



IT FOR ENERGY IN MICROFINANCE

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Introduction and Methodology

The questionnaire with 400 samples are made using randomised values. The questionnaire can be divided into two. One specifically for calculating the Tier Level and another for estimating the necessity of a loan. There are four sheets in the submitted excel as shown below:

Initial Selection of Questions	Loan Assessment Questionnaire	Questionnaire for Tier Calculat	Tier Calculation
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“Initial Selection of Questions” Tab

Here a list of around 54 questions were selected as part of the initial phase of the project.

“Loan Assessment Questionnaire” Tab

The questionnaire which is used to calculate the loan eligibility has the below questions and some has the weightage factor as shown below.

Sample Name	Weightage Factor
Do you have Generator	0.3
Daily Generator Use	
Do you have Battery and Storage Devices	0.3
Battery and Storage Device Capacity	
Have Solar Home System	0.3
Solar Home System Capacity	
Have Solar Lantern/Lighting system	0.1
Have Solar Lantern/Lighting system	

- Four questions(q1,q2,q3 and q4) are taken into consideration for calculating the loan eligibility and each of them is given a weightage(w1,w2,w3,w4).
- These four questions can have a value of 0 and 1(True or False)

Loan Eligibility Factor(LEF)

The Term “Loan Eligibility Factor”(LEF) is introduced to determine the aforementioned aspect

- $LEF = q1 * w1 + q2 * w2 + q3 * w3 + q4 * w4$
- The value of LEF ranges from 0 to 1.
- Lower the value, higher will be the loan eligibility

Logic behind LEF

- Can be indirectly used to assess the financial situation of the household
- Able to assess the current electrical accessibility
- Higher the value means, the household has enough provision for electricity even if the household is not connected to the national grid
- Lower value means there are less provisions for electrical access or grid.
- Hence, more will be the necessity of a loan for such households.

“Questionnaire for Tier Calculation” Tab

The questionnaire which is used to calculate the tier has the below questions:

Sample Name
Household connected to the national grid?
have got an electric/pre-paid meter?
Monthly Electricity Bill(Dollars)
Monthly Electricity Consumption(KWh)
Is the quality of electricity service the same all year?
Hours of electricity availability (in 24 hours)
Hours of electricity availability (During Evening)
No of Disruptions per week

Avg time of disruption(in minutes)
Have Voltage Fluctuations?
Fluctuations affecting the Devices?
Annual Household Income
Bill Paid to Utility?
Prepaid Card?
Paid to Authorized representatives?
Any Past accidents
Any Future Threats

- As per the requirement the tier has to be calculated for 7 attributes.
- Each colour represents the questions associated to a particular attribute
- Questions without any colour are generic and are not associated to any particular attributes.

“Tier Ranking” Tab

Here the tier ranking for each household is calculated using formulas and then the final tier ranking is calculated.

Assumptions

Reg:-Connection to the National GRID.

- The scenario considered includes households which are not connected to the national grid but are connected to private suppliers of electricity. This implies that they might have an electricity meter and they might be charged by the private agency.
- If they are connected to the national grid, then all the households must have an electricity meter and pays electricity bills.

Other Assumptions:

The index column of the data are identified by names. Each name of the person represents a household. Hence the word household has been used interchangeably with the name.

Main Parameters/Questions that Determine the Attributes

Monthly Electricity Bill

Logic Behind The Random Function

IF(B2>0,RANDBETWEEN(1,200)*.1*RANDBETWEEN(1,10),RANDBETWEEN(1,50)*RANDBETWEEN(0,1))

- B2>0 implies connected to the national grid which then implies that an electricity bill will be associated for such cases.
- *.1*RANDBETWEEN(1,10) implies that the most of the households belong to the lower spectrum of the society or tiers

- The households that are not connected to grid makes payment to private owners but the number of such households only constitute 50% of the total households that are not connected to the grid.
- Such households that are connected to private households tend to consume more electricity showing that rich households can afford such private parties.

Hours of daily usage

Logic Behind The Random Function

=IF((AND(B2>0, D2>100)),RANDBETWEEN(15,24),RANDBETWEEN(0,24))

- If connected to the national grid and the payment is more than 100 dollars, then they have a high electricity duration.
- However if there is no grid connection then the chances of electricity coverage can be from 0 to 24. Showing that it is very unreliable.
- The same formula is applied for the evening hours but in a lesser range.

Disruptions and Average Time of Disruption

Logic Behind The Random Function

=IF((AND(B2>0, D2>100)),RANDBETWEEN(0,7), RANDBETWEEN(3,30))

- If the household is connected to the grid and has an electricity bill greater than 100 dollars then the no of disruption is less due to the smaller upper limit in the random function
- For all the remaining households the random function has a broader range from 3 to 30 indicating that the no of disruptions will be more due to the lesser quality of the service provided.

=IF((AND(B2>0, D2>100)),RANDBETWEEN(0,15), RANDBETWEEN(10,30))

- The same logic applied for the no of disruption has been applied here. Households that are connected to the grid and has higher electricity bill have a lesser range of outage/disruption time.
- The remaining households that are not connected to the grid has a randomize function with a broader and higher range indicating lesser quality of the electric services.

Voltage Fluctuations

Logic Behind The Random Function

IF((AND(B2>0, D2>100)),RANDBETWEEN(0,1)*RANDBETWEEN(0,1),IF(D2=0,0,RANDBETWEEN(0,1)))

- For all the households with National Grid connectivity and Monthly electricity bill greater than 100, the probability of voltage fluctuations is .25
- For all the households without grid connectivity but pays an electricity bill to a private entity has more chances of voltage fluctuation and the probability is .5

Voltage Fluctuations affecting the Device

IF(K2=0,0,IF((AND(B2>0, D2>100)),RANDBETWEEN(0,1)*RANDBETWEEN(0,1)*RANDBETWEEN(0,1),RANDBETWEEN(0,1)))

- All the devices in households without voltage fluctuations are not affected

- All the devices in households with voltage fluctuations but are connected to the national grid and pays an electricity bill of greater than 100 dollars per month are affected with a probability of 1/6. This implies that households paying higher electricity bills have superior quality of devices and hence they are not getting affected.

Annual Household Income

Logic Behind The Random Function

=IF((AND(B2>0, D2>100)), D2/5*100*12*0.1*RANDBETWEEN(10,30), IF(D2=0, RANDBETWEEN(300,500),D2/5*100*12*0.1*RANDBETWEEN(1,10)))

- If the household is connected to the grid and the monthly bill is more than 100 dollars, then all the households come under the Tier 3,4 and 5 Category. The electricity bill in such cases are just between 1.67% and 5% of the annual household income.
- All the households that doesn't pay an electricity bill has an income between 300 and 500 dollars annually.
- The electricity bill of the remaining households (that are either connected to the grid or to private entities) are between 5 and 50% of the annual household income.

Bill payed to Utility and Prepaid Card

- =IF(B2>0, RANDBETWEEN(0,1),0)
- =IF((AND(B2>0, N2<1)),1,0)
- This implies that all the households that are connected to the grid either pays electricity bill to the Utility or through the Prepaid Card but not both

Paid to Authorized representatives

- =IF((OR(O2>0, N2>0)),0,IF(D2>0,1,0))
- Households that are not connected to the grid and doesn't have an electricity bill are not using any of the aforementioned paying methods. But those that are not connected to the grid and has an electricity bill makes payment to the authorized representatives.

Past Accidents and Future Threats

Logic Behind The Random Function

Assumption: - Here households that doesn't have any electric facility might have also had an accident due to other alternatives like Kerosene Lamp, Candle etc

PAST ACCIDNETS RANDOM FUNCTION

=IF((AND(B2>0, D2>100)),0,RANDBETWEEN(0,1)*RANDBETWEEN(0,1))

FUTURE THREATS RANDOM FUCTION

=IF((AND(B2>0, D2>100)),0,RANDBETWEEN(0,1))

- All households that are connected to the grid and pays and electricity bill greater than 100 has no past accidents and has no future risks
- 25% of the remaining households (- not connected to the grid or pays an electricity bill less than 100) had a past accident
- 50% of the remaining households (- not connected to the grid or pays an electricity bill less than 100) are in risk of a future threat.