agents ({=StockAgents Wages+TemporalAgentsWages}). The overhead expense is computed as a percentage of the compensation expense since the model assumes that human capital is the main cost driver ({=TotalCompensationExpense\*Inputs!OverheadasaPercentageofMonthly Compensation}).

The stream Total Expenditure is the sum of the capital expenditure and operating expense ({=TotalCompensationExpense+TotalEquipmentCost+TotalOverheadCost}).

*Financial Statement Worksheet: Calculates the output streams Net Cash Flow, Net Income and Net Change in Assets.*

The output stream Net Cash Flow is calculated as the difference between the incoming cash flow and the outgoing cash flow. The incoming cash flow is the Generated Sales Commission calculated in the ‘Revenue' worksheet, and the outgoing cash flow is the Total Expenditure calculated in the ‘Expenses’ worksheet.

The output stream Net Income is calculated by subtracting the different expenses incurred from the Operating Revenue stream. Operating Revenue is the Generated Sales Commission stream calculated in the ‘Revenue' worksheet. The Operating Expense and Depreciation expense were calculated in the ‘Expenses’ worksheet. The Tax Expense is calculated by multiplying the input parameter Corporate Tax Rate with the Operating Income if the operating income is positive ({=IF(OperatingIncome>0,OperatingIncome\*Inputs! CorporateTaxRate,0) }). Operating Income is an intermediate stream used to calculate the tax expense, and it is calculated by subtracting Operating Expense and Depreciation Expense from Operating Revenue ({=OperatingRevenue-Operating ExpenseDepreciation Expense}).

The output stream Net Change in Assets is calculated as the difference between capital expenditure and depreciation expense ({=Expenses!CapitalExpenditure-Expenses!DepreciationExpense}).

*Outputs Worksheet: Summarizes the output streams generated in the intermediate calculation worksheets.*

This worksheet displays the following streams: Occupancy, Total Temporal Agents Used, Total Stock Agents Hired, Temporal Agent Hires, Stock Agent Hires, Equipment Sets to be Purchased, Net Cash Flow, Net Income and Net Change in Assets. It also displays the output parameter Total Temporal Agents Used. This worksheet does not contain any calculations since all of these streams and parameters have been calculated in the intermediate calculation worksheets.

1. **How to locate all inputs, outputs, and intermediate results**

The CCenter model is organized into an input worksheet, an output worksheet and intermediary calculation worksheets. All the input parameters and streams are located in the ‘Inputs’ worksheet and are classified using the following categories: employee section, customer section, sales section, inventory section, overhead expenses section, and financial section. Output parameters and streams are located in the ‘Outputs’ worksheet and are classified into the following sections: performance metrics, hiring requirements, purchasing requirements and financial data.

As described in the next section, all important intermediate results in the model are highlighted and named. Therefore, named ranges and parameters can be easily found using the name box in the tool bar. If further assistance is needed, named streams and parameters can be found using the ‘Name Manager’ under the formula tab in the Excel Ribbon (Office 2007+).

Finally, all the intermediary calculation worksheets have headings to improve the readability of the worksheet and help the reader easily find intermediate results.

1. **Guide to visual cues and naming conventions**

The CCenter model uses the following cell coloring convention:

Yellow: Denotes input parameters and streams that can be changed by the user. Only found on the ‘Inputs’ worksheet.

Green: Denotes input parameters and streams that can be changed by the user and have been selected to change a scenario. Only found on the ‘Inputs’ worksheet.

Light Blue: Denotes output streams and output parameters. Streams and parameters that are highlighted in light blue outside the ‘Output’ worksheet denote that they are referenced in the ‘Output’ worksheet.

Light Orange: Denotes named ranges that are called by other worksheets.

Pink: Denotes named parameters and ranges.

White: Denotes non-named streams.

Gray: Denotes titles.

Throughout the model, all the named rages are based on their heading names (highlighted in gray to the left of the parameter or stream) using camel case. Note that the stream Equipment Cost in the ‘Inputs’ worksheet is a vertical stream, so its heading is in the cell Inputs!E54.

Streams that require calculations in which the first value has a different formula are easily identified by a square around the first value.

1. **How to make changes**

In order to make changes to model, the following guidelines should be followed:

1. New input parameters and streams should be added to the ‘Inputs’ worksheet, named with local scope, and highlighted yellow if it can be modified by the user. Note that if the new input parameters and streams are for the creation of a scenario, they should be highlighted green. Finally, the new input parameters and streams should either be added under the existing categories or under a new category.
2. New output parameters and streams should be added to the ‘Outputs’ worksheet, named with local scope and highlighted in light blue. Also, the new output parameters and streams should be referencing parameters and streams calculated in an intermediate calculation worksheet (outputs should not be calculated in the ‘Output’ worksheet). The referenced parameters and streams should also be highlighted in light blue in their respective intermediate calculation worksheets. Finally, the new output parameters and streams should either be added under the existing categories or a new category.
3. Intermediate calculations can be added in either the existing or new intermediate calculation worksheets. While adding these new calculations, the visual cues described in section three should be implemented.

The current CCenter model can be expanded in several ways. The following are few ideas for expansion:

1. The model does not include a rewarding system. Usually, in call centers the sales agents are rewarded after achieving certain performance metrics. Such a rewarding system could be used to extend the model by expanding the workforce compensation calculation.
2. In the CCenter model, the productivity of an agent is only modeled by his success rate to push a product upgrade. In call centers productivity is also measured by the length of each phone call. Therefore, the current model could be extended by implementing an improvement or learning curve that shows how on average the duration of a phone call diminishes over time for new hires.
3. The current model treats all sales agents the same. In reality, sales agents can be ranked (e.g stellar, good, intermediate, and bad). The model could be expanded by taking this categorization into consideration when calculating the sales productivity.
4. The model does not consider the previous experience of a new hired stock agent (i.e. he or she could have been a recurring temporal agent at the call center). The previous experience of a new hired stock agent would affect his or her learning curve. As a result, the model could implement a calculation that dynamically creates the appropriate learning curve or curves based on the months of experience of the new hire.