Maximizing Court Time Utilization

Background

- Backlog and pendency of the cases is one of the main problems of the Indian legal system.
- One of the reason behind this is that there is no systematic scheduling of cases on a day to day basis. Because of this, it is seen that court's time is not being utilized efficiently.
- There is a need to come up with a data driven model that can help in proper scheduling of cases and therefore help in maximizing judicial time.

Objective/Problem Statement

- Maximizing court's time by analysing the historical data in terms of time taken at different stages for different case types.
- Input: Pending cases with a judge, Cases data with Time information.
- Output :
  - Which cases(Which type and stage cases) to be scheduled on a particular date, based on the pendency till that date ?
  - What is the maximum number of cases which can be assigned to a judge in a day?

Data

Time and Motion data for the cases are given, which contain following information:

- Date (dd-mm-yy)
- Case No. (Pre-populated from causelist)
- Case Type
- Party Name
- Advocate Name
- Stage(Pre-populated from cause list)
- Mapping (Derived stage)
- Start Time and Stop Time
- Total Time for the case

Steps of Data Exploration and Preparation

Extract the data from Excel

Transform the data: –

- *In Cleaning: Case No. (Pre-populated from causelist) & Stage (Pre-populated from causelist) has inappropriate values. I prepared mapping for the same. (For this I dropped duplicate values, and assign them in appropriate value)*
- *In Enriching: The judge's data (from time and motion data) was not in same format. I manipulated that data in a general format. In time column there were problem in stop time (where the value of stop time was 1:00 pm time output value was negative), I correct that values manually.*
- *In Filtering: I filtered one or two columns (Specially time column), because the information was not accurate.*

- *In Validating: There were so many invalid values present in data. Data entry errors, corrupted data e.g. In time column in place of ":" there is ";" or "."*
  I used trim and substitute functions in case type and stage type mapping for a unique value case and stage type.
- *Missing values treatment: I Identified patterns/reasons for missing and recode correctly. In Case No. column there were different kind of missing values e.g. some rows haven't case no while, some has only "no & year not type". I dropped empty rows and pass incomplete rows with correction in next step.*

Average Time on Case Type and Stage(Minutes)

This table contains the data about time for each case type and case stage.

This table can be derived from the raw table by aggregating the cases data at type and stage level and taking the average time spent on the cases. This table can be made by aggregating all judges cases data or only cases for a particular judge.

CASE TYPE/ STAGE	Accused Statement	ADR	Appearance	Arguments	Bail
A.A.	3	4	5	4	4
A.C.	4	4	2	5	5
AS	5	5	4	2	8
CRL.A.	2	8	5	4	4
CRL.Misc	1	6	2	5	5

Current Pending Cases Distribution(Count)

This table contains the data about count of cases for each case type and case stage.

This table can be derived from the raw table by aggregating the cases data at type and stage level for a particular judge.

CASE TYPE/ STAGE	Accused Statement	ADR	Appearance	Arguments	Bail
A.A.	30	0	5	4	4
A.C.	4	0	2	5	5
AS	5	0	4	20	80
CRL.A.	2	8	5	4	40
CRL.Misc	100	6	2	5	50

Solution Approach

We can formulate this problem as optimization problem, where:

- Objective function : Total Time spent on the cases for a Judge.
- Optimization Type : Maximization
- Constraints :
  - Total time for a Judge should not exceed 6 hours.(360 Minutes)
  - Case count will be integer values.
  - Also allocated cases cannot exceed the values of current pending cases for each case type and stage.
  - There can be other constraints on Case Types or Stage. Eg. Evidence, Final Arguments etc.

Other constraints

- A judge need to get atleast/atmost K no. of cases of type X.
- A judge need to get atleast/atmost K no. of cases of stage Y.
- A judge can get cases as per priority.

Case Allocation Table(Count)

- This is the table, we need to find using optimization.
- This table answers the question: How many cases of “X” type and “Y” stage can be allocated to the judge, so that the total time is maximized ?
- Solution of Optimization :

CASE TYPE/ STAGE	Accused Statement	ADR	Appearance	Arguments	Bail
A.A.	30	0	5	1	0
A.C.	0	0	0	5	5
AS	5	0	0	0	0
CRL.A.	0	0	5	0	0
CRL.Misc	0	6	0	5	16

Work in Progress

- This solution can be scaled to any number of judges.
- As and when Case is assigned/processed, data update should happen for the next day allocation.
- Currently, we find the count of cases to be allocated at Type and Stage level. Can be done at case number level also, where we define that , which case need to be heard today, for a particular judge. Needs to be done using “R”.