**Decision Tables \***

*Example scenario: “A marketing company wishes to construct a decision table to decide how to treat clients according to three characteristics: Gender, City Dweller, and age group: A (under 30), B (between 30 and 60), C (over 60). The company has four products (W, X, Y and Z) to test market. Product W will appeal to female city dwellers. Product X will appeal to young females. Product Y will appeal to Male middle aged shoppers who do not live in cities. Product Z will appeal to all but older females.”*

Decision tables are used to model complicated programming logic. They can make it easy to see that all possible combinations of conditions have been considered; when conditions are missed, it is easy to see this. The tables are composed of 4 parts: conditions, actions, condition alternatives (each column is a rule), and actions for the rules.

The process used to create a decision table is the following:

1. Identify conditions and their alternative values.
   * There are 3 conditions: gender, city dweller, and age group. Put these into table as 3 rows in upper left side.
   * Gender’s alternative values are: F and M.
   * City dweller’s alternative values are: Y and N
   * Age group’s alternative values are: A, B, and C
2. Compute max. number of rules.
   * Determine the product of number of alternative values for each condition.
   * 2 x 2 x 3 = 12.
   * Fill table on upper right side with one column for each unique combination of these alternative values. Label each column using increasing numbers 1-12 corresponding to the 12 rules. For example, the first column (rule 1) corresponds to F, Y, and A. Rule 2 corresponds to M, Y, and A. Rule 3 corresponds to F, N, and A. Rule 4 corresponds to M, N, and A. Rule 5 corresponds to F, Y, and B. Rule 6 corresponds to M, Y, and B and so on.
3. Identify possible actions
   * Market product W, X, Y, or Z. Put these into table as 4 rows in lower left side.
4. Define each of the actions to take given each rule.
   * For example, for rule 1 where it is F, Y, and A; we see from the above example scenario that products W, X, and Z will appeal. Therefore, we put an ‘X’ into the table’s intersection of column 1 and the rows that correspond to the actions: market product W, market product X, and market product Z.

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| Gender | F | M | F | M | F | M | F | M | F | M | F | M |
| City | Y | Y | N | N | Y | Y | N | N | Y | Y | N | N |
| Age | A | A | A | A | B | B | B | B | C | C | C | C |
| MarketW | X |  |  |  | X |  |  |  | X |  |  |  |
| MarketX | X |  | X |  |  |  |  |  |  |  |  |  |
| MarketY |  |  |  |  |  |  |  | X |  |  |  |  |
| MarketZ | X | X | X | X | X | X | X | X |  | X |  | X |

1. Verify that the actions given to each rule are correct.
2. Simplify the table.
   * Determine if there are rules (columns) that represent impossible situations. If so, remove those columns. There are no impossible situations in this example.
   * Determine if there are rules (columns) that have the same actions. If so, determine if these are rules that are identical except for one condition and for that one condition, all possible values of this condition are present in the rules in these columns. In the example scenario, columns 2, 4, 6, 7, 10, and 12 have the same action. Of these columns: 2, 6, and 10 are identical except for one condition: age group. The gender is M and they are city dwellers. The age group is A for rule 2, B for rule 6, and C for rule 10. Therefore, all possible values of condition ‘age group’ are present. For rules 2, 6, and 10; the age group is a “don’t care”. These 3 columns can be collapsed into one column and a hyphen is put into the age group location to signify that we don’t care what the value of the age group is, we will treat all male city dwellers the same: market product Z.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Gender | F | M | F | M | F | M | F | M | F | M |
| City | Y | Y | N | N | Y | N | N | Y | N | N |
| Age | A |  | A | A | B | B | B | C | C | C |
| MarketW | X |  |  |  | X |  |  | X |  |  |
| MarketX | X |  | X |  |  |  |  |  |  |  |
| MarketY |  |  |  |  |  |  | X |  |  |  |
| MarketZ | X | X | X | X | X | X | X |  |  | X |